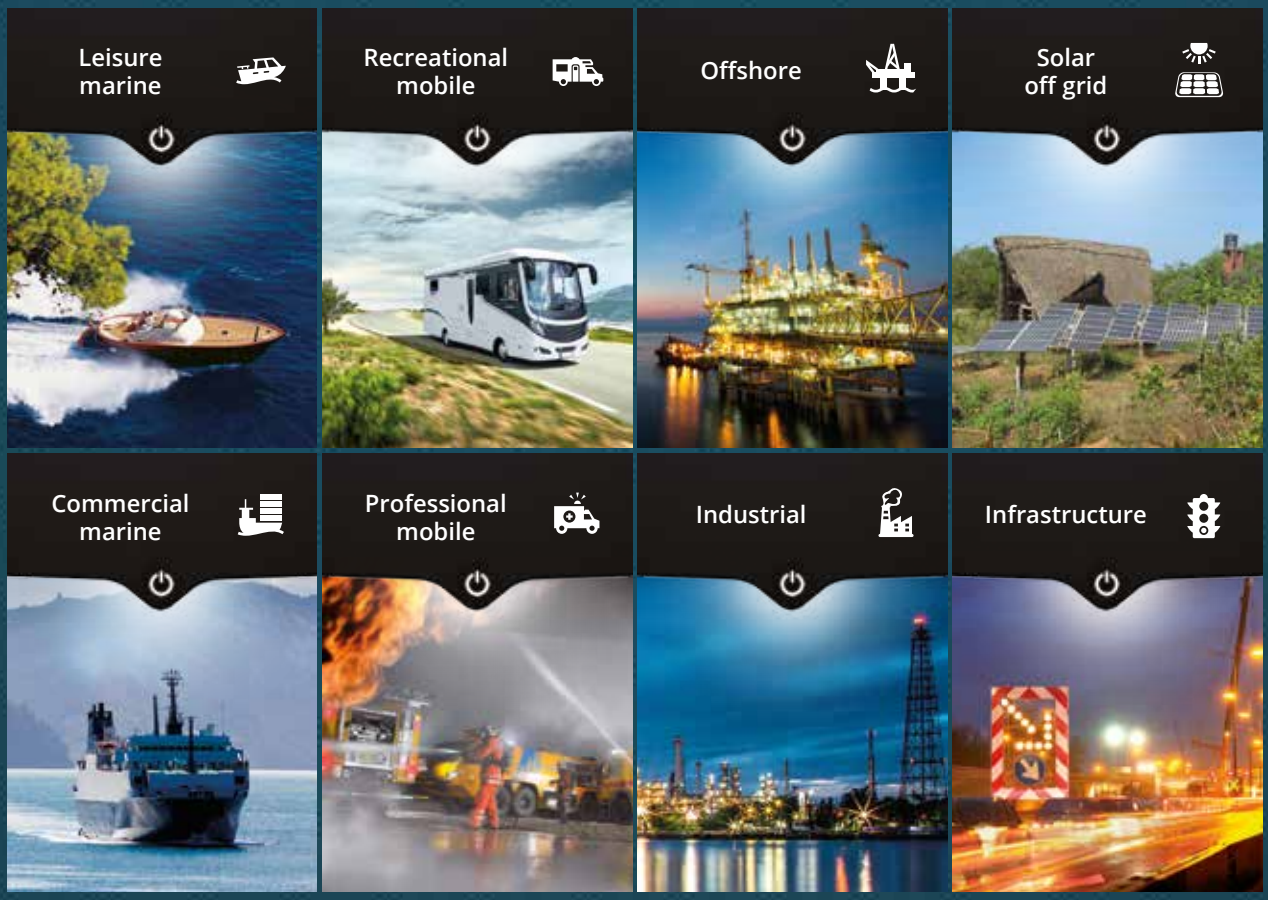
ENGLISH

THE POWER
TO BE INDEPENDENT

POWER BOOK 2019

MASTERVOLT
THE POWER TO BE INDEPENDENT

Core segments



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MASTERVOLT

THE POWER TO BE INDEPENDENT

MASTERVOLT'S MISSION

The power to be independent, by providing the world with meaningful energy solutions.

MASTERVOLT'S VISION

Mastervolt will enable people to be self-sufficient in their need for power, regardless their location. Through innovation and collaboration, we want to achieve a leading role in niches of our core markets by 2020. Supported by our specialisms in managing, monitoring, converting, and storing power we add value for our customers. We offer the best working environment for people who share our passion.

We invite you to browse through this Powerbook as inspiration and guidance to see what is possible in the realm of high performance electrical systems and technologies.

Great products and great service. The hallmark of Mastervolt.

Mastervolt stands for reliable and innovative autonomous power solutions. As specialists in the management, conversion and storage of electrical energy, we offer a comprehensive product portfolio with a power range from 300 W to 40 kWatt. Our electric solutions are widely used in demanding markets such as marine, mobile, off shore, industrial, autonomous solar and infrastructure.

Stronger together

Mastervolt is part of Power Products, LLC, which includes various leading brands within its Marine, Mobile & Industrial division. Ancor, BEP, Blue Sea Systems, CZone, Lenco, Marinco, Mastervolt and ProMariner provided innovative electrical solutions as independent companies for decades. Now these leading companies have come together to offer the broadest and most complete electrical product range for every conceivable application.

Breakthrough technology, optimum performance

Mastervolt has been a strong, innovation-driven company since its founding in 1991. Product development takes place in three highly sophisticated R&D centres, in Amsterdam (The Netherlands), Auckland (New Zealand) and Wisconsin (USA), where our engineers are continuously searching for new ways to connect breakthrough technology with optimum performance.

Superior service

This capacity to innovate is what truly sets Mastervolt apart. Our added value is to offer products, technologies and systems of the highest quality coupled with superior global service. The passion and commitment of our people make the difference.

We are Mastervolt.

The Power to be Independent.

Mastervolt is an ISO 9001 certified company.

Why Mastervolt?

The Mastervolt philosophy is based on six pillars:

Worldwide Network

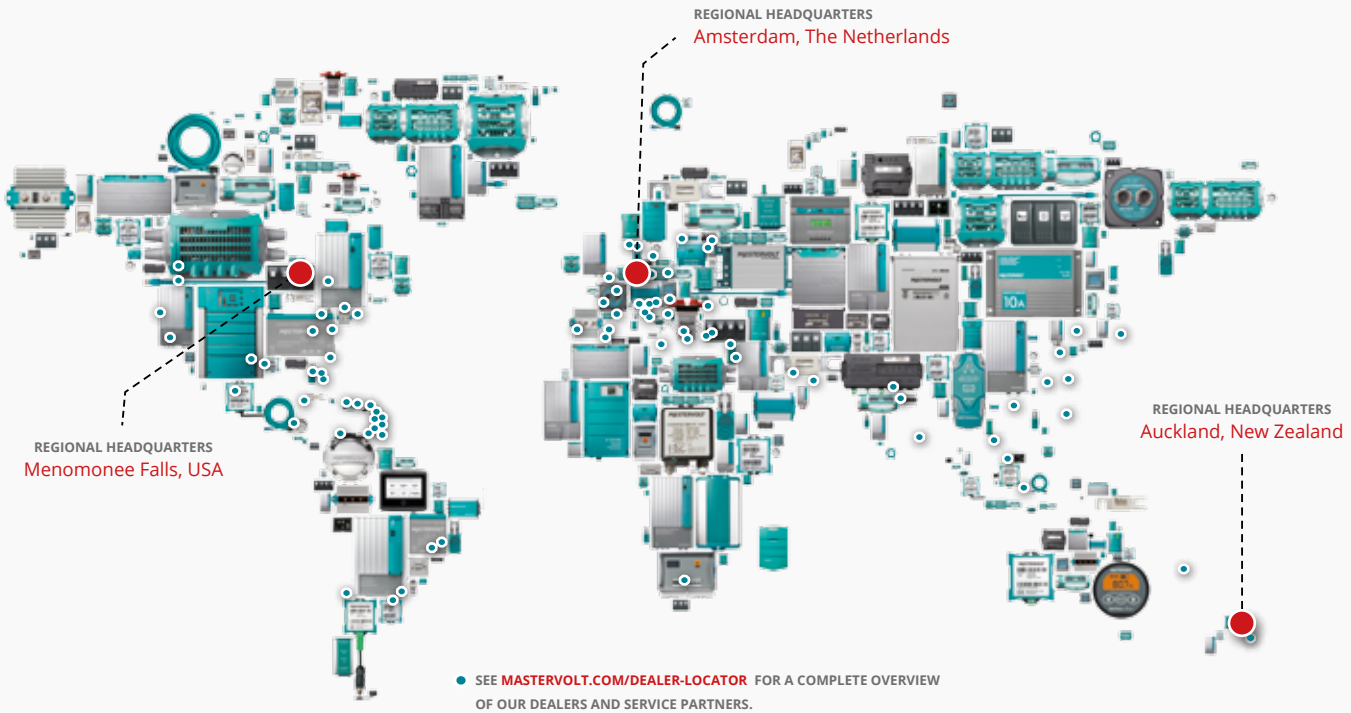
Top class expertise and support is available throughout the world's three geographical regions: the Americas, EMEA and APAC. With offices and partners in more than 80 countries, our customers know that wherever in the world they may be, we can deliver precise and fully tailored services without delay. All Mastervolt partners are members of our online professional community where they can apply for training, ask questions, find knowledge and discuss the latest product ideas and improvements. Together they provide an exceptional customer experience at all times.

Innovations

Breakthrough technology is in our DNA and Mastervolt's highly skilled engineers are responsible for translating tomorrow's technology into the ultimate performance today. Throughout the company Mastervolt embraces state-of-the-art technology to stay ahead of the curve. Employees are continuously looking for better ways to design, develop, test and improve new and existing products as well as ship them faster, offer better support and help our customers find the perfect solution.

System Solutions

Whatever the industry or application, Mastervolt is power solution focused, offering components that are designed to easily integrate into comprehensive systems. From DC battery power connected by quality wire to power conversion products designed for efficiency, from complete digital switching technologies to monitoring at the touch of a finger, Mastervolt provides the flexibility and customisable systems you desire for your applications.



- SEE **MASTERVOLT.COM/DEALER-LOCATOR** FOR A COMPLETE OVERVIEW OF OUR DEALERS AND SERVICE PARTNERS.

Integration

Success is achieved by cooperation. Systems are getting more complex every day, customer demand is increasing and (CAN) communication makes virtually all kinds of integration possible. As well as making these systems available, fully integrated and comprehensible, cooperating with partners allows us to help you get the most from your business opportunities. Together we can deliver a fully integrated system that works well and has all the relevant components.

Premium Brands

With the world's leading Marine brands under one roof we can offer a full range of products that fulfil every need. Mastervolt is constantly extending its offering by adding products that enable customers to build complete(r) systems and have these products available via one source. The one-stop-shop principle gives easy access to all our brands, enabling you to increase your share of wallet in any system.

Customer Focus

A globally oriented customer focus is an important pillar of Mastervolt's activities. So too is our commitment to responding to new market developments as it determines which markets we serve and how we position our company and products. We remind clients that they are investing in high-quality technology, advanced systems and superior support and service. Mastervolt is always working to expand its global A-brand reputation while using the solid knowledge of our markets and customers gained by research and analysis to lead us forward.

The leading power companies join forces

The expression 'The power to be independent' has never been more meaningful with the unmatched range of electrical products and system solutions that Ancor, BEP, Blue Sea Systems, CZone, Marinco, Mastervolt and ProMariner offer. Whether you are looking for an electrical component or full power electronic integrated system, we provide what you need.

ANCOR

For over 30 years, Ancor has been the industry leader for quality tinned copper Marine Grade™ wire and cable. Ancor's comprehensive product line includes wires and cables, terminals and connectors, wire management products, and hand tools. Ancor designs products to the highest standards that meet UL, ABYC, NMMA and USCG standards.

ancorproducts.com

BEP

BEP offers a varied range of battery switches, bus bars, fuses and fuse holders for safe and reliable operations within its Pro Installer series. BEP's innovative culture and engineering excellence is focused on simplifying the installation and optimizing the user experience with thoroughly tested products that will thrive in any harsh environment.

bepmarine.com

BLUE SEA SYSTEMS

Blue Sea Systems was founded to create innovative, high quality electrical products to improve the safety, simplicity, and reliability of boating. Now, the range of product has expanded to over 1,000 items and distributed to Marine, Industrial, RV and Specialty Vehicles markets. Products include battery switches, automatic charging relays, fuse blocks, busbars, meters, and power distribution panels.

bluesea.com

POWER PRODUCTS LLC

Mastervolt's parent company, Power Products LLC, aims to offer you a continuously growing portfolio of powerful brands. We are therefore constantly looking for new companies to strengthen our market position, and increase our range of electrical components and power management systems. If you are interested in our brands and latest acquisitions, go to ■ mastervolt.com/our-brands. You can also browse or download the catalogues of the various brands via this link.

CZONE

For 10 years, the groundbreaking Digital Switching technology from CZone has revolutionized the control and management of electrical systems on boats, RVs and emergency vehicles. CZone provides complete control and monitoring of all electrical circuits through dedicated touch screens, iPad, wireless remote, or through the screen of one of CZone's integration partners. CZone provides improved performance, safety, and reliability.

czone.net

MARINCO

Since 1972, Marinco power inlets and cords have set the industry standard. They are built to withstand the harshest marine environments. Marinco has continued to expand their product line to offer a complete range of shore power cords from 16 to 100 amps, as well as a broad range of cord adapters. Marinco is also a leading supplier of wipers, spotlights and horns to the marine industry.

marinco.com

ProMariner™

ProMariner™ was founded more than 35 years ago with one premise: to make boating more enjoyable. ProMariner pioneered a complete line of fully automatic on-board marine battery chargers, and continues to bring innovation to marine battery chargers today. The passion and dedication to quality is what has made ProMariner the market leader in on board marine battery chargers.

promariner.com

Get all the comforts of home with the most innovative battery chargers and inverters

Mastervolt's battery chargers and inverters are advanced, reliable and of excellent quality. Whether you wish to use a microwave, charge your stern thruster battery or use an entertainment system, Mastervolt equipment ensures you all the comforts of home.

BATTERY CHARGERS

Mastervolt battery chargers offer your batteries more capacity and a longer lifespan. They combine multiple functions in one device and charge batteries safely and fully, even when completely depleted.

14 MASS

Robust battery charger with integrated alarm functions and comprehensive certification.
The best choice for heavy professional and semi-professional applications.

RECOMMENDED FOR:

18 CHARGEMASTER

The ChargeMaster series is suitable for recreational and semi-professional use, and safely charges multiple battery banks at the same time.

The ChargeMaster Plus charges nearly every combination of three batteries in a fast and safe way, combining three battery chargers, a battery isolator and VSR in one compact device.

RECOMMENDED FOR:

26 EASYCHARGE

A starter model including the proven Mastervolt 3-step+ charge characteristic. Waterproof and robust battery charger, also available in a portable version.

RECOMMENDED FOR:

SINE WAVE INVERTERS

Mastervolt offers a complete range of pure sine wave inverters from 300 watts to 40 kilowatts for professional and recreational use.

30 MASS SINE

The Mass Sine Ultra, suitable for parallel and 3-phase configuration, is ideal for large installations.

The Mass Sine is designed for continuous use in the most extreme conditions.

RECOMMENDED FOR:

34 AC MASTER

Pure sine wave inverter with excellent price/quality ratio for recreational and semi-professional applications.

RECOMMENDED FOR:

Charge & Convert

INVERTER/CHARGER COMBINATIONS

Mastervolt Combis integrate a powerful battery charger, an efficient inverter and a versatile transfer system in one robust, lightweight and compact device.

42 MASS COMBI ULTRA MASS COMBI PRO

The Mass Combi Ultra is available in up to 3500 watts. Parallel or three-stage configuration enables capacities up to 35 kW. The Ultra model has a solar input and a secondary battery charger.

A 'Pro' model is available for professional use.

RECOMMENDED FOR:

46 MASS COMBI

Offers a high capacity for a very competitive price, charges two battery sets at once, and is available with analogue remote control or a digital MasterBus.

DC-DC CONVERTERS

The versatile Mastervolt converters ensure all your equipment has a stable feed with the right current.

50 MAC, MAGIC

The perfect choice for professional use, with low conversion losses, battery charger and dimming function.

The Mac Plus is also ideal for Euro 5/6 applications. Can be parallel switched for capacities over 100 amperes.

RECOMMENDED FOR:

56 DC MASTER

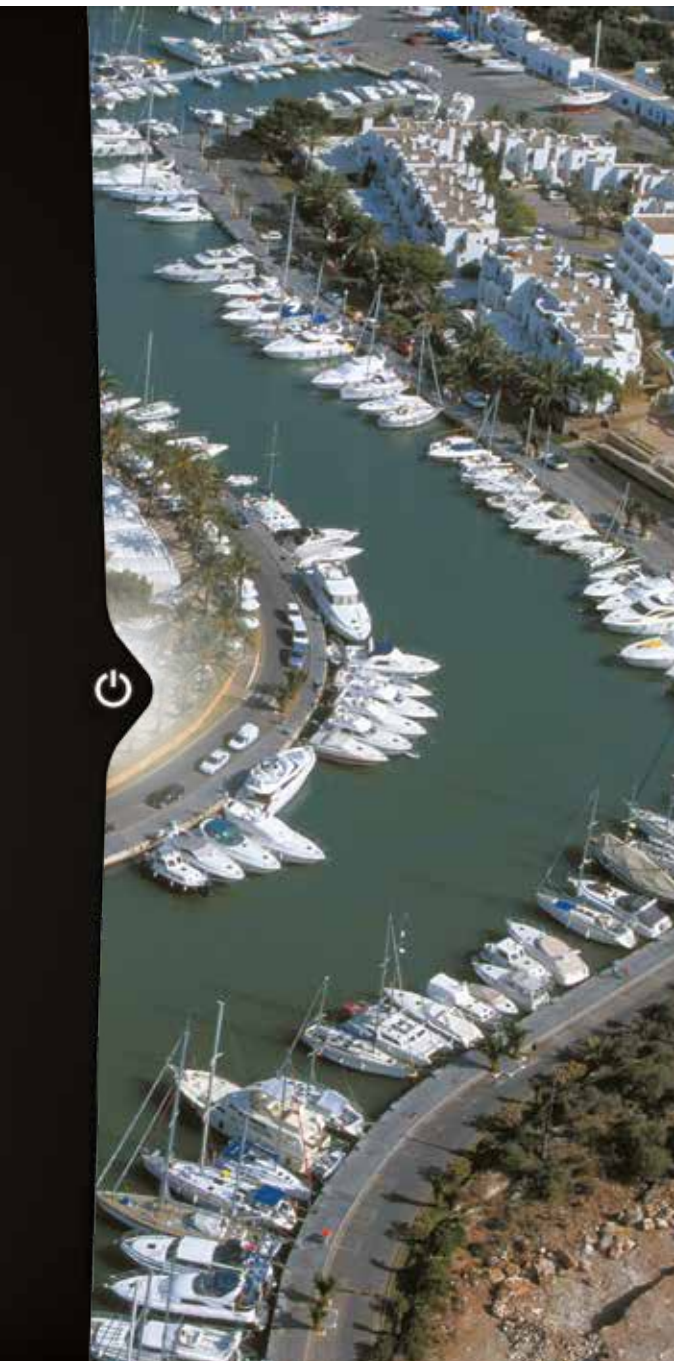
Converters with an excellent price/quality ratio, easy to install and highly suitable for recreational and semi-professional applications.

RECOMMENDED FOR:

Mastervolt Battery Chargers: A long life for your battery

We know how important it is to charge your batteries safely, reliably and quickly, even if the power supply is affected by low quality or limited availability. You also value batteries that have a long lifespan while maintaining their capacity. Mastervolt offers you the best possible solution.

The Mastervolt 3-step+ charging method ensures more power and a longer life for your batteries. Our battery chargers integrate multiple functions making sure your batteries are safely and completely charged, even when they are depleted. Fast battery charging is guaranteed by the efficient use of the available grid or generator power (all Mastervolt battery chargers have a power factor correction).



Which Mastervolt battery charger best meets your needs?

Mastervolt offers four ranges of battery chargers:

- **Mass**
  For the tougher tasks in professional and semi-professional situations. With its integrated alarm functions and various approvals, the Mass is the best choice for professionals.

- **ChargeMaster series**
  The ChargeMaster series is suitable for recreational and semi-professional use. It is easy to install and includes a detailed display and easy controls. The ChargeMaster safely charges multiple battery banks at the same time, anywhere in the world.

  The ChargeMaster Plus is a new generation of battery chargers that will replace the ChargeMaster in stages. The ChargeMaster Plus combines three battery chargers, a battery isolator and VSR in one compact device. This all-in-one solution can charge all batteries, even when you're on the go.

- **EasyCharge**
  Entry level model with proven Mastervolt 3-step+ charge characteristic, in a waterproof epoxy-filled, non-corrosive enclosure.

- **EasyCharge Portable**
  For people on the move, the portable version offers a rugged solution that can be used everywhere.

The best battery charger for every application

PROLONGED BATTERY LIFE

MULTI CHARGING

The ChargeMaster series can charge multiple battery banks at once. The Mass battery charger has one main outlet to optimally charge a battery bank. Both guarantee a long lifespan for your batteries, even with daily and intensive use. ChargeMaster Plus can smoothly charge a combination of multiple battery types, sizes and voltages. The intelligent built-in auxiliary power means that all Mastervolt battery chargers can also charge a completely discharged battery (< 8 V).

Charging Lithium Ion batteries

Mastervolt battery chargers can seamlessly charge Lithium Ion batteries as the Mastervolt battery chargers communicate directly with the Lithium Ion battery via the integrated MasterBus (or have been adapted to the required charging voltages).

Qualifications

All Mastervolt products comply with one or more of these approvals (see relevant product specifications for details). If the required qualification is not present, ask your account manager for an addition.

MASTER TIP

Choosing the right battery charger

Determine:

- How many battery banks do I want to charge?
- The battery charger must have the same voltage as the battery bank.
- Rule of thumb is that 25 % of the battery capacity as a charge capacity is sufficient to safely and quickly charge batteries while still supplying power to the consumers (for instance, a 50-amp battery charger is sufficient for a 200 Ah battery). Increase up to 50 % for Mastervolt Gel batteries and 100 % for Mastervolt Lithium Ion batteries for faster charging.

Mass Series:
The right choice for demanding conditions

Mass battery chargers are designed for the toughest conditions for professional, semi-professional and recreational purposes. Even under the most extreme conditions the products from the Mass series operate faultlessly, giving you round-the-clock output when necessary.

The sustainability and technologies that underpin the Mass concept have long been proven in practice. With an MTBF of 180,000 hours at full capacity and 24/7 use, the Mass products are ideal for the toughest tasks and any situation that requires a reliable power supply.

FEATURES

- Designed for the most difficult conditions.
- Lightweight, stainless steel, anodised aluminium casing.
- Coating of internal components prevents damage from damp or condensation to ensure a longer lifespan.
- Insensitive to electromagnetic effects from other devices.
- Suitable for every type of battery, also charges flat batteries.
- Delivered as standard with temperature sensor.
- Full power at temperatures of up to 45˚C.
- Load capacities from 80 to 1000 Ah or more.
- Stable and ripple free 24 and 48 V power supply, even without batteries.
- The Current Control function prevents the breakdown of fuses.
- Parallel switching possible using multiple battery chargers.
- Connections in accordance with CE, ABYC A-31 and IEC60945.
- Certified by RRR, RMRS, DNV (24/25, 24/50, 24/75, 24/100 models) and Germanische Lloyd, Lloyds (24/75, 24/100 models).

MASTERBUS COMPATIBLE

MasterBus Compatible

Mastervolt battery chargers can be easily connected to a MasterBus network with only one cable and one connection. You can also choose central, local or remote monitoring, configuration and control of your system.

Made tough by smart design

The certified Mass battery chargers are very strong, designed to withstand heavy vibrations and shocks. Their premium quality components meet the highest possible specifications, while the smart and extra robust mounting adds to the professional end result.

For professional use: GMDSS

Professional users will benefit from a front display with GMDSS alarm functions. GMDSS stands for Global Maritime Distress and Safety System, an internationally agreed-upon set of safety procedures, types of equipment, and communication protocols that is a requirement for the SOLAS (Safety Of Life At Sea) convention and uses DSC and satellite communication.
This front display is available for Mass 24/25-2 DNV, Mass 24/50-2, Mass 24/75, Mass 24/100 and Mass 24/100-3ph.

Specifications Mass battery chargers



	Mass 24/15-2	Mass 24/25-2	Mass 24/25-2 DNV	Mass 24/50-2
Product code	*40020156*	*40020256*	*40720266*	*40020506*
Product code 120 V				
GENERAL SPECIFICATIONS				
Nominal output voltage	24 V	24 V	24 V	24 V
Total charge current	15 A at 28.5 V	25 A at 28.5 V	25 A at 28.5 V	50 A at 28.5 V
Number of battery outlets	2	2	2	2
Charge current second output	3 A	3 A	3 A	3 A
Recommended battery capacity	30-150 Ah	50-250 Ah	50-250 Ah	100-500 Ah
Nominal input voltage	230 V (180-265 V) - 50/60 Hz	230 V (180-265 V) - 50/60 Hz	230 V (180-265 V) - 50/60 Hz	230 V (180-265 V) - 50/60 Hz
Power supply mode	yes	yes	yes	yes
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hxwxd	325 x 220 x 111 mm 12.8 x 8.7 x 4.4 inch	325 x 220 x 111 mm 12.8 x 8.7 x 4.4 inch	365 x 220 x 111 mm 14.4 x 8.7 x 4.4 inch	340 x 261 x 130 mm 13.4 x 10.3 x 5.1 inch
Weight	3.3 kg / 7.3 lb	3.3 kg / 7.3 lb	3,5 kg / 7.7 lb	4.6 kg / 10.1 lb
Approvals	CE, ABYC A-31, RRR, RMRS	CE, ABYC A-31, RRR, RMRS	CE, ABYC A-31, DNV, RRR, RMRS	CE, ABYC A-31, DNV, RRR, RMRS
TECHNICAL SPECIFICATIONS				
Charge characteristic *Charge characteristic can be set to your requirements. See page 242 for default settings.*	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion
Temperature sensor	yes (included)	yes (included)	yes (included)	yes (included)
DC voltage drop compensation	yes	yes	yes	yes
DC consumption	< 1 mA	< 1 mA	< 1 mA	< 1 mA
Full load consumption (230 V AC)	550 W	880 W	880 W	1800 W
Power factor control	> 0.95	> 0.95	> 0.95	> 0.95
Temperature range (ambient temp.)	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power
Cooling	vario fan	vario fan	vario fan	vario fan
Protection degree	IP23	IP23	IP23	IP23
Protections	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
MasterBus compatible	yes	yes	yes	yes
Charger Status Interface (alarm contact)	yes	yes	yes	yes

OPTIONS

	MasterView Read-out *77010050*	option	option	option	option
		Remote panel for reading the charge status of your battery charger, including error notifications.			
	EasyView 5 *77010310*	option	option	option	option
		Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.			
	MasterShunt *77020110*	option	option	option	option
		MasterBus integrated battery monitor, with detailed information on the status of your batteries for an optimised charging process, incl. voltage, current, remaining time and consumption capacity in percentage.			
	DC Distribution *77020200*	option	option	option	option
		Smallest distribution model available. It connects up to four DC devices to the DC groups, such as a battery charger, inverter, alternators and solar panels. With the included plug & play cable it can be easily connected to the MasterBus network.			
	MasterBus USB Interface *77030100*	option	option	option	option
		Communication port between MasterBus and the USB port of your PC; enables reading and configuration of your MasterBus system on the PC when combined with MasterAdjust software (free to download).			
MasterVision panels					
	C3-RS *70403040*	option	option	option	option
		Remote monitor for battery chargers, with a regulator for reducing grid power consumption.			
	GMDSS remote panel *70400050*	option	option	option	option
		Remote monitoring for Mass battery chargers, with GMDSS system monitoring functions. Battery voltage and current are displayed on the digital panel.			

				UPCOMING MODEL 		
	Mass 24/75	**Mass 24/100**	**Mass 24/100-3ph**	**Mass 24/75**	**Mass 48/25**	**Mass 48/50**
	40020756	*40021006*	*40031006*	*40120756*	*40040256*	*40040506*
	24 V	24 V	24 V	24 V	48 V	48 V
	75 A at 28.5 V	100 A at 28.5 V	100 A at 28.5 V	75 A at 28.5 V	25 A at 57 V	50 A at 57 V
	1	1	1	1	1	1
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	150-750 Ah	200-1000 Ah	200-1000 Ah	150-800 Ah	100-500 Ah	100-500 Ah
	230 V (180-265 V) - 50/60 Hz	230 V (180-265 V) - 50/60 Hz	3 x 400 V (365-550 V) - 50/60 Hz	120 V (90-130 V) - 60/50 Hz	230 V (180-265 V) - 50/60 Hz	230 V (180-265 V) - 50/60 Hz
	yes	yes	yes	yes	yes	yes
	LED display	LED display	LED display	LED display	LED display	LED display
	420 x 318 x 130 mm 16.5 x 12.5 x 5.1 inch	420 x 318 x 130 mm 16.5 x 12.5 x 5.1 inch	420 x 318 x 130 mm 16.5 x 12.5 x 5.1 inch	420 x 318 x 130 mm 16.5 x 12.5 x 5.1 inch	340 x 261 x 130 mm 13.4 x 10.3 x 5.1 inch	420 x 318 x 130 mm 16.5 x 12.5 x 5.1 inch
	7.7 kg / 17 lb	7.7 kg / 17 lb	7.7 kg / 17 lb	7.7 kg / 17 lb	4.6 kg / 10.1 lb	7.7 kg / 17 lb
	CE, ABYC A-31, RRR, RMRS, Lloyds, DNV	CE, ABYC A-31, RRR, RMRS, Lloyds, DNV	CE, ABYC A-31, RRR, RMRS	CE, ABYC A-31, DNV	CE, ABYC A-31, RRR, RMRS	CE, ABYC A-31, RRR, RMRS
	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion
	yes (included)	yes (included)	yes (included)	yes (included)	yes (included)	yes (included)
	yes	yes	yes	yes	yes	yes
	< 1 mA	< 1 mA	< 1 mA	< 1 mA	< 1 mA	< 1 mA
	2600 W	3500 W	3500 W	2770 W	1800 W	3500 W
	> 0.95	> 0.95	> 0.95	> 0.95	> 0.95	> 0.95
	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power	-25 °C to 80 °C; > 45 °C derating power
	vario fan	vario fan	vario fan	vario fan	vario fan	vario fan
	IP23	IP23	IP23	IP23	IP23	IP23
	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
	yes	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes	yes
	option	option	option	option	option	option
	option	option	option	option	option	option
	option	option	option	option	option	option
	option	option	option	option	option	option
	option	option	option	option	option	option
	option	option	option	option	option	option
	option	option	option	option	option	option

ChargeMaster Series:
Charge your batteries quickly and completely!

Make the most of your batteries with the ChargeMaster series, plugging in and charging anywhere in the world. Mastervolt's ChargeMaster guarantees fast and complete charging of your batteries no matter where you are. Thanks to Mastervolt's innovative 3-step+ charging process, batteries also perform better and last longer.

MASTERBUS COMPATIBLE

All ChargeMasters can be easily connected to a MasterBus network with only one cable and one connection (with the exception of the ChargeMaster 12/10, ChargeMaster 12/15-2 and ChargeMaster 24/6). What's more, you have the option for central, local or remote monitoring, configuration and control of your system.

Clear Display

A clearly lit display on the ChargeMaster provides all essential information: charge current, charge voltage, charge phase and battery content measurement and/or battery condition measurement as a percentage of available Ah capacity. The display also provides an indication of MasterBus communication. Three buttons adjacent to the read-out panel allow for easy operating of the entire system.

The ChargeMaster is available in various models to guarantee you the ideal battery charger for any situation and demand.

FEATURES

- For recreational and semi-professional use.
- Suitable for any type of battery, including Lithium Ion batteries.
- 3-Step+ charging technology for fast and complete charging, also charges depleted batteries.
- Memory function prevents overcharging in case of unreliable mains.
- Safe and complete charging due to standard safety features.
- Charging capacity up to 1000 Ah.
- Easy to connect and quick to install.
- Can charge multiple battery banks simultaneously.
- Built-in system functionality (MasterBus) in combination with other Mastervolt products.
- Clear control panel.
- Supplies your system without battery.

Charging your batteries with every voltage

The Mastervolt ChargeMaster supplies a maximum capacity wherever you are via auto-ranging. Auto-ranging ensures perfect fully automatic operation anywhere in the world, regardless of the available mains voltage (90-265 V AC, 50 or 60 Hz). The 3-step+ charging technology guarantees fast and complete charging, while the cos phi 1 regulation gets the most out of limited generator capacity.

Robust Connections

Solid metal-to-metal connectors equipped with strain relief prevent corrosion and overheating.

Charging multiple battery banks

The ChargeMaster series has three equal charge outputs. Those of the smaller ChargeMaster models are pre-installed with two metres of cable for a plug & play solution, while the heavier models have one full output (for example for your service battery) and two outputs of 10 A, ideal for your starter batteries.

DC Power Supply

Even if the batteries are not connected, Mastervolt ChargeMaster battery chargers can provide a constant DC output allowing you to turn on lights or keep the fridge cold.

Specifications ChargeMaster battery chargers 12 V

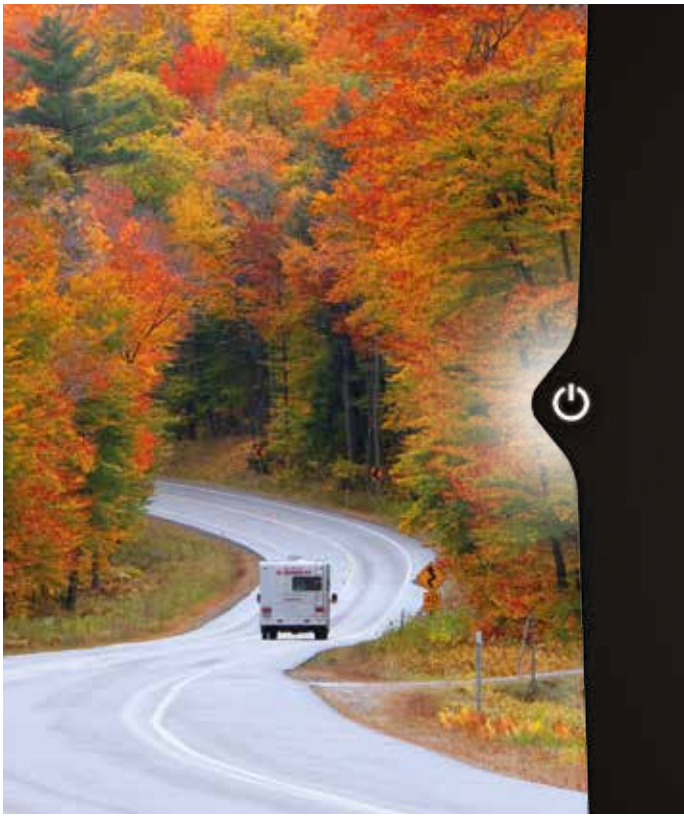



	ChargeMaster 12/10	ChargeMaster 12/15-2	ChargeMaster 12/25-3	ChargeMaster 12/35-3
Product code	*43011000*	*43011500*	*44010250*	*44010350*
GENERAL SPECIFICATIONS				
Nominal output voltage	12 V	12 V	12 V	12 V
Total charge current	10 A at 14.25 V	15 A at 14.25 V	25 A at 13.25 V	35 A at 14.4 V
Number of battery outlets	1	2	3	3
Charge current second output	n.a.	15 A	25 A	35 A
Charge current third output	n.a.	n.a.	25 A	35 A
Recommended battery capacity	25-100 Ah	30-150 Ah	50-250 Ah	70-350 Ah
Nominal input voltage	230 V (180-265 V) - 50/60 Hz	230 V (180-265 V) - 50/60 Hz	120/230 V (90-265 V) - 50/60 Hz	120/230 V (90-265 V) - 50/60 Hz
AC connection	cable + plug	cable + plug	2 mtr AC cable	connector strips
Power supply mode	no	no	yes	yes
Display/read-out	1 LED	1 LED	LED display	LED display
Dimensions, hxwxd	180 x 121 x 50 mm 7.1 x 4.8 x 2 inch	206 x 121 x 50 mm 8.1 x 4.8 x 2 inch	234 x 132 x 60 mm 9.2 x 5.2 x 2.4 inch	291 x 210 x 131 mm 11.5 x 8.3 x 5.2 inch
Weight	1 kg / 2.2 lb	1 kg / 2.2 lb	1.8 kg / 4 lb	4 kg / 9 lb
Fastening	4x screw	4x screw	4x screw	mounting bracket (included) or 4x screw
Approvals	CE, ABYC A-31, RRR	CE, ABYC A-31, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR
TECHNICAL SPECIFICATIONS				
Charge characteristic *Charge characteristic can be set to your requirements. See page 242 for default settings.*	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion
Temperature compensation	no	no	yes	yes
Voltage compensation	automatic	automatic	automatic	automatic
DC consumption	< 1 mA	< 1 mA	< 2 mA	< 5 mA
Full load consumption (230 V AC)	170 W	250 W	450 W	575 W
Current Control function	no	no	no	yes, via MasterBus
Power factor control	> 0.95	> 0.95	≥ 0.98	≥ 0.98
Temperature range (ambient temp.)	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power
Cooling	natural cooling	vario fan	vario fan	vario fan
Protection degree	IP65	IP21	IP23	IP23
Protections	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
MasterBus compatible	no	no	yes	yes
Charger Status Interface (alarm contact)	yes, integrated	yes, integrated	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)

OPTIONS

	MasterView Read-out *77010050*	n.a.	n.a.	option	option
	Remote panel for reading the charge status of your battery charger, including error notifications.				
	EasyView 5 *77010310*	n.a.	n.a.	option	option
	Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.				
	MasterShunt *77020110*	option	option	option	option
	MasterBus integrated battery monitor, with detailed information on the status of your batteries for an optimised charging process, incl. voltage, current, remaining time and consumption capacity in percentage.				
	DC Distribution *77020200*	n.a.	n.a.	option	option
	Smallest distribution model available. It connects up to four DC devices to the DC groups, such as a battery charger, inverter, alternators and solar panels. With the included plug & play cable it can be easily connected to the MasterBus network.				
	MasterBus USB Interface *77030100*	n.a.	n.a.	option	option
	Communication port between MasterBus and the USB port of your PC; makes possible reading and configuration of your MasterBus system on the PC when combined with MasterAdjust software (free to download).				
	Multipurpose Contact Output *77030500*	n.a.	n.a.	option	option
	MasterBus controllable potential-free contact, with alarm notification on the onboard system (low voltage or no AC), usable as CSI alarm contact.				

			
	ChargeMaster 12/50-3	**ChargeMaster 12/70-3**	**ChargeMaster 12/100-3**
	44010500	*44010700*	*44011000*
	12 V	12 V	12 V
	50 A at 14.4 V	70 A at 14.4 V	100 A at 14.4 V
	3	3	3
	50 A	10 A	10 A
	50 A	10 A	10 A
	100-500 Ah	140-700 Ah	200-1000 Ah
	120/230 V (90-265 V) - 50/60 Hz	120/230 V (90-265 V) - 50/60 Hz	120/230 V (90-265 V) - 50/60 Hz
	connector strips	connector strips	connector strips
	yes	yes	yes
	LED display	LCD display	LCD display
	291 x 210 x 131 mm 11.5 x 8.3 x 5.2 inch	362 x 277 x 150 mm 14.3 x 11 x 5.9 inch	362 x 277 x 150 mm 14.3 x 11 x 5.9 inch
	4 kg / 9 lb	7 kg / 16 lb	7 kg / 16 lb
	mounting bracket (included) or 4x screw	mounting bracket (included) or 4x screw	mounting bracket (included) or 4x screw
	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR
	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion
	yes	yes	yes
	automatic	automatic	automatic
	< 5 mA	< 5 mA	< 5 mA
	825 W	1200 W	1700 W
	yes, via MasterBus	yes, via MasterBus	yes, via MasterBus
	≥ 0.98	≥ 0.98	≥ 0.98
	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power
	vario fan	vario fan	vario fan
	IP23	IP23	IP23
	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
	yes	yes	yes
	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)
	option	option	option
	option	option	option
	option	option	option
	option	option	option
	option	option	option
	option	option	option



The following models are also available in Quick Connect (OEM) version with a WAGO 770-113 connector and 25 cm cable:

- ChargeMaster 12/25-3, ***product code 44010252***
- ChargeMaster 12/35-3, ***product code 44010352***
- ChargeMaster 12/70-3, ***product code 44010702***
- ChargeMaster 12/100-3, ***product code 44011002***

In addition to Mastervolt battery chargers, we also supply ProMariner ProNauticP battery chargers.

For more information, please consult the ProMariner product catalogue and website.

ProMariner™

Specifications ChargeMaster battery chargers 24 V




	ChargeMaster 24/6	ChargeMaster 24/12-3	ChargeMaster 24/20-3	ChargeMaster 24/30-3
Product code	*43020600*	*44020120*	*44020200*	*44020300*
GENERAL SPECIFICATIONS				
Nominal output voltage	24 V	24 V	24 V	24 V
Total charge current	6 A at 28.5 V	12 A at 26.5 V	20 A at 28.8 V	30 A at 28.8 V
Number of battery outlets	1	3	3	3
Charge current second output	n.a.	12 A	20 A	30 A
Charge current third output	n.a.	12 A	20 A	30 A
Recommended battery capacity	25-70 Ah	24-120 Ah	40-200 Ah	60-300 Ah
Nominal input voltage	230 V (180-265 V) – 50/60 Hz	120/230 V (90-265 V) – 50/60 Hz	120/230 V (90-265 V) – 50/60 Hz	120/230 V (90-265 V) – 50/60 Hz
AC connection	socket	2 mtr AC cable	connector strips	connector strips
Power supply mode	no	yes	yes	yes
Display/read-out	1 LED	LED display	LED display	LED display
Dimensions, hxwxd	180 x 121 x 50 mm 7.1 x 4.8 x 2 inch	234 x 132 x 60 mm 9.2 x 5.2 x 2.4 inch	291 x 210 x 131 mm 11.5 x 8.3 x 5.2 inch	291 x 210 x 131 mm 11.5 x 8.3 x 5.2 inch
Weight	1 kg / 2.2 lb	1.8 kg / 4 lb	4 kg / 9 lb	4 kg / 9 lb
Fastening	4x screw	4x screw	mounting bracket (included) or 4x screw	mounting bracket (included) or 4x screw
Approvals	CE, ABYC A-31, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR
TECHNICAL SPECIFICATIONS				
Charge characteristic *Charge characteristic can be set to your requirements. See page 242 for default settings.*	IUoUoo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUoo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion
Temperature compensation	no	yes	yes	yes
Voltage compensation	automatic	automatic	automatic	automatic
DC consumption	< 1 mA	< 2 mA	< 2.5 mA	< 2.5 mA
Full load consumption (230 V AC)	210 W	435 W	660 W	925 W
Current Control function	no	no	yes, via MasterBus	yes, via MasterBus
Power factor control	> 0.95	≥ 0.98	≥ 0.98	≥ 0.98
Temperature range (ambient temp.)	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 25 °C derating power	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power
Cooling	natural cooling	vario fan	vario fan	vario fan
Protection degree	IP65	IP23	IP23	IP23
Protections	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
MasterBus compatible	no	yes	yes	yes
Charger Status Interface (alarm contact)	yes, integrated	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)

OPTIONS					
	MasterView Read-out *77010050*	n.a.	option	option	option
	Remote panel for reading the charge status of your battery charger, including error notifications.				
	EasyView 5 *77010310*	n.a.	option	option	option
	Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.				
	MasterShunt *77020110*	option	option	option	option
	MasterBus integrated battery monitor, with detailed information on the status of your batteries for an optimised charging process, incl. voltage, current, remaining time and consumption capacity in percentage.				
	DC Distribution *77020200*	n.a.	option	option	option
	Smallest distribution model available. It connects up to four DC devices to the DC groups, such as a battery charger, inverter, alternators and solar panels. With the included plug & play cable it can be easily connected to the MasterBus network.				
	MasterBus USB Interface *77030100*	n.a.	option	option	option
	Communication port between MasterBus and the USB port of your PC; makes possible reading and configuration of your MasterBus system on the PC when combined with MasterAdjust software (free to download).				
	Multipurpose Contact Output *77030500*	n.a.	option	option	option
	MasterBus controllable potential-free contact, with alarm notification on the onboard system (low voltage or no AC), usable as CSI alarm contact.				




	ChargeMaster 24/40-3	ChargeMaster 24/60-3	ChargeMaster 24/80-3	ChargeMaster 24/100-3
	44020400	*44020600*	*44020800*	*44021000*
	24 V	24 V	24 V	24 V
	40 A at 28.8 V	60 A at 28.8 V	80 A at 28.8 V	100 A at 28.8 V
	3	3	3	3
	10 A	10 A	10 A	10 A
	10 A	10 A	10 A	10 A
	80-400 Ah	120-600 Ah	160-800 Ah	200-1000 Ah
	120/230 V (90-265 V) – 50/60 Hz	120/230 V (90-265 V) – 50/60 Hz	120/230 V (90-265 V) – 50/60 Hz	120/230 V (90-265 V) – 50/60 Hz
	connector strips	connector strips	connector strips	connector strips
	yes	yes	yes	yes
	LCD display	LCD display	LCD display	LCD display
	362 x 277 x 150 mm 14.3 x 11 x 5.9 inch	362 x 277 x 150 mm 14.3 x 11 x 5.9 inch	432 x 277 x 150 mm 17 x 11 x 5.9 inch	432 x 277 x 150 mm 17 x 11 x 5.9 inch
	7 kg / 16 lb	7 kg / 16 lb	8 kg / 18 lb	8 kg / 18 lb
	mounting bracket (included) or 4x screw	mounting bracket (included) or 4x screw	mounting bracket (included) or 4x screw	mounting bracket (included) or 4x screw
	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR	CE, ABYC A-31, SAE J1171/ISO 8846 ignition protected, RMRS, RRR
	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion
	yes	yes	yes	yes
	automatic	automatic	automatic	automatic
	< 5 mA	< 5 mA	< 5 mA	< 5 mA
	1400 W	2000 W	2700 W	3375 W
	yes, via MasterBus	yes, via MasterBus	yes, via MasterBus	yes, via MasterBus
	≥ 0.98	≥ 0.98	≥ 0.98	≥ 0.98
	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power	-25 °C to 60 °C, > 40 °C derating power
	vario fan	vario fan	vario fan	vario fan
	IP23	IP23	IP23	IP23
	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
	yes	yes	yes	yes
	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)
	option	option	option	option
	option	option	option	option
	option	option	option	option
	option	option	option	option
	option	option	option	option
	option	option	option	option

The following models are also available in Quick Connect (OEM) version with a WAGO 770-113 connector and 25 cm cable:

- ChargeMaster 24/20-3, ***product code 44020202***
- ChargeMaster 24/30-3, ***product code 44020302***
- ChargeMaster 24/40-3, ***product code 44020402***
- ChargeMaster 24/60-3, ***product code 44020602***
- ChargeMaster 24/80-3, ***product code 44020802***
- ChargeMaster 24/100-3, ***product code 44021002***

DAME NOMINATED 2016

ChargeMaster Plus Series:
All-in-one solution for faster and safer charging

ChargeMaster Plus is the next generation of battery chargers that integrates multiple functions into one single device. Replacing auxiliary chargers, battery isolators and VSR, ChargeMaster Plus reduces system complexity and cost. Designed for versatility, it charges virtually any combination of three batteries in a fast and safe way and works anywhere in the world.

BATTERY'S BEST FRIEND

With the new Battery's Best Friend architecture, ChargeMaster Plus is capable of charging a multitude of battery chemistries, sizes and voltages. All batteries are charged with the fast and safe 3-step+ charge method. Other unique features are:

- Revival mode: automatically revives even fully depleted batteries.
- Multi voltage: charge 12 V starter battery in a 24 V system, without additional components.
- Priority Charge: redirect available power to the lowest battery, for faster charging.
- Smart Input: charge all three batteries from one single alternator for continuous charging on the go.

GLOBAL CHARGING

Global Charging

The ChargeMaster Plus handles worldwide AC voltages and frequencies. Resisting large voltage fluctuations and high temperatures, it keeps working in harsh environments. For marine and mobile markets, ChargeMaster Plus is CE, E-mark, ABYC, UL, SAE, CEC and RCM/C-Tick compliant.

SYSTEM SIMPLICITY

System Simplicity

Nowadays, equipment must be self-explaining. The ChargeMaster Plus displays the charge phase of all three outputs in an understandable way. Robust and ergonomic connections save installation time. An integrated VSR eliminates the need for additional components and ensures that the alternators energy is funnelled through to the batteries.

POWERFUL CONNECTIONS

Powerful Connections

In modern applications, all components work together. CAN-based MasterBus enables the charger to communicate with displays, shunts and power systems including communication standards like CZone®, NMEA and CANopen. The ChargeMaster Plus can operate as a power supply for delicate communication equipment, or during the construction phase of a boat.

FEATURES

- Multicharger with two outputs, one in/output, DC-DC converter, current limiter and VSR.
- Combine Lithium Ion, Gel or AGM, and large or small 12/24 V battery banks on a single battery charger.
- Charges multiple batteries while being underway.
- Extended specifications: offers 20 % more output at 14.4 V and 80 % charging power at 60 °C.
- Safe Charge: quickly recognize the State of Charge for extended battery life.
- Very wide operating range of 80-275 V AC, 35-70 Hz.
- Compact, easy to connect and quick to install.

MASTER TIP

ChargeMaster Plus simplifies charging systems. Charging faster and safer than ever, this all-in-one charging solution offers best value for money.

Specifications ChargeMaster Plus battery chargers

	NEW MODEL	NEW MODEL	NEW MODEL	NEW MODEL
				
	ChargeMaster Plus 12/75-3	**ChargeMaster Plus 12/100-3**	**ChargeMaster Plus 24/40-3**	**ChargeMaster Plus 24/60-3**
Product code	*44310750*	*44311000*	*44320400*	*44320600*
GENERAL SPECIFICATIONS				
Nominal output voltage (output 1 & 2)	12 V	12 V	24 V	24 V
Nominal output voltage (output 3)	12 V	12 V	24 V / 12 V	24 V / 12 V
Number of battery outlets	2 + 1	2 + 1	2 + 1	2 + 1
Total charge current	75 A at 14.4 V	100 A at 14.4 V	40 A at 28.8 V	60 A at 28.8 V
Output current output 3 *In case of current limiting, otherwise full output.*	5-40 A at 12 V	5-40 A at 12 V	5-20 A at 24 V 10 A at 12 V	5-20 A at 24 V 10 A at 12 V
Input current 'Smart Input'	40 A at 12 V	40 A at 12 V	20 A at 24 V	20 A at 24 V
Recommended battery capacity	320-800 Ah	400-1000 Ah	160-400 Ah	200-500 Ah
Nominal input voltage	120/230 V (80-275 V) 50/60 Hz	120/230 V (80-275 V) 50/60 Hz	120/230 V (80-275 V) 50/60 Hz	120/230 V (80-275 V) 50/60 Hz
Max. AC current (230 V / 120 V)	6.5 A / 13 A	8.5 A / 17 A	6.8 A / 13.5 A	10.2 A / 20.4 A
AC connection	screw terminals, suitable up to up to 6 mm^2	screw terminals, suitable up to up to 6 mm^2	screw terminals, suitable up to up to 6 mm^2	screw terminals, suitable up to up to 6 mm^2
Power supply mode	yes	yes	yes	yes
Display/read-out	LED	LED	LED	LED
Dimensions, hxwxd	384 x 250 x 127 mm 15.1 x 9.8 x 5 inch	384 x 250 x 127 mm 15.1 x 9.8 x 5 inch	384 x 250 x 127 mm 15.1 x 9.8 x 5 inch	384 x 250 x 127 mm 15.1 x 9.8 x 5 inch
Weight	5.9 kg / 13 lb	5.9 kg / 13 lb	5.9 kg / 13 lb	5.9 kg / 13 lb
Zertifizierungen	CE, E-mark, ABYC, UL1236, SAE J1171, CEC, RCM/C-Tick	CE, E-mark, ABYC, UL1236, SAE J1171, CEC, RCM/C-Tick	CE, E-mark, ABYC, UL1236, SAE J1171, CEC, RCM/C-Tick	CE, E-mark, ABYC, UL1236, SAE J1171, CEC, RCM/C-Tick
TECHNICAL SPECIFICATIONS				
Charge characteristic *Charge characteristic can be set to your requirements.* *See page 242 for default settings.*	IUoUo, automatic / 3-step+ for Gel/AGM/Lithium Ion/ traction/spiral	IUoUo, automatic / 3-step+ for Gel/AGM/Lithium Ion/ traction/spiral	IUoUo, automatic / 3-step+ for Gel/AGM/Lithium Ion/ traction/spiral	IUoUo, automatic / 3-step+ for Gel/AGM/Lithium Ion/ traction/spiral
Temperature compensation	-30 mV/°C / -17 mV/°F temperature sensor included	-30 mV/°C / -17 mV/°F temperature sensor included	-30 mV/°C / -17 mV/°F temperature sensor included	-30 mV/°C / -17 mV/°F temperature sensor included
Voltage compensation	through MasterShunt	through MasterShunt	through MasterShunt	through MasterShunt
DC consumption	< 2 mA (MasterBus off)	< 2 mA (MasterBus off)	< 2 mA (MasterBus off)	< 2 mA (MasterBus off)
Current Control function	yes, through MasterBus	yes, through MasterBus	yes, through MasterBus	yes, through MasterBus
Power factor control	yes, > 0.98	yes, > 0.98	yes, > 0.98	yes, > 0.98
Temperature range (ambient temp.)	-25 °C to 80 °C, derating > 40 °C	-25 °C to 80 °C, derating > 40 °C	-25 °C to 80 °C, derating > 40 °C	-25 °C to 80 °C, derating > 40 °C
Cooling	vario fan	vario fan	vario fan	vario fan
Protection degree	IP23, vertical mounting	IP23, vertical mounting	IP23, vertical mounting	IP23, vertical mounting
Protections	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
MasterBus compatible	yes	yes	yes	yes
Charger Status Interface (alarm contact)	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)	yes, using a Multipurpose Contact Output (product code 77030500)

OPTIONS					
	MasterView Read-out *77010050*	option	option	option	option
	Remote panel for reading the charge status of your battery charger, including error notifications.				
	EasyView 5 *77010310*	option	option	option	option
	Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.				
	MasterShunt *77020110*	option	option	option	option
	MasterBus integrated battery monitor, with detailed information on the status of your batteries for an optimised charging process, incl. voltage, current, remaining time and consumption capacity in percentage.				
	DC Distribution *77020200*	option	option	option	option
	Smallest distribution model available. It connects up to four DC devices to the DC groups, such as a battery charger, inverter, alternators and solar panels. With the included plug & play cable it can be easily connected to the MasterBus network.				
	MasterBus USB Interface *77030100*	option	option	option	option
	Communication port between MasterBus and the USB port of your PC; makes possible reading and configuration of your MasterBus system on the PC when combined with MasterAdjust software (free to download).				
	Multipurpose Contact Output *77030500*	option	option	option	option
	MasterBus controllable potential-free contact, with alarm notification on the onboard system (low voltage or no AC), usable as CSI alarm contact.				

EasyCharge:
Waterproof fixed-mount battery chargers

The fixed-mount, waterproof units are fully sealed in an epoxy-filled, non-corrosive enclosure, and built to IP68 waterproofing standards, easily meeting global regulations like CE, CSA, CEC, and ABYC.
The outputs are completely isolated, and can be used in either series or parallel for higher voltage or current, including 12 or 24 V outputs.

Highly efficient and simple to use, these chargers are designed for harsh environments, and are fully salt, shock and vibration tested. Currently, 6 A single bank and 10 A dual bank types models are available.

A key feature is the 'sense and send' technology, which allows the chargers to detect which batteries need the most charge and prioritise accordingly. The battery chargers have the ability to charge wet, AGM and Gel batteries, with a universal input (120-230 V) for total worldwide freedom.

FEATURES

- Entry level model with Mastervolt 3-step+ charge characteristic.
- Suitable for charging Gel, AGM and flooded batteries.
- Full power up to 40 ° C.
- Quick charging function to extend battery life.
- Includes cable & Euro plug.
- Can charge one or two battery banks.
- Sense-Send™ (10 A model): determines which battery is being charged first.
- Series and parallel configuration.
- Stain resistant and waterproof.
- International certification.

Specifications EasyCharge battery chargers

	EasyCharge 6A	EasyCharge 10A
Product code	*43310600*	*43321000*
With UK plug	*43310602*	*43321002*
GENERAL SPECIFICATIONS		
Total charge current	6 A at 12 V	10 A at 12 V 5 A at 24 V
Recommended battery capacity: charge (based on 50 % discharged battery)	to 120 Ah	to 120 Ah
Nominal input voltage	120/230 V (90-265 V), 50/60 Hz	120/230 V (90-265 V), 50/60 Hz
AC connection	1.2 m (4 ft) cable + Euro plug	1.2 m (4 ft) cable + Euro plug
DC connection	ring terminals	ring terminals
Dimensions, hxwxd	76 x 152 x 51 mm 3 x 6 x 2 inch	127 x 178 x 51 mm 5 x 7 x 2 inch
Weight	1.8 kg / 4 lb	2.8 kg / 6.2 lb
Approvals	CE, ABYC	CE, ABYC
TECHNICAL SPECIFICATIONS		
Charge characteristic	IUoUo, automatic 3-step+ for Gel/AGM/flooded	IUoUo, automatic 3-step+ for Gel/AGM/flooded
Temperature range (ambient temp.)	-20 °C to 50 °C	-20 °C to 40 °C
Protection degree	IP68	IP68
Protections	spark free, short circuit, reverse polarity, over-voltage, current limited, over-temperature	spark free, short circuit, reverse polarity, over-voltage, current limited, over-temperature
MasterBus compatible	no	no

EasyCharge Portable:
Waterproof portable battery chargers

For people on the move, the EasyCharge portable battery charger offers a reliable solution that can be used on the boat, car, motorcycle, and camper van. With a rugged, ergonomic construction, and waterproof to IP65 standard, the portable chargers have an intuitive control panel and a universal input (120-230 V) for total worldwide freedom.

Users can quickly select between 6 V (ideal for toys, classic cars and motorcycles) and 12 V operation. The units include 1.8 m of DC cable that connects to either a 61 cm lead with ring terminals, or a 61 cm lead with alligator clips, for easy installation and a variety of applications; both leads are included in the package.

FEATURES

- Entry level model with Mastervolt 3-step+ charge characteristic.
- Suitable for any type of battery, including Lithium Ion (model 4.3 A).
- Full power up to 40 ° C.
- Includes cable & Euro plug.
- Simple switching between 6 V and 12 V.
- Portable and waterproof.
- Easy to connect through ring terminals, or alligator clips (included).

Specifications EasyCharge Portable battery chargers

	EasyCharge Portable 1.1A	EasyCharge Portable 4.3A
Product code	*43510100*	*43510400*
With UK plug	*43510102*	*43510402*
GENERAL SPECIFICATIONS		
Total charge current	1.1 A	4.3 A
Recommended battery capacity: maintain	2.2 to 40 Ah	14 to 120 Ah
Recommended battery capacity: charge	2.2 to 25 Ah	14 to 90 Ah
Nominal input voltage	120/230 V (90-265 V), 50/60 Hz	120/230 V (90-265 V), 50/60 Hz
AC connection	1.8 m (6 ft) cable + Euro plug (CEE7/16)	1.8 m (6 ft) cable + Euro plug (CEE7/16)
DC connection	ring and alligator clip connections, with integrated fuse for additional safety	ring and alligator clip connections, with integrated fuse for additional safety
Dimensions, hxwxd	152 x 63 x 35.5 mm 6 x 2.5 x 1.4 inch	161 x 72 x 34.7 mm 6.3 x 2.8 x 1.7 inch
Weight	0.5 kg / 1.1 lb	0.9 kg / 2 lb
Approvals	CE, ABYC	CE, ABYC
TECHNICAL SPECIFICATIONS		
Charge characteristic	IUoUo, automatic 3-step+ for Gel/AGM/flooded	IUoUo, automatic 3-step+ for Gel/AGM/flooded/Lithium Ion
Temperature range (ambient temp.)	-20 °C to 40 °C	-20 °C to 40 °C
Protection degree	IP65	IP65
Protections	short circuit, reverse polarity, over-voltage, current limited, over-temperature	short circuit, reverse polarity, ver voltage, current limited, over-temperature
MasterBus compatible	no	no

In addition to the waterproof Mastervolt battery chargers, we also supply ProMariner ProSport series waterproof battery chargers.

For more information, please consult the ProMariner product catalogue and ProMariner website.

ProMariner™

Mastervolt Sine Wave Inverters: Enjoy the comforts of home

Your AC installation offers you a wealth of benefits by making the use of any domestic appliance possible, from microwave oven to hairdryer, DVD player to power tools. A Mastervolt inverter allows you to easily convert the voltage of your 12 V or 24 V battery to 230V/50Hz or 120V/60Hz, so you enjoy all the comforts of home wherever you choose to go.

Mastervolt offers a complete range of inverters from 300 watt to 40 kwatt, for 230V/50Hz as well as 120V/60Hz (American voltage).

Completely independent

Grid power regularly fluctuates and can cause your lights to flicker. Sometimes it may even drop below 180 volt, causing some devices to stop functioning. The Mastervolt sine wave inverter ensures a perfect AC voltage, and makes power problems a thing of the past. The pure sine wave technology also helps protect your equipment against failures, humming or interference on monitors or TV's and ensures a longer lifespan.

Which Mastervolt sine wave inverter fits your needs?

- **Mass Sine Ultra**
  This model is intended for professional applications with high power demands, and extends the Mass Sine series. With 4 kW AC power, the Mass Sine Ultra meets the highest energy requirements. The latest V6 technology increases the efficiency and enables multiple units to work in parallel and 3-phase configuration.

- **Mass Sine**
  These high quality sine wave inverters have proven themselves in the most extreme conditions for over twenty-five years. Although the dimensions and connections of the various models have remained the same, the technology has evolved, resulting in a fast, efficient, one-on-one replacement with minimal downtime.

- **AC Master**
  These affordable sine wave inverters convert 12 or 24 V battery voltage into reliable grid power, making it ideal for recreational and semi-professional applications.

QUOTE

"With Mastervolt we mount a reliable battery (management) system with variable components and very good documentation. Remote maintenance is possible through the Internet, and completes the whole system. We have been working for more than seven years with Mastervolt and projects are always solution-oriented and skilfully addressed. One can speak of truly outstanding technical support and we can certainly have trust in such a partnership."

ARMIN DIETZ, HEAD CUSTOMER SERVICE CONCORDE REISMOBILE, GERMANY

No humming with HF technology

Our use of high-frequency switch technology means you can say goodbye to humming transformers and hello to efficiency. Mastervolt inverters are also small and light-weight to ensure easy installation.

High peak power during start up

Mastervolt sine wave inverters can deliver high peak power (up to 200 %) to equipment that requires extra current for a short period of time while powering up.

Simple and safe to connect

The inverters feature robust connection technology, internal in the larger models and a plug & play socket with cable for the smaller models.

Efficient use of batteries

A high efficiency when inverting and an automatic economy mode when there is no consumption gives you longer use of your batteries.

Pure Sine Wave

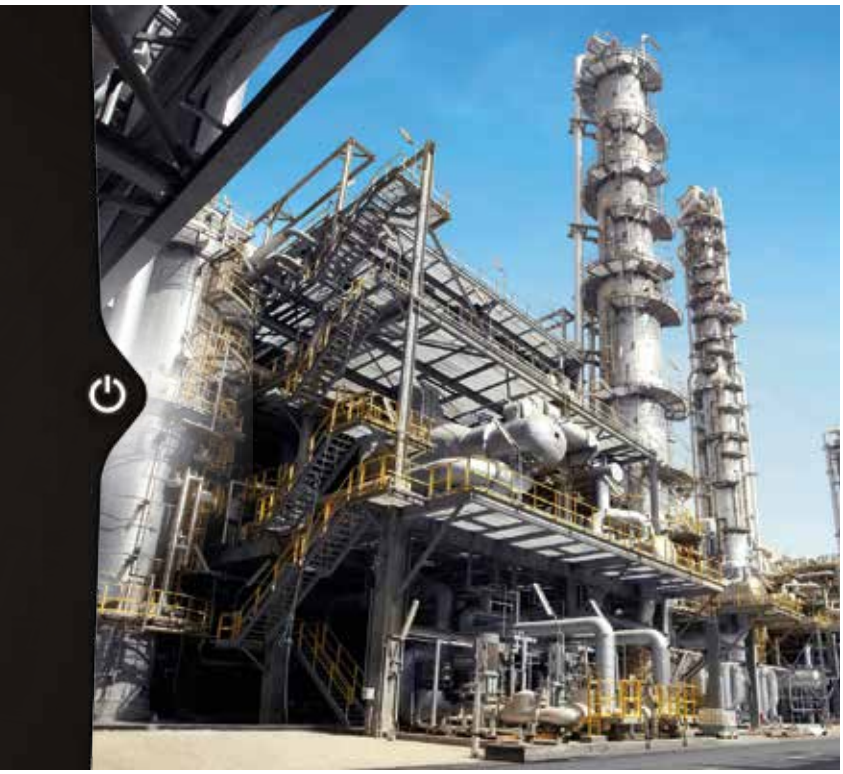
Mastervolt inverters generate a sine wave shaped output current similar or even better than that of the public grid and perfectly suited for powering sensitive equipment.

MasterBus Compatible

Every Mass Sine (Ultra) inverter can be easily connected to a MasterBus network with only one cable and one connection. You can also choose central, local or remote monitoring, configuration and control of your system.

Mass Sine Ultra and Mass Sine:
For the toughest tasks

Even under the most extreme conditions the products from the Mass series operate faultlessly, giving you round-the-clock output when necessary. With an MTBF of 180,000 hours at full capacity and 24/7 use, the Mass products are ideal for the toughest tasks and any situation that requires a reliable power supply.



Optimal flexibility in system design

Choosing an independent sine wave inverter allows you complete freedom of choice of battery charging equipment. You can freely adapt the rating of these chargers, depending on the desired charge time. In case you want to use renewable energy sources, you may want to choose an MPPT solar charge regulator.

High Yield

The high yield and automatic economy mode are designed to allow digital clocks to work properly and ensure you many more hours of operation from your batteries. The application of high-frequency technology prevents any annoying humming and zooming sounds, while the high peak capacity ensures that the high inrush current required for electrical tools, for example, is seamlessly produced.

FEATURES

- For heavy duty work in professional and semi-professional applications.
- Full capacity at temperatures up to 40 °C.
- Pure sine wave output prevents failures and damage to connected sensitive equipment.
- High peak capacity for the seamless switching on of complex and heavy loads.
- Dynamic, battery-specific input current for an optimal use of every type of battery (Mass Sine Ultra).
- Parallel configuration of up to ten devices for a capacity up to 40 kW (Mass Sine Ultra).
- 3-Phase configuration for a capacity up to 36 kW (Mass Sine Ultra).
- Integrated MasterBus (Mass Sine Ultra) or MasterBus compatible (Mass Sine).
- Suitable for mobile applications.
- Professional connections.
- Automatic, reliable and safe operation.
- Optional: Masterswitch/Systemswitch for automatic selection of the desired energy source.

Mass Sine Ultra

With an AC capacity of 4000 W in one unit, the Mass Sine Ultra can satisfy even the greatest energy demands. As ten units can be switched in parallel or 3x3 in a three-stage configuration, the Mass Sine Ultra can supply a capacity of up to 40 kW. The inverter provides full power at 40 °C and works smoothly even in extreme conditions such as engine rooms and technical spaces. Like all Mass products, the inverter is supplied in a compact and robust casing.

This inverter is the best choice if you are looking for autonomous AC capacity of over 3 kW.

Latest Technology

The extremely efficient V6 power electronics save volume and weight with minimal sound levels and a very low ripple voltage which extends the lifespan of your batteries. At the same time, digital technology prevents any annoying flickering and voltage fluctuations.

Make the most of your batteries

The Mass Sine Ultra is equipped with a dynamic battery voltage window. Taking into account the type of battery and current, this function ensures the inverter can supply AC longer without overtaxing the batteries.

Mass Sine

Mastervolt's Mass Sine inverters have been proving their value in the most extreme conditions for over 25 years.

Clear Indicators

The Mass Sine features easy controls on the device itself. As inverters are often built in, we also supply an effective remote control panel, the C4-RI. In addition, the Mass Sine can be controlled via its intuitive display, the EasyView 5, thanks to the integration of MasterBus communication using a MasterBus Inverter Interface or AC Power Analyser.

Easy and safe connections

The Mass Sine inverters provide robust and professional connections for fast and safe installation.

Specifications Mass Sine (Ultra) sine wave inverters

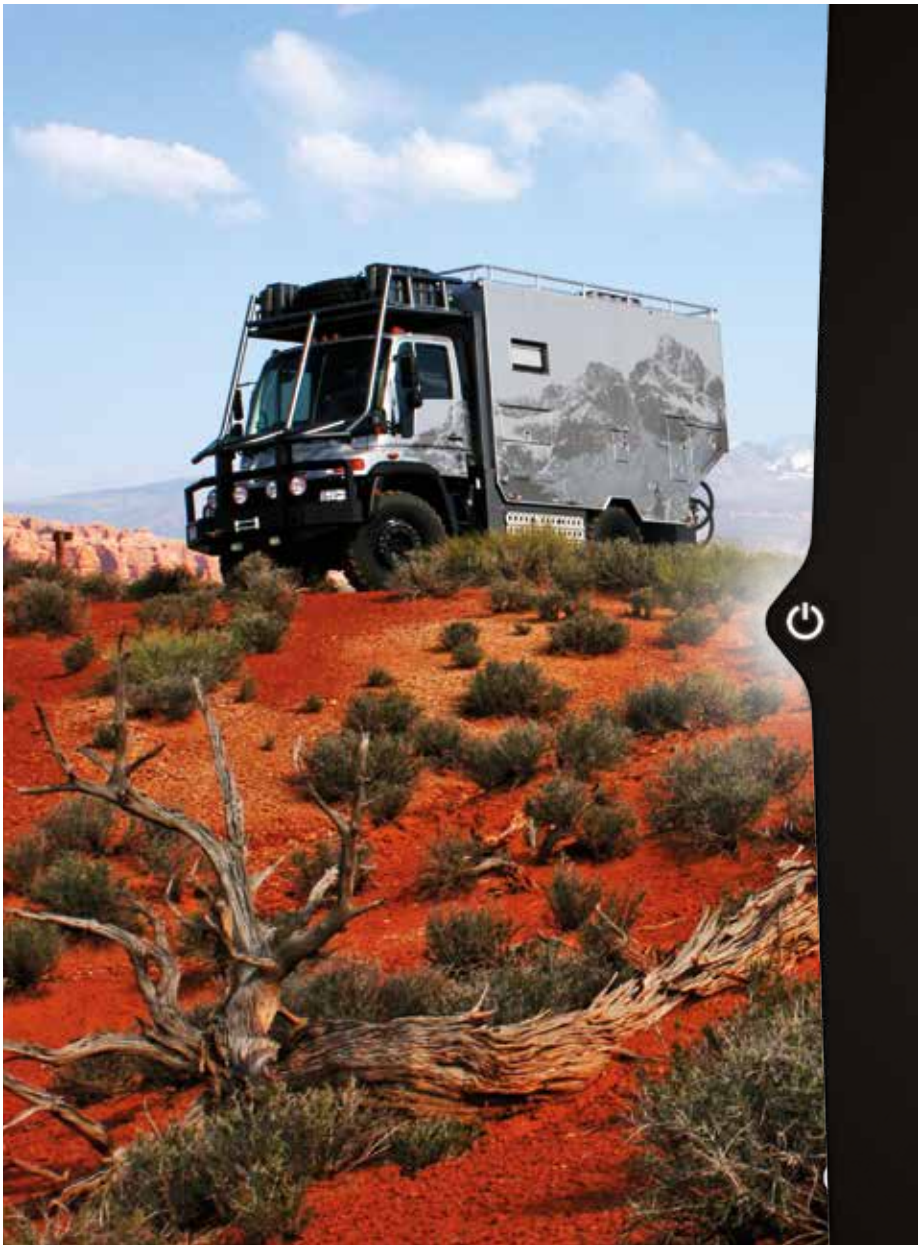



	Mass Sine 12/2000	Mass Sine 24/800	Mass Sine 24/1500	Mass Sine 24/2500
Product code 230 V	*24012000*	*24020800*	*24021500*	*24022500*
Product code 230 V 60 Hz	*24112000*	*24120800*	*24121500*	*24122500*
GENERAL SPECIFICATIONS				
Nominal battery voltage	12 V	24 V	24 V	24 V
Recommended battery capacity	> 200 Ah	> 50 Ah	> 150 Ah	> 200 Ah
Output voltage	230 V (± 5 %) – 50 Hz (± 0.01 Hz)	230 V (± 5 %) – 50 Hz (± 0.01 Hz)	230 V (± 5 %) – 50 Hz (± 0.01 Hz)	230 V (± 5 %) – 50 Hz (± 0.01 Hz)
P30 power at 40 °C, cos phi 1	2000 W	800 W	1500 W	2500 W
Continuous power at 40 °C, cos phi 1	1800 W	650 W	1200 W	2000 W
Peak load	4000 W	1600 W	2900 W	5000 W
Output waveform	true sine	true sine	true sine	true sine
AC connection	internal	internal	internal	internal
Efficiency	92 %	92 %	92 %	92 %
Display/read-out	LED display	LED display	LED display	LED display
Parallel configuration	no	no	no	no
3-Phase configuration	no	no	no	no
Dimensions, hxwxd	420 x 318 x 136 mm 16.5 x 12.5 x 5.4 inch	325 x 220 x 111 mm 12.8 x 8.7 x 4.4 inch	340 x 261 x 130 mm 13.4 x 10.3 x 5.1 inch	420 x 318 x 130 mm 16.5 x 12.5 x 5.1 inch
Weight	14.6 kg / 32.2 lb	3.9 kg / 8.6 lb	8 kg / 17.4 lb	14.6 kg / 32.2 lb
Approvals	CE, E-mark, ABYC A-31	CE, E-mark, ABYC A-31	CE, E-mark, ABYC A-31	CE, E-mark, ABYC A-31
TECHNICAL SPECIFICATIONS				
Technology	HF switch mode	HF switch mode	HF switch mode	HF switch mode
Max. ripple on DC (battery)	5 % RMS	5 % RMS	5 % RMS	5 % RMS
Input current (nominal load)	183 A	36 A	68 A	115 A
No-load power consumption (ON mode)	480 mA – 6 W	240 mA – 5.6 W	200 mA – 5 W	250 mA – 6 W
No-load power consumption (energy saving mode)	50 mA – 0.6 W	35 mA – 0.8 W	25 mA – 0.6 W	25 mA – 0.6 W
Minimal DC fuse (slow blow) *DC fuse depends on the cable size*	250 A	63 A	100 A	160 A
Minimal cable size	70 mm^2	16 mm^2	25 mm^2	50 mm^2
Harmonic distortion typical	< 5 %	< 5 %	< 5 %	< 5 %
Power factor control	all power factors allowed	all power factors allowed	all power factors allowed	all power factors allowed
Transfer system	Masterswitch/Systemswitch compatible, see page 128 for more information	Masterswitch/Systemswitch compatible, see page 128 for more information	Masterswitch/Systemswitch compatible, see page 128 for more information	Masterswitch/Systemswitch compatible, see page 128 for more information
Temperature range (ambient temp.)	-25 °C to 80 °C; > 40 °C derating	-25 °C to 80 °C; > 40 °C derating	-25 °C to 80 °C; > 40 °C derating	-25 °C to 80 °C; > 40 °C derating
Cooling	natural/forced	natural/forced	natural/forced	natural/forced
Protection degree	IP23	IP23	IP23	IP23
Protections	over-temperature, overload, short circuit, high battery, low battery	over-temperature, overload, short circuit, high battery, low battery	over-temperature, overload, short circuit, high battery, low battery	over-temperature, overload, short circuit, high battery, low battery
MasterBus compatible	yes, using a MasterBus Inverter Interface or AC Power Analyser	yes, using a MasterBus Inverter Interface or AC Power Analyser	yes, using a MasterBus Inverter Interface or AC Power Analyser	yes, using a MasterBus Inverter Interface or AC Power Analyser

OPTIONS

	C4-RI *70404110*	option	option	option	option
		Remote control on/off for the Mass Sine sine wave inverter.			
	EasyView 5 *77010310*	option	option	option	option
		In combination with MasterBus Inverter Interface. Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.			
	MasterBus USB Interface *77030100*	option	option	option	option
		In combination with MasterBus Inverter Interface. Communication port between MasterBus and the USB port of your PC; makes possible reading and configuration of your MasterBus system on the PC when combined with MasterAdjust software (free to download).			
	MasterBus Inverter Interface *77030700*	option	option	option	option
		Integrates the Mass Sine inverter in a MasterBus network.			
	AC Power Analyser *77031200*	option	option	option	option
		Integrates the Mass Sine inverter in a MasterBus network and visualizes the AC voltage, current and power.			

	Mass Sine Ultra 24/4000	Mass Sine 24/5000
	26024000	*24095100*
	n.a.	*24195100*
	24 V	24 V
	> 350 Ah	> 400 Ah
	230 V (± 2 %) – 50/60 Hz selectable (± 0.005 %)	230 V (± 5 %) – 50 Hz (± 0.01 Hz)
	--	5000 W
	4000 W	4000 W
	7000 W	9000 W
	true sine	true sine
	internal	internal
	≥ 92 %	92 %
	LED display	LED display
	yes, up to 10 standard	no
	yes, up to 3x3	no
	472 x 318 x 178 mm 18.6 x 12.5 x 7 inch	470 x 315 x 254 mm 18.5 x 12.4 x 10 inch
	15 kg / 33.1 lb	19 kg / 41.9 lb
	CE, ABYC	CE, E-mark, ABYC A-31
	V6 HF switch mode	HF switch mode
	5 % RMS	5 % RMS
	200 A	230 A
	660 mA – 16 W	250 mA – 6 W
	300 mA – 7 W	50 mA – 1.2 W
	250 A	1x 250 A of 2x 125 A
	70 mm²	2x 70 mm²
	< 1 %	< 5 %
	all power factors allowed	all power factors allowed
	Masterswitch/Systemswitch compatible, see page 128 for more information	Masterswitch/Systemswitch compatible, see page 128 for more information
	-25 °C to 60 °C; > 40 °C derating	-25 °C to 80 °C; > 40 °C derating
	natural/forced	natural/forced
	IP23	IP23
	over-temperature, overload, short circuit, high battery, low battery	over-temperature, overload, short circuit, high battery, low battery
	yes	yes, using a MasterBus Inverter Interface or AC Power Analyser
	n.a.	option
	option	option
	option	option
	n.a.	option
	n.a.	option



The following models are also available in Quick Connect (OEM) version with a WAGO 770-103 connector and 25 cm cable:

- Mass Sine 12/2000 230 V, ***product code 24021002***
- Mass Sine 12/2000 120 V, ***product code 25012002***

AC Master Series:
Reliable AC power for recreational and semi-professional use

These affordable sine wave inverters convert 12 or 24 V battery voltage into reliable 230 V 50/60 Hz grid power, making them ideal for recreational and semi-professional applications.

The AC Master series is easy to install and delivers full output, even under the most demanding conditions. The pure sine wave technology provides an outstanding power quality, ensuring the correct functioning of sensitive equipment.

The usage of high frequency switching technology eliminates any annoying humming and buzzing sounds.

Representing complete value for money, these ruggedly built inverters provide essential home comforts when you're far from the nearest grid connection.

Applications

Both recreational and semi-professional use, where grid power varies or is unavailable. Applications include lighting, appliances, electric cooking and power tools. For (mobile) applications in your home, office or service vehicle, or during your holidays.

FEATURES

- Pure sine wave technology protects sensitive equipment.
- Delivers full output at high peak power under the most demanding conditions.
- Automatic power saving system for extended runtime.
- Compact and lightweight design, saving valuable installation time.
- Reliable and safe operation; protected against over-temperature, overload, short circuit, high or low battery voltage.
- Variable speed fan for quiet operation at low power.
- Optional remote control for instant switch off of the inverter and all connected equipment.
- Convenient plug connection for all models, 2500/3500 Watt models also hard wired.

In addition, the 2500/3500 Watt models offer:

- Combine 2 up to 15 units to obtain high power or 3-phase systems.
- Integrated transfer system, switches automatically between AC power sources.

Specifications AC Master sine wave inverters 12 V




	AC Master 12/300	AC Master 12/500	AC Master 12/700	AC Master 12/1000
Product code	*28010300*	*28010500*	*28010700*	*28011000*
With UK plug	*n.a.*	*n.a.*	*28210700*	*28211000*
With NZ/AU plug	*n.a.*	*n.a.*	*28410700*	*28411000*
GENERAL SPECIFICATIONS				
Output voltage	230 V – 50 Hz (± 0,1.%)	230 V – 50 Hz (± 0,1.%)	200/220/230/240 V 50/60 Hz (selectable)	200/220/230/240 V 50/60 Hz (selectable)
Output waveform	true sine	true sine	true sine	true sine
Nominal battery voltage	12 V	12 V	12 V	12 V
Recommended battery capacity	≥ 60 Ah	≥ 100 Ah	≥ 100 Ah	≥ 130 Ah
Continuous power at 25 °C / 77 °F, cos phi 1	300 W	500 W	700 W	1000 W
Continuous power at 40 °C / 104 °F, cos phi 1	250 W	400 W	700 W	1000 W
Peak load	600 W	800 W	< 810 W (1 min.) < 1230 W (1 sec.)	< 1150 W (1 min.) < 1750 W (1 sec.)
AC connection	universal	universal	plug connection EU (Schuko) or UK	plug connection EU (Schuko) or UK
Efficiency	90 %	90 %	91 %	92 %
Parallel configuration	n.a.	n.a.	n.a.	n.a.
3-Phase configuration	n.a.	n.a.	n.a.	n.a.
Display/read-out	LED display	LED display	LED indication: battery voltage, load level, status	LED indication: battery voltage, load level, status
Dimensions, hxwxd	210 x 130 x 60 mm 8.3 x 5.1 x 2.4 inch	210 x 130 x 60 mm 8.3 x 5.1 x 2.4 inch	200 x 330 x 83 mm 7.9 x 13 x 3.3 inch	200 x 372 x 83 mm 7.9 x 14.6 x 3.3 inch
Weight	1,16 kg / 2.55 lb	1,22 kg / 2.69 lb	2,7 kg / 6 lb	3,3 kg / 7.3 lb
Alarms	4 alarm modes	4 alarm modes	potential free alarm contact	potential free alarm contact
Approvals	CE, E-mark, ABYC A-31	CE, E-mark, ABYC A-31	CE, E-mark, RCM	CE, E-mark, RCM
TECHNICAL SPECIFICATIONS				
Technology	high frequency, input & output fully isolated	high frequency, input & output fully isolated	high frequency, input & output fully isolated	high frequency, input & output fully isolated
Input current (nominal load)	22.5 A	37.5 A	70 A	100 A
No-load power consumption (energy saving mode)	0.33 A – 4 W	0.33 A – 4 W	< 0.1 A	< 0.1 A
Minimal DC fuse (slow blow)	2x 40 A	2x 40 A	100 A	125 A
Minimal cable size	1.5 mtr DC cable delivered as standard	1.5 mtr DC cable delivered as standard	25 mm^2	35 mm^2
Harmonic distortion typical	< 6 %	< 6 %	< 5 %	< 5 %
Cos phi	all power factors allowed	all power factors allowed	all power factors allowed	all power factors allowed
Transfer system	n.a.	n.a.	n.a.	n.a.
Temperature range (ambient temp.)	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C	-20 °C to 40 °C, derating power > 40 °C	-20 °C to 40 °C, derating power > 40 °C
Protection degree	IP23, vertical wall mounting	IP23, vertical wall mounting	IP21, horizontal wall mounting	IP21, horizontal wall mounting
Protections	over-temperature, over load, short circuit, high/low battery voltage	over-temperature, over load, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)
Cooling	natural/forced	natural/forced	temperature and load controlled fan	temperature and load controlled fan
MasterBus compatible	no	no	no	no
OPTION Inverter Control Panel (ICP) *70405080*	n.a.	n.a.	option	option

On/off control for the AC Master sine wave inverter with a clear on/off indicator which indicates when the inverter is active. In addition, the ICP makes it possible to turn the inverter on or off automatically by means of a 12-volt input, for example when switching on the onboard AC power or while starting an engine. The ICP remote control comes with 8 m (25 ft) cable.

			
	AC Master 12/1500	**AC Master 12/2500**	**AC Master 12/3500**
	28011500	*28012500*	*28013500*
	28211500	*n.a.*	*n.a.*
	28411500	*28412500*	*28413500*
	200/220/230/240 V 50/60 Hz (selectable)	230/240 V - 50/60 Hz (selectable)	230/240 V - 50/60 Hz (selectable)
	true sine	true sine	true sine
	12 V	12 V	12 V
	≥ 160 Ah	≥ 270 Ah	≥ 360 Ah
	1500 W	2500 W	3500 W
	1500 W	2500 W	3500 W
	< 1730 W (1 min.) < 2650 W (1 sec.)	< 3000 W (1 min.) < 4000 W (1 sec.)	< 4500 W (1 min.) < 6000 W (1 sec.)
	plug connection EU (Schuko) or UK	hardwired + plug connection EU (Schuko)	hardwired + plug connection EU (Schuko)
	93 %	88 %	90 %
	n.a.	yes, up to 15 units	yes, up to 15 units
	n.a.	yes, 3 units	yes, 3 units
	LED indication: battery voltage, load level, status	LED indication: battery voltage, load level, status	LED indication: battery voltage, load level, status
	248 x 421 x 83 mm 9.8 x 16.6 x 3.3 inch	283 x 436 x 128 mm 11.1 x 17.2 x 5 inch	283 x 496 x 128 mm 11.1 x 19.5 x 5 inch
	4,2 kg / 9.3 lb	8 kg / 17.6 lb	10 kg / 22 lb
	potential free alarm contact	potential free alarm contact	potential free alarm contact
	CE, E-mark, RCM	CE, E-mark, RCM	CE, E-mark, RCM
	high frequency, input & output fully isolated	high frequency, input & output fully isolated	high frequency, input & output fully isolated
	150 A	250 A	350 A
	< 0.1 A	< 1.1 A	< 1.4 A
	175 A	300 A	400 A
	50 mm^2	95 mm^2	120 mm^2
	< 3 %	< 3 %	< 3 %
	all power factors allowed	all power factors allowed	all power factors allowed
	n.a.	integrated, automatic (inverter to grid: 8~10 ms, grid to inverter: 16~50 ms). Not for parallel & 3-phase operation (external transfer system possible).	integrated, automatic (inverter to grid: 8~10 ms, grid to inverter: 16~50 ms). Not for parallel & 3-phase operation (external transfer system possible).
	-20 °C to 40 °C, derating power > 40 °C	-20 °C to 60 °C, derating power > 40 °C	-20 °C to 60 °C, derating power > 35 °C
	IP21, horizontal wall mounting	IP21, horizontal wall mounting	IP21, horizontal wall mounting
	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)
	temperature and load controlled fan	temperature and load controlled fan	temperature and load controlled fan
	no	no	no
	option	option	option

The models below are also available shortly in 120V/60Hz version with GFCI connection:

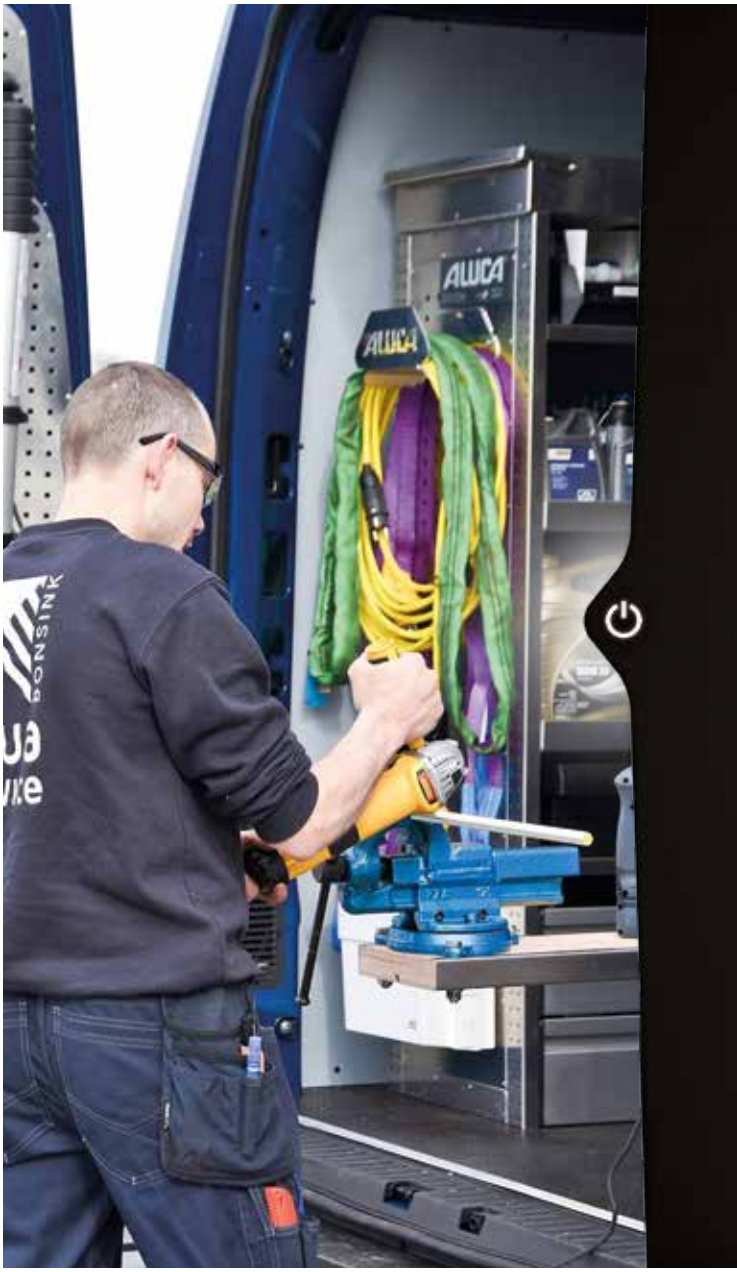
- AC Master 12/700, *product code 28510700*
- AC Master 12/2000, *product code 28512000*

Specifications AC Master sine wave inverters 24 V




	AC Master 24/300	AC Master 24/500	AC Master 24/700	AC Master 24/1000
Product code	*28020300*	*28020500*	*28020700*	*28021000*
With UK plug	*n.a.*	*n.a.*	*28220700*	*28221000*
With NZ/AU plug	*n.a.*	*n.a.*	*28420700*	*28421000*
GENERAL SPECIFICATIONS				
Output voltage	230 V – 50 Hz (± 0,1.%)	230 V – 50 Hz (± 0,1.%)	200/220/230/240 V 50/60 Hz (selectable)	200/220/230/240 V 50/60 Hz (selectable)
Output waveform	true sine	true sine	true sine	true sine
Nominal battery voltage	24 V	24 V	24 V	24 V
Recommended battery capacity	≥ 30 Ah	≥ 50 Ah	≥ 50 Ah	≥ 65 Ah
Continuous power at 25 °C / 77 °F, cos phi 1	300 W	500 W	700 W	1000 W
Continuous power at 40 °C / 104 °F, cos phi 1	250 W	400 W	700 W	1000 W
Peak load	600 W	800 W	< 810 W (1 min.) < 1230 W (1 sec.)	< 1150 W (1 min.) < 1750 W (1 sec.)
AC connection	universal	universal	plug connection EU (Schuko) or UK	plug connection EU (Schuko) or UK
Efficiency	91 %	91 %	93 %	94 %
Parallel configuration	n.a.	n.a.	n.a.	n.a.
3-Phase configuration	n.a.	n.a.	n.a.	n.a.
Display/read-out	LED display	LED display	LED indication: battery voltage, load level, status	LED indication: battery voltage, load level, status
Dimensions, hxwxd	210 x 130 x 60 mm 8.3 x 5.1 x 2.4 inch	210 x 130 x 60 mm 8.3 x 5.1 x 2.4 inch	200 x 330 x 83 mm 7.9 x 13 x 3.3 inch	200 x 372 x 83 mm 7.9 x 14.6 x 3.3 inch
Weight	1,16 kg / 2.55 lb	1,22 kg / 2.69 lb	2,7 kg / 6 lb	3,3 kg / 7.3 lb
Alarms	4 alarm modes	4 alarm modes	potential free alarm contact	potential free alarm contact
Approvals	CE, E-mark, ABYC A-31	CE, E-mark, ABYC A-31	CE, E-mark, RCM	CE, E-mark, RCM
TECHNICAL SPECIFICATIONS				
Technology	high frequency, input & output fully isolated	high frequency, input & output fully isolated	high frequency, input & output fully isolated	high frequency, input & output fully isolated
Input current (nominal load)	11 A	19 A	35 A	50 A
No-load power consumption (energy saving mode)	0.16 A – 4 W	0.16 A – 4 W	< 0.06 A	< 0.05 A
Minimal DC fuse (slow blow)	40 A	40 A	50 A	63 A
Minimal cable size	1.5 mtr DC cable delivered as standard	1.5 mtr DC cable delivered as standard	16 mm^2	16 mm^2
Harmonic distortion typical	< 6 %	< 6 %	< 5 %	< 5 %
Cos phi	all power factors allowed	all power factors allowed	all power factors allowed	all power factors allowed
Transfer system	n.a.	n.a.	n.a.	n.a.
Temperature range (ambient temp.)	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C	-20 °C to 40 °C, derating power > 40 °C	-20 °C to 40 °C, derating power > 40 °C
Protection degree	IP23, vertical wall mounting	IP23, vertical wall mounting	IP21, horizontal wall mounting	IP21, horizontal wall mounting
Protections	over-temperature, over load, short circuit, high/low battery voltage	over-temperature, over load, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)
Cooling	natural/forced	natural/forced	temperature and load controlled fan	temperature and load controlled fan
MasterBus compatible	no	no	no	no
OPTION  Inverter Control Panel (ICP) *70405080*	n.a.	n.a.	option	option
On/off control for the AC Master sine wave inverter with a clear on/off indicator which indicates when the inverter is active. In addition, the ICP makes it possible to turn the inverter on or off automatically by means of a 12-volt input, for example when switching on the onboard AC power or while starting an engine. The ICP remote control comes with 8 m (25 ft) cable.				

	AC Master 24/1500	AC Master 24/2500
	28021500	*28022500*
	28221500	*n.a.*
	28421500	*28422500*
	200/220/230/240 V 50/60 Hz (selectable)	230/240 V - 50/60 Hz (selectable)
	true sine	true sine
	24 V	24 V
	≥ 80 Ah	≥ 135 Ah
	1500 W	2500 W
	1500 W	2500 W
	< 1730 W (1 min.) < 2650 W (1 sec.)	< 3000 W (1 min.) < 4000 W (1 sec.)
	plug connection EU (Schuko) or UK	hardwired + plug connection EU (Schuko)
	94 %	88 %
	n.a.	yes, up to 15 units
	n.a.	yes, 3 units
	LED indication: battery voltage, load level, status	LED indication: battery voltage, load level, status
	248 x 421 x 83 mm 9.8 x 16.6 x 3.3 inch	283 x 436 x 128 mm 11.1 x 17.2 x 5 inch
	4,2 kg / 9.3 lb	8 kg / 17.6 lb
	potential free alarm contact	potential free alarm contact
	CE, E-mark, RCM	CE, E-mark, RCM
	high frequency, input & output fully isolated	high frequency, input & output fully isolated
	75 A	125 A
	< 0.05 A	< 0.7 A
	100 A	160 A
	25 mm^2	50 mm^2
	< 5 %	< 5 %
	all power factors allowed	all power factors allowed
	n.a.	integrated, automatic (inverter to grid: 8~10 ms, grid to inverter: 16~50 ms). Not for parallel & 3-phase operation (external transfer system possible).
	-20 °C to 40 °C, derating power > 40 °C	-20 °C to 60 °C, derating power > 40 °C
	IP21, horizontal wall mounting	IP21, horizontal wall mounting
	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)	over-temperature, overload, short circuit, high/low voltage, reverse polarity (fuse)
	temperature and load controlled fan	temperature and load controlled fan
	no	no
	option	option



The models below are also available shortly in 120V/60Hz version with GFCI connection:

- AC Master 24/700, ***product code 28520700***
- AC Master 24/2000, ***product code 28522000***

Mastervolt Combi Series: High-quality power supply with first-class comfort, wherever you are

Mastervolt Combis integrate a powerful battery charger, a quiet and efficient inverter and a versatile switching system in one robust, lightweight and compact device. This multi-faceted product offers a carefree power supply for recreational and professional use.

Possible applications vary from launches to 16-metre yachts, from campers to demo trucks, from holiday homes to remote businesses, and from backup systems to grid connected systems with energy storage. Each Mass Combi Ultra, Mass Combi Pro and Mass Combi can be used as an automatic stand-alone device for a non-stop power supply or as part of a larger power system.

MasterBus Compatible

The MasterBus platform brings advanced system functions within reach and allows users to monitor a complete power system from a single display. The intelligent 'one cable' system minimises cable connections and saves valuable weight and space. After connecting, you can automate and adapt your system to your personal demands.

Which Mastervolt Combi suits you?

- **Mass Combi Ultra**
  The Mass Combi Ultra is based on the well-known Mass Combi range but is even more compact, stronger and more efficient and comprehensive. In addition to easier installation and higher capacities, the Combi Ultra has various unique benefits such as full capacity in high temperatures, an integrated solar charge regulator, and separate grid power and generator inputs. Up to ten units can be parallel switched and the Combi Ultra offers a 3-phase power supply. Five different Mass Combi Ultra and Pro models are available for systems ranging from 3,000 watt to 40 kW.

- **Mass Combi Pro**
  Designed for professional use. This version has all the Mass Combi Ultra features but without solar input and secondary charger. The Pro provides the optimal balance of strength, versatility and cost. It is the perfect solution for professional applications.

- **Mass Combi**
  Mastervolt offers four Mass Combi models ranging from 1600 to 2600 watt. The Mass Combi is recognised as the best product in the market and has proven its reliability many times. It offers the best of both worlds: an advanced battery charger and a quiet inverter combined in one compact device.

POWER ASSIST

Power Assist for extra power

If you require more power than the grid or generator can provide, the Mass Combi series will make up the shortfall by inverting from the battery. The Combi also ensures that the battery is recharged once the peak demand has passed.

COMPACT

EASY INSTALL

Ease of installation

The integrated design of three devices into one, lightweight body and robust mounting clamps give considerable savings in (labour) time and costs.

Exceptional Performance

HIGH EFFICIENCY

HIGH TEMP PERFORMANCE

POWERFUL

The inverter is quiet, clean and efficient, and offers the full capacity even in extreme ambient temperatures. Pure sine wave energy and a peak capacity of 200 % guarantee a problem-free start, even for the heaviest loads.

Not just any battery charger

PROLONGED BATTERY LIFE

The built-in battery charger uses Mastervolt's proven 3-step+ charging technology to allow the optimal charging of all battery types, including our advanced Lithium Ion models. The battery charger supplies a maximum charge current, even with a higher charge voltage, and speeds up the complete recharging of your batteries.

Mass Combi Ultra & Mass Combi Pro:
Powerful, complete and versatile

The Mass Combi Ultra series comprises several models, varying from 3000 W to 3500 W. For higher capacities up to 35 kW the Combi Ultra can be used in parallel or 3-phase configurations. An efficient and integrated solar charge regulator helps make the most of your solar panels.

The Mass Combi Ultra is equipped with the latest technologies. The new 'V6' inverter technology ensures a uniquely low stand-by use, while an ultra-fast Digital Signal Processor guarantees seamless switching between all available energy sources. ***Power Assist*** prevents power dips and failures, even with a weak electricity connection or small generator. Moreover, all Mass Combi Ultra models are equipped with MasterBus.

Higher yield from solar energy

At Mastervolt we used our knowledge gained in the grid connected solar sector to make a super-efficient built-in MPPT solar charge regulator.

Compared to most solar charge regulators on the market, the MPPT offers up to 30 % more yield from solar panels. The solar panels power 'hidden' consumers and keep your batteries in optimal condition.

'Pro' Models

For professional applications. Mastervolt offers a 'Pro' model, featuring all Ultra functions, but without the solar input and secondary battery charger.

QUOTE

"The Mass Combi Ultra was developed for a rapidly evolving market. It is a compact unit with advanced electronics, offering a solar input, a generator input, and a parallel connection, all with very quiet operation. It offers more power to the commercial and industrial sectors, along with the option for three-phase operation. The Mass Combi Ultra is a huge leap forward and sets new industry standards."

DAAN HOBBELEN, MANAGER BUSINESS DEVELOPMENT MASTERVOLT AMSTERDAM, THE NETHERLANDS

FEATURES

- For professional and semi-professional use.
- Quiet, powerful inverter with 200 % peak power.
- Compact, lightweight and hum-free thanks to HF technology.
- Pure sine wave voltage prevents malfunctions and damage to sensitive equipment such as adapters.
- High yield and more power from your batteries.
- Intelligent 3-step+ battery charger with low DC ripple current for fast charging times and long battery life.
- Power Assist: prevents blown fuses.
- A dynamic battery voltage window allows you to enjoy AC power for longer without damaging your batteries.
- Active Optima Cooling concept prevents unnecessary fan noise.
- Charges two individual battery banks simultaneously (Mass Combi Ultra).
- An integrated MPPT solar charge controller allows for 30% more yield from solar power for charging the batteries (Mass Combi Ultra).
- Quick installation and reliable professional connections.
- CE and ABYC certified.

Quiet Operation

The Mass Combi Ultra and Mass Combi Pro can provide up to 50 % of the charging current or inverter capacity without fan cooling. This is perfect for night-time operation; if little power is consumed, the fan stops turning and goes silent. When maximum capacity is required, or the ambient temperature is very high, the Active Optima Cooling concept regulates the fan speed in a linear way, ensuring that it never spins too fast or makes any unnecessary ticking noises.

Parallel and 3-phase operation

The Mass Combi Ultra functionality goes beyond stand-alone operation, the design also allows parallel and 3-phase configurations for larger applications up to 35 kW. For larger systems, an external transfer system is required.

Dual AC inputs and outputs

The Mass Combi Ultra and Mass Combi Pro have inputs for generator or mains supply, each optimized for the power source. A robust intelligent transfer system switches seamlessly between AC power, generator and inverter, and ensures a constant power supply. Flickering lights or failure of electronic equipment belong to the past. Separate AC outputs provide the ability to power heavy users via mains and/or generator.

Specifications
Mass Combi Ultra
Mass Combi Pro
230 V




	Mass Combi Ultra 12/3000-150	Mass Combi Ultra 24/3500-100	Mass Combi Ultra 48/3500-50	Mass Combi Pro 12/3000-150
Product code	*38013000*	*38023500*	*38343500*	*38513000*
SPECIFICATIONS SINE WAVE INVERTER				
Nomimal DC voltage	12 V (9.5 – 16 V)	24 V (19 – 32 V)	48 V (38 – 62 V)	12 V (9.5 – 16 V)
Output voltage	180-260 V, adjustable	180-260 V, adjustable	180-260 V, adjustable	180-260 V, adjustable
Output waveform	true sine	true sine	true sine	true sine
Continous power at 40 °C, cos phi 1	3000 W	3500 W	3500 W	3000 W
Surge capability	6000 W	7000 W	7000 W	6000 W
Parallel configuration *For larger systems, an external transfer system is required.*	yes, up to 10 standard	yes, up to 10 standard	yes, up to 10 standard	yes, up to 10 standard
3-Phase configuration	yes, up to 3x3	yes, up to 3x3	yes, up to 3x3	yes, up to 3x3
Max. efficiency	≥ 90 %	≥ 92 %	≥ 93 %	≥ 90 %
Energy saving mode consumption	7 W	7 W	7 W	7 W
SPECIFICATIONS BATTERY CHARGER				
Max. charge current at 40 °C	150 A at 14.25 V	100 A at 28.5 V	50 A at 57 V	150 A at 14.25 V
Secondary charger output voltage	12 V	12/24 V selectable	12/24 V selectable	n.a.
Secondary charger output current	10 A	10 A	10 A	n.a.
Battery temperature sensor	yes, included	yes, included	yes, included	yes, included
SPECIFICATIONS TRANSFER SYSTEM				
AC input (generator)	50 A (switched)	50 A (switched)	50 A (switched)	50 A (switched)
AC input (mains)	30 A (switched)	30 A (switched)	30 A (switched)	30 A (switched)
AC output 1	67 A	67 A	67 A	67 A
AC output 2	50 A (switched)	50 A (switched)	50 A (switched)	50 A (switched)
Transfer speed	seamless (< 1 ms)	seamless (< 1 ms)	seamless (< 1 ms)	seamless (< 1 ms)
SOLAR INPUT DC SPECIFICATIONS				
Input voltage range	25-50 V	25-100 V	n.a.	n.a.
Max. PV peak power	500 Wp	500 Wp	n.a.	n.a.
Max. input current	19 A	19 A	n.a.	n.a.
Max. charge current	30 A at 14.25 V	15 A at 28.5 V	n.a.	n.a.
MPP Tracker	full power at 25-50 V	full power at 35-80 V	n.a.	n.a.
GENERAL SPECIFICATIONS				
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hxwxd	472 x 318 x 178 mm 18.6 x 12.5 x 7 inch	472 x 318 x 178 mm 18.6 x 12.5 x 7 inch	472 x 318 x 178 mm 18.6 x 12.5 x 7 inch	472 x 318 x 178 mm 18.6 x 12.5 x 7 inch
Weight	15.3 kg / 33.1 lb	15.3 kg / 33.1 lb	15.3 kg / 33.1 lb	15.3 kg / 33.1 lb
Approvals	CE, ABYC, RMRS	CE, ABYC, RMRS	CE, ABYC, RMRS	CE, ABYC
TECHNICAL SPECIFICATIONS				
Charge characteristic	IUoUo, automatic 3-step+ for AGM/Gel/MLI/flooded/ traction/spiral	IUoUo, automatic 3-step+ for AGM/Gel/MLI/flooded/ traction/spiral	IUoUo, automatic 3-step+ for AGM/Gel/MLI/flooded/ traction/spiral	IUoUo, automatic 3-step+ for AGM/Gel/MLI/flooded/ traction/spiral
Ground relay	yes, configurable	yes, configurable	yes, configurable	yes, configurable
Temperature range (ambient temp.)	-25 °C to 60 °C, derating > 40 °C	-25 °C to 60 °C, derating > 40 °C	-25 °C to 60 °C, derating > 40 °C	-25 °C to 60 °C, derating > 40 °C
Cooling	vario fan	vario fan	vario fan	vario fan
Protection degree	IP23 (vertical mounting)	IP23 (vertical mounting)	IP23 (vertical mounting)	IP23 (vertical mounting)
Protections	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
MasterBus compatible	yes	yes	yes	yes

OPTIONS

	EasyView 5 *77010310*	option	option	option	option
		Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.			
	MasterBus USB Interface *77030100*	option	option	option	option
		Communication port between MasterBus and the USB port of your PC; makes possible reading and configuration of your MasterBus system on the PC when combined with MasterAdjust software (free to download).			
	RJ12 communication / sync cable, available lengths: 1, 3, 6, 10 or 15 metre	option	option	option	option
		High quality communication cable fitted with RJ12 type modular plugs, suitable for connecting a remote control panel. Also suitable as a sync cable for Mass Combi Ultra or Mass Combi Pro models, both in parallel or 3-phase configurations.			

Mass Combi Pro
24/3500-100
38523500

24 V (19 – 32 V)
180-260 V, adjustable
true sine
3500 W
7000 W
yes, up to 10 standard
yes, up to 3x3
≥ 92 %
7 W
100 A at 28.5 V
n.a.
n.a.
yes, included
50 A (switched)
30 A (switched)
67 A
50 A (switched)
seamless (< 1 ms)
n.a.
n.a.
n.a.
n.a.
n.a.
LED display
472 x 318 x 178 mm 18.6 x 12.5 x 7 inch
15.3 kg / 33.1 lb
CE, ABYC
IUoUo, automatic 3-step+ for AGM/Gel/MLI/flooded/ traction/spiral
yes, configurable
-25 °C to 60 °C, derating > 40 °C
vario fan
IP23 (vertical mounting)
over-temperature, overload, short circuit, high/low battery voltage
yes
option
option
option

Mastervolt Mass Combi: best price/quality ratio

The exceptionally reliable Mass Combi series offers a lot of power at a highly competitive price. In addition, the four models are also available in two customer-friendly variations with remote control or MasterBus.

The powerful 3-step+ battery charger guarantees maximum battery life and can simultaneously charge two battery banks. The inverter with high peak power starts even the heaviest loads, with the Mass Combi 12/1600 being easily sufficient for your espresso machine. A built-in distribution system switches between grid and inverter power, while two separate AC outputs allow users to connect critical loads to a preferred group.

Grid connected solar power system with energy storage

The Mass Combi enables the expansion of a grid connected solar power system with energy storage in batteries. This way the majority of the generated energy is used, and users are less dependent on the electricity grid. In this setup, the Mass Combi is part of a MasterBus controlled system, which is described in detail on page 231.

FEATURES

- Compact, lightweight and no hum thanks to HF technology.
- High yield and more power from your batteries.
- Intelligent 3-step+ battery charger with low DC ripple current for fast charging times and long battery life.
- Charges two individual battery banks simultaneously.
- Quiet, powerful inverter with 200 % peak power.
- Power Assist: prevents blown fuses.
- Pure sine wave energy prevents failures and damage to sensitive equipment such as adapters.
- Dual AC outputs to separate critical equipment from heavy loads.
- Higher yields possible via parallel switching (only for 2200 and 2600 W models).
- Professional connections ensure fast installation and operational security.
- CE approved and E-marking for mobile applications.
- Attractively priced packages with MasterBus or remote control (see page 48 for more information).

QUOTE

"I believe that the off-grid market will grow strongly in the coming years, requiring more professionalism across the board. The Mastervolt systems concept is unique in this market: equipment designed to work at peak performance, brought in terms of communications and management under an integrated system. The brand, professionalism and recognised expertise of Mastervolt in the energy management of stand-alone sources generates confidence among customers."

DIEGO VOLPI, MANAGING DIRECTOR DISTRIBUTOR MASTERVOLT ITALIA

Specifications Mass Combi 230 V




	Mass Combi 12/1600-60	Mass Combi 12/2200-100	Mass Combi 24/1800-35	Mass Combi 24/2600-60
Product code	*36011600*	*36012200*	*36021800*	*36022600*
Incl. MasterBus Combi Interface *(see page 48 for details)* 1	*36011602*	*36012202*	*36021802*	*36022602*
Incl. remote control *(see page 48 for details)* 2	*36011601*	*36012201*	*36021801*	*36022601*
GENERAL SPECIFICATIONS SINE WAVE INVERTER				
Nominal DC voltage	12 V (10-15 V)	12 V (10-15 V)	24 V (19-31 V)	24 V (19-31 V)
Continuous power at 25 °C, cos phi 1	1600 W	2150 W	1800 W	2550 W
Max. peak load	3000 W	4000 W	3000 W	4000 W
Parallel configuration	no	yes, up to 2 units	no	yes, up to 2 units
Synchronise with mains/generator	yes	yes	yes	yes
Output voltage	180-250 V (adjustable) 50/60 Hz (± 0.05 %)	180-250 V (adjustable) 50/60 Hz (± 0.05 %)	180-250 V (adjustable) 50/60 Hz (± 0.05 %)	180-250 V (adjustable) 50/60 Hz (± 0.05 %)
Output waveform	true sine	true sine	true sine	true sine
Max. efficiency	≥ 90 %	≥ 90 %	≥ 90 %	≥ 90 %
DC consumption at 230 V	< 9 W	< 9 W	< 9 W	< 9 W
Energy saving mode consumption	0.5 W	0.5 W	0.5 W	0.5 W
GENERAL SPECIFICATIONS BATTERY CHARGER				
Max. charge current (adjustable)	60 A at 14.25 V	100 A at 14.25 V	35 A at 28.5 V	60 A at 28.5 V
Primary AC consumption (full charge)	4.5 A	7.2 A	5.2 A	8.5 A
Charge current second output	5 A	5 A	5 A	5 A
Battery temperature sensor	yes, included	yes, included	yes, included	yes, included
SPECIFICATIONS TRANSFER SYSTEM				
AC input 1	50 A (25 A switched, to short break output)	50 A (25 A switched, to short break output)	50 A (25 A switched, to short break output)	50 A (25 A switched, to short break output)
AC output 1	25 A (shortbreak output)	25 A (shortbreak output)	25 A (shortbreak output)	25 A (shortbreak output)
AC output 2	50 A (power output)	50 A (power output)	50 A (power output)	50 A (power output)
Transfer speed	semi-seamless (10 ms typical)	semi-seamless (10 ms typical)	semi-seamless (10 ms typical)	semi-seamless (10 ms typical)
GENERAL SPECIFICATIONS				
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hxwxd	371 x 318 x 143 mm 14.6 x 12.5 x 5.6 inch	496 x 318 x 156 mm 19.5 x 12.5 x 6.1 inch	371 x 318 x 143 mm 14.6 x 12.5 x 5.6 inch	496 x 318 x 156 mm 19.5 x 12.5 x 6.1 inch
Weight	7.8 kg / 17.2 lb	11 kg / 24.3 lb	7.8 kg / 17.2 lb	11 kg / 24.3 lb
Approvals	CE, ABYC, E4, RMRS	CE, ABYC, E4, RMRS	CE, ABYC, E4, RMRS	CE, ABYC, E4, RMRS
TECHNICAL SPECIFICATIONS				
Charge characteristic	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction
Max. current power output	50 A	50 A	50 A	50 A
Max. current shortbreak / inverter output	25 A	25 A	25 A	25 A
Ground relay	yes, configurable	yes, configurable	yes, configurable	yes, configurable
Temperature range (ambient temp.)	-25 °C to 60 °C, derating > 25 °C	-25 °C to 60 °C, derating > 25 °C	-25 °C to 60 °C, derating > 25 °C	-25 °C to 60 °C, derating > 25 °C
Cooling	maintenance-free vario fans	maintenance-free vario fans	maintenance-free vario fans	maintenance-free vario fans
Protection degree	IP23 (vertical mounting)	IP23 (vertical mounting)	IP23 (vertical mounting)	IP23 (vertical mounting)
Protections	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
MasterBus compatible	yes, in combination with a MasterBus Combi Interface	yes, in combination with a MasterBus Combi Interface	yes, in combination with a MasterBus Combi Interface	yes, in combination with a MasterBus Combi Interface

OPTIONS

	EasyView 5 *77010310*	option	option	option	option
		In combination with a MasterBus Combi Interface. Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.			
	MasterBus USB Interface *77030100*	option	option	option	option
		Communication port between MasterBus and the USB port of your PC; makes possible reading and configuration of your MasterBus system on the PC when combined with MasterAdjust software (free to download).			

MASTER TIP

Maximise your convenience with a Mass Combi package deal.

1 Combi Deal with MasterBus (MB version)

To integrate the Mass Combi into a MasterBus system in a simple manner, Mastervolt can deliver all Mass Combi models in a MasterBus version. The relevant product code includes the Mass Combi model of your choice, complemented by a MasterBus Combi interface.

MasterBus Combi Interface

This interface makes the Mass Combi part of the MasterBus system, a communication and networking platform developed by Mastervolt. All components easily connect with each other within a MasterBus system, making for easy and intuitive operation. At the same time, the installation requires far fewer cables, which reduces the chance of any complications. The entire system may be operated with a single EasyView 5 touchscreen panel.

2 Combi Deal with remote control (Remote version)

In addition, Mastervolt can provide all Mass Combi models in a Remote version so that the AC and DC power status can be monitored remotely. The relevant product code includes the Mass Combi model of your choice, plus an ICC control panel and an APC control panel.

Inverter Charger Control (ICC) control panel

The ICC control panel provides information on the DC consumption, charge phase, malfunction diagnosis and the availability of the grid power supply. This panel also features a ‘charger only’ on/off button.

AC Power Control (APC) control panel

The APC control panel provides clear information about the AC power, the grid voltage and the settings of the AC breaker. The APC control panel enables you to set the maximum input current to prevent the AC breaker from tripping.

Specifications Mass Combi 120 V




	Mass Combi 12/2500-100	Mass Combi 12/4000-200	Mass Combi 24/2500-60	Mass Combi 24/4000-120
Product code	*37012505*	*37014005*	*37022505*	*37024005*
GENERAL SPECIFICATIONS SINE WAVE INVERTER				
Nominal DC voltage	12 V (10-15 V)	12 V (10-15 V)	24 V (19-31 V)	24 V (19-31 V)
Continuous power at 77 °F / 25 °C, cos phi 1	2500 W	3750 W	2500 W	3750 W
Max. peak load	4000 W	7500 W	4000 W	7500 W
Parallel configuration	yes, up to 2 units	no	yes, up to 2 units	no
Synchronise with mains/generator	yes	yes	yes	yes
Output voltage	120 V (± 5 %) 60 Hz, ± 0.05 %	120 V (± 5 %) 60 Hz, ± 0.05 %	120 V (± 5 %) 60 Hz, ± 0.05 %	120 V (± 5 %) 60 Hz, ± 0.05 %
Output waveform	true sine	true sine	true sine	true sine
Max. efficiency	≥ 90 %	≥ 90 %	≥ 90 %	≥ 90 %
DC consumption at 120 V	< 9 W	< 18 W	< 9 W	< 18 W
Energy saving mode consumption	0.5 W	1 W	0.5 W	1 W
GENERAL SPECIFICATIONS BATTERY CHARGER				
Input voltage range	90-135 V	90-135 V	90-135 V	90-135 V
Max. charge current (adjustable)	100 A at 14.25 V	200 A at 14.25 V	60 A at 28.5 V	120 A at 28.5 V
Primary AC consumption (full charge)	1700 W – 14.5 A	3400 W - 29 A	2000 W - 17 A	3500 W - 29 A
Charge current second output	5 A	2 x 5 A	5 A	2 x 5 A
Battery temperature sensor	yes, included	yes, included	yes, included	yes, included
GENERAL SPECIFICATIONS				
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hxwxd	19.5 x 12.5 x 6.1 inch 496 x 318 x 156 mm	19.5 x 12.5 x 11 inch 496 x 318 x 279 mm	19.5 x 12.5 x 6.1 inch 496 x 318 x 156 mm	19.5 x 12.5 x 11 inch 496 x 318 x 279 mm
Weight	24.3 lb / 11 kg	46.3 lb / 21 kg	24.3 lb / 11 kg	46.3 lb / 21 kg
Approvals	CE, ABYC	CE, ABYC	CE, ABYC	CE, ABYC
TECHNICAL SPECIFICATIONS				
Charge characteristic	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction	IUoUo, automatic / 3-step+ for Gel/AGM/MLI/ flooded/spiral/traction
Max. current power output	50 A	50 A	50 A	50 A
Max. current shortbreak / inverter output	35 A	35 A	35 A	35 A
Transfer speed	semi-seamless (25 ms max., 10 ms typical)	semi-seamless (25 ms max., 10 ms typical)	semi-seamless (25 ms max., 10 ms typical)	semi-seamless (25 ms max., 10 ms typical)
Ground relay	yes, configurable	yes, configurable	yes, configurable	yes, configurable
Temperature range (ambient temp.)	-13 °F to 140 °F -25 °C to 60 °C; derating > 77 °F / 25 °C	-13 °F to 140 °F -25 °C to 60 °C; derating > 77 °F / 25 °C	-13 °F to 140 °F -25 °C to 60 °C; derating > 77 °F / 25 °C	-13 °F to 140 °F -25 °C to 60 °C; derating > 77 °F / 25 °C
Cooling	maintenance-free vario fans	maintenance-free vario fans	maintenance-free vario fans	maintenance-free vario fans
Protection degree	IP23 (vertical mounting)	IP23 (vertical mounting)	IP23 (vertical mounting)	IP23 (vertical mounting)
Protections	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage	over-temperature, overload, short circuit, high/low battery voltage
MasterBus compatible	yes, in combination with a MasterBus Combi Interface	yes, in combination with a MasterBus Combi Interface	yes, in combination with a MasterBus Combi Interface	yes, in combination with a MasterBus Combi Interface

OPTIONS

	Remote ICC *70405000*	option	delivered as standard	option	delivered as standard
		Indication of DC consumption, charge phase, AC present, failure, with on/off/'charger only' switch & 6 metre cable.			
	Remote APC *70405010*	option	option	option	option
		Indication of AC consumption, AC voltage, fuse value of the grid/generator connection, with Power Sharing.			
	EasyView 5 *77010310*	option	option	option	option
		In combination with a MasterBus Combi Interface. Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.			
	MasterBus Combi Interface *77030475*	option	option	option	option
		Integrates the Mass Combi in a MasterBus network.			

Mastervolt DC-DC Converters: For 12, 24 and 48 volt

A DC-DC converter can provide other voltages than those applied in your basic system. By using a DC-DC converter, other voltages can be reached. They also ensure that all your equipment has a stable power supply with the right voltage.

Mac & Magic Series

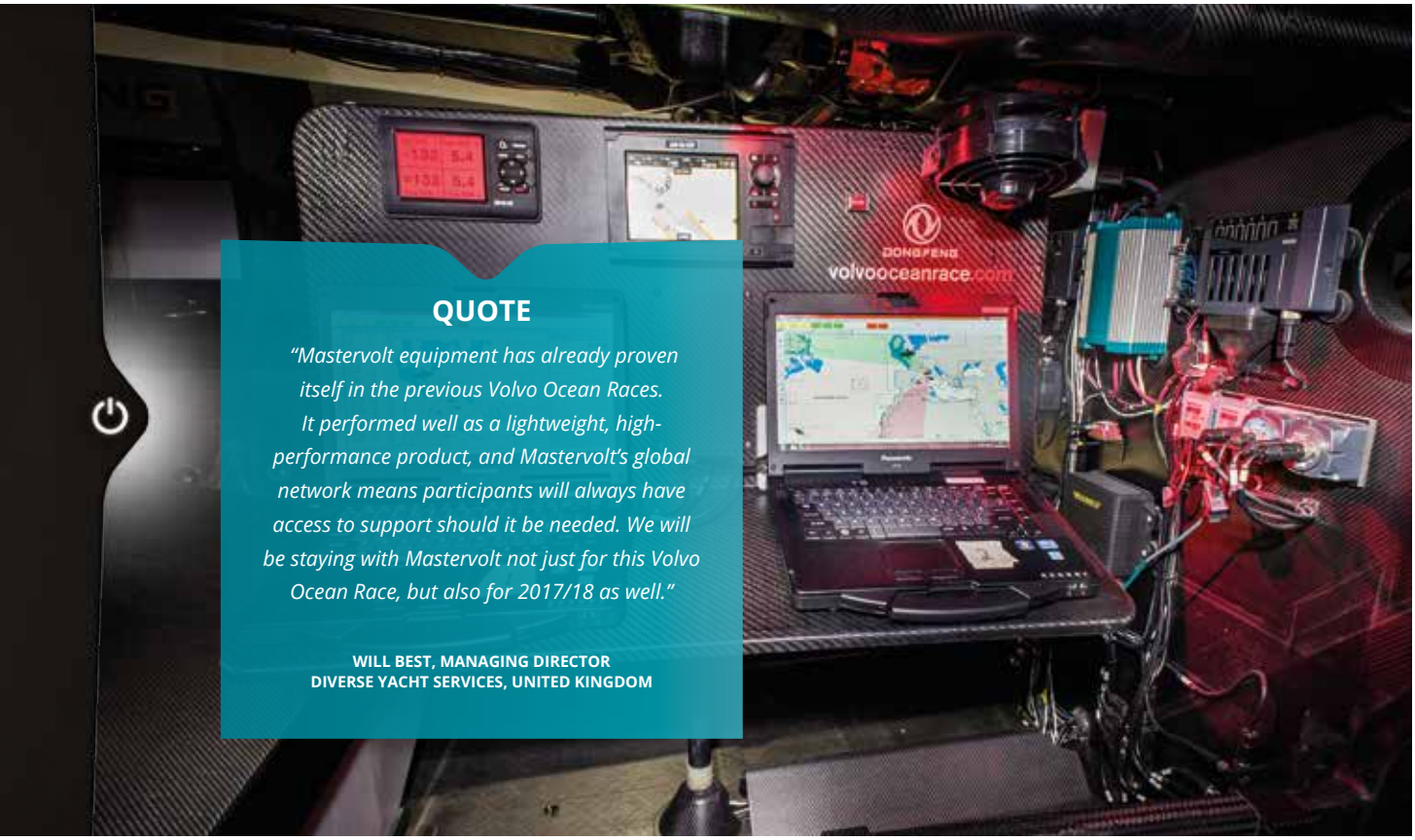
- Professional use.
- Converter and 3-step battery charger.
- Parallel switchable.
- Adjustable and programmable output voltage.
- Voltage stabilisation for a longer lifespan of halogen lights, etc.
- Dimmer function for Mac & Magic models.
- Mac Plus: optimal charging in Euro 5/6 applications.

The ***Mac/Magic*** models can regulate the voltage both up and down to ensure an optimal voltage stabilisation, even when the battery voltage fluctuates due to heavy loads. The galvanic isolation between input and output prevents disruptions to, for instance, communication equipment.

The ***Mac Plus*** is ideal for charging service batteries in vehicles with a smart Euro 5/6 alternator.
The Mac Plus charges the batteries quickly, even when the alternator is inactive and the battery voltage very low. The automatic start/stop function ensures that empty starter batteries become a thing of the past.
The Mac Plus comes with integrated MasterBus (CAN) communication and E-mark certification. It seamlessly charges Lithium Ion, Gel and AGM batteries via the tried and tested Mastervolt 3-stage charging method.

DC Master Series

- Recreational and semi-professional use.
- Easy to install using included mounting bracket.
- Excellent price/performance ratio.
- Available in isolated and non-isolated version.



QUOTE

"Mastervolt equipment has already proven itself in the previous Volvo Ocean Races. It performed well as a lightweight, high-performance product, and Mastervolt's global network means participants will always have access to support should it be needed. We will be staying with Mastervolt not just for this Volvo Ocean Race, but also for 2017/18 as well."

WILL BEST, MANAGING DIRECTOR
DIVERSE YACHT SERVICES, UNITED KINGDOM

Courtesy of Ian Roman / Volvo Ocean Race.

Programmable via laptop or PC

CUSTOMIZE

Remote control the Mac/Magic via your laptop or desktop PC or configure your personal preferences. The device has a communication port and easy installation with a PC-Link and MasterAdjust software.

3-Step battery charger

Connected to the 24 V main battery, the Mac/Magic series can also be used as an advanced 3-step battery charger for 12/24 V Gel, AGM, flooded or Lithium Ion batteries.

Euro 5/6 solution

Charging service batteries in Euro 5/6 applications? The Mac Plus provides constant power to the service battery, even when the alternator is inactive.

PARALLEL OPERATION

Parallel Operation

Lots of consumers on board? The parallel configuration of several units will provide you over 100 amperes. Advanced high-frequency technology with modern microprocessors ensures minimum power loss when switching from 24 to 12 V and vice versa.

COST SAVING

Energy-saving dimmer function

Many standard light dimmers convert part of the energy to heat and also lose unnecessary energy. The Mastervolt Mac/Magic converters regulate the power supply efficiently and without excessive heat build-up, for optimal safety (multiple converters can be used for multiple lamps).

Solid Connections

Galvanized brass connection block with screw terminal or chrome-plated fast-on for DC in/out for the Mac/Magic models. The robust M8 connections of the Mac Plus prevent any loosening due to vibrations.

Specifications Mac & Mac Plus DC-DC converters

		UPCOMING MODEL	UPCOMING MODEL	UPCOMING MODEL
				
	Mac 24/12-20	**Mac Plus 12/12-50**	**Mac Plus 12/24-30**	**Mac Plus 24/12-50**
Product code	*81200100*	*81205100*	*81205300*	*81205200*
INPUT SPECIFICATIONS				
Nominal input voltage	24 V	12 V	12 V	24 V
Input range	20-32 V DC	10-16 V DC	10-16 V DC	19-30 V DC
OUTPUT SPECIFICATIONS				
Nominal output voltage*	13.6 V DC	13.6 V DC	13.6 V DC	27.2 V DC
Output voltage	10-15 V DC	10-15 V DC	20-28.5 V DC	10-15 V DC
Output voltage dimmer*	4-13 V DC	n.a.	n.a.	n.a.
Output voltage stabilisation	2 % at extremes of temps, load and input	2 % at extremes of temps, load and input	2 % at extremes of temps, load and input	2 % at extremes of temps, load and input
Ripple	max. 1 % peak peak	max. 1 % peak peak	max. 1 % peak peak	max. 1 % peak peak
Power (max./nominal)	300 / 270 W	725 / 675 W	725 / 675 W	750 / 710 W
Max. output current	20 A	50 A	30 A	50 A
Charge current - 3-step mode	16 A	50 A	30 A	50 A
Parallel configuration	yes	yes	yes	yes
GENERAL SPECIFICATIONS				
Galvanic isolation	no	no	no	no
Voltage limited	yes	yes	yes	yes
Efficiency	>90 % (at nom. input voltage, full load); 92 % peak	> 95 % (at nom. input voltage, full load); 97 % peak	> 95 % (at nom. input voltage, full load); 97 % peak	> 95 % (at nom. input voltage, full load); 97 % peak
Protected against overload	yes	yes	yes	yes
Protected against over-temperature	yes	yes	yes	yes
Dimmer function	yes, by external momentary switch via fast-on connection, to be activated by DIP-switch setting	n.a.	n.a.	n.a.
Alarm contact	no	yes, through MasterBus	yes, through MasterBus	yes, through MasterBus
Dimensions, hxwxd	190 x 130 x 61 mm 7.5 x 5.1 x 2.4 inch	251 x 164 x 72 mm 10 x 6.5 x 2.8 inch	251 x 164 x 72 mm 10 x 6.5 x 2.8 inch	251 x 164 x 72 mm 10 x 6.5 x 2.8 inch
Weight	1 kg / 2.2 lb	2 kg / 4.4 lb	2 kg / 4.4 lb	2 kg / 4.4 lb
Approvals	CE	CE, E-mark	CE, E-mark	CE, E-mark
TECHNICAL SPECIFICATIONS				
3-Step charge option	yes (DIP switch settings)	yes (DIP switch settings)	yes (DIP switch settings)	yes (DIP switch settings)
DC consumption	< 30 mA	< 5 mA	< 5 mA	< 5 mA
Connections input/output	screw terminals, maximum wire size 16 mm² / AWG5	3 x M8 terminal for cable diameters of 10-50 mm², (positive input, positive output, joint negative 8-pole screw connection for cable diameters of 0.75-1.5 mm² (remote on/off, temperature sensor,		
Temperature range (ambient temp.)	-25 °C to 60 °C; > 40 °C derating power	-25 °C to 60 °C; > 40 °C derating power	-25 °C to 60 °C; > 40 °C derating power	-25 °C to 60 °C; > 40 °C derating power
Cooling	natural cooling	natural cooling	natural cooling	natural cooling
Protection degree	IP21	IP23	IP23	IP23
MasterBus compatible	yes, in combination with a MasterBus Serial Interface	yes	yes	yes

* Adjustable with MasterAdjust software.

OPTIONS						
	PC-Link *21730300*	option	n.a.	n.a.	n.a.	
		Interface between Magic converter and PC, in combination with the MasterAdjust software (free to download). The PC-Link can be directly connected to a computer serial port.				
	EasyView 5 *77010310*	option	option	option	option	
		In combination with a MasterBus Serial Interface. Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.				
	MasterBus Serial Interface *77030450*	option	n.a.	n.a.	n.a.	
		Integrates the Mac & Magic converters in a MasterBus network.				

UPCOMING MODEL

Mac Plus
24/24-30
81205400

24 V
19-30 V DC
27.2 V DC
20-28.5 V DC
n.a.
2 % at extremes of temps, load and input
max. 1 % peak peak
850 / 810 W
30 A
30 A
yes
no
yes
> 95 % (at nom. input voltage, full load); 97 % peak
yes
yes
n.a.
yes, through MasterBus
251 x 164 x 72 mm 10 x 6.5 x 2.8 inch
2 kg / 4.4 lb
CE, E-mark
yes (DIP switch settings)
< 5 mA
connection) voltage measurement)
-25 °C tot 60 °C; > 40 °C derating power
natural cooling
IP23
yes
n.a.
option
option

FEATURES MAC PLUS SERIES

- DC-DC converter with charge function, suitable for smart Euro 5/6 alternators.
- With E-mark certification for mobile applications.
- Parallel configuration for currents of over 100 A possible.
- Automatic on/off function prevents empty batteries.
- Optimal voltage stabilisation protects sensitive equipment, lighting and loads.
- Professional connections.
- Compact and easy to install.
- M8 connections for robust, vibration-free securing.
- Voltage drop compensation for optimal performance, independent of cable length.
- Temperature compensation extends battery lifespan.

Specifications Magic converters




	Magic 24/12-20	Magic 24/24-20	Magic 12/12-20	Magic 12/24-10
Product code	*81300100*	*81300200*	*81300400*	*81300300*
INPUT SPECIFICATIONS				
Nominal input voltage	24 V	24 V	12 V	12 V
Input range	19-32 V DC	19-32 V DC	11-16 V DC	11-16 V DC
OUTPUT SPECIFICATIONS				
Nominal output voltage*	13.6 V DC	27.2 V DC	13.6 V DC	27.2 V DC
Output voltage	10-15 V DC	20-28.5 V DC	10-15 V DC	20-28.5 V DC
Output voltage dimmer*	4-13 V DC	8-26 V DC	4-13 V DC	8-26 V DC
Output voltage stabilisation	2 % at extremes of temperatures, load and input	2 % at extremes of temperatures, load and input	2 % at extremes of temperatures, load and input	2 % at extremes of temperatures, load and input
Ripple	max. 1 % peak peak	max. 1 % peak peak	max. 1 % peak peak	max. 1 % peak peak
Power (max./nominal)	300 / 300 W	580 / 580 W	300 / 300 W	300 / 300 W
Max. output current	20 A	20 A	20 A	10 A
Charge current - 3-step mode	16 A	16 A	16 A	8 A
Parallel configuration	yes	yes	yes	yes
GENERAL SPECIFICATIONS				
Galvanic isolation	yes	yes	yes	yes
Voltage limited	yes	yes	yes	yes
Efficiency	>90 % (at nom. input voltage, full load); 92 % peak	>90 % (at nom. input voltage, full load); 92 % peak	>90 % (at nom. input voltage, full load); 92 % peak	>90 % (at nom. input voltage, full load); 92 % peak
Protected against overload	yes	yes	yes	yes
Protected against over-temperature	yes	yes	yes	yes
Dimmer function	yes, by external momentary switch via fast-on connection, to be activated by DIP-switch setting	yes, by external momentary switch via fast-on connection, to be activated by DIP-switch setting	yes, by external momentary switch via fast-on connection, to be activated by DIP-switch setting	yes, by external momentary switch via fast-on connection, to be activated by DIP-switch setting
Alarm contact	yes (fast-on connector)	yes (fast-on connector)	yes (fast-on connector)	yes (fast-on connector)
Dimensions, hxwxd	227 x 154 x 81 mm 8.9 x 6.1 x 3.2 inch	227 x 154 x 81 mm 8.9 x 6.1 x 3.2 inch	227 x 154 x 81 mm 8.9 x 6.1 x 3.2 inch	227 x 154 x 81 mm 8.9 x 6.1 x 3.2 inch
Weight	1.8 kg / 4 lb	1.8 kg / 4 lb	1.8 kg / 4 lb	1.8 kg / 4 lb
Approvals	CE	CE	CE	CE
TECHNICAL SPECIFICATIONS				
3-Step charge option	yes (DIP switch settings)	yes (DIP switch settings)	yes (DIP switch settings)	yes (DIP switch settings)
DC consumption	< 115 mA	< 115 mA	< 115 mA	< 115 mA
Connections input/output	screw terminals, maximum wire size 16 mm² / AWG5	screw terminals, maximum wire size 16 mm² / AWG5	screw terminals, maximum wire size 16 mm² / AWG5	screw terminals, maximum wire size 16 mm² / AWG5
Temperature range (ambient temp.)	-25 °C to 60 °C; > 40 °C derating power power	-25 °C to 60 °C; > 40 °C derating power power	-25 °C to 60 °C; > 40 °C derating power power	-25 °C to 60 °C; > 40 °C derating power power
Cooling	maintenance-free vario fans	maintenance-free vario fans	maintenance-free vario fans	maintenance-free vario fans
Protection degree	IP21	IP21	IP21	IP21
MasterBus compatible	yes, in combination with a MasterBus Serial Interface	yes, in combination with a MasterBus Serial Interface	yes, in combination with a MasterBus Serial Interface	yes, in combination with a MasterBus Serial Interface

* Adjustable with MasterAdjust software.

OPTIONS						
	PC-Link *21730300*	option	option	option	option	
		Interface between Magic converter and PC, in combination with the MasterAdjust software (free to download). The PC-Link can be directly connected to a computer serial port.				
	EasyView 5 *77010310*	option	option	option	option	
		In combination with a MasterBus Serial Interface. Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.				
	MasterBus Serial Interface *77030450*	option	option	option	option	
		Integrates the Mac & Magic converters in a MasterBus network.				

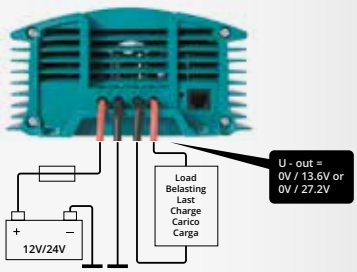
ISOLATED OR NON-ISOLATED?

The non-isolated Mac (Plus) and DC Master models have an electrical connection between the input and output.
Features:

- Low costs.
- Efficient: low heat generation.
- Compact.
- Suited to applications with negative earthing.

The isolated Magic and DC Master models provide galvanic isolation between input and output circuits.
Features:

- Extra touch-proof.
- Interference suppression for sensitive equipment.
- Available with negative or positive grounding.



Magic as power supply

The Magic models can be fully used as a stabilised power supply: From 12 to 24 V, from 24 to 12 V or from 24 to 24 V. Inputs and outputs are galvanically isolated.

Specifications
DC Master converters




Non-isolated	**DC Master 24/12-3**	**DC Master 24/12-6**	**DC Master 24/12-12**	**DC Master 24/12-24**
Product code	*81400100*	*81400200*	*81400300*	*81400330*
INPUT SPECIFICATIONS				
Nominal input voltage	24 V	24 V	24 V	24 V
Input range (max.)	20-32 V DC (35 V)	20-32 V DC (35 V)	20-32 V DC (35 V)	20-32 V DC (35 V)
OUTPUT SPECIFICATIONS				
Nominal output voltage	13.6 V	13.6 V	13.6 V	13.6 V
Maximum power	82 W	136 W	245 W	408 W
Nominal power	41 W	82 W	164 W	326 W
Current max. 2 minutes / continuous *Two minutes of extra power for short power boosts.*	6 A / 3 A	10 A / 6 A	18 A / 12 A	30 A / 24 A
Parallel configuration	yes, up to 10	yes, up to 10	yes, up to 10	yes, up to 10
DC consumption	< 15 mA	< 15 mA	< 15 mA	< 15 mA
GENERAL SPECIFICATIONS				
Dimensions, hxwxd	67 x 87 x 50 mm 2.6 x 3.4 x 2 inch	89 x 87 x 50 mm 3.5 x 3.4 x 2 inch	127 x 87 x 50 mm 5 x 3.4 x 2 inch	167 x 87 x 50 mm 6.6 x 3.4 x 2 inch
Weight	200 g / 0.44 lb	250 g / 0.55 lb	405 g / 0.9 lb	620 g / 1.4 lb
Approvals	CE, E-mark	CE, E-mark	CE, E-mark	CE, E-mark
Galvanic isolation	no	no	no	no
Stabilised	yes	yes	yes	yes
Connections input/output	fast-on	fast-on	fast-on	fast-on
Temperature range (ambient temp.)	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power
Cooling	natural cooling	natural cooling	natural cooling	natural cooling
Protection degree	IP53	IP53	IP53	IP53




Isolated	**DC Master 12/12-3**	**DC Master 12/12-6**	**DC Master 24/12-3**	**DC Master 24/12-6**
Product code	*81500600*	*81500700*	*81500100*	*81500200*
INPUT SPECIFICATIONS				
Nominal input voltage	12 V	12 V	24 V	24 V
Input range (max.)	10-15.5 V DC (16 V)	10-15.5 V DC (16 V)	20-32 V DC (35 V)	20-32 V DC (35 V)
OUTPUT SPECIFICATIONS				
Nominal output voltage	13.6 V	13.6 V	13.6 V	13.6 V
Maximum power	54 W	108 W	82 W	136 W
Nominal power	41 W	82 W	41 W	82 W
Current max. 2 minutes / continuous *Two minutes of extra power for short power boosts.*	4 A / 3 A	8 A / 6 A	6 A / 3 A	10 A / 6 A
Parallel configuration	yes, up to 10	yes, up to 10	yes, up to 10	yes, up to 10
DC consumption	< 15 mA	< 15 mA	< 15 mA	< 15 mA
GENERAL SPECIFICATIONS				
Dimensions, hxwxd	89 x 87 x 50 mm 3.5 x 3.4 x 2 inch	127 x 87 x 50 mm 5 x 3.4 x 2 inch	89 x 87 x 50 mm 3.5 x 3.4 x 2 inch	127 x 87 x 50 mm 5 x 3.4 x 2 inch
Weight	280 g / 0.6 lb	440 g / 1 lb	289 g / 0.6 lb	505 g / 1.1 lb
Approvals	CE, E-mark	CE, E-mark	CE, E-mark	CE, E-mark
Galvanic isolation	yes	yes	yes	yes
Stabilised	yes	yes	yes	yes
Connections input/output	fast-on	fast-on	fast-on	fast-on
Temperature range (ambient temp.)	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power
Cooling	natural cooling	natural cooling	natural cooling	natural cooling
Protection degree	IP53	IP53	IP53	IP53






DC Master 24/12-50	DC Master 12/24-3	DC Master 12/24-7	DC Master 48/12-6	DC Master 48/12-9	DC Master 48/12-20
81400352	*81400400*	*81400500*	*81400600*	*81400700*	*81400800*
24 V	12 V	12 V	48 V	48 V	48 V
20-32 V DC (35 V)	10-15.5 V DC (16 V)	10-15.5 V DC (16 V)	40-62 V DC (65 V)	40-62 V DC (65 V)	40-62 V DC (65 V)
13.6 V	27.2 V	27.2 V	13.6 V	13.6 V	13.6 V
720 W	109 W	245 W	109 W	132 W	326 W
500 W	82 W	191 W	82 W	108 W	272 W
60 A / 50 A	4 A / 3 A	9 A / 7 A	8 A / 6 A	11 A / 9 A	24 A / 20 A
yes, up to 10	yes, up to 10	yes, up to 10	yes, up to 10	yes, up to 10	yes, up to 10
< 15 mA	< 15 mA	< 25 mA	< 15 mA	< 15 mA	< 25 mA
283 x 125 x 74 mm 11 x 4.9 x 2.9 inch	89 x 87 x 50 mm 3.5 x 3.4 x 2 inch	167 x 87 x 50 mm 6.6 x 3.4 x 2 inch	89 x 87 x 50 mm 3.5 x 3.4 x 2 inch	127 x 87 x 50 mm 5 x 3.4 x 2 inch	217 x 87 x 50 mm 8.5 x 3.4 x 2 inch
1.8 kg / 4 lb	300 g / 0.66 lb	640 g / 1.3 lb	270 g / 0.6 lb	370 g / 0.8 lb	770 g / 1.7 lb
CE, E-mark	CE, E-mark	CE, E-mark	CE, E-mark	CE, E-mark	CE, E-mark
no	no	no	no	no	no
yes	yes	yes	yes	yes	yes
screw terminal	fast-on	fast-on	fast-on	fast-on	fast-on
-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power
natural cooling	natural cooling	natural cooling	natural cooling	natural cooling	natural cooling
IP53	IP53	IP53	IP53	IP53	IP53




DC Master 24/12-12	DC Master 24/12-24	DC Master 24/24-3	DC Master 24/24-7
81500300	*81500350*	*81500400*	*81500500*
24 V	24 V	24 V	24 V
20-32 V DC (35 V)	20-32 V DC (35 V)	20-32 V DC (35 V)	20-32 V DC (35 V)
13.6 V	13.6 V	27.2 V	27.2 V
245 W	408 W	109 W	245 W
164 W	326 W	82 W	191 W
18 A / 12 A	30 A / 24 A	4 A / 3 A	9 A / 7 A
yes, up to 10	yes, up to 10	yes, up to 10	yes, up to 10
< 15 mA	< 15 mA	< 15 mA	< 25 mA
167 x 87 x 50 mm 6.6 x 3.4 x 2 inch	217 x 87 x 50 mm 8.5 x 3.4 x 2 inch	127 x 87 x 50 mm 5 x 3.4 x 2 inch	217 x 87 x 50 mm 8.5 x 3.4 x 2 inch
590 g / 1.3 lb	785 g / 1.7 lb	440 g / 1 lb	780 g / 1.7 lb
CE, E-mark	CE, E-mark	CE, E-mark	CE, E-mark
yes	yes	yes	yes
yes	yes	yes	yes
fast-on	fast-on	fast-on	fast-on
-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power	-25 °C to 80 °C, > 30 °C derating power
natural cooling	natural cooling	natural cooling	natural cooling
IP53	IP53	IP53	IP53

All DC Master converters come with a mounting bracket, screws and fast-ons.

Mastervolt also offers four-step DC-DC chargers by ProMariner, available in 12V/40A and 24V/20A.

For more information, please consult the ProMariner product catalogue and website.

ProMariner™

Smart solutions for energy storage

Mastervolt provides autonomous energy supply for vehicles, boats and homes which are sometimes disconnected from the grid for long periods. Powerful and reliable batteries are the solution: Mastervolt provides several battery technologies designed for optimal performance, reliability and a long service life even in harsh environments.

LITHIUM ION

Lithium Ion batteries ensure fast, safe and efficient use, an extremely long lifespan and 70 % savings on volume and weight. All Mastervolt Lithium Ion batteries use the extremely safe LiFePO4 chemical process.

62 MLI

Top quality Lithium Ion batteries. High capacity and specifically developed for extremely short charging cycles. Equipped with various functions such as an integrated Battery Management System and MasterBus/CAN communication.

RECOMMENDED FOR:

62 MLS

With the well-known Lithium Ion benefits but intended for small-scale applications, these small batteries combine a long lifespan with a minimal weight and size.

RECOMMENDED FOR:

GEL

In these batteries, the electrolyte is absorbed by a Gel. Gel batteries are entirely maintenance-free and because they do not produce gas when used in a normal way, can be placed anywhere.

66 MVG

Ideal as service battery and for cyclic use. For medium to large 12 and 24 V systems with a high number of charging and discharging cycles. Charges very quickly.

RECOMMENDED FOR:

66 MVSV 2 Volt

Robust Gel batteries designed for large systems and intensive use. Charge quickly and are extremely durable. Suitable for horizontal and vertical placement and problem-free deep discharge.

RECOMMENDED FOR:

Store

AGM

AGM batteries or glass fibre batteries can be discharged quickly with very high currents, making them ideal for starter applications.

68 AGM

The excellent starter current makes this battery an ideal replacement for traditional open batteries. Also suitable for light cyclic use.

RECOMMENDED FOR:

68 AGM SLIMLINE

Universal and very slim battery with an exceptionally small footprint. Saves up to 15 % in volume and weight.

RECOMMENDED FOR:

68 AGM 6 Volt

Alternative solution regarding placement and size for composing high capacity 12/24/48 V battery sets.

RECOMMENDED FOR:

BATTERY ISOLATORS

Mastervolt offers various smart solutions for managing multiple batteries.

70 BI Battery Mate

Battery isolators with minimal energy loss.

RECOMMENDED FOR:

73 Charge Mate

For connecting and/ or disconnecting two batteries with optional current limiter and current priority.

73 Battery Watch

Battery switch with protection against overcurrent and excessively deep discharge of your batteries.

Mastervolt Batteries: The right choice for power storage

Mastervolt makes selecting the right battery simple. Whether you choose a low priced battery such as AGM or an innovative and advanced Lithium Ion battery, Mastervolt has the right battery for every application.

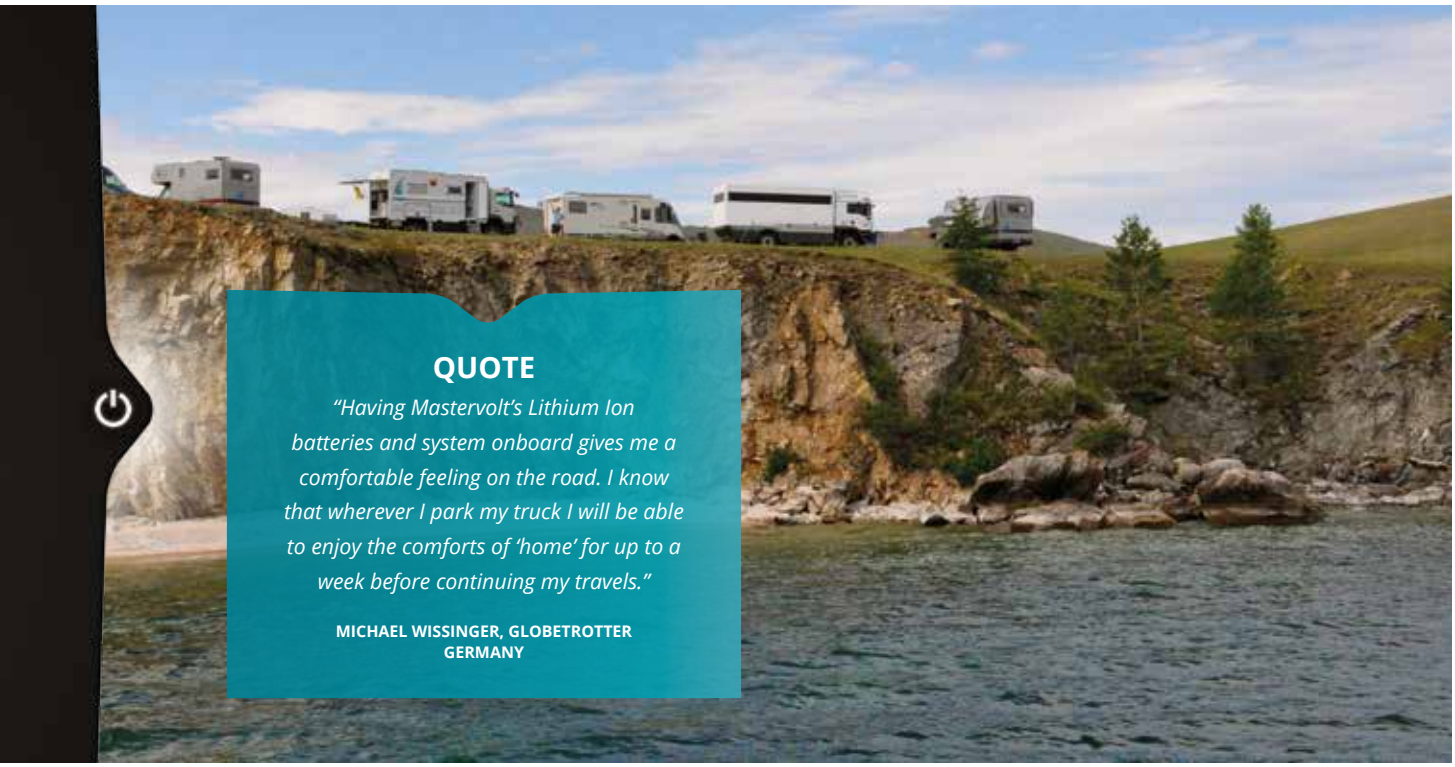
Mastervolt has divided its entire battery range of 36 types into seven series and five different battery technologies. Each series has its specific features.

All Mastervolt batteries offer you these advantages:

- Maintenance-free.
- Safe - no gassing.
- Easy to install.
- Designed for cyclic use (charge/discharge).
- Minimum self-discharge.
- Two year warranty.

Issues to take into account:

- Determining the correct battery capacity for your new battery/ batteries is very important. For support and more information see ■ ***mastervolt.com/batteries.***
- Choosing the right battery charger guarantees the maximum lifespan for your batteries. Mastervolt's modern 3-step+ charge technology charges your batteries safely and quickly. For more information see ■ ***mastervolt.com/chargers.***
- A battery monitor is the best way to make the most of your batteries. Go to ■ ***mastervolt.com/batterymonitor*** for more information.



QUOTE

"Having Mastervolt's Lithium Ion batteries and system onboard gives me a comfortable feeling on the road. I know that wherever I park my truck I will be able to enjoy the comforts of 'home' for up to a week before continuing my travels."

MICHAEL WISSINGER, GLOBETROTTER GERMANY

MORE INFORMATION ■ MASTERVOLT.COM/BATTERIES

Which battery is best for your application?

	Traditional open batteries	1 MLI Lithium Ion	2 MLS Lithium Ion	3 MVG gel semi-traction	4 MVSV 2V gel traction	5 AGM semi-traction
Maintenance-free	–	★★★★	★★★★	★★★★	★★★★	★★★★
No gas formation during charging	★	★★★★★	★★★★★	★★★	★★★	★★★
Low self discharge while inactive	–	★★★	★★★★	★★★★	★★★★	★★★★
Lifespan with complete discharge	★	★★★★★	★★★★★	★★★	★★★★	★★
Lifespan with limited discharge	★★	★★★★★	★★★★★	★★★★	★★★★	★★★
Resilience to excessive charge current	★★	★★★★★	★★★	★★★	★★★★	★★
Suitable for prolonged high discharge current	★★★	★★★★★	★★★★	★★★	★★★	★★★
Suitable for selection of battery bank with high capacity	★★	★★★★★	★★	★★★	★★★★★	★★
Suitable for E-propulsion	★	★★★★★	★★	★★★	★★★★	★★★★
Suitable for starting motors	★★	★★★★	★★	★★★	★★	★★★★
Shock-resistance	★	★★★★	★★★★	★★★★	★★★★	★★★★
Number of charge/discharge cycles	★	★★★★★	★★★★★	★★★	★★★★	★★
Temperature-resistance	★	★★★★★	★★★★★	★★★★	★★★★	★★
Installation angle/angle of inclination	–	★★★★	★★★★	★★★★	★★★★	★★★★
Return on investment with limited use	★	★★★	★★★	★★★	★★★★	★★★
Return on investment with intensive use	★	★★★★★	★★★★★	★★★	★★★★	★★
Product warranty	± 1 year	2 year	2 year	2 year	7 year pro rata	2 year
Worldwide service	★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★

★★★★★ excellent ★★★★ very good ★★★ good ★★ adequate ★ inadequate – poor

1 Lithium Ion Batteries

Lithium Ion batteries have a high energy density, offering savings of up to 70 % in volume and weight compared to traditional lead-acid batteries. They are perfect for cyclic applications, making over 2000 cycles with very deep (80 %) discharges, effectively storing 5 times as much energy over its lifespan compared to lead-acid.

The Mastervolt MLI range is top of the line. It offers large capacity batteries designed for extreme duty cycling, with all possible features such as integrated Battery Management System (BMS) and MasterBus/CAN communication.

2 The MLS (small Lithium Ion) range offers the possibility of benefiting from the advantages of Lithium Ion technology where the need for capacity or heavy duty is less. These small batteries are the ideal choice for substantially reducing weight and volume and increasing lifetime in standard applications.

3 Gel Batteries

In Gel batteries, the electrolyte is absorbed by a Gel. This type of battery is entirely maintenance-free and has no gas formation with normal use. As no extra ventilation is required, Gel batteries can be installed anywhere. They are ideal as service battery and for cyclical use, and can be charged very quickly.

4 Traction Batteries

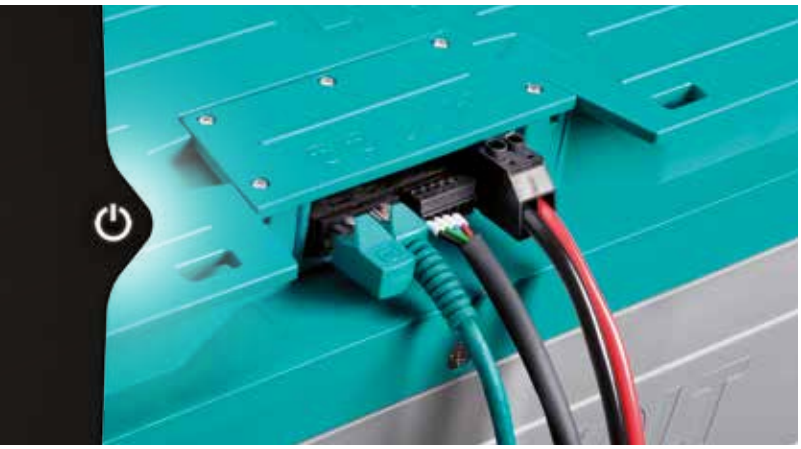
This robust Gel battery is designed for regular and deep discharging (> 1000 full cycles), and is ideal for large systems that require intensive use and a very long lifespan.

5 AGM Batteries

In AGM batteries, the electrolyte (mixture of water and sulphuric acid) is largely absorbed in glass fibre. This type of battery is entirely maintenance-free and there is no gas formation with normal use. Not requiring any ventilation, these batteries can be installed almost anywhere.

Their construction gives a very fast discharge at very high currents so AGM batteries are ideal for systems that require high currents (for instance when starting an engine). The battery poles can be unscrewed and this type of battery can be combined with every standard battery terminal.

Lithium Ion Batteries



Lithium Ion is the battery technology of today. Do you want to be the fastest or best performing? Do you want to save energy or burn less fuel? Do you want your investment to last longest? Do you want to be 'out there' longest without getting anxious about your energy? Then Lithium Ion is your choice of batteries.

A few of its outstanding features

- Space and weight savings up to 70 %.
- Three times the lifespan of traditional batteries.
- Extremely fast charging and discharging.
- High efficiency: not wasting energy.
- Safe operation.

Mastervolt brings Lithium Ion technology in two product ranges.

- **MLI Series**
  Large capacity series, fully equipped for extreme cycling, like running air conditioning, pumps or electric motors for long periods of time with short intermittent charging.

- **MLS Series**
  Small capacity series, suitable for smaller applications, such as portable/mobile equipment or backup power.

MASTER TIP

Safest Lithium Ion technology available

The term Lithium Ion encompasses multiple chemistries, having slightly different compositions of materials. These differences result in variations of energy and power density, lifespan, cost and safety. As safety is our primary concern, Mastervolt chooses to use only the safest available Lithium Ion chemistry, Lithium-iron phosphate (LiFePO4).

MLI Series

The MLI series is designed to be able to enjoy all the best properties of Lithium Ion technology in the harshest conditions (high charge/discharge currents, flooded environment, mechanical shock or vibrations). To do this, the MLI batteries bring two things on top of Lithium-iron phosphate cells: a sturdy, waterproof housing and the best Battery Management System (BMS). The BMS ensures optimal use of each individual cell, even during fast charge and discharge, and has integrated battery monitoring to always have the best information on the state of your battery. Last but not least, it has MasterBus/CAN communication to the Mastervolt battery charger to ensure the best possible recharging and lifetime of the battery.

MLS Series

The MLS series is the MLI Ultra's smaller brother, for smaller capacity applications where reducing weight/volume and/or increasing cycle life is key. It is specifically designed to be as easy as possible to install. The MLS series comes with an integrated safety switch, this saves installation and commissioning time.
For higher capacity, multiple MLS batteries can easily be connected in parallel. While the MLS series is a little less heavy duty than the MLI Ultra series, it gives an ideal entry to the benefits of Lithium Ion technology. Perhaps consider replacing your existing lead-acid battery?

Suitable for large battery banks

The MLI series is ideal for electric and hybrid applications, and can be connected in parallel unlimited. The built-in common-rail technology offers an easy series connection of multiple MLI Ultra batteries.

RELIABLE

Safe Operation

The Mastervolt MLI series is equipped with an integrated Battery Management System (BMS) and communication through MasterBus/ CAN. Even in the harshest cycling conditions this guarantees efficient and safe operation of the battery.
The MLS batteries come with an integrated automatic safety switch. Safety always comes first.

LONG LIFESPAN

Superior Performance

Mastervolt Lithium Ion batteries have a realistic lifespan of over 2000 cycles at a depth of discharge (DOD) of 80 %. This means five times more energy storage than lead acid batteries thanks to features such as extremely high efficiency, the almost complete absence of self discharge and the minimal build-up of the infamous ‘memory effect’.

LOW WEIGHT

LOW VOLUME

Weight Reduction

As speed and performance are crucial aspects, a Lithium Ion battery with 70 % less weight offers considerable benefits. A vessel or vehicle with a storage capacity of 20 kWh on board, can easily save up to 500 kg and achieve a substantially better performance.

EASY INSTALL

Easy Installation

The MLI series includes two integrated handles with a recess for the correct and practical installation of the cables. The battery poles are easily accessible and completely protected, so no extra isolation covers are needed. The MLS batteries make a great ‘drop-in replacement’ for a system with lead-acid batteries, because no system changes or additional components are required.

MLI Series

FEATURES

- Top performance, heavy duty Lithium Ion batteries.
- Ideal for running heavy loads for long periods and short charge times.
- Saves up to 70 % in space and weight.
- Three times the lifespan of traditional batteries.
- High cycle efficiency.
- Fast charging up to half an hour.
- High discharge rate up to 3C.
- MasterBus/CAN communication with every Mastervolt battery charger.
- Integrated Battery Management System (BMS).
- Integrated battery monitoring (Ah consumed, state of charge).
- Series connection up to 10 batteries possible.
- Waterproof electronics cabinet.
- Extremely safe LiFePO4 chemistry.
- Tested and certified according to UN38.3.

Specifications MLI Series

Product code	
GENERAL SPECIFICATIONS	
Nominal battery voltage	
Nominal battery capacity	
Nominal battery energy capacity	
Max. charge current / continuous discharge current	
Max. continuous discharge current	
Peak discharge current	
Cycle life	
Battery monitoring	
MasterBus/CAN communication	
Battery terminals	
Mounting position	
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	
Weight	
TECHNICAL SPECIFICATIONS	
Battery chemistry	
Protection degree	
Parallel connection	
Series connection	
Safety protections	
Safety relay controls	

MLS Series

FEATURES

- Entry into Lithium Ion technology.
- For smaller capacity applications up to 90 Ah.
- Drop-in replacement for lead-acid batteries.
- Saves up to 70 % in space and weight.
- Three times the lifespan of traditional batteries.
- High cycle efficiency.
- Fast charging up to one hour.
- High discharge rate up to 1C.
- Integrated Battery Management System (BMS).
- Self-regulating due to its integrated automatic safety disconnect.
- Suitable for unlimited parallel operation.
- Waterproof electronics cabinet.
- Extremely safe LiFePO4 chemistry.
- Tested and certified according to UN38.3.

Specifications MLS Series

Product code	
GENERAL SPECIFICATIONS	
Nominal battery voltage	
No-load voltage, fully charged	
Nominal battery capacity	
Nominal battery energy capacity	
Max. charge current / continuous discharge current	
Max. short discharge current	
Peak discharge current	
Cycle life	
Battery terminals	
Mounting position	
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	
Weight	
TECHNICAL SPECIFICATIONS	
Battery chemistry	
Protection degree	
Parallel connection	
Series connection *See the configuration and requirements manual.*	
Starter battery	
Safety protections	
Safety disconnect	

RELATED PRODUCTS

Battery terminals & isolation covers, page 75.

Battery Monitoring, page 114.

NEW MODEL

MLI-E 12/1200	MLI Ultra 12/2500	MLI Ultra 12/5000	MLI Ultra 24/5000
66011200	*66012500*	*66015000*	*66025000*
13,2 V	13.2 V	13.2 V	26.4 V
90 Ah	180 Ah	360 Ah	180 Ah
1200 Wh	2500 Wh	5000 Wh	5000 Wh
90 A (1 C)	500 A (2.8 C)	500 A (1.4 C)	500 A (2.8 C)
200 A (2.2 C)	500 A (2.8 C)	500 A (1.4 C)	500 A (2.8 C)
350 A (3.8 C) for 30s	1800 A (10 C) for 10s	1800 A (5 C) for 10s	1800 A (10 C) for 10s
~5000 at 80 % DoD	~2000 at 80 % DoD	~2000 at 80 % DoD	~2000 at 80 % DoD
integrated	integrated	integrated	integrated
CAN	MasterBus	MasterBus	MasterBus
M8	M8	M8	M8
upright (recommended) or either long side	upright (recommended) or either long side	upright (recommended) or either long side	upright (recommended) or either long side
353 x 175 x 190 mm 13.9 x 6.9 x 7.5 inch	341 x 197 x 355 mm 13.3 x 7.8 x 14 inch	622 x 197 x 355 mm 24.5 x 7.8 x 14 inch	622 x 197 x 355 mm 24.5 x 7.8 x 14 inch
12.5 kg / 27.6 lb	31 kg / 68.3 lb	58 kg / 127.9 lb	58 kg / 127.9 lb
Lithium Iron Phosphate	Lithium Iron Phosphate	Lithium Iron Phosphate	Lithium Iron Phosphate
IP65	IP65 (electronics cabinet)	IP65 (electronics cabinet)	IP65 (electronics cabinet)
yes, unlimited	yes, unlimited	yes, unlimited	yes, unlimited
no	yes, up to 10 batteries (series balancing up to 2 batteries)		
over-voltage, under voltage, over-temperature	over-voltage, under voltage, over-temperature	over-voltage, under voltage, over-temperature	over-voltage, under voltage, over-temperature
n.a.	integrated	integrated	integrated

MASTER TIP

CAUTION!
For additional safety, Mastervolt prescribes the use of a safety relay for the MLI Ultra series as mandatory part of the battery installation. Mastervolt provides 12- and 24-volt models, so you can always opt the correct voltage.

MANDATORY ITEM

Safety relay 12 volt *79007700*

Safety relay 24 volt *79007702*

The installation of an external safety relay is required and ensures the security of your battery installation.

MLS 12/80	MLS 12/130	MLS 12/260	MLS 12/390	MLS 24/260
65010006	*65010010*	*65010020*	*65010030*	*65020010*
12 V	12 V	12 V	12 V	24 V
12.8 V	12.8 V	12.8 V	12.8 V	25.6 V
6 Ah	10 Ah	20 Ah	30 Ah	10 Ah
77 Wh	128 Wh	256 Wh	384 Wh	256 Wh
6 A (1 C)	10 A (1 C)	20 A (1 C)	30 A (1 C)	10 A (1 C)
for 30 seconds 12 A (2 C)	for 30 seconds 25 A (2.5 C)	for 30 seconds 40 A (2 C)	for 30 seconds 60 A (2 C)	for 30 seconds 25 A (2 C)
for 2 seconds 24 A (4 C)	for 2 seconds 48 A (4.8 C)	for 2 seconds 85 A (4 C)	for 2 seconds 100 A (3.3 C)	for 2 seconds 48 A (4 C)
2000 at 80 % DoD	2000 at 80 % DoD	2000 at 80 % DoD	2000 at 80 % DoD	2000 at 80 % DoD
M5	M5	M5	M5	M5
upright (recommended) or either long side	upright (recommended) or either long side	upright (recommended) or either long side	upright (recommended) or either long side	upright (recommended) or either long side
90 x 70 x 109 mm 3.5 x 2.8 x 4.3 inch	151 x 65 x 102 mm 5.9 x 2.6 x 4 inch	180 x 77 x 161 mm 7.1 x 3 x 6.3 inch	181 x 126 x 140 mm 7.1 x 5 x 5.5 inch	180 x 77 x 161 mm 7.1 x 3 x 6.3 inch
0.8 kg / 1.8 lb	1.5 kg / 3.3 lb	3.1 kg / 6.8 lb	4.9 kg / 10.8 lb	3.1 kg / 6.8 lb
Lithium Iron Phosphate	Lithium Iron Phosphate	Lithium Iron Phosphate	Lithium Iron Phosphate	Lithium Iron Phosphate
IP65 (electronics cabinet)	IP65 (electronics cabinet)	IP65 (electronics cabinet)	IP65 (electronics cabinet)	IP65 (electronics cabinet)
unlimited	unlimited	unlimited	unlimited	unlimited
no	no	no	no	no
not recommended	not recommended	not recommended	not recommended	not recommended
over-voltage, under voltage, over-temperature	over-voltage, under voltage, over-temperature	over-voltage, under voltage, over-temperature	over-voltage, under voltage, over-temperature	over-voltage, under voltage, over-temperature
yes, electronic	yes, electronic	yes, electronic	yes, electronic	yes, electronic

MVG Gel Series

FEATURES

- Perfect service battery for medium sized and large 12 V and 24 V systems.
- Extremely long lifespan.
- No gas formation with normal use.
- Fast recharge, high charge current possible.
- For intensive cycle use with a high number of charge/discharge cycles.
- Very low self-discharge.
- High return on investment.
- Two year warranty.

Specifications MVG Gel Series

	MVG 12/25
Product code	*64000250*
Nominal battery voltage	12 V
Nominal battery capacity C20*	25 Ah
Max. charge current	12.5 A
CCA to DIN	110 A
CCA to SAE	175 A
Battery terminal	A-type
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	167 x 176 x 126 mm 6.6 x 6.9 x 5 inch
Weight	9.6 kg / 21.2 lb

MVSV 2 V Gel Series

FEATURES

- Ideal for large systems that require intensive use and a very long lifespan.
- For intensive cycle use with a high number of charge/discharge cycles.
- Charges quickly.
- Extremely sustainable battery for large installations.
- Robust build for longer lifespan.
- Deep discharging without problems.
- Can be installed horizontally or vertically.
- Seven year warranty (pro rata).

Specifications MVSV 2 V Gel Series

	MVSV 280
Product code	*68000280*
Nominal battery voltage	2 V
Nominal battery capacity C10*	280 Ah
Max. charge current	140 A
Battery terminal	F-M8
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	126 x 208 x 399 mm 5 x 8.2 x 15.7 inch
Weight	23 kg / 50.7 lb

	MVSV 1500
Product code	*68001500*
Nominal battery voltage	2 V
Nominal battery capacity C10*	1500 Ah
Max. charge current	750 A
Battery terminal	F-M8
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	212 x 277 x 690 mm 8.3 x 10.9 x 27.2 inch
Weight	95 kg / 209.4 lb

* C10 = battery capacity at a discharge time of 10 hours, till 1.80 V per cell.
C20 = battery capacity at a discharge time of 20 hours, till 10.5 V per battery.

RELATED PRODUCTS

Battery terminals & isolation covers, page 75.

Battery Monitoring, page 114.

MVG 12/55	MVG 12/85	MVG 12/120	MVG 12/140	MVG 12/200
64000550	*64000850*	*64001200*	*64001400*	*64002000*
12 V	12 V	12 V	12 V	12 V
55 Ah	85 Ah	120 Ah	140 Ah	200 Ah
27.5 A	42.5 A	60 A	70 A	100 A
230 A	270 A	450 A	540 A	630 A
380 A	450 A	760 A	920 A	1100 A
A-type	A-type	A-type	A-type	A-type
261 x 136 x 230 mm 10.3 x 5.4 x 9.1 inch	330 x 171 x 236 mm 13 x 6.7 x 9.3 inch	513 x 189 x 223 mm 20.2 x 7.4 x 8.8 inch	513 x 223 x 223 mm 20.2 x 8.8 x 8.8 inch	518 x 274 x 238 mm 20.4 x 10.8 x 9.4 inch
18.1 kg / 39.9 lb	29.2 kg / 64.4 lb	40 kg / 88.2 lb	47 kg / 103.6 lb	67 kg / 147.7 lb

MVSV 420	MVSV 500	MVSV 580	MVSV 750	MVSV 1000	MVSV 1250
68000420	*68000500*	*68000580*	*68000750*	*68001000*	*68001250*
2 V	2 V	2 V	2 V	2 V	2 V
420 Ah	500 Ah	580 Ah	750 Ah	1000 Ah	1250 Ah
210 A	250 A	290 A	375 A	500 A	625 A
F-M8	F-M8	F-M8	F-M8	F-M8	F-M8
126 x 208 x 515 mm 5 x 8.2 x 20.3 inch	147 x 208 x 515 mm 5.8 x 8.2 x 20.3 inch	168 x 208 x 515 mm 6.6 x 8.2 x 20.3 inch	147 x 208 x 690 mm 5.8 x 8.2 x 27.2 inch	212 x 193 x 690 mm 8.3 x 7.6 x 27.2 inch	212 x 235 x 690 mm 8.3 x 9.3 x 27.2 inch
30 kg / 66.1 lb	35 kg / 77.2 lb	39 kg / 86 lb	49 kg / 108 lb	66 kg / 145.5 lb	80 kg / 176.4 lb

MVSV 1650	MVSV 2200	MVSV 2700
68001651	*68002200*	*68002700*
2 V	2 V	2 V
1650 Ah	2200 Ah	2700 Ah
825 A	1100 A	1350 A
F-M8	F-M8	F-M8
212 x 277 x 759 mm 8.3 x 10.9 x 29.9 inch	216 x 400 x 816 mm 8.5 x 15.7 x 32.1 inch	214 x 489 x 816 mm 8.4 x 19.3 x 32.1 inch
115 kg / 253.5 lb	160 kg / 352.7 lb	198 kg / 436.5 lb

AGM Series

FEATURES

- Excellent starter function.
- Perfect upgrade for flooded lead acid batteries.
- Same initial power surge in an AGM 12/90 Ah as 180 Ah flooded lead-acid battery.
- Glass-fibre technology ensures low internal resistance.
- Use of thicker plates extends lifespan.
- Can be combined with every standard battery terminal.
- Also for medium cyclical use.
- Two year warranty.

Specifications AGM Series

	AGM 12/55 (group 24)
Product code	*62000550*
Nominal battery voltage	12 V
Nominal battery capacity C20*	55 Ah
Max. charge current	15.3 A
CCA to DIN	250 A
CCA to SAE	400 A
Battery terminal	M6
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	257 x 132 x 200 mm 10.1 x 5.2 x 7.9 inch
Weight	17 kg / 37.5 lb

AGM SlimLine Series

FEATURES

- Ideal universal and very slim battery; suitable for starter functions.
- Compressed AGM technology.
- Saves up to 15 % in volume.
- Saves up to 15 % in weight.
- Miniscule footprint; 2x 185 Ah for a 200 Ah battery footprint.
- Convenient M6 connections.
- Two year warranty.

Specifications AGM SlimLine Series

	AGM-SL 12/150
Product code	*63001500*
Nominal battery voltage	12 V
Nominal battery capacity C20*	150 Ah
Max. charge current	43 A
CCA to DIN	490 A
CCA to SAE	790 A
Battery terminal	M6
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	560 x 110 x 280 mm 22 x 4.3 x 11 inch
Weight	40.5 kg / 89.3 lb

AGM 6 volt Series

FEATURES

- Offers an alternative solution in placement and dimensioning.
- Easy configuration of 12/24/48 V battery banks, with high capacity.
- Double pole for easy installation.
- No gas formation with normal use.
- Can be combined with every standard battery terminal.
- Two year warranty.

Specifications AGM 6 volt Series

	AGM 6/260 Ah
Product code	*61002600*
Nominal battery voltage	6 V
Nominal battery capacity C20*	260 Ah
Max. charge current	72 A
CCA to DIN	590 A
CCA to SAE	1040 A
Battery terminal	A-type + stud M10
Max. outer dimensions, lxwxh (incl. terminals/grip handles)	295 x 180 x 298 mm 11.6 x 7.1 x 11.7 inch
Weight	35.5 kg / 78.3 lb

* C20 = battery capacity at a discharge time of 20 hours, till 10.5 V per battery.

AGM 12/70 (group 27)	AGM 12/90 (group 31)	AGM 12/130	AGM 12/160 (group 4D)	AGM 12/225 (group 8D)	AGM 12/270 (group Super 8D)
62000700	*62000900*	*62001300*	*62001600*	*62002250*	*62002700*
12 V	12 V	12 V	12 V	12 V	12 V
70 Ah	90 Ah	130 Ah	160 Ah	225 Ah	270 Ah
19.5 A	25.5 A	36 A	45 A	63 A	76.5 A
290 A	360 A	590 A	550 A	680 A	750 A
460 A	570 A	940 A	870 A	1080 A	1200 A
M8	M8	M8	M8	M8	M8
348 x 167 x 178 mm 13.7 x 6.6 x 7 inch	330 x 173 x 220 mm 13 x 6.8 x 8.7 inch	408 x 176 x 228 mm 16.1 x 6.9 x 8.9 inch	485 x 170 x 242 mm 19.1 x 6.7 x 9.5 inch	522 x 240 x 224 20.6 x 9.5 x 8.8 inch	522 x 268 x 226 mm 20.6 x 10.6 x 8.9 inch
21 kg / 46.3 lb	28 kg / 61.7 lb	37.6 kg / 82.9 lb	42.3 kg / 93.3 lb	63.5 kg / 140 lb	73 kg / 161 lb

AGM-SL 12/185
63001850
12 V
185 Ah
53 A
580 A
930 A
M6
560 x 126 x 280 mm 22 x 5 x 11 inch
51.2 kg / 112.9 lb

AGM 6/400 Ah
61004000
6 V
400 Ah
110 A
620 A
1100 A
A-type + stud M10
295 x 180 x 428 mm 11.6 x 7.1 x 16.9 inch
53 kg / 116.8 lb

RELATED PRODUCTS

Battery terminals & isolation covers, page 75.

Battery Monitoring, page 114.

Optimal division of charge current over multiple batteries

Onboard systems usually consist of two or more batteries that function independently when powering the 12, 24 or 48 V consumers. These batteries require independent charging with reliable battery isolators or battery combiners.

Mastervolt offers several intelligent solutions:

- Battery isolators that divide your charge current with a minimum energy loss.
- The Charge Mate for connecting and/or disconnecting two batteries.
- Battery Watch for monitoring the condition of your batteries (also usable as main switch).

Complete range for every system

- **BI series** battery isolators for conventional systems with an alternator or battery charger and two or three batteries.
- **Battery Mate** battery isolators with a negligible voltage drop; most suitable for charging multiple batteries, possibly with various brands of alternators, even if their charge voltage cannot be adjusted. Ensures high efficiency and negligible energy loss.
- **Charge Mate** for switching two batteries in parallel while charging.
- **Battery Watch** battery switch with protection against overvoltage and depletion of the battery.

Charging two or three batteries at high capacity

The Battery Mate is ideal for alternators with a maximum charge current of 160 A or 250 A. It can charge two or three batteries with a very high yield and without voltage drop.

Robust and Durable

Completely corrosion-proof material with aluminium heat sinks. The electronic components are encased in synthetic materials, the BI models have molded diode splitters.

Clear Monitoring

Safety guaranteed: The Battery Mate LED display indicates whether the power input is active.

Fast Installation

The synthetic end plates feature connection lugs, the solid bolt connections with nuts and locking rings ensure easy installation.

Compact and Lightweight

The Mastervolt BI battery isolators are compact and fully solid state, preventing wear. The weight varies from 580 to 1300 grams.

BI Battery Isolators

Mastervolt's BI battery isolators are based on conventional diode technology. The diode voltage drop (ca. 0.6 V) can be compensated for by adapting the output voltage of the connected charger or alternator. Mastervolt Mass battery chargers and Alpha Pro charge regulators are standardly equipped with automatic voltage drop compensation.

Specifications BI battery isolators




	BI 702-S	BI 703	BI 1202-S	BI 1203-S
Product code	*83007021*	*83007030*	*83012021*	*83012031*
Number of battery banks	2	3	2	3
Max. output charger	50 A	50 A	80 A	80 A
Max. output alternator	70 A	70 A	120 A	120 A
Compensation diode	yes	no	yes	yes
Dimensions, hxwxd	157 x 140 x 80 mm 6.2 x 5.5 x 3.1 inch	207 x 140 x 80 mm 8.1 x 5.5 x 3.1 inch	207 x 140 x 80 mm 8.1 x 5.5 x 3.1 inch	207 x 140 x 80 mm 8.1 x 5.5 x 3.1 inch
Weight	0.58 kg / 1.3 lb	1.1 kg / 2.4 lb	1.2 kg / 2.6 lb	1.3 kg / 2.9 lb

Battery Mate

While BI battery isolators are conventional diode splitters, the Battery Mate's technology is electronic and includes mosfets (transistors). Its components compensate for the voltage drop and ensure that charging continues at the right voltage level, even with several battery banks. The Battery Mate is compatible with any type of alternator/battery charger, in both existing and new systems. As the voltage loss between the alternator and battery is negligible, the Battery Mate performs far better than conventional battery isolators. This ensures fast and complete charging of your batteries without having to make additional adjustments to the alternator.

Specifications Battery Mate



	Battery Mate 1602 IG	Battery Mate 1603 IG	Battery Mate 2503 IG
Product code	*83116025*	*83116035*	*83125035*
Number of battery outlets	2	3	3
Max. output charger	120 A	120 A	200 A
Max. output alternator	160 A	160 A	250 A
Dimensions, hxwxd	207 x 140 x 80 mm 8.1 x 5.5 x 3.1 inch	207 x 140 x 80 mm 8.1 x 5.5 x 3.1 inch	207 x 140 x 80 mm 8.1 x 5.5 x 3.1 inch
Weight	1 kg / 2.2 lb	1 kg / 2.2 lb	1 kg / 2.2 lb

Mastervolt also offers ProMariner battery isolators, the ProIsoCharge series.

For more information, please consult the ProMariner product catalogue and website.

ProMariner™

Mastervolt also offers a Digital Voltage Sensing Relay from BEP, the DVSR.

For more information, please consult the BEP product catalogue and website.

BEP

Mastervolt offers a comprehensive range of battery switches, bus bars, fuses and fuse holders for safe and reliable operation: the Pro Installer series.

See also the BEP product catalogue and website where we offer the most extended product portfolio worldwide, including the EZ-Mount switches.

> Check out how Pro Installer compares to a conventional system.

BEP

QUOTE

"Our demanding technicians had been looking for a simple way to make serial DC distribution boards for some time. Pro Installer products offered the perfect solution, allowing us to easily connect and switch various components. This involves both Mastervolt power electronics and the products by Pro Installer, BEP and Blue Sea. It saves our mechanics a great deal of installation time, helps save space and results in clear, well-organised DC distribution boards."

SANDER JETTEN, TECHNICAL DIRECTOR
JETTEN SHIPYARD, THE NETHERLANDS

Charge Mate

A secondary battery is becoming increasingly common. As a second battery can prevent the main battery from depleting and being unable to start, this seems like a safe and reliable solution. The second battery, however, also has to be charged regularly. The Charge Mate series connects both batteries during charging and keeps them isolated when discharging. The Charge Mate 1202 and 2502 are especially practical for small systems, the Charge Mate Pro provides additional functionality by limiting the charge current to the second battery to 40 A or 90 A. The main battery is therefore charged with priority. The return current is automatically blocked and power dips of the onboard network are reduced. An emergency start function is possible by connecting an optional bypass switch.

Specifications Charge Mate

NEW MODEL




	Charge Mate 1202	Charge Mate 2502	Charge Mate Pro 40	Charge Mate Pro 90
Product code	*83301202*	*83302502*	*83304002*	*83309002*
GENERAL SPECIFICATIONS				
Input voltage range	n.a.	n.a.	9-32 V	9-32 V
Battery voltage	12/24 V	12/24 V	automatic 12/24 V detection	automatic 12/24 V detection
Max. current	120 A	500 A	limited to 40 A	limited to 90 A
Number of modes	n.a.	on, off, auto, start assist	on, off, auto, start assist	on, off, auto, start assist
Dimensions, hxwxd	76 x 46 x 46 mm 3 x 1.8 x 1.8 inch	90 x 80 x 85 mm 3.5 x 3.1 x 3.3 inch	157 x 140 x 80 mm 6.2 x 5.5 x 3.2 inch	157 x 140 x 80 mm 6.2 x 5.5 x 3.2 inch
Weight	0.125 kg / 0.3 lb	0.65 kg / 1.4 lb	0.88 kg / 1.94 lb	0.88 kg / 1.94 lb
TECHNICAL SPECIFICATIONS				
No-load power consumption	switch open: < 1 mA at 12/24 V DC	switch open: < 1 mA at 12/24 V DC	switch open: < 1 mA at 12/24 V DC	switch open: < 1 mA at 12/24 V DC
Inrush current (250 ms)	2000 A	2000 A	n.a.	n.a.
Switch on voltage	13-15 V (12 V) 26-30 V (24 V)	13-15 V (12 V) 26-30 V (24 V)	13.5 V (12 V) 27 V (24 V)	13.5 V (12 V) 27 V (24 V)
Switch on delay	5 sec.	30 sec.	5 sec.	5 sec.
Switch off voltage	< 12.75 V (12 V) < 25.5 V (24 V)	< 12.25... > 15 V (12 V) < 25.5...> 30 V (24 V)	12.75 V (12 V) 25.5 V (24 V)	12.75 V (12 V) 25.5 V (24 V)
Switch off delay	no	3 minutes	2.5 sec.	2.5 sec.
Relay	electro-mechanical	electro-mechanical	electronically (MOSFETs)	electronically (MOSFETs)
Ambient temperature	-40 to 65 °C	-40 to 60 °C	-40 to 60 °C	-40 to 60 °C
Protection degree	IP21	IP21	IP65	IP65

Battery Watch

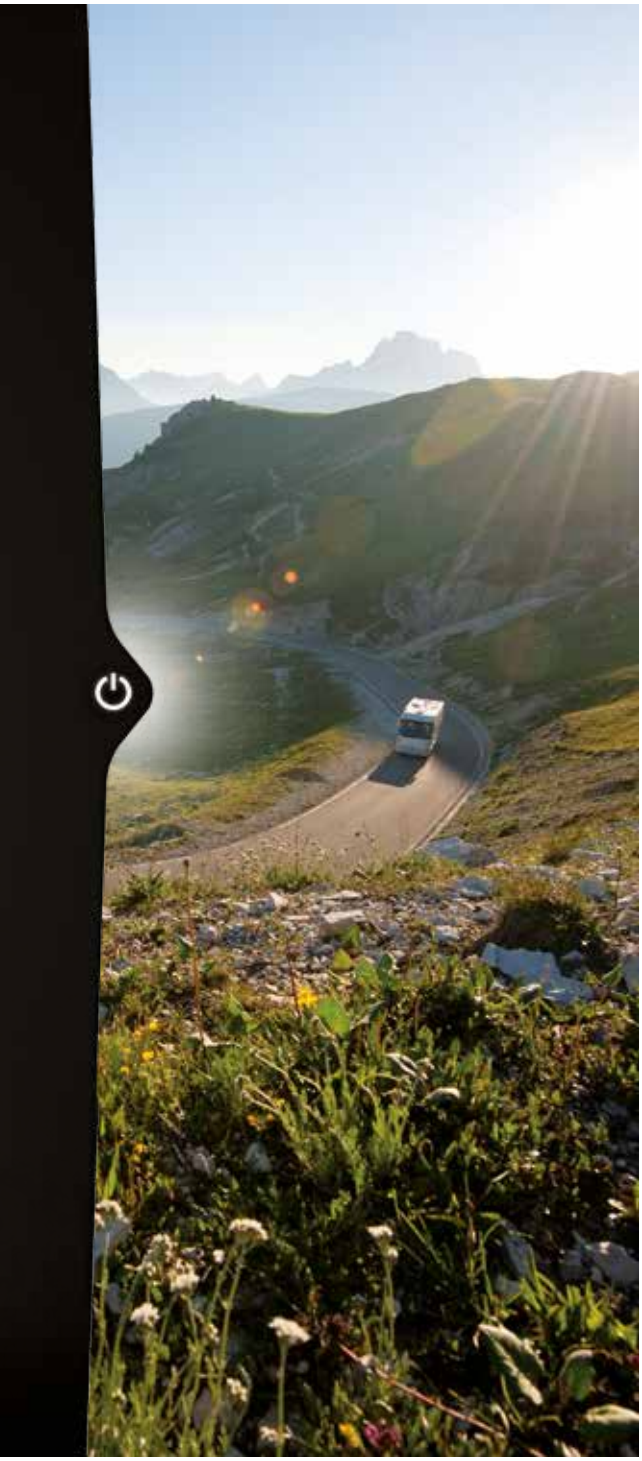
The Battery Watch is an essential element of any well-equipped battery system, offering you an electronic watchdog that ensures a much longer lifespan for your batteries. The unit monitors the optimum condition of your batteries and can also be used as a main battery isolation switch. LED lights provide a clear read-out and the undervoltage limit can be set using DIP switches.

Specifications Battery Watch

	Battery Watch
Product code	*83200150*
Input voltage	8-32 V
Max. DC load	150 A
Switch off under voltage 12 V	9-12 V
Switch off under voltage 24 V	18-24 V
Dimensions, hxwxd	157 x 140 x 80 mm 6.2 x 5.5 x 3.2 inch
Weight	0.6 kg / 1.3 lb

Battery accessories for convenience, safety and comfort

Capacity and the right type of battery are important, but so too are safety, comfort and ease of installation; three aspects of your battery for which Mastervolt has numerous intelligent accessories. We will help you get the most out of your 12 V, 24 V or 48 V system, and ensure a maximum lifespan for your batteries.



Strong connections for maximum safety

Your battery set is not complete without a proper and safe connection with the electrical system. Mastervolt recommends connections with corrosion-proof links and heavy-duty screw bolts. A proper cover and isolation of the battery poles prevents sparks or short circuiting.

Secure Fuses

The MasterShunt (page 84) can be fitted with a Class T fuse or ANL fuse. The Class T fuse is suitable for the high short-circuit current of Lithium Ion batteries.

For the DC distribution, Mastervolt offers an extensive range of ATM, ATO/ATC and MAXI fuses and fuse holders in addition to ANL fuses. A comprehensive portfolio is featured in the BEP and Blue Sea System product catalogues and on their websites.

BEP BLUE SEA SYSTEMS

Battery Switches

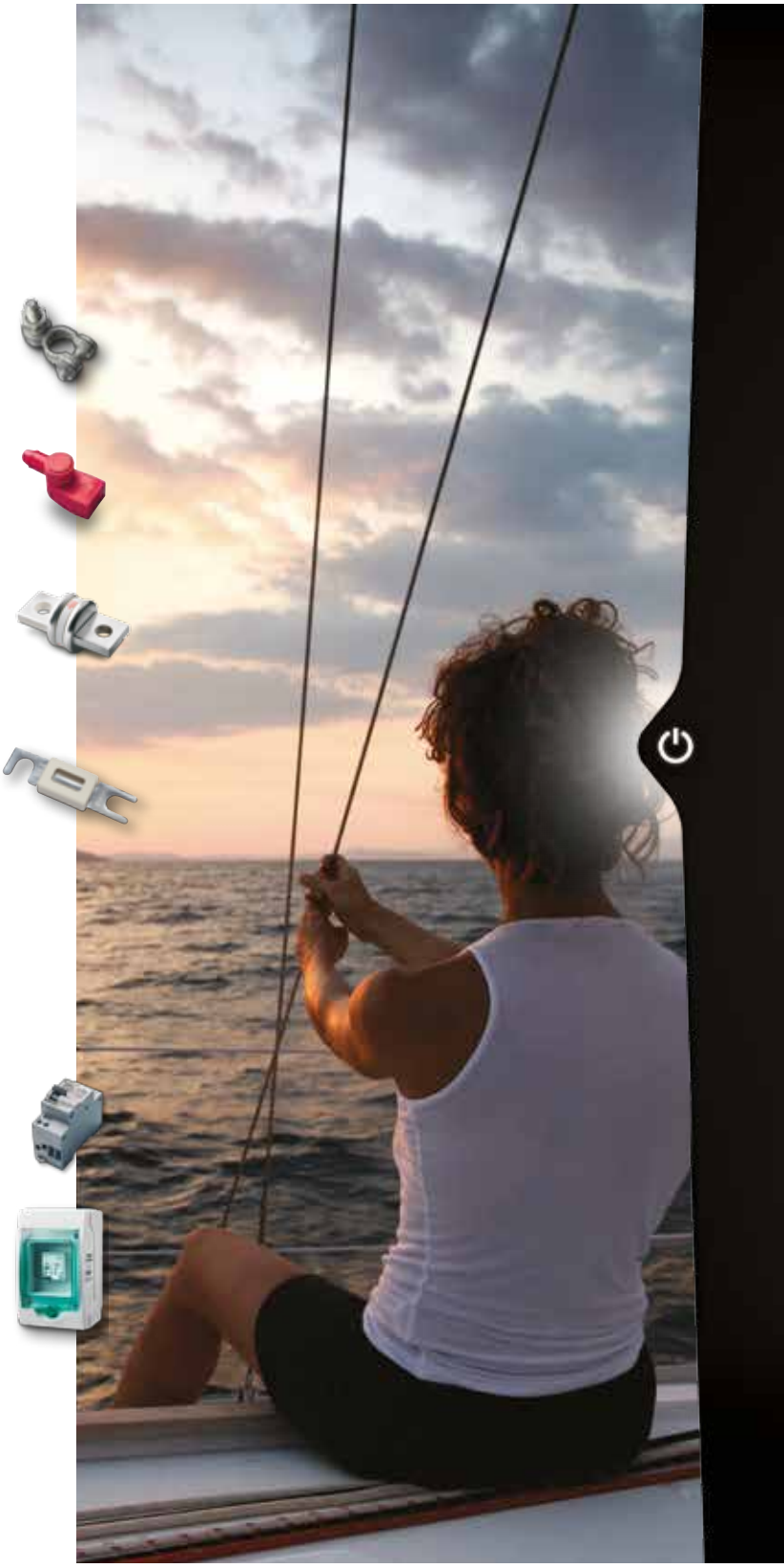
Mastervolt offers a comprehensive range of battery switches that allow you to isolate your on board power or starter system from its supply voltage.

The full product portfolio is available in the product catalogues and on the websites of BEP and Blue Sea Systems.

MORE INFORMATION ■ BEPMARINE.COM ■ BLUESEA.COM

Specifications

Description	Product code
BATTERY TERMINALS	
Battery terminal with M10 thread plus	*68061100*
Battery terminal with M10 thread min	*68061200*
Battery terminal with M12 thread plus	*68061300*
Battery terminal with M12 thread min	*68061400*
ISOLATION COVERS	
Cover 457N3V02 red, for product code 68061100 & 68061300	*68457302*
Cover 457N3V14 black, for product code 68061200 & 68061400	*68457314*
MASTERSHUNT & DC DISTRIBUTION FUSES	
Class T fuse 500 A / 160 V DC, current limiting capability 20 kA	*77049000*
Bus bar	*77020150*
ANL fuses	
20 A	*77049020*
40 A	*77049040*
50 A	*77049050*
63 A	*77049063*
80 A	*77049080*
100 A	*77049100*
125 A	*77049125*
160 A	*77049160*
175 A	*77049175*
200 A	*77049200*
250 A	*77049250*
300 A	*77049300*
355 A	*77049355*
400 A	*77049400*
425 A	*77049425*
500 A	*77049500*
EARTH LEAKAGE SWITCHES	
DPN VIGI 16 A/B/30 mA, 1P+N	*6385401610*
Shore Fix 16 A/30 mA; basic fuse between AC plug and onboard system.	*124001000*



MASTER TIP

A discharge deeper than the battery capacity will greatly shorten the life of your battery. Mastervolt delivers very accurate battery monitors, which help you keep track on the charge status of your battery.

RELATED PRODUCTS

Battery Monitoring, page 114.

Easy power management and extensive monitoring

Mastervolt delivers top-quality components which communicate with each other through an extensive network. Thanks to multiple remote panels and the possibility to integrate equipment by other brands, customers can control their energy system in whatever way they find suitable, at any time and in any place.

AMPERIAN

Amperian is a powerful digital assistant that monitors your Mastervolt system anywhere in the world.

79 AMPERIAN INTERFACE

Amperian allows you or your system provider to remotely operate and monitor your power system. The interface makes all system data available online.

RECOMMENDED FOR:

MASTERBUS

The MasterBus platform automates your power system by facilitating seamless communication between all Mastervolt products, bringing advanced system functions easily within reach at reasonable cost, for perfect control!

82 DISPLAYS

The waterproof EasyView 5 system monitor makes operating your system personal and simple. The MasterView Read-out provides a clear overview of your batteries' charging status and any errors.

84 COMPONENTS

Mastervolt offers various MasterBus components to further optimise your power system. Examples include MasterShunt, an intelligent battery monitor that enables system automation, and DC Distribution, the smallest DC distributor on the market.

86 INTERFACES

Seamless integration of products not equipped with a MasterBus interface, or communication standards such as NMEA 2000, CANopen, Modbus, FireCAN, PBUS and many others.

91 ACCESSORIES

MasterBus accessories such as MasterShunt fuses, cables and terminators, plus DIY packages.

RECOMMENDED FOR:

Manage & Monitor

CZONE

Decentralised switching results in smart systems, fewer cables and less installation work. The CZone operating and monitoring system offers decentralised digital switch modules for operating equipment such as lighting, pumps and navigation equipment.

94 DISPLAYS
The Touch 5 and Touch 10 touchscreen displays form the interface between the CZone network and the user.

98 COMPONENTS
The CZone operating and monitoring system offers a bespoke solution for any operating system including COI; DC input/output interface, ACOI for AC circuits or the ACMI; a grid voltage transfer system.

RECOMMENDED FOR:

104 INTERFACES
The Wireless Interface enables safeguarding and monitoring of your on board system using an iPad. The CZone MasterBus Bridge Interface combines MasterBus and CZone into one compact operating and monitoring system.

106 ACCESSORIES
Accessories such as NMEA 2000 certified cables, remotes, cable glands and connector blocks complete your CZone system.

BATTERY MONITORING

A Mastervolt battery monitoring system prevents unpleasant surprises.

114 BATTMAN
Choose the easy-to-use BattMan Lite, or the complete BattMan Pro for indication of remaining time and historical data.

114 MASTERLINK BTM-III
The comprehensive BTM-III monitors three batteries, including indication of remaining time and capacity.

114 MASTERSHUNT + EASYVIEW 5
A MasterShunt and EasyView enable complete energy management in a personalised way.

RECOMMENDED FOR:

AMPERIAN

NEW MODEL

Your powerful digital assistant

Amperian is a powerful digital assistant which keeps an eye on your Mastervolt power system, anywhere in the world. Ranging from remote battery monitoring up to system optimization, Amperian provides you with a ticket to the future.

The future starts now

Mastervolt and her parent company Power Products LLC are passionate about reliable systems and excellent service. The new Amperian platform aims to unburden our customers: this web service allows both service providers and owners* to check a power system remotely and make adjustments where needed. Having access to the Internet equals access to your system and when something comes up, such as a battery charger that's no longer plugged in, Amperian will alert you automatically.

Using Amperian

Amperian comes with a secure account which allows access to your system. Authorize your service provider to obtain expert service and advice: 'No Worries' taken to a whole new level.

Empower your system with Amperian

Mastervolt has designed a new Interface to access the benefits of Amperian. The Amperian Interface can reach every individual MasterBus device within your system. It connects to the Internet using an Ethernet or WiFi connection. Integrated 3G/4G communication is under development.

Service Offering

Building on the Internet of Things, the Amperian platform will be the cornerstone for various new tools and services. The initial release, by means of the Amperian Interface, provides access to:

- E-mail alerts: e-mail notifications sent from your system.
- Log book: alerts stored in your personal Amperian account.
- MasterAdjust Web: remote monitoring and configuration tool for service providers.

E-mail alerts and logbook

In case a system alert comes up, Amperian will provide you with a notification immediately. If anything out of the ordinary occurs in your system, you will always be aware. Prevent surprises such as empty batteries or tanks when you needed them to be filled. Return to your truck, yacht, RV or standalone system, being reassured that everything is in order for a successful working day or a wonderful trip. Using the logbook available on the Amperian web portal, you will be able to look up the history of these events.

** under development.*

MORE INFORMATION ■ MASTERVOLT.COM/AMPERIAN

FEATURES

- Web based, digital assistant.
- Online monitoring of the power system.
- Remote service tool for service providers.
- Log book keeps history of events.
- Automatic e-mail notification of exceptions occurring in the power system.
- Secure, encrypted connection.

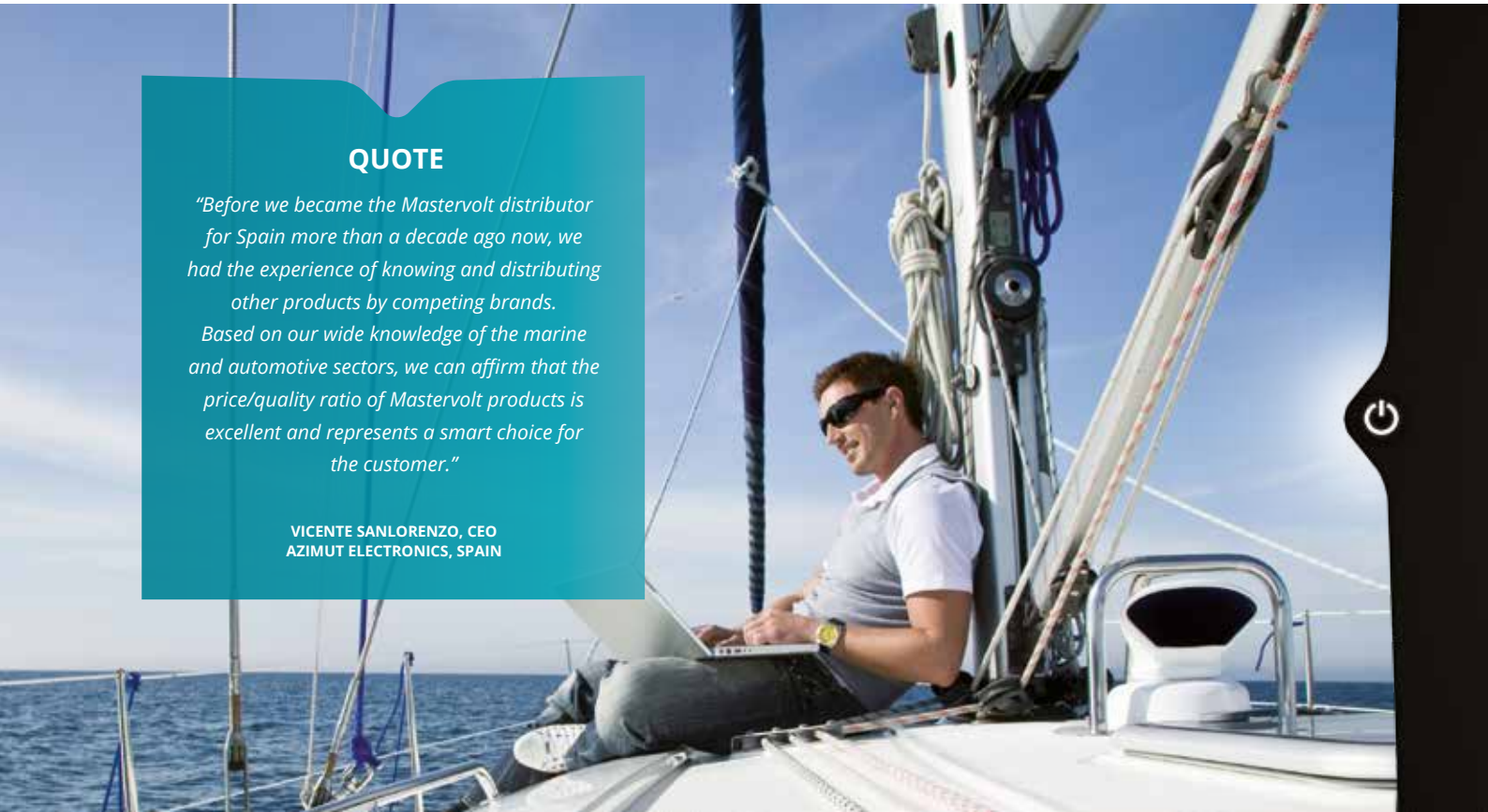
NEW MODEL

Amperian Interface

Product code	*77034000*
GENERAL SPECIFICATIONS	
Function	communication interface between MasterBus and Mastervolt's internet based Amperian platform
Communication protocol	MasterBus, MQTT via Ethernet
Secure connection	yes
Operating voltage range	9 – 32 V DC
Current consumption	< 450 mA at 12 V < 225 mA at 24 V
MasterBus Powering	no
Protection degree	IP54
Dimensions, hxwxd	105 x 190 x 60 mm 4.1 x 7.5 x 2.4 inch
Weight	700 gr / 1.5 lb
Connectivity	WiFi, Ethernet
Data communicated	any MasterBus data requested
Delivered with	power cable, WiFi antenna, MasterBus RJ45 adapter

Don't worry, Amperian is on site!

For service providers, MasterAdjust Web is the powerful tool for remote monitoring and configuration of any MasterBus connected system. This web-based version of the well-known MasterAdjust software, allows the service provider to work on Mastervolt systems from any location. Solving problems has never been quicker or easier. Whether the owner is earning a living on the road or spending free time on the water, this service will help protect him from interruption of the silent electric power he or she invested in.



QUOTE

"Before we became the Mastervolt distributor for Spain more than a decade ago now, we had the experience of knowing and distributing other products by competing brands. Based on our wide knowledge of the marine and automotive sectors, we can affirm that the price/quality ratio of Mastervolt products is excellent and represents a smart choice for the customer."

VICENTE SANLORENZO, CEO
AZIMUT ELECTRONICS, SPAIN

The intelligent simplicity of MasterBus

The advanced functions of custom made systems are now within easy reach thanks to the MasterBus platform (single communication protocol with high-speed CANbus technology). The intelligent, one-cable MasterBus network greatly simplifies wiring, saving you valuable space and weight. Additionally, you can automate and customise your system to meet all your requirements.

As owners demand high levels of onboard luxury and comfort, professional and recreational applications need to carry more equipment which in turn takes up more space. This makes it all the more essential to intelligently install equipment in the available space - and that is where the MasterBus communication network of Mastervolt comes in.

The wide range of interfaces and modules allows you to connect any equipment you wish to your MasterBus system and manage, monitor or operate it locally, centrally or even from your home. The galvanic isolation of the MasterBus network ensures a safe and stable network.

Professional Perspective

MasterBus also makes life easier for designers, builders and installers of power systems with less material, less work, less fuss and an easy testing method. Additionally, it is available in ten languages and offers the same user interface for all (Mastervolt) products, such as battery chargers, inverters, Combis, batteries or other devices. All control panels have an identical layout, with or without PC software.

Easy Maintenance

Replacing a component can often lead to complex configuration problems. Not with Mastervolt. The MasterBus network ‘recognises’ any replacement directly and automatically asks whether you want to keep the same or change your configuration. You stay well informed and with everything under control.

QUOTE

"Mastervolt is the only manufacturer that designs & produces most of its products in-house. That is why all their products work together almost seamlessly, and the reason why we've been working exclusively with Mastervolt for the past 23 years!"

MIGUEL SAS, MANAGING DIRECTOR
NAVEX ELEKTRO NV, BELGIUM

MasterBus Displays: Monitor & control your MasterBus network

Fast and clear information about your electrical system is vital. Usually multiple panels are required to read the details of an expansive electrical system, and the interpretation of these panels and how they relate to one another is left to the user. Mastervolt puts an end to this undesirable situation by using a clear communication platform (MasterBus) and the smart EasyView 5 display.

EasyView 5

Waterproof System Monitor with intuitive touchscreen

Controlling your Mastervolt system has never been easier!

FEATURES

- Water proof, 'daylight readable' colour display.
- Intuitive touch control.
- Customizable favourite pages.
- Log book for warnings and alarms.
- Buzzer and Home button.
- Easy mounting: front mount, wall mount or retrofit.
- MasterBus powered, or 12/24 V input.
- Easy updating through MasterBus and USB.

The EasyView 5 features a sharp, waterproof display which is clearly readable in daylight. Thanks to the colour touchscreen and multi-language menu, the display is a pleasure to operate. Easily customizable favourite pages show all relevant system information at a glance.

Applications

The EasyView 5 completes any MasterBus system. With its handy functionality and compact size, the EasyView is ideal for yachts, vehicles and stationary systems. Applicable in various markets such as marine, mobile (recreational and professional), infrastructure, offshore, off grid and industrial. The possibilities are endless!

	EasyView 5
Product code	*77010310*
GENERAL SPECIFICATIONS	
Power supply	MasterBus powered, or 12/24 V input
Resolution	480 x 272 pixels
Colour depth	16 bits
Display/read-out	4.3 inch high contrast display with capacitive touch control
Languages on display	ENG, NL, DE, SP, IT, FRA, FIN, SWE, DEN, NOR
Mounting	front mount, wall mount and MasterView Easy retrofit
Alarms	buzzer integrated
Dimensions, hxwxd	113 x 127 x 43 mm 4,4 x 5,0 x 1,7 inch
Weight	300 gr / 0.7 lb
Delivered with	UV protection cover, wall mount casing, MasterBus cable
TECHNICAL SPECIFICATIONS	
MasterBus connection	yes
Power consumption	< 160 mW (idle mode)
Connections	2x MasterBus, USB, 12/24 V
Protection degree	IP67; waterproof front

MORE INFORMATION ■ MASTERVOLT.COM/EASYVIEW

Some examples of the many possibilities:

Customize Favourites

Customize favourite pages to meet your specific needs for information and control, to show information in the most convenient way.

Adjust Parameters

Use the EasyView 5 to adjust frequently used settings, like the shore fuse or to switch on your inverter.

Modify System Settings

In the system page you will find every possible system setting.

Alarms and Logs

No surprises! The EasyView 5 helps to keep your system in top condition by assisting you with alerts. Logging of the alarms provides valuable insight in the operation of your system.

MasterView Read-out

Remote panel for reading the charge status of your battery charger, including error notifications.

	MasterView Read-out
Product code	*77010050*
Display	7 LEDs
Dimensions, hxw	60 x 65 mm 2.4 x 2.6 inch
Weight	70 g / 0.15 lb
MasterBus connection	yes
Powered by	MasterBus
Power consumption	144 mW
Protection degree	IP21

If your dashboard is full and does not offer space for the EasyView display, this module allows you to integrate the MasterView Read-out into your own control panel.

	MasterView Read-out OEM
Product code	*77010030*

System Panel Controller

Enables the use of MasterView System software on a standard display or panel PC (in combination with Windows or Linux operating system). The System Panel Controller also serves as a license key.

	System Panel Controller
Product code	*77031900*
MasterBus powering	yes (when the PC is switched on)
Dimensions, hxwxd	91 x 185 x 33 mm 3.6 x 7.3 x 1.3 inch
Weight	± 750 g / 1.65 lb
Protection degree	IP65
Delivered with	USB cable, SPC cable, MasterBus cable, MasterBus terminator, user's manual

MasterBus Network Components

MasterShunt 500

NEW MODEL

MasterShunt is the heart of every MasterBus energy system. This integrated battery monitor shares information about the battery bank with other Mastervolt devices such as battery chargers, Combis, and displays. No surprises: allowing complete automation of your system, MasterShunt improves comfort, prolongs battery life and extends your runtime.

The MasterShunt 500 provides all information needed for monitoring your battery bank and control of your system, such as voltage, current, state of charge and time remaining. All information is made available to the system by a single MasterBus cable. Extremely accurate measurement of current flow over state of charge enables the MasterShunt to precisely determine the time remaining.

Programmable events and an integrated real time clock make it possible to fully automate your system. Examples are to start your generator automatically when the battery bank is low (or just delaying at night!), or to automatically generate a warning at a certain depth of discharge. The proven MasterShunt design has been upgraded to obtain an even higher level of accuracy and control. Taking into account battery specific parameters, MasterShunt takes reading accuracy to a whole new level.

A new service mode prevents loss of valuable information, such as the state of charge, during system maintenance. A maximum Depth of Discharge (DOD) can be set and time remaining will be adjusted accordingly.

The renewed MasterShunt allows freedom of choice with regards to fuse type, rating and location. The battery monitor is supplied with an internal bus bar, to be used in situations where an external fuse holder is selected. In case the MasterShunt is installed close to the battery, the bus bar may be replaced by either an ANL type or Class T main fuse, saving both space and cost.

MASTERBUS COMPATIBLE

FEATURES

- Digital shunt providing the energy system with extensive information and historical data.
- Very accurate and reliable determination of State of Charge (SOC).
- Easy connection to all MasterBus devices.
- Power saving mode for reduced idle consumption.
- Service mode prevents memory loss during system maintenance.
- Realistic and precise indication of the time remaining.
- Smart MasterBus powering mode reduces idle consumption to a bare minimum.
- For higher current, multiple MasterShunt models may be installed in parallel.
- MasterConnect system makes connecting to the DC Distribution product very easy.
- Straight forward, easy to install.
- Freedom of choice for fuse type, rating and location. Suitable for T-fuse and ANL-fuse (to be ordered separately).
- Robust housing with isolation of the DC connections.

	MasterShunt 500
Product code	*77020110*
Dimensions, hxwxd	150 x 150 x 65 mm 5.9 x 5.9 x 2.5 inch
Weight	0.7 kg / 1.54 lb
Battery types	Gel, AGM, flooded, Lithium Ion
Battery voltage	12, 24 or 48 V DC
Current	300 A continuously, 400 A for 10 min., 500 A for 5 min. and 600 A for 2 min.
MasterBus powering	yes, incl. Smart MasterBus Powering
Idle consumption	23 mA (normal operation), <1 mA (power saving, MasterBus off)
System functionality	alarm, timers, auto start/stop for the generator
System information	e.g. time remaining, voltage, current, state of charge
Programmable alarms	warning low voltage, warning low state of charge, high voltage
Protection degree	IP21
Main fuse	bus bar included in MasterShunt, Class T fuse or ANL fuse to be ordered separately
Delivered with	MasterShunt, temperature sensor, MasterBus terminator, MasterBus cable, isolation cover for DC connections

SYSTEM CONTROL

PROLONGED BATTERY LIFE

EASY INSTALL

MORE INFORMATION ■ MASTERVOLT.COM/MASTERBUS

DC Distribution 500

The DC Distribution 500 is the smallest distribution model available. It connects up to four DC devices, such as a battery charger, inverter, alternators and solar panels. With the plug & play cable it can be easily connected to the MasterBus network. The EasyView panel gives all fuses logical names, for instance, referring to the connected equipment, to ensure you receive understandable error notifications (for example: battery charger fuse defect).

	DC Distribution 500
Product code	*77020200*
Dimensions, hxwxd	150 x 216 x 65 mm 5.9 x 7.9 x 2.5 inch
Weight	1.2 kg / 2.6 lb
Battery voltage	12, 24 or 48 V DC
Current	300 A continuous / 500 A for 5 minutes
MasterBus powering	no
Standard fuses	80 A (2x), 160 A and 125 A - ANL type (deviating values can be ordered separately)
Spare fuse	125 A - ANL type
Alarm	fuse monitoring
Protection degree	IP21
Delivered with	four standard fuses and one spare fuse, hex tool, MasterBus terminator, MasterBus cable, cable protections for DC connections

Digital DC 10x10A

As the pinnacle of system intelligence, the Mastervolt Digital DC 10x10A has ten 10 A outputs for all functions including lighting, pumps, electronics, etc. It comes standard with intelligent alarm functions and luxury options include:

- Follow me home (light stays on for a specific time).
- Delayed dimming of lights (including ten built-in dimmers).
- Alarm signal for overload.
- Every output has a hardware and software fuse.
- Reset the fuses via the MasterBus network.
- Possibility of higher currents (up to 100 A) with parallel switching of multiple outputs.
- Logical Blocks.

	Digital DC 10x10A
Product code	*77020400*
Dimensions, hxwxd	40 x 229 x 110 mm 1.6 x 9.0 x 4.3 inch
Weight	750 gr / 1.7 lb
MasterBus powering	yes
Power consumption	< 2 mA at 12/24 V
Protection degree	IP21
DC OUTPUT	
Connection	cable max. 4 mm²
Maximum software fuse current	10 A per channel
Hardware fuse current	15 A per channel
DC INPUT	
Connections	max. 95 mm² or directly connected to MasterShunt or DC Distribution
Maximum current	100 A
Supply voltage	8-30 V DC

Integrate your MasterBus System: MasterBus Interfaces

Mastervolt offers a wide range of interfaces to increase the versatility of your MasterBus network. Connect multiple components to distribute information to your MasterBus products or connect products that require information from the MasterBus network, such as a NMEA 2000, CANopen or Modbus network, and vice versa.

All interfaces (and modules) can be installed in various ways, from DIN rails to surface mounting. MasterBus is available in ten languages: English, Dutch, German, French, Spanish, Italian, Norwegian, Swedish, Finnish and Danish.

NEW MODEL

MasterBus CANopen Interface

The MasterBus CANopen Interface facilitates transparent, 2-way communication between MasterBus and the CANopen standard, which is adopted in many automotive and industrial automation applications.

	MasterBus CANopen Interface
Product code	*77032600*
Programmability	MasterAdjust conventional configuration or string-based mapping
Data communicated	all MasterBus information and control items
Power consumption	< 40 mA
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight (excl. cable)	70 g / 0.15 lb
Protection degree	IP21
Delivered with	CANopen adapter cable (100 mm, M12 5-pin connector) and MasterBus terminator

NEW MODEL

MasterBus Philippi Interface

The MasterBus Philippi Interface makes it possible to view and control Mastervolt products on a Philippi PSM2 display. Mastervolt products use the CAN-based MasterBus protocol to communicate between products. Similar, the company Philippi uses the PBUS protocol. The MasterBus Philippi Interface connects these worlds.

	MasterBus Philippi Interface
Product code	*77031850*
Programmability	automatic & manual configuration
Data communicated	selection of most popular values per product
Power consumption	< 40 mA
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight (excl. cable)	70 g / 0.15 lb
Protection degree	IP21
Delivered with	connection cable (100 mm), MasterBus cable, MasterBus terminator

MasterBus FireCAN Interface

The MasterBus FireCAN Interface connects the vehicle's central communication system to the MasterBus network. FireCAN is a standardised CANbus protocol for electronic applications in fire fighting vehicles, that incorporates manufacturer-specific components.

	MasterBus FireCAN Interface
Product code	*77032400*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight (excl. cable)	70 g / 0.15 lb
Protection degree	IP21
Delivered with	FireCAN connection cable, MasterBus terminator, user's manual

MasterBus NMEA 2000 Interface

The MasterBus NMEA 2000 Interface provides the MasterBus network with NMEA 2000 information, and vice versa.

	MasterBus NMEA 2000 Interface
Product code	*77031800*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight (excl. cable)	70 g / 0.15 lb
Protection degree	IP21
Delivered with	NMEA connection cable, MasterBus cable, MasterBus terminator, user's manual

MasterBus Modbus Interface

The MasterBus Modbus Interface can provide all information from the 'closed' MasterBus network for other monitoring and operating systems by means of the Modbus protocol.

	MasterBus Modbus Interface
Product code	*77030800*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	MasterBus cable, MasterBus terminator, user's manual

MasterBus Combi Interface

This interface integrates a Mastervolt Mass Combi in a MasterBus network and allows it to be operated or monitored via a EasyView 5 panel or PC.

	MasterBus Combi Interface
Product code	*77030475*
MasterBus powering	yes
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	Interface connection cable, MasterBus terminator, user's manual

MasterBus Inverter Interface

The MasterBus Inverter Interface integrates the Mastervolt Mass Sine inverter in a MasterBus network and allows it to be operated and monitored via EasyView 5 or PC.

	MasterBus Inverter Interface
Product code	*77030700*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	Interface connection cable, MasterBus cable, MasterBus terminator, user's manual

MasterBus Serial Interface

Connect conventional Mastervolt products to MasterBus. Data becomes permanently available to allow configuration, operation and monitoring via EasyView 5 or PC. Suitable for Masterlink BTM-III, Mac and Magic DC-DC converters.

	MasterBus Serial Interface
Product code	*77030450*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	Interface connection cable, MasterBus cable, MasterBus terminator, user's manual

MasterBus USB Interface

The MasterBus USB Interface enables you to read and configure the MasterBus network via your PC.

	MasterBus USB Interface
Product code	*77030100*
MasterBus powering	yes (when the PC is switched on)
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	USB connection cable, MasterBus cable, MasterBus terminator, user's manual

GPRS Module

Communicate with your system via mobile phone, allowing you to monitor current information or operate the system by remote control via a text message or easy shortcuts. Alarm notifications per text message are optional.

	GPRS Module
Product code	*77031000*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	GPRS antenna, MasterBus cable, MasterBus terminator, user's manual. *SIM card not included*

NOTE

Please note that in some countries (or specific network operators) the G2/GPRS networks are being switched off. For the Asia Pacific area and the Americas, this is already in progress, and the GPRS module will no longer be available in these areas.
For Europe, the GPRS module will remain available for the time being. It is expected that in Europe, end 2020, the G2/GPRS network will no longer be supported.

GPRS Module: Communicate with your system via mobile phone.

MasterBus Tank Level Interface

This interface converts analogue sensor input signals to MasterBus data. Selectable input signals: 4-20 mA, 0-300 Ω, 8-70 V DC.

	MasterBus Tank Level Interface
Product code	*77030300*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	MasterBus cable, MasterBus terminator, user's manual

Digital Input

Connect up to four switches to the MasterBus network. Delivery includes connection cables.

	Digital Input
Product code	*77030900*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	cable with plug, MasterBus cable, MasterBus terminator, user's manual

Digital AC 1x6A

Switches all AC loads, no matter where they are. Loads up to 6 A can be directly switched, higher loads should be switched via an external relay.

	Digital AC 1x6A
Product code	*77031500*
MasterBus powering	no
Max. relay current	6 A (230 V AC single pole)
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	MasterBus cable, MasterBus terminator, user's manual

MasterBus Power Interrupter

The MasterBus Power Interrupter switches off parts of the MasterBus network. This reduces the no-load consumption and is useful if a large system will not be used for an extended period. Communication remains possible.

	MasterBus Power Interrupter
Product code	*77031550*
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	user's manual

MasterBus Repeater

The MasterBus Repeater doubles the maximum length of your MasterBus network.

	MasterBus Repeater
Product code	*77031100*
MasterBus powering	yes
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 90 g / 0.20 lb
Protection degree	IP21
Delivered with	MasterBus cable, MasterBus terminator, user's manual

Multipurpose Contact Output

This potential-free programmable contact can be customised and programmed to give your MasterBus network unprecedented possibilities. Use it, for example, to control a ventilator, or to operate a generator.

	Multipurpose Contact Output
Product code	*77030500*
Potential free contact	NO-C-NC - 1 A / 30 V DC
MasterBus powering	no
Dimensions, hxwxd	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 80 g / 0.18 lb
Protection degree	IP21
Delivered with	MasterBus cable, MasterBus terminator, user's manual

Switch Input 3 PCB

Switch Input 3 makes Carling switches compatible with MasterBus. Multiple functions can be easily linked with this module.

	Switch Input 3 PCB
Product code	*77031300*
MasterBus powering	no
Dimensions, hxwxd	54 x 86 x 58 mm 2 x 3.4 x 2.3 inch (incl. mounting frame)
Distance between switches	26.1 mm
Weight	35 g / 0.08 lb (incl. MasterBus terminator)
Protection degree	IP21
Delivered with	MasterBus terminator, user's manual. *Switches and mounting frame not included*

Switch Input 4 PCB

Provides LED indications for additional information. For example: The LED will blink when a connected lamp fails.

	Switch Input 4 PCB
Product code	*77031400*
MasterBus powering	no
Dimensions, hxwxd	56 x 120 x 65 mm 2.2 x 4.7 x 2.6 inch (incl. mounting frame)
Distance between switches	27.3 mm
Weight	45 g / 0.1 lb (incl. MasterBus terminator)
Protection degree	IP21
Delivered with	MasterBus terminator, user's manual. *Switches and mounting frame not included*

AC Power Analyser

The AC Power Analyser is a multi-functional measuring device which can visualise the AC current and AC voltage, frequency, Cos Phi and power inside the system. Can also be used as MasterBus interface for the Mass Sine series, and offers a free programmable potential-free contact.

	AC Power Analyser
Product code	*77031200*
MasterBus powering	yes
Dimensions, hxwxd	80 x 181 x 28 mm 3.1 x 7.1 x 1.1 inch
Weight	± 530 g / 1.17 lb
Protection degree	IP65
Delivered with	MasterBus cable, MasterBus terminator, current transformer 100:5, user's manual

Use it to connect AC power devices such as generators or isolation transformers to the MasterBus network.

CZone MasterBus Bridge Interface

The CZone MasterBus Bridge Interface physically connects the MasterBus and CZone networks together, enabling the two networks to communicate and act as one. This provides seamless control and monitoring of Mastervolt power electronics from CZone displays or partner products.

FEATURES

- Control of Mastervolt inverters and chargers from CZone displays, switches or partner products.
- Display MasterBus acquired systems information such as tank and power levels on CZone displays.
- Transfer of alarms between both systems.

	CZone Masterbus Bridge Interface
Product code	*80-911-0072-00*
MasterBus powering	no
Dimensions, HxlxP	69 x 69 x 50 mm 2.7 x 2.7 x 2 inch
Weight	145 g / 0.32 lb
Protection degree	IP65
Delivered with	MasterBus cable adapter, MasterBus terminator, user's manual

Please contact Mastervolt or your local dealer for possibilities in your specific application.

QUOTE

"With the help of Mastervolt products, we are able to realize the wishes of our selected customers. As Premium Partner, we almost exclusively provide and install offshore solutions, special vehicles, prototypes, government vehicles and RVs, in which the power supply via Mastervolt's Lithium Ion batteries play an essential role. Due to many years of experience and the innovations of Mastervolt, we guarantee a high level of reliability, quality and sustainability in the implementation of these projects."

STEVEN THURM, OWNER/MANAGING DIRECTOR
THURM MEDIA / OBT GMBH, GERMANY

Practical: MasterBus Accessories

Fuses

The MasterShunt standard comes with a bus bar. You can also choose a robust Class T fuse, suitable for high short circuit currents of the Lithium Ion batteries, or for ANL fuses.

Product code	
77049000	**Class T fuse 500 A / 160 V DC, current limiting capability 20 kA**
77020150	**bus bar**

The DC Distribution standard comes with five ANL fuses: 80 A (2x), 125 A and 160 A, and a 125 A spare fuse.

Replacement fuses and other amperages:

Product code	ANL fuse
77049020	**20 A**
77049040	**40 A**
77049050	**50 A**
77049063	**63 A**
77049080	**80 A**
77049100	**100 A**
77049125	**125 A**
77049160	**160 A**
77049175	**175 A**
77049200	**200 A**
77049250	**250 A**
77049300	**300 A**
77049400	**400 A**
77049425	**425 A**
77049500	**500 A**

MasterBus Terminator

The terminators ensure interference-free operation and high communication speeds.

Product code	
77040000	

MasterBus Communication Cable

Suitable for data traffic and powering peripheral equipment in harsh environments, this is the only cable you need for your MasterBus network. MasterBus compatible products come standard with two ports, while other equipment requires an interface. A DIY kit is optional.

Product code	
77040020	**0.2 m**
77040050	**0.5 m**
77040100	**1 m**
77040300	**3 m**
77040600	**6 m**
77041000	**10 m**
77041500	**15 m**
77042500	**25 m**
77045000	**100 m**

MasterBus DIY kit

Cut your own cables to length and finish, comprising:

- Professional RJ45 crimping tool.
- 50 x MasterBus RJ45 connectors.
- 50 x green MasterBus RJ45 protection boots.
- 100 m green MasterBus CAT5E UTP cable.

Product code	
77050000	

Separately available:

Product code	
77040010	**25 x MasterBus RJ45 connectors, 8-pole**
77040015	**25 x green isolation caps for RJ45 connector**

Digital Switching: the future is now

By switching decentrally, it is possible to build smarter systems with less cables and installation work. Central switchboards are replaced by decentralised digital switching modules, controlled via a bus system. These modules operate equipment such as lights, pumps and navigation equipment. Different input modules can be connected to this bus as well.

Take for example the 77EB, the flagship of the range from Gold Coast based Riviera Australia. With 6 battery banks, 172 DC circuits, 35 AC circuits, two generators, two shore power connections, four battery chargers and an inverter, managing the onboard systems is a complex task!

CZone® does the hard work automatically, with simple control and monitoring from any of the four touch screens fitted in engine room, crew quarters, saloon and flybridge, allowing this boat to be run by a couple without crew if desired.

On the Riviera 77EB, the CZone network comprises of 70 modules communicating over the NMEA 2000 bus. The four main modes of operation are Systems Off, Cruising, Dock Unattended, and Entertaining, switching multiple AC and DC circuits at the same time, plus controlling individual AC sources at the single touch of a control screen.

Advanced AC control allows automatic generator start/stop, auto changeover of the energy sources, and full integration with the Mastervolt power electronics.

QUOTE

"CZone provides Riviera owners with reliable onboard power electronics. The integrated system gives our owners more functionality with less components, while straightforward and practical design make installation simple. In Mastervolt, we have a partner that understands our requirements and provides Riviera with the quality and reliability our owners demand."

GREIG PAYNE, ELECTRICAL MANAGER
RIVIERA YACHTS, AUSTRALIA

CZone® Networked Control and Monitoring System

The CZone® digital control & monitoring network simplifies installation of electrical systems through the replacement of complicated, cumbersome wiring to switch and fuse panels, with state-of-the-art, robust interfaces and light NMEA 2000 network cable. It also provides a sophisticated solution via the automation of complicated control and monitoring issues associated with today's onboard systems.

Installation

Builders recognise an immediate benefit with reductions in cable usage, harness weights and installation times. The CZone system also integrates many stand-alone components into one intuitive system. Wiring is dramatically simplified as the CZone system is designed to remove complex switching clusters and wiring runs. Modules can easily be added into the system to best suit the OEM and end-users' needs.

Configuration

We provide the tools to help you determine the modules needed based on your specific requirements. You can simply program the system with the intuitive CZone configuration tool.

Integration

The CZone system is NMEA 2000 certified and uses the standard Micro cables and connectors. This also allows a single network backbone to be installed for multiple systems (CZone and other NMEA 2000 devices). Additionally, the CZone system can share certain monitoring functions with other NMEA 2000 compliant screens. The CZone MasterBus Bridge Interface expands the system integration to a whole new level. No other company can bring digital switching, power electronics and marine navigation systems together into one interactive, seamless system.

Versatility and Security

The CZone system, designed for 9 V to 32 V systems, features built-in timers, dimmers (including support for halogen lighting), alarms, voltage reducers and load shedding. With safety in mind, the CZone system features a manual bypass. Our No-Single-Failure-Point technology ensures a plug & play system with redudancies that are designed to handle mishaps. If a module is damaged, the system will automatically program the replacement module when it is plugged in. This means any module can be replaced without using high tech service people. Our security features allow custom configurations that can be locked.

CZone® Displays

The CZone® displays are designed with both the manufacturer and end-user in mind. The easy-to-use display screens put the control of all components directly at your fingertips. Multiple display interfaces can be used in the same system. The scroll and click interface is simple to use in the roughest of seas or bumpiest of roads.

CZone displays are the interface between the CZone network and the user. They offer full control of circuits as well as the ability to view important onboard system information, such as tank levels and power levels (for both AC and DC supplies). Audio and visual alarms with systems diagnostics are also provided.

CZone displays are extremely intuitive to use with simple controls and a menu structure that is easy to follow. The 'modes of operation' feature allows the control of multiple circuits with a single push of a button. For instance, 'night running' mode turns pre-selected lights on to dim levels. These modes can all be configured by the user.

MORE INFORMATION ■ MASTERVOLT.COM/CZONE

Settings

Allows an OEM or technician access (via password) to the configuration of a system. No need for a computer to set or change configuration settings such as circuit labels, circuit breaker sizes, etc.

Modes

Ease of operation assured. With one press of the key users can turn on a group of circuits without having to scroll, search for, and turn on the individual circuits that they need for the operation of their vessel or vehicle. When leaving, simply press “systems off” to turn off all non-essential circuits. Entertainment mode allows preset activation of lounge lights, music, etc. All functions can be controlled remotely.

Control

Breaks down the circuits into easy to identify groups for quick control, i.e. to turn on fresh water pump the user can open the “pumps” group and make the appropriate selection. This screen also allows the user to monitor the status of the circuit i.e. on, off, fault and current draw.

Power Control

- Turn circuits on and off, including timer and light dimming control.
- Set modes of operation.

Monitoring

Allows user to easily monitor AC and DC power, tanks, data, alarms, and circuit status. Presents data in analogue and digital form.

DC Power Meter

- Displays voltages of multiple battery banks, includes low and high voltage alarms.
- Displays charge and discharge (amp) of multiple battery banks.
- Displays battery capacity in ampere hours and % charge/discharge, includes low ampere hour alarm.
- Logging of battery minimum and maximum voltage levels.
- Logging of minimum battery capacity level.

AC Power Meter

- Displays multiple line voltages (230 and 120 V), includes high and low voltage alarm.
- Displays AC line frequencies, includes high and low frequency alarm and AC power consumption in kW.
- Logging of minimum and maximum voltage and frequency levels.
- Logging of maximum AC current.

Tank Levels

- View tank level information for multiple tanks and fluid types.

Data

- Displays standard NMEA 2000 information.
- Displays temperature and pressure values.
- Monitors all circuits connected to the CZone network.

Alarms and Diagnostics

- Logging of circuit run time and on cycles.
- CZone network status reporting.
- Indicates alarms for onboard faults in audio and visual form (bilge pump operation, smoke alarm).
- Logging of alarms with date and time.

CZone® Displays

Touch 10

The gateway to your CZone digital switching and Mastervolt power electronics system has just been transformed by the 'state of the art' Touch 10.

The sleek, attractive screen design will complement the interior of any high-end vessel or recreational vehicle, while offering the very latest generation capacitive touchscreen technology, high bright display for use in sunlight and high resolution providing a more crisp and detailed graphical user interface.

All of this has been packaged into an innovative, splash-proof marine mounting system to provide an outstanding 'human-machine' experience.

Product code	
80-911-0100-00	**Touch 10**
80-911-0101-00	**Retrofit plate** *(required for retrofitting old 10" Touch Screen)*
Screen	10.1" LED-backlit projected capacitive touchscreen display with IPS technology
Aspect ratio	widescreen 16:10
Resolution	1280 x 800 pixels
Protection degree	IP66
Brightness	500 cd/m²
Supply voltage	8-32 V
Power consumption	1 A at 12 V, 500 mA at 24 V
Interfaces	NMEA 2000, USB2.0, Ethernet
Dimensions, hxwxd	196 x 275 x 41 mm 7.7 x 10.8 x 1.6 inch
Weight	1.8 kg

Touch 5

NEW MODEL

The sleek Touch 5 adds a compact touchscreen option to your CZone installation. While offering many of the same features as its bigger brother, the Touch 10, this display module adds WiFi connectivity as well as the higher specification IPx7 waterproofing.

With a super bright widescreen display and the latest capacitive touchscreen technology, this compact unit outperforms perfectly in sunlight. It also suits smaller applications where space is at a premium, or on larger applications as a secondary display.

FEATURES

- Easy to use touch interface.
- Glass dash styling.
- Super bright widescreen display.
- Low profile flush mounting.
- Reduced system cost and complexity, combines display and Wireless Interface functionality into one unit.
- IPx7 water ingress protection.
- Built-in WiFi connectivity.
- Micro SD card slot.
- NMEA 2000 compatible.

Product code	
80-911-0124-00	**Touch 5**
80-911-0135-00	**Retrofit plate 12 V** *(required for retrofitting old 3.5" Display Interface)*
80-911-0136-00	**Retrofit plate 24 V** *(required for retrofitting old 3.5" Display Interface)*
Screen	5" LED-backlit projected capacitive widescreen touch
Resolution	800 x 480 pixels
Protection degree	IPx7
Brightness	1200 cd/m²
Supply voltage	12 V DC
Power consumption	900 mA at 13.5 V
Interfaces	NMEA 2000, Micro SD
Dimensions, hxwxd	120 x 152 x 58 mm 4.7 x 6.0 x 2.3 inch
Approvals	CE, RCM

Let CZone® do the thinking...

CZone removes the one-to-one relationship between each physical switch and the item being controlled, and allows multiple devices to be controlled by a single touch.

This simplifies the display and ensures critical items are not forgotten, like navigation lights when running at night. The combinations can also overlap, allowing the same device to be controlled in different ways by different modes.

Modes

So for example a mode for “Daytime Running” might turn on the fridge, fresh-water pump, toilet pump and bilge blower. A “Night Running” mode might add navigation lights to this and dim the instrument lights, while a “Night Anchor” mode would turn these off and replace them with the anchor light, interior lights and underwater lights. In this way a small number of programmed modes could cater for all the combinations required during normal operation.

Creating modes is done using the CZone configuration software, and this can incorporate suitable graphics. Modes can then be programmed to display graphically which devices are enabled for each mode, ensuring immediate understanding of what the state is of each device is in the current mode.

Combination Output Interface (COI)

The complete CZone® system in a box!

NEW MODEL

The Combination Output Interface (COI) combines multiple input and output devices into one module, offering a compact and intelligent replacement for traditional DC fuse boxes and circuit breaker panels with digital switching technology.

Digital switching systems just became more cost effective and easier to install with the CZone Combination Output Interface (COI). This one box replaces up to five separate units, with convenient Deutsch connectors and IPx5 water resistance, providing a complete CZone system for smaller applications. The COI's high continuous power output (150 amps), plus space, installation time and cost savings also make it the perfect building block for larger systems.

Quick Access and Overview

Partnered with either a dedicated CZone display, or with a multi-functional display from one of our integration partners (B&G, Furuno, Garmin, Lowrance, Simrad), the Combination Output Interface heralds a new era in providing simple, intuitive control over the increasingly complex systems found on today's applications.

Product code	
80-911-0119-00	**COI with connectors**
80-911-0120-00	**COI without connectors** *(for refit or service purposes)*
Communication protocol	NMEA 2000
Channels	30
Output channels (high)	4 x 25 A
Output channels (low)	12 x 10 A (dimmable)
Analogue inputs	8 (positive or negative switching, 0-32 V)
Additional monitoring	2 voltage sensors (on main positive stud and NMEA 2000 power)
Circuit current monitoring	all 16 output channels
Circuit protection	configurable electronic fuse + mechanical fuse and bypass
Digital switch inputs	6 digital input switches with backlight via digital breakout
Max. continuous current	150 A at 40 °C (derating > 40 °C)
NMEA 2000 power consumption	250 mA at 12 V 180 mA at 12 V standby
Connectors	Deutsch
Power supply	M8 (5/16") stud positive, M6 (1/4") stud negative
Supply voltage	9-32 V (with power available LED and voltage monitoring)
Bilge pump circuits	4 high current channels: integrated manual control and 'pump running' detection
Protection degree	IPx5 (mounted at 0 °C +/-90 °C)
Dimensions (incl. optional cable cover), hxwxd	338 x 235 x 62 mm 13.3 x 9.3 x 2.4 inch
Weight	1.9 kg / 4.2 lb
Approvals	CE, ABYC, NMEA

FEATURES

- High density 30 channel module minimizes installation, interconnections and footprint, while delivering best value per circuit.
- Full mechanical fuse protection plus bypass on all circuits as required by ABYC/CE.
- Industry standard Deutsch connectors provide fast, plug & play installation. A Deutch connector kit is delivered as standard with product code 80-911-0119-00.
- Optional cable cover offers improved aesthetics and greater mounting flexibility.
- Proven, rugged CZone design includes IPx5 water ingress protection and NMEA 2000 certification.
- High power bilge pump channels allow manual control plus 'pump running' feedback from a single channel – without additional wiring.
- USB port provides easy system update from USB flash drive.

OPTIONS

COI cable cover
80-911-0123-00
Optional cover for clean finish, covers connectors and cables.

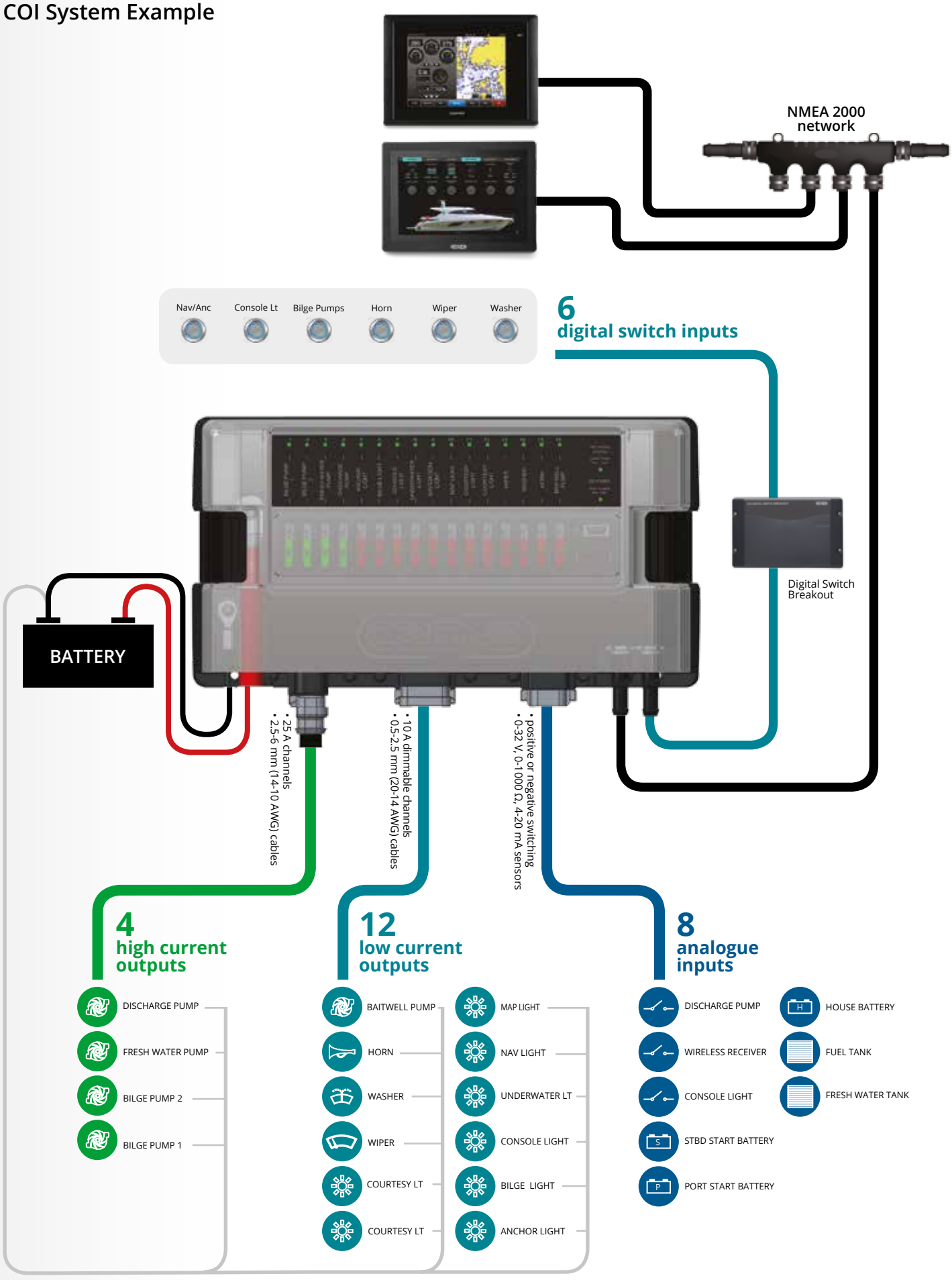
COI Digital Switch Breakout
80-911-0134-00
The COI Digital Switch Breakout (DSB) interfaces CZone digital switches with your CZone COI module. Including 2 mtr DSB to COI cable.

COI DSB cable, 5 mtr
80-911-0129-00

COI Deutsch connector kit *(delivered as standard with 80-911-0119-00)*
80-911-0131-00
Includes all necessary Deutsch plugs, contacts, wafers & seals for COI.

Deutsch HDT-48-00 crimp tool
80-911-0133-00
Crimp tool for Deutsch contacts.

COI System Example



CZone® Network Components

COI Digital Switch Breakout (DSB)

NEW MODEL

Product code
80-911-0134-00
Includes 2 mtr DSB to COI cable

The COI Digital Switch Breakout (DSB) is the interface between the Combination Output Interface (COI) and up to six CZone digital switches (push button or Rocker). The digital switches include dimmable LED backlighting, systems on, fault codes and a plug and play harness simplifying installation.

COI Digital Switch Breakout (DSB)

- Connect up to 6 digital switches to the COI.
- Support for single or double throw switches (up to 12 programmable switch points).
- Uses existing SCI switch cables with options for Rocker or push button plugs at various lengths.
- Digital switches include dimmable backlighting for 'systems on' and fault codes.
- Dimensions, hxwxd:
  100 x 156 x 42 mm / 3.9 x 6.1 x 1.7 inch
- IPx5 water ingress protection.
- Including 2 mtr DSB to COI cable.

Switch Control Interface (SCI)

Product code	Product code
80-911-0011-00	*80-911-0012-00*
Switch Control Interface with seal	**Switch Control Interface only**

The Switch Control Interface provides an interface between the CZone network and the traditional mechanical switches with which manufacturers and users are familiar. The SCI simplifies your wiring, supports your existing choice of switches, protects against failures and allows for more installation options.

Switch Control Interface (SCI)

- Single switch position can control multiple OI channels.
- Attaches to switch panels via custom SCI cable.
- Multiple SCI switches can control single OI channel.
- Output for backlighting of switch labels (dimmable).
- Outputs systems on and function/fault codes to systems on LED of switches (dimmable).
- Dimensions, hxwxd:
  100 x 156 x 42 mm / 3.9 x 6.1 x 1.7 inch
- IPx5 water ingress protection.
- Programmable switch types.
- 8 inputs per module (16 individual controls).
- Sequential button press functionality.
- Choice of push button or rocker style switch.

Signal Interface (SI)

Product code	Product code
80-911-0013-00	*80-911-0014-00*
Signal Interface with seal and connector	**Signal Interface only**

The Signal Interface connects the CZone system to your external sensors, alarms and switching devices. The SI allows intelligent, automated operation of circuits depending on the state of the input.

Signal Interface (SI)

- Accepts inputs from traditional switch types being used to control outputs.
- Accepts inputs from switches to trigger alarm i.e. high water float switch.
- Accepts inputs from industry-standard tank senders (0-5V, 10-180 Ohm, 240-33 Ohm).
- Accepts inputs from general voltaic or resistive signals, can be used for controlling outputs or to display a physical position, e.g. show a hatch is partially open.
- LED status indicators for each input.
- Dimensions, hxwxd:
  100 x 156 x 42 mm / 3.9 x 6.1 x 1.7 inch
- IPx5 water ingress protection.
- Outputs standard NMEA 2000 sentences.
- Resistive input range 0–1000 Ohms.
- Voltage sensing input range 0–34 V DC.

Note: High and low alarm levels can be set for all inputs.

Meter Interface (MI)

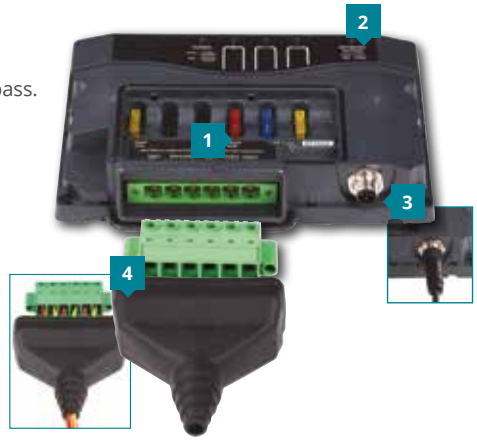
Product code	Product code
80-911-0005-00	*80-911-0006-00*
Meter Interface with seal and plug	**Meter Interface only**

The Meter Interface accepts inputs from external AC and DC power metering sensors such as: AC and DC voltage and amps, AC kWatts, and DC battery capacity in amp hours and % remaining. All with user definable high and low alarms.

Meter Interface (MI)

AC
3 x AC voltage inputs (multi voltage).
2 x AC current inputs.
Calculates true RMS power.
DC
3 x DC voltage inputs (multi voltage).
2 x DC current inputs.
Calculates battery capacity as ampere hours and percentage charge remaining.
Resolution for current metering down to 0.1 A.
GENERAL
Dimensions, hxwxd: 100 x 156 x 42 mm / 3.9 x 6.1 x 1.7 inch
IPx5 water ingress protection.
Outputs standard NMEA 2000 power monitoring sentences.

1. Fuses for emergency circuit bypass.
2. Network status indicator.
3. NMEA 2000 connector.
4. Connector and protective boot.



Motor Output Interface (MOI)

Product code	Product code
80-911-0007-00	*80-911-0008-00*
Motor Output Interface with connector and protective boot	**Motor Output Interface only**

The Motor Output Interface has an output pair for controlling DC motors which require a reversal of polarity to change the direction of their mechanical operation. For example, a DC motor for an electric window mechanism will move the window up or down depending on the polarity of the feed to the motor. The MOI also incorporates two standard output channels as found on the Output Interface (OI).

Motor Output Interface (MOI)

Single motor control and two normal channels per unit, 20 A per output.
Built-in circuit protection.
IPx5 water ingress protection.
Dimensions, hxwxd: 128 x 200 x 45 mm / 5 x 7.9 x 1.8 inch

Output Interface (OI)

Product code	Product code
80-911-0009-00	*80-911-0010-00*
Output Interface with connector and protective boot	**Output Interface only**

The Output Interface provides an intelligent replacement for traditional circuit breaker and fuse panels. It has six high power, robust output channels which provide the power supply, control and fusing for a circuit as well as integrating many other features such as timers and dimmers. Connection to the unit is simple: a large 6-way plug allows connections to cables of up to 16 mm² (6AWG) in size, or multiple smaller conductors. No need for specialised crimp terminals and expensive crimp tools to be carried for terminations to CZone, just a blade screwdriver. A protective flexible boot offers protection to the connections from harsh environment conditions.

Output Interface (OI)

4 levels of backup fusing including manual override (as required by ABYC).
Multiple channels can be bridged together to offer higher current switching.
Power consumption 12 V: 85 mA (standby 60 mA).
Dimensions, hxwxd: 128 x 200 x 45 mm / 5 x 7.9 x 1.8 inch
Small, non-metallic, easy to install case.
IPx5 water ingress protection.
6 x 20 amps circuits.
Programmable software ‘fuse’ sizes.

CZone® Network Components

AC Output Interface (ACOI)

Searching for a simplified way to network, monitor and control onboard AC circuits? The AC Output Interface does it all and provides circuit protection for onboard AC devices. It is easy to install, configure and operate the digital control system with pre-wired components for quick connections.

This gives you a customizable solution to suit unique installation and application needs, including 'night operation' as well as control at multiple locations. It has eight outputs (up to 50 A each), supports multiple pole designs and has two separate buss feeds. To facilitate things, status LEDs and manual bypass are located right at the enclosure.

FEATURES

- Circuit status and run current displayed for each circuit.
- Customizable to suit installation requirements.
- Pre-wired for quick connection.
- Staggered start up of loads.
- 110 V, 240 V, 110/220 V.
- Supports multiple pole designs, i.e. double, triple, four pole.
- Utilizes standard DIN rail mounted components for circuit protection and control.
- Can support two separate buss feeds (i.e. 2 load groups) in one box.
- Delay before circuits come on to allow generators to come up to speed.
- Provides circuit protection and control.
- Status LEDs at enclosure.
- Manual bypass at enclosure.
- Provision for MCB/RCDs.
- Timers.
- 50 or 60 Hz.

Sample AC control screen.

Product code	*80-911-0069-00* *For quotation purposes only, contact Mastervolt for custom requirements.*

ACOI standard

8 x 50 A relays protected with 10 A MCB's.
Pre-wired.
Current monitoring on each channel.
IPx5 enclosure.
LED status indicators for each input.
Dimensions, hxwxd: 430 x 276 x 186 mm / 17 x 10.9 x 7.3 inch

Product code	
80-911-0082-00	**Brown tails (APAC/Europe)**
80-911-0096-00	**Black tails (US)**

ACOI DIN rail mount

8 x 50 A relays.
Fitted with 600 mm tails.
Cost effective solution, own enclosures and MCB's can be sourced.
Current monitoring on each channel.
Dimensions, hxwxd: 77 x 160 x 60 mm / 3 x 6.3 x 2.4 inch

AC Mains Interface (ACMI)

A sophisticated source selector or transfer switch, the AC Mains Interface enables the user to specify the AC power source (generator, inverter, mains). Developed for use with the CZone digital control system, but may also be used as a stand-alone device.

The ACMI can be programmed to automatically change the supply source when the current rating is exceeded, and includes a manual override and user-friendly display screen that ensures easy current, voltage, frequency, and power monitoring. Other features include six monitored, over-current protected main power inputs of up to 100 A each, as well as two outputs, which enables two separate load groups and a parallel option for use with a single source. To simplify installation, the ACMI comes pre-wired.

Product code	*80-911-0068-00* *For quotation purposes only, contact Mastervolt for custom requirements.*

ACMI standard

Three inputs: 1 x 16 A mains, 1 x 32 A mains, 1 x 50 A generator parallel.
Two load groups: 40 A.
230 V AC 50 Hz.
Current, voltage, frequency and power monitoring incorporated.
Manual override panel on enclosure.
Dimensions, hxwxd: 430 x 540 x 186 mm / 17 x 21.3 x 7.3 inch

FEATURES

- Six source inputs up to 100 A (e.g. 2 x mains, 2 x generator).
- Monitoring of channel status (on/off/fault).
- Provides circuit protection and control.
- Manual override at enclosure and via remote panel.
- Customizable to suit installation requirements.
- Supports multiple pole designs, i.e. double, triple, four pole.
- 110 V, 240 V, 110/220 V.
- IPx5 enclosure.
- Utilizes standard DIN rail mounted components for circuit protection and control.
- Current, voltage, frequency and power monitoring incorporated (six channels).
- Physical and software lockouts between source controls (prevents two sources from becoming connected).
- Reverse polarity and bad power supply alarms including auto disconnect and lockouts.
- Two outputs (load groups), allows for two separate load groups with parallel option for use with single source.
- Auto changeover.
- Provision for RCD's.
- Load shedding.
- Status LEDs at enclosure.
- Pre-wired for quick connection.
- Timer controls.
- 50 or 60 Hz.

Sample AC mains screen.

Wireless Interface

Monitor and control your onboard systems from your iPad

iPad® is a trademark of Apple Inc.

The Wireless Interface allows your iPad to interface with the onboard CZone® system for full monitoring and control of the electrical equipment via a clear and intuitive display. The interface acts as a hub for the seamless connection between the two popular communication networks of MasterBus and CZone®.

FEATURES

- User-friendly homepage to monitor and control onboard circuits.
- Integrated control and monitoring of Mastervolt power products including battery chargers and inverters.
- Monitor AC/DC power and battery data.
- Monitor tank levels.
- Receive visible alarms.
- Connect a maximum of three devices simultaneously.
- Ability to personalise homepage to display favourite circuits, modes and monitoring.
- Connects to CZone or MasterBus network for control and monitoring of systems.
- Customise your layout.
- The Wireless Interface acts as the hub between MasterBus/CZone networks and local WiFi devices.
- ***NOTE***: WI MasterBus connector required for MasterBus connection.
- Ethernet connection to connect to other LANs.
- USB connection for configuration updates.
- Power cable and aerial included.

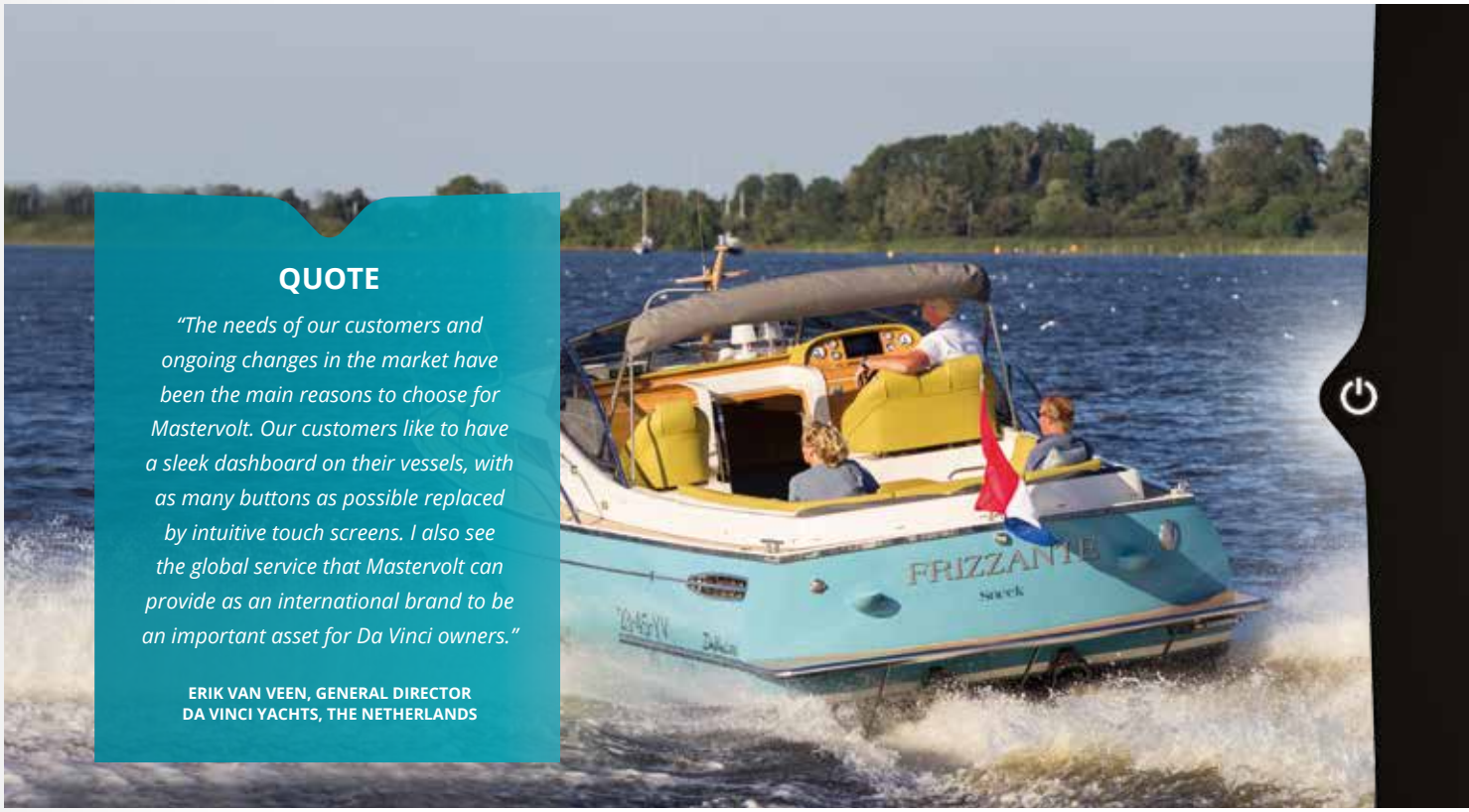
Product code	
80-911-0090-00	**Wireless Interface**
80-911-0095-00	**WI MasterBus connector** *(required for MasterBus connection)*
MasterBus powering	no
Dimensions, hxwxd	105 x 190 x 60 mm 4.1 x 7.5 x 2.4 inch
Weight	0.685 kg / 1.5 lb
Protection degree	IP54
Delivered with	power cable, WiFi antenna, USB cable, user's manual

MORE INFORMATION ■ MASTERVOLT.COM/CZONE

Wireless Interface Configuration Tool

User-friendly configuration tool for PC.

- Allows full customization of CZone app home page.
- Import multiple images for your own layout.
- Easy drag and drop of circuits and alarms onto application image.
- Configure network settings on wireless server.
- Create user profiles for logging into the CZone app.



QUOTE

"The needs of our customers and ongoing changes in the market have been the main reasons to choose for Mastervolt. Our customers like to have a sleek dashboard on their vessels, with as many buttons as possible replaced by intuitive touch screens. I also see the global service that Mastervolt can provide as an international brand to be an important asset for Da Vinci owners."

ERIK VAN VEEN, GENERAL DIRECTOR
DA VINCI YACHTS, THE NETHERLANDS

CZone® Accessories

Single T-connector

NEW MODEL

Connects a single device into the NMEA backbone.

Product code
80-911-0029-00

2 Way T-connector

NEW MODEL

Connects multiple devices into the NMEA backbone.

Product code
80-911-0047-00

4 Way T-connector

NEW MODEL

Connects multiple devices into the NMEA backbone.

Product code
80-911-0048-00

Blanking Caps

Protects unused T-connectors from dust and water.

	Product code
Male	*80-911-0050-00*
Female	*80-911-0051-00*

Terminating Resistors

NEW MODEL

Use at either end of the NMEA backbone to complete the network. Each network must have a male and female terminator.

	Product code
Male	*80-911-0031-00*
Female	*80-911-0030-00*

90° Elbow Connector

NEW MODEL

Space saving connector for modules, displays and cabling connections.

Product code
80-911-0046-00

NMEA 2000 Power Cable

NEW MODEL

Provides power to the NMEA 2000 network. 0.8 mm² (18 AWG) conductors meet ABYC standard to protect the network from electromagnetic interference.

	Product code
1 m / 3.2 ft	*80-911-0028-00*

Backbone Cable

NEW MODEL

Special low voltage drop backbone cable ensures ultimate reliability for your NMEA 2000 network.

	Product code
0.5 m / 1.6 ft	*80-911-0026-00*
2 m / 6.5 ft	*80-911-0027-00*
5 m / 16 ft	*80-911-0024-00*
10 m / 32 ft	*80-911-0025-00*

Network Cable

NEW MODEL

Thinner, more flexible cables connect individual devices to the NMEA network.

	Product code
0.5 m / 1.6 ft	*80-911-0116-00*
2 m / 6.5 ft	*80-911-0117-00*
2 m / 6.5 ft	*80-911-0118-00*
5 m / 16 ft	*80-911-0115-00*

Power Cable for Touch 10

Supplies power for Touch 10 display.

	Product code
2 pin, 2 m / 6.5 ft	*80-911-0032-00*

AC Transducer

- Includes 3 voltage transformers for up to 3 voltage inputs.
- Dimensions: 69 x 140 x 50 mm / 2.75 x 5.5 x 2 inch.
- Used for AC voltage measurement Meter Interface.

Product code
AC-VSEN-4

CZone Wireless Remote Kit

Simple to set up, wireless remote control. Buttons are configurable for momentary on or latching control of circuits.

- 80 m (250 ft) operating range.
- Rolling code.

Product code
80-911-0045-00

Cable Gland for SCI, silicone

Product code
80-911-0035-00

Cable Gland for SI, silicone

Product code
80-911-0036-00

Cable Gland for MI, silicone

Product code
80-911-0033-00

Terminal Block for SI/MI, 8-way

Product code
80-911-0043-00

Terminal Block for OI/MOI, 6-way

Product code
80-911-0041-00

Terminal Block for MI, 6-way

Product code
80-911-0042-00

Seal Boot for OI/MOI 6-wire, silicon

Product code
80-911-0034-00

Hole Plugs

	Product code
3.2 mm, for MI and SI cable glands	*80-911-0016-00*
5 mm, for SCI cable glands	*80-911-0017-00*

DC Current Shunt

- 450A / 50mV shunt supplied with DC Systems Monitor (DCSM), product code 80-600-0027-00.
- Dimensions, hxwxd:
  83 x 45 x 44 mm
  3.25 x 2.8 x 2.75 inch.

Product code
LB-450-50

Through Bulkhead Adaptor

For use on the backbone to transition through a waterproof bulkhead or to connect removable equipment such as a computer interface.

- NMEA 2000 network.

Product code
80-911-0052-00

Female Field Service Connector

To make your own NMEA cables.

- NMEA 2000 network.

Product code
80-911-0053-00

Male Field Service Connector

To make your own NMEA cables.

- NMEA 2000 network.

Product code
80-911-0054-00

CZone® Accessories

USB CAN Adapter

Connects your PC to the CZone network for configuration and system setup.

Product code
80-911-0044-00

Cable Assembly

Suitable for Switch Control Interface and Digital Switch Breakout, to suit push buttons.

	Product code
0.5 metres	*80-911-0085-01*
1 metres	*80-911-0086-01*
2 metres	*80-911-0087-01*
5 metres	*80-911-0088-01*
8 metres	*80-911-0089-01*

Cable Assembly

Suitable for Switch Control Interface and Digital Switch Breakout, to suit Rocker switches.

	Product code
0.5 metres	*80-911-0018-00*
1 metres	*80-911-0019-00*
2 metres	*80-911-0020-00*
3 metres	*80-911-0021-00*
4 metres	*80-911-0022-00*
5 metres	*80-911-0023-00*

Push Buttons

For use with CZone systems only (3,3 V).

- Momentary and latched actuation options available.
- Blue and red circuit status indication LED options.
- 19 mm mounting hole.
- IP67 environmental protection.
- Stainless steel components.
- Maximum 5 amps each.

	Product code
Momentary (ON)/OFF, red LED	*80-911-0060-00*
Latching ON/OFF, red LED	*80-911-0063-00*
Momentary (ON)/OFF, blue LED	*80-911-0062-00*
Latching ON/OFF, blue LED	*80-911-0061-00*

Custom Rocker Switches

Red or blue systems in operation and backlighting LEDs. *Multiple Rocker labels available upon request.*

	Product code
ON/OFF, red LED	*80-911-0037-00*
Mom (ON)/OFF, red LED	*80-911-0038-00*
ON/OFF/ON, red LED	*80-911-0039-00*
Mom (ON)/OFF/(ON), red LED	*80-911-0040-00*
Mom (ON)/OFF, blue LED	*80-911-0066-00*
Mom (ON)/OFF/(ON), blue LED	*80-911-0071-00*

Wireless Interface

Wireless monitoring and control of onboard systems from your tablet.
Allows your tablet to interface with an onboard digital switching system for full monitoring and control of the electrical equipment via a clear and intuitive display. The interface acts as a hub for the seamless connection between MasterBus and CZone.

	Product code
Wireless Interface	*80-911-0090-00*
WI MasterBus connector *(required for MasterBus connection)*	*80-911-0095-00*

More information on page 104.

Current Transformer

Max. current 150 A AC.
One CT-10-3 current transformer is supplied with the AC Systems Monitor (***product code 80-600-0023-00***). A second current transformer must be ordered if a twin line system is in use.
Dimensions: 37.5 x 39 x 14 mm / 1.5 x 1.55 x .55 inch.
Hole size: 12 mm / 0.5 inch.

Product code
CT-10-3

Heavy Duty Current Transformer

Max. current 150 A AC.
CT-HD is available for systems with large mains cables, too large for CT-10-3 (order separately).
Dim.: Ø 47 x 10.5 mm / 1.85 x 0.4 inch.
Hole size: 32 mm / 1.25 inch.

Product code
CT-HD

CZone Network Bridge Interface

For isolating sections of a NMEA 2000 network to decrease standby current draw. Isolation when bridging between two CAN networks, (e.g. connecting CZone to Simrad Simnet). For expansion of the NMEA 2000 network when the maximum node limit for the network has been reached *(node = any device connected to the NMEA 2000 network)*. Once fitted, 40 additional nodes can be added.

Product code
80-911-0057-00

Surge Protection Module

Protect your electronics from being damaged by harmful high voltage spikes. When fitted to the battery supply, these modules look for sudden increases in voltage then switch into protection mode to absorb and suppress the high energy spike.

	Product code
12 V DC	*80-707-0004-00*
24 V DC	*80-707-0005-00*

CZone MasterBus Bridge Interface

The CZone MasterBus Bridge Interface physically connects the MasterBus and CZone networks together, enabling the two networks to communicate and act as one. This provides seamless control and monitoring of Mastervolt power electronics from CZone displays or partner products.

FEATURES

- Control of Mastervolt inverters and chargers from CZone displays, switches or partner products.
- Display MasterBus acquired systems information such as tank and power levels on CZone displays.
- Transfer of alarms between both systems.

	CZone Masterbus Bridge Interface
Product code	*80-911-0072-00*
MasterBus powering	no
Dimensions, hxwxd	69 x 69 x 50 mm 2.7 x 2.7 x 2 inch
Weight	145 g / 0.32 lb
Protection degree	IP65
Delivered with	MasterBus cable adapter, MasterBus terminator, user's manual

Please contact Mastervolt or your local dealer for possibilities in your specific application.

CZone® Integration Partners

CZone has partnered with leading manufacturers of multifunctional displays, such as Navico (Simrad, B&G, Lowrance), Mercury, Volvo Penta, Garmin and Furuno. This makes it even easier to monitor and check energy systems and circuits on board.

CZone technology is integrated with easy-to-read graphics into chartplotters and multi-function displays. View CZone monitoring data, tank levels and battery capacity alongside radar, fish finder, video and chart plotter information or navigate to the CZone page to operate any circuit from the intuitive control page.

Integrate various sonar technologies, autopilot, connectivity, apps, engine data and multimedia.

CZone mode controls, visible on the touchscreens, allow multiple circuits to be turned on and off with a single touch, all customisable to your needs.

With CZone technology, control and monitoring is available at your fingertips, at the helm or flybridge, at desired locations on the boat or vehicle, programmed into the remote key fob, or from an app on your tablet.

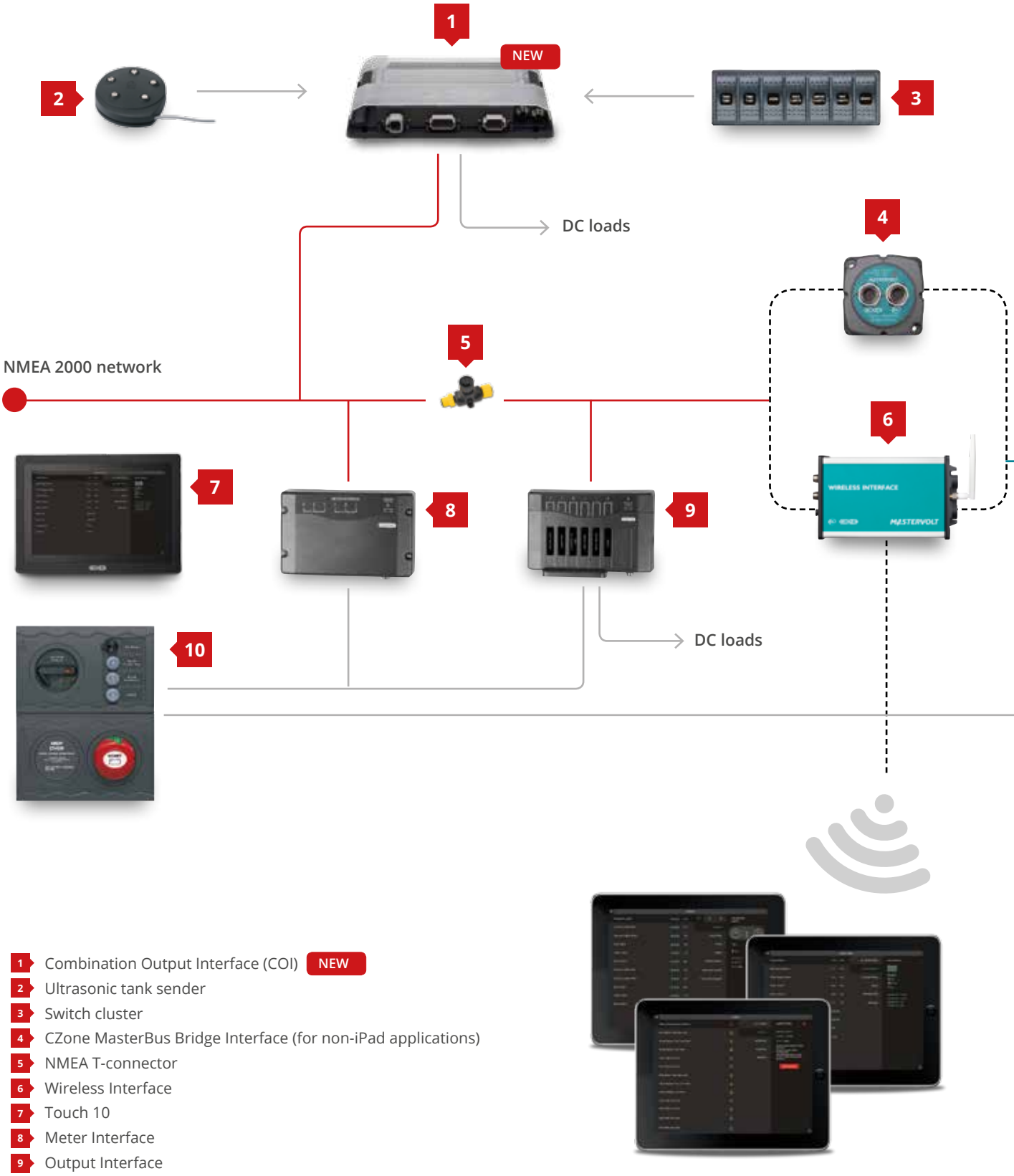
SIMRAD B&G LOWRANCE GARMIN FURUNO

QUOTE

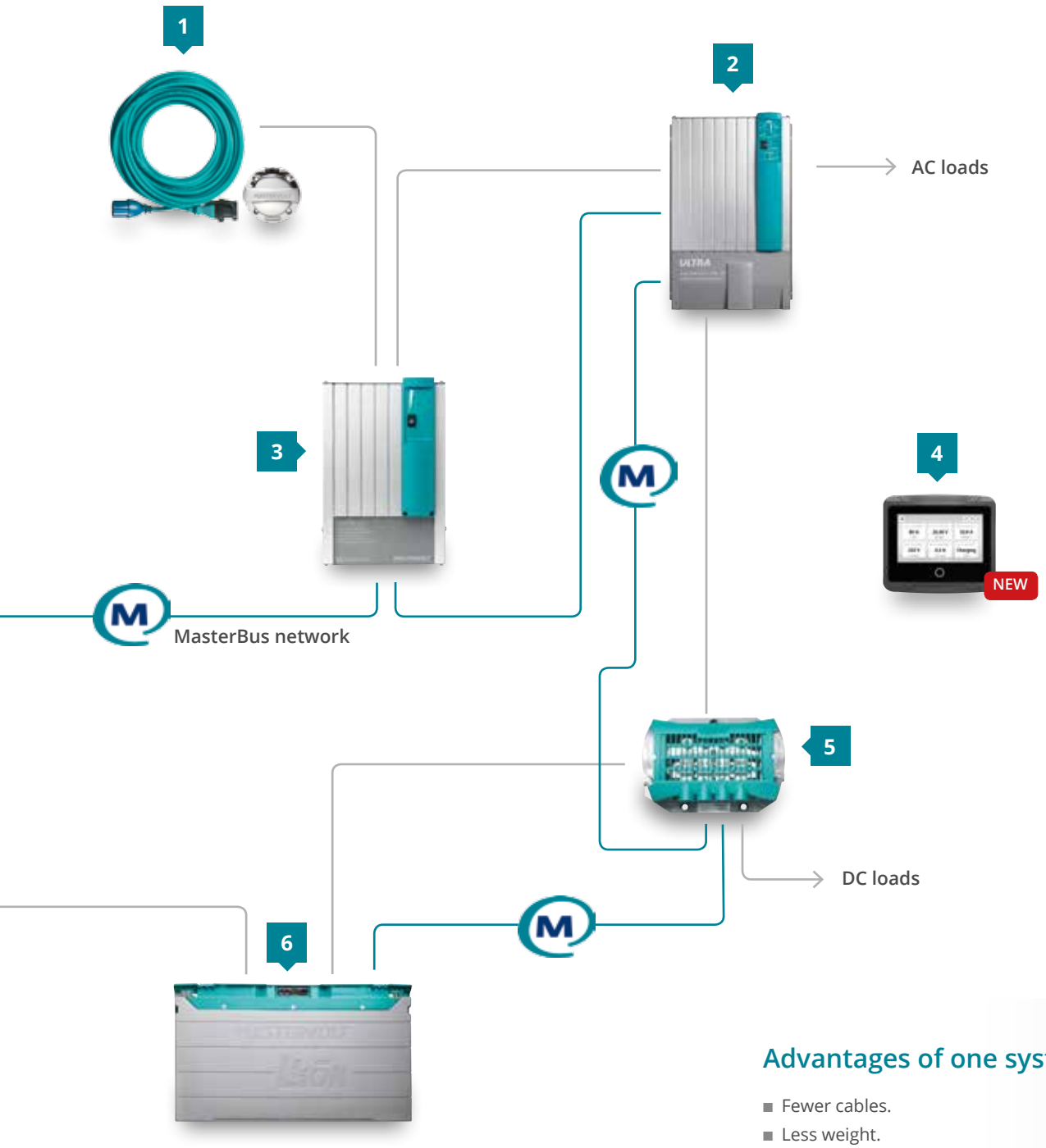
"Garmin strives to provide the easiest and most intuitive user experience to the market, and we've taken it to the next level, integrating Mastervolt's automated power and circuit management with the Garmin GPSMAP 8000 Helm Series. From controlling various lighting configurations to monitoring bait well levels and more, CZone technology puts the simplicity of automated operations at the boater's fingertips."

DAN BARTEL, VICE PRESIDENT WORLDWIDE SALES GARMIN, USA

Fully Integrated CZone® MasterBus System



1. Combination Output Interface (COI) NEW
2. Ultrasonic tank sender
3. Switch cluster
4. CZone MasterBus Bridge Interface (for non-iPad applications)
5. NMEA T-connector
6. Wireless Interface
7. Touch 10
8. Meter Interface
9. Output Interface
10. Battery distribution panel



1. Grid power
2. Mass Combi Ultra
3. Mass GI isolation transformer
4. EasyView 5 NEW
5. DC Distribution
6. Mastervolt Lithium Ion Ultra 12 V (service battery)

Advantages of one system:

- Fewer cables.
- Less weight.
- Installation time savings.
- Increased flexibility in terms of design changes.
- 'Superyacht' power and load management capabilities.
- Remotely accessible.
- Easy to maintain.
- Integrated solution.
- Single button 'mode' selection.
- Reliable and safe.
- Global service network.

Mastervolt Monitoring: A window into the life of your batteries

Unexpected flat batteries are never a good start to the day. A Mastervolt battery monitoring system brings an end to nasty surprises. A clear display shows performance, consumption and available battery capacity. Management of larger, complex systems is also available. This includes monitoring and operation of multiple functions such as AC and DC power provision via the generator, mains or main engine. The choice is yours.

A choice of instruments for different needs

Measuring the actual amount of energy remaining in a battery is a complex task, different to simply checking the level in a water or fuel tank. Many factors influence how much energy the battery can still supply, including its age, the surrounding temperature and the intensity of the loads connected to the battery. Although a voltmeter can give a rough indication of the battery's condition, there is a more accurate and reliable way to obtain information - via one of Mastervolt's battery monitors.

Available in four different models:

- **BattMan Lite**;
  An affordable battery monitor that does exactly that: providing critical information about the status of your battery bank under all circumstances. Additionally it will warn you when your battery bank is empty.

- **BattMan Pro**;
  Also displays the remaining time until your battery needs to be charged and stores special battery status events.

- **Masterlink BTM-III**; Provides an accurate indication of the voltage, current, amp-hours, remaining time and remaining capacity of battery bank 1, and the actual and estimated capacity of battery banks 2 and 3. The built-in microprocessor calculates the remaining capacity and stores historic data.

- **MasterShunt + EasyView 5**;
  MasterBus integrated battery monitor collecting detailed information on the status of your batteries. The MasterBus remote panel with touchscreen control provides information on the charge process as well as other system information.

MASTER TIP

A Mastervolt battery monitor can also function as an active warning system. A potential-free contact can give a signal to an acoustic alarm or even an automatic start/stop system for the generator.

RELIABLE · COST SAVING · EASY INSTALL · WATERPROOF

Specifications Battery Monitoring

				NEW MODEL 
	BattMan Lite	**BattMan Pro**	**Masterlink BTM-III**	**MasterShunt + EasyView 5**
Product code	*70405060*	*70405070*	*70403163*	*77020110 + 77010310*
Application	Battery monitor, 12/24 V DC with large, splash proof display (IP65) and power bar.	Battery monitor, 12/24 V DC with large, splash proof display (IP65) and power bar. Displays remaining time and stores special battery status events.	Battery monitor, 12/24 V DC with LCD display and LED bar.	The MasterShunt in combination with an EasyView 5 panel is the most advanced battery monitor you can find. Touchscreen control of all functions.
GENERAL SPECIFICATIONS				
Number of battery outlets	2; service (fully), starter (voltage)	2; service (fully), starter (voltage)	3; service, starter & bowthruster	one battery set per MasterShunt
Display/read-out	voltage, current, amp-hours, battery capacity in %	voltage, current, amp-hours, time remaining, battery capacity in %, special battery status events	voltage, current, amp-hours, time remaining, battery capacity in %, special battery status events	voltage, current, amp-hours, time remaining, battery capacity in %, inverter & charger operation, Power Sharing, special battery status events
Dimensions, hxwxd	64 x 79 mm 2.5 x 3.1 inch	64 x 79 mm 2.5 x 3.1 inch	65 x 120 mm 2.6 x 4.7 inch	113 x 113 x 37 mm / 4.5 x 4.5 x 1.5 inch
Dimensions shunt, hxwxd	87 x 45 x 35 mm - M8 3.3 x 1.7 x 1.4 inch - M8	87 x 45 x 35 mm - M8 3.3 x 1.7 x 1.4 inch - M8	84 x 44 x 44 mm - M8 / 3.3 x 1.7 x 1.7 inch - M8	150 x 150 x 65 mm / 5.9 x 5.9 x 2.5 inch
Built-in depth	72.5 mm 2.8 inch	72.5 mm 2.8 inch	40 mm / 1.6 inch (55 mm / 2.2 inch incl. cover and cable)	surface mount
Weight (excl. shunt)	0,1 kg / 0.22 lb	0,13 kg / 0.29 lb	0.25 kg / 0.6 lb	1 kg / 2.2 lb
TECHNICAL SPECIFICATIONS				
Max. Ah capacity	999 Ah	9999 Ah	9999 Ah	9999 Ah
Supply voltage	9-35 V	9-35 V	8-50 V	8-60 V
Voltage range	0-35 V	0-35 V	7-35 V	0-60 V
Current consumption (backlight off)	8 mA / 12 V 6 mA / 24 V	8 mA / 12 V 6 mA / 24 V	28 mA / 12 V 16 mA / 24 V	32 mA /1 2 V 17 mA / 24 V
Current consumption (backlight on)	30 mA / 12 V 18 mA / 24 V	30 mA / 12 V 18 mA / 24 V	100 mA / 12 V 50 mA / 24 V	100 mA / 12 V 50 mA / 24 V
Voltage resolution	0.1 V	0.01 V	0.1 V	0.1 V
Voltage accuracy	± 0.3 %	± 0.3 %	± 0.6 %	± 0.6 %
Shunt specification	500 A / 50 mV (service set)	500 A / 50 mV (service set)	500 A / 50 mV (service set)	digital shunt
Current measurement range	0-500 A	0-500 A	0-500 A (option incl. 1000 A)	0-500 A
Current accuracy	± 0.4 %	± 0.4 %	± 0.8 %	± 0.8 %
Battery alarm contact	yes, potential free	yes, potential free	yes, open collector	yes, via MasterBus alarm interface
Remaining time indication	no	yes	yes	yes
Historical data	no	yes	yes	yes
MasterBus compatible	no	no	no	yes
Connection cable (6-wire) necessary	yes	yes	no	no
Modular cable necessary	no	no	no	MasterBus cable included
Languages on display	universal	universal	English, Dutch, French, Spanish, German, Danish, Finnish, Norwegian, Italian, Swedish	English, Dutch, French, Spanish, German, Danish, Finnish, Norwegian, Italian, Swedish

From the sun to your alternator: you decide how!

Whether you are on a trip across the world or just on the move for a few days, alternative sources of energy are indispensable in order to remain independent of grid power: in other words, you need a mobile source of electricity. Mastervolt has multiple solutions for generating electricity, from solar charge regulators to high-output alternators.

ALTERNATORS AND CHARGE REGULATORS

Mastervolt's alternators and charge regulators ensure you get the most out of your propulsion engine. An ideal alternative for a generator.

118 ALPHA

Standard alternators only supply the desired capacity at a high rpm. The Mastervolt Alpha alternator was specifically designed for powerful charging, even at low rpm and high ambient temperatures. It is suitable for various installation methods, and also available as a multi-string model.

RECOMMENDED FOR:

118 ALPHA PRO

The Alpha alternator is supplied with an Alpha Pro charge regulator as standard. This charge regulator maximises the capacity of the alternator and ensures the battery bank is optimally charged via the 3-step+ charge method. It is suitable for 12 V and 24 V, MasterBus compatible and appropriate for alternators up to 400 amps charge current.

RECOMMENDED FOR:

Generate

SOLAR CHARGE REGULATORS

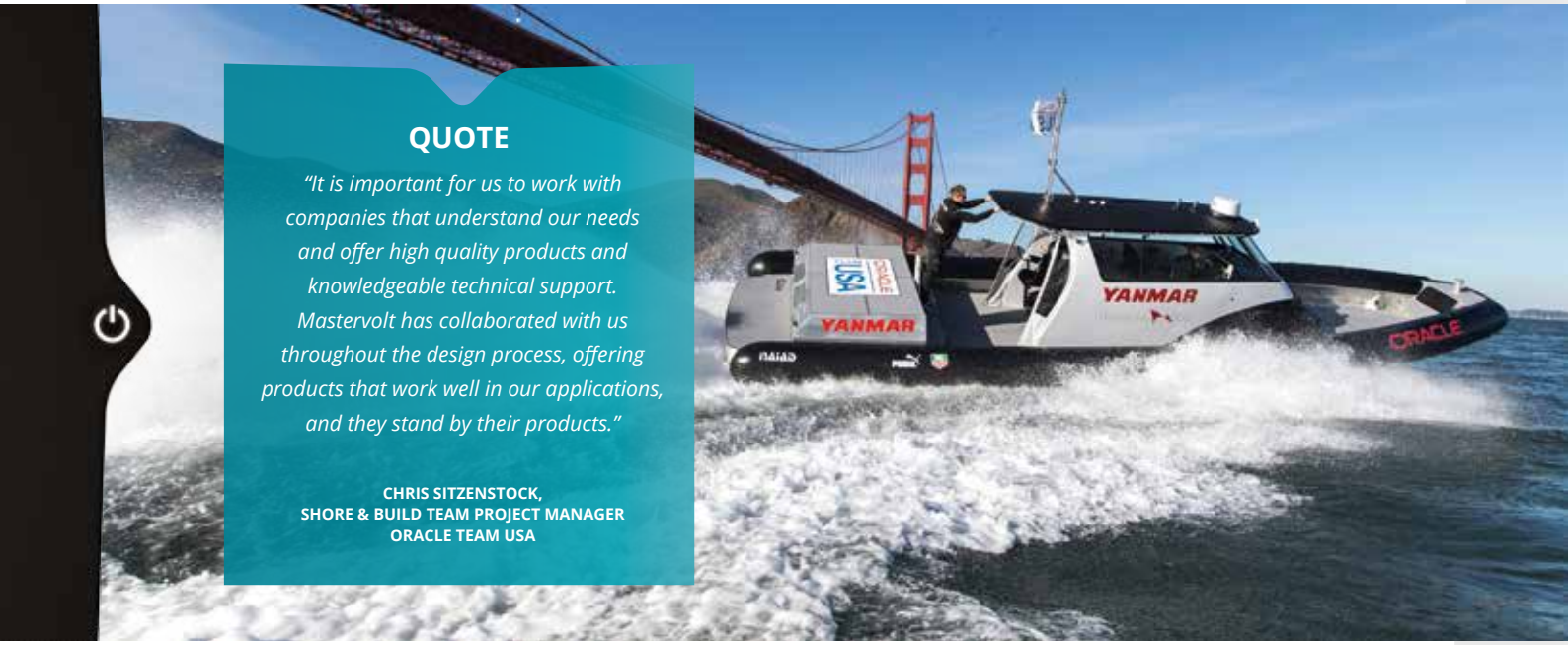
Mastervolt solar charge regulators ensure a maximum yield from the often highly irregular availability of sunlight.

122 SOLAR CHARGEMASTER

The Solar ChargeMaster series SCM includes two types of charge regulators: PWM charge regulators with an excellent price/quality ratio, and MPPT modes for medium to large systems. The MPPT version charges the batteries up to 30 % faster than the PWM models, with the same number of solar panels.

RECOMMENDED FOR:

Alternators and Charge Regulators: For rapidly recharged batteries



QUOTE

"It is important for us to work with companies that understand our needs and offer high quality products and knowledgeable technical support. Mastervolt has collaborated with us throughout the design process, offering products that work well in our applications, and they stand by their products."

CHRIS SITZENSTOCK,
SHORE & BUILD TEAM PROJECT MANAGER
ORACLE TEAM USA

The existing alternator on the main engine is designed to charge the starter battery. As a result the combination is not ideal for fast and full charging of other batteries, especially if you want to charge the batteries over a short time or when powering a heavy load.

There are two options to solve this issue:
Equip the standard alternator with a Mastervolt Alpha Pro charge regulator. This charge regulator maximises the output of alternators by regulating the alternator in a way that ensures the batteries receive the optimum charge. The proven 3-step+ charge method guarantees fast and safe charging of your batteries.
You can also choose a powerful second Mastervolt Alpha alternator with Alpha Pro charge regulator. This combination was specifically designed for charging service batteries, and allows you to charge quickly and turn off your engine when you want.

POWERFUL

Alpha Pro Charge Regulators

- Suitable for 12 and 24 V.
- Including plug & play connection cable, an adapter cable for Bosch alternators is optional.
- The Alpha Pro series is suitable for most alternators with a charging current of up to 400 amps.
- Automatic voltage and temperature compensation.
- 'Keep alive' function for tachometer.
- MasterBus compatible.

PROLONGED BATTERY LIFE

The charge regulator measures the battery temperature and adjusts the charging process accordingly, resulting in a safe and fast charge. Therefore the battery is always kept in good condition.

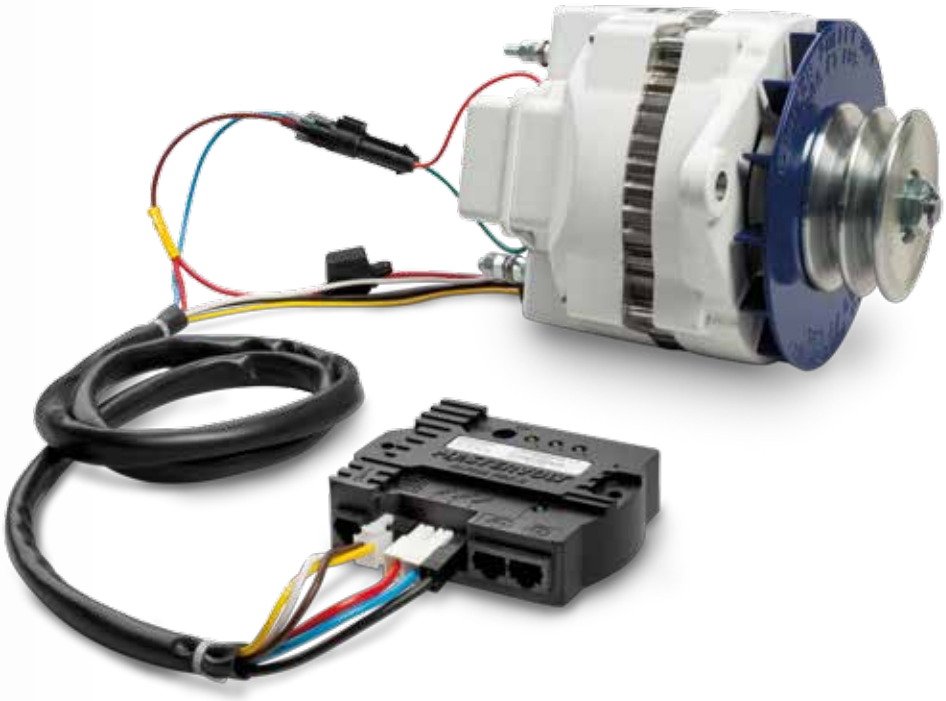
Alpha Alternator Series

- Fast and complete charging of all batteries.
- Power supply for all consumers.
- 12 V and 24 V versions.
- 75 A to 150 A charge current.
- As standard, delivered with Alpha Pro charge regulator for an optimal performance and longer-lasting batteries.

Using a Battery Mate, Charge Mate or BI battery isolator in conjunction with an Alpha Alternator, makes it possible to easily charge two or three separate battery banks simultaneously.

MASTER TIP

A second alternator on the main engine, combined with a larger battery bank and inverter, could be an alternative for a generator.



For all engine types

Alpha alternators are equipped with several fixations for customised alternator brackets, available from your installer or engine supplier. Some engine brands come with Mastervolt alternator brackets as an option.

Fast charging, even at a stationary rpm

Standard alternators only supply the specified capacity at a high rpm. The Mastervolt Alpha alternator is specifically designed for powerful charging, even with a low engine rpm.

Alpha Pro: Easy to operate

Easy operation LEDs on the body of the charge regulator indicate the charge phase. The Alpha Pro is designed as a 'fit all' solution. Just one unit is needed for both 12 and 24 V applications, with a simple selector switch to set the regulator to the right voltage. The charge regulator can also be used on any other brand of alternator that has a standard Bosch connector, using a Bosch adapter cable (optional).

MasterBus Connectivity

The Alpha Pro is compatible with MasterBus, allowing easy monitoring via a EasyView touchscreen. In a MasterBus system, the voltage drop over the battery cable and the battery temperature is compensated automatically.

Multi-belt pulley

The 12/130 and 24/75 models are also available with a multi-belt pulley.

Performs above 40 °C

Forced cooling by fan operation of the pulley provides a lot of power in higher temperatures, especially close to the engine.

Specifications Alpha Pro

NEW MODEL

	Alpha Pro MB	Alpha Pro III
Product code	*45512000*	*45513000*
GENERAL SPECIFICATIONS		
Link to MasterShunt	yes	yes
Connection to Mastervolt alternator	yes	yes
Connection to Bosch alternator	yes, using a Bosch adapter cable (product code 45510500)	yes, using a Bosch adapter cable (product code 45510500)
Cooling	fanless	fanless
Nominal output voltage	12 V / 24 V	12 V / 24 V
Cable length regulator/alternator	1.5 mtr / 5 ft oil resistant connection cable	1.5 mtr / 5 ft oil resistant connection cable
Connection plug regulator/alternator	Alpha/Mastervolt	Alpha/Mastervolt
Display/read-out	LED display	LED display
MasterBus powering	yes	yes
Dimensions, hxwxd	90 x 109 x 30 mm 3.5 x 4.3 x 1.2 inch	90 x 109 x 30 mm 3.5 x 4.3 x 1.2 inch
Weight	0.4 kg / 0.9 lb	0.4 kg / 0.9 lb
Delivered with	battery temperature sensor with 6 m (20 ft) cable	battery temperature sensor with 6 m (20 ft) cable
Approvals	CE	CE
TECHNICAL SPECIFICATIONS		
Charge characteristic	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion	IUoUo, automatic / 3-step+ for Gel/AGM/ flooded/Lithium Ion
Charge voltage Bulk/Absorption/Float	default setting for AGM, Gel and Lithium Ion (adjustable)	default setting for AGM, Gel and Lithium Ion (adjustable)
Absorption time	4 hours, adjustable from 0 minutes to 10 hours	4 hours, adjustable from 0 minutes to 10 hours
Temperature compensation	-30 mV / °C -22 mV / °F	-30 mV / °C -22 mV / °F
Voltage compensation	voltage drop compensation in DC cables up to 3 V	voltage drop compensation in DC cables up to 3 V
Alternator type	alternators with negative excitation	alternators with negative excitation
Field currents	up to 10 amps	up to 20 amps
MasterBus compatible	yes	yes

OPTIONS

Bosch adapter cable *45510500*

option

Connection cable for any other brand of alternator that has a standard Bosch connector.

option

Alternator temperature sensor *41500400*

option (software update required)

When used in combination with with non-Mastervolt alternators, this alternator temperature sensor may offer additional protection against over heating (see manual for instructions).

option

Benefits of a Mastervolt Charge Regulator

- The Alpha Pro charge regulator maximises the output of Mastervolt Alpha alternators or any other alternator by regulating the alternator in a way that the batteries receive the optimum charge. The proven 3-step+ charge method used by all Mastervolt battery chargers guarantees fast and safe charging of your batteries.
- The Alpha Pro helps to cut emissions by requiring less run time because it maximises the power from any alternator. A battery can be charged quickly even at very low RPM, especially when connected to an Alpha series alternator. By connecting the Alpha Alternator to a Battery Mate or battery isolator, several battery banks can be charged simultaneously.
- Does your tachometer sometimes indicate zero while the engine is running? The 'keep alive' function of the Alpha Pro gets rid of this problem for ever.

The Alpha Pro comes standard with connection cable and battery temperature sensor.

MORE INFORMATION ■ MASTERVOLT.COM/CHARGE-REGULATORS

Specifications Alpha Alternators





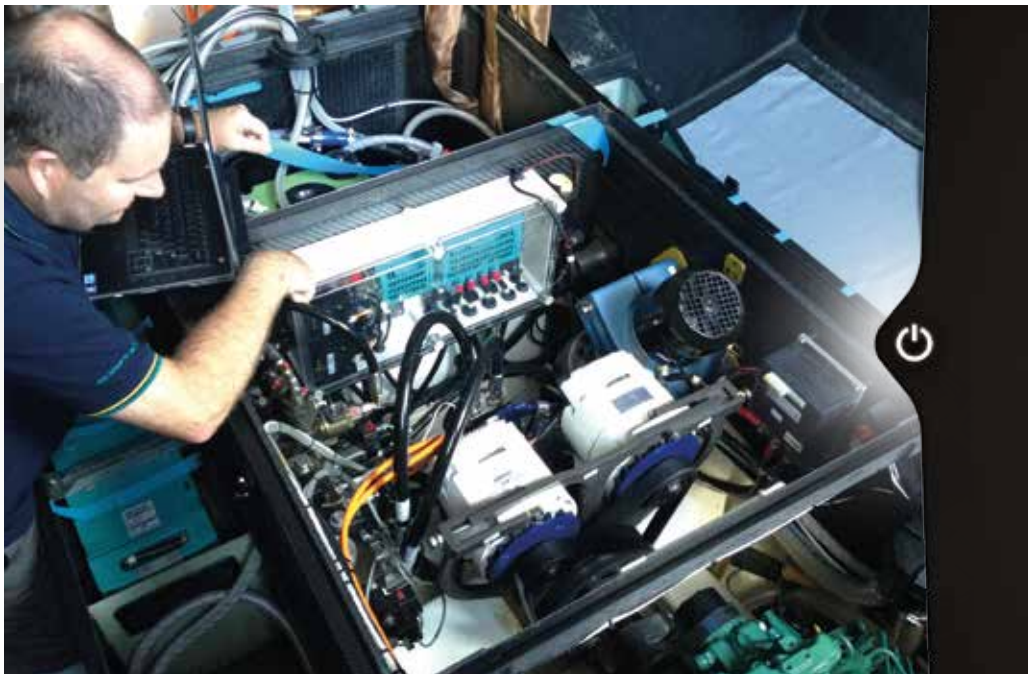
	12/90 MB	12/130 MB	24/75 MB	24/110 MB	24/150 MB
Product code	*48512090*	*48512130*	*48524075*	*48524110*	*48524150*
Delivered with multi-belt pulley		*48512131*	*48524076*		
GENERAL SPECIFICATIONS					
Charge regulation	an Alpha Pro charge regulator comes standard with all models	an Alpha Pro charge regulator comes standard with all models	an Alpha Pro charge regulator comes standard with all models	an Alpha Pro charge regulator comes standard with all models	an Alpha Pro charge regulator comes standard with all models
Total charge current	90 A	130 A	75 A	110 A	150 A
Cable length regulator/alternator	1.5 metre, oil resistant connection cable - delivered as standard	1.5 metre, oil resistant connection cable - delivered as standard	1.5 metre, oil resistant connection cable - delivered as standard	1.5 metre, oil resistant connection cable - delivered as standard	1.5 metre, oil resistant connection cable - delivered as standard
Belt section	2xA	2xA	2xA	2xA	2xA
Isolated from mass	yes	yes	yes	yes	yes
Directions of revolutions	2	2	2	2	2
Mounting	five to six, six o'clock & five past six	six o'clock	six o'clock	six o'clock	five to six, six o'clock & five past six
Dimensions	go to ■ mastervolt.com/alternators for drawings	go to ■ mastervolt.com/alternators for drawings	go to ■ mastervolt.com/alternators for drawings	go to ■ mastervolt.com/alternators for drawings	go to ■ mastervolt.com/alternators for drawings
Weight	5.5 kg / 12.1 lb	10.1 kg / 22.3 lb	10.1 kg / 22.3 lb	10.1 kg / 22.3 lb	13.1 kg / 28.9 lb
TECHNICAL SPECIFICATIONS					
Charge voltage absorption	14.25 V	14.25 V	28.5 V	28.5 V	28.5 V
Charge voltage float	13.25 V	13.25 V	26.5 V	26.5 V	26.5 V
Pulley (double) diameter	73 mm	88 mm	88 mm	88 mm	92 mm
OPTION  Multi-belt pulley (sold separately) *48400030*	n.a.	n.a.	n.a.	option	option

MASTERVOLT
OFFICIAL SUPPLIER

VOLVO OCEAN RACE
ROUND THE WORLD

During the 2015/16 edition of the Volvo Ocean Race, the batteries had a single primary source of charging via two 24 V/150 A Mastervolt alternators, regulated by two Alpha Pro charge regulators, which could fully charge the Lithium Ion batteries in one hour. Data captured from this race has shown that each alternator spun some 88.2 million times!

For the 2017/18 edition, Mastervolt has chosen again as the official power supplier.



The sun as an additional energy source

Solar cells provide power from daylight. This renewable energy source boosts your independence and also helps keep your battery in optimal condition. Mastervolt's solar know-how plays a key role.

Efficient, Reliable and Safe

The Mastervolt Solar ChargeMaster charge regulators maximise yield from the often very irregular supply of sunlight. Robust power electronics convert the energy from the solar panels, taking the charge status of the batteries into account. Mastervolt's solar charge regulators are suitable for energy systems with system voltages of 12 V, 24 V and 48 V, and charge any battery type, including Mastervolt Lithium Ion (MLI) batteries. They ensure an optimal and efficient charge cycle and are highly reliable. The 3-step+ charging method guarantees an extra-long lifespan for your batteries. A MasterBus connection is available for optimal integration within the energy system.

Versatile and Flexible

Mastervolt solar charge regulators can be used flexibly to complement your energy system, or in places where no electricity is available, such as remote holiday cottages or chalets.

In addition, the solar charge regulators are a perfect mobile solution for campers, special vehicles, yachts and traffic & information signs. They are also ideal for professional applications at remote petrol stations, telecom relay stations or offshore units.

The Solar ChargeMaster series comprises two charge regulators based on PWM (Pulse Width Modulation) technology and two models that are equipped with MPPT (Maximum Power Point Tracker) technology.

The PWM charge regulators offer an excellent price/performance ratio and very low energy consumption for small and medium systems. Larger systems are better suited to the SCM25 MPPT and SCM60 MPPT-MB regulators.

FEATURES

- High efficiency: your batteries are charged quickly.
- Capacity for solar panel configurations of up to 3600 Wp.
- Suitable for AGM, gel, flooded and Mastervolt Lithium Ion (MLI) batteries.
- Fast and flexible setting of battery type.
- Battery temperature sensor for long lifespan of your batteries.
- Automatic 12 V/24 V/48 V detection.
- Switchable output.
- Noiseless operation.
- LCD display.
- Fully protected against over-temperature, over load, high/low battery voltage, high/low PV voltage, short circuit and reverse polarity.

ADDITIONAL FEATURES MPPT MODELS

- Charges up to 30 % faster with the same number of solar panels.
- Fewer cables, quick installation and lower losses.
- Suitable for all solar panels, including the inexpensive 60-cell panels.
- Suitable for humid environments (IP23).
- Large, clear LCD display.
- Audible signal (SCM25 MPPT).
- Monitoring and control via MasterBus (SCM60 MPPT-MB).

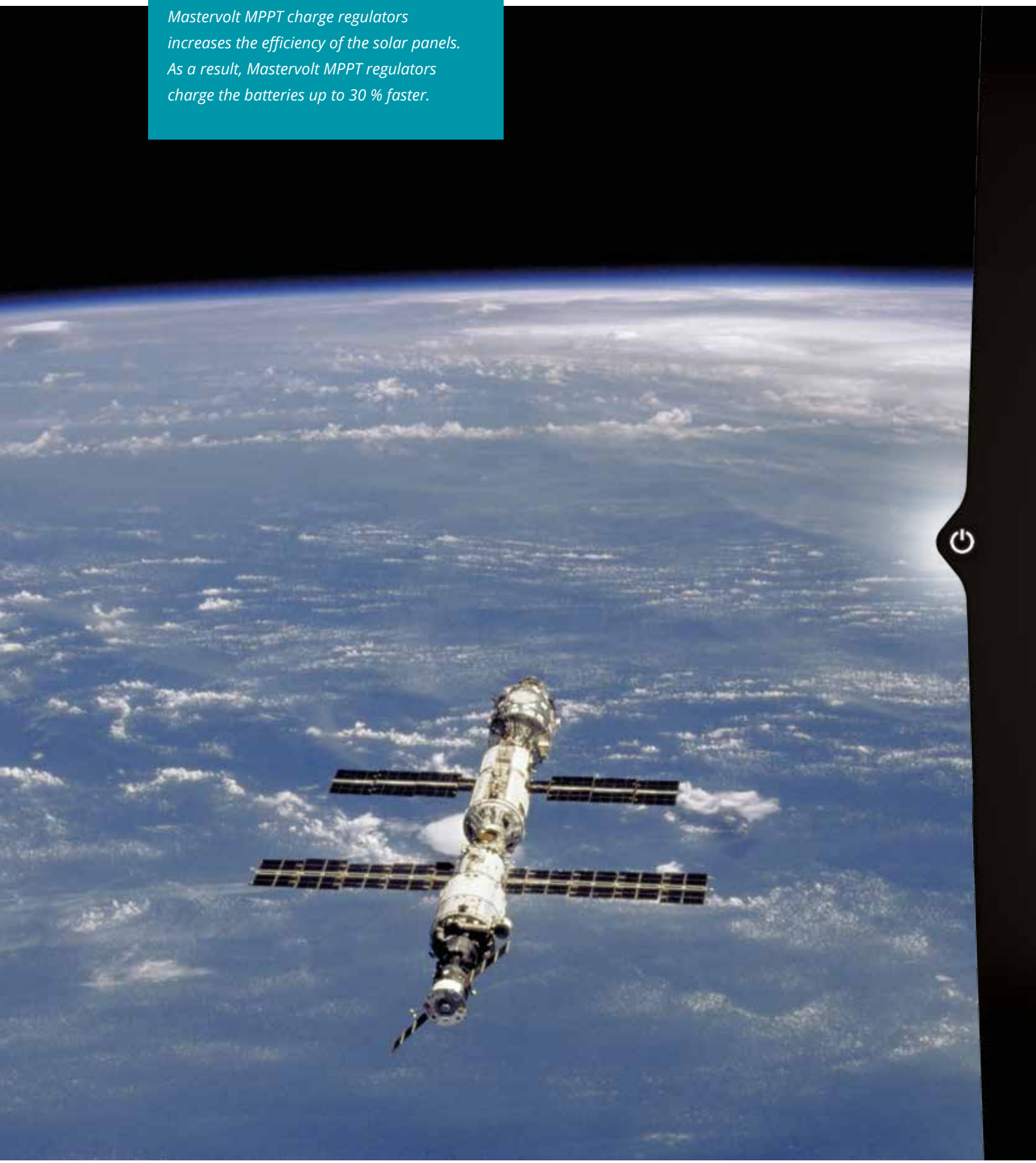
Specifications Solar ChargeMaster




	SCM25 MPPT	SCM60 MPPT-MB	SCM20	SCM40
Product code	*131902500*	*131906000*	*131802000*	*131804000*
GENERAL SPECIFICATIONS				
Display/read-out	backlit LCD with PV power, load power, battery voltage, charge current, warnings, battery state of charge, battery setting	backlit LCD with PV power, load power, battery voltage, charge current, warnings, battery state of charge, battery setting	LCD display with battery state of charge, status output, battery setting	LCD display with battery state of charge, status output, battery setting
Dimensions, hxwxd	135 x 190 x 75 mm 5.3 x 7.5 x 3.0 inch	398 x 168 x 104 mm 15.7 x 6.6 x 4.1 inch	98 x 140 x 41 mm 3.9 x 5.5 x 1.6 inch	98 x 140 x 41 mm 3.9 x 5.5 x 1.6 inch
Weight	1.3 kg / 2.9 lb	5.5 kg / 12.1 lb	0.2 kg / 0.4 lb	0.23 kg / 0.5 lb
Alarms	buzzer	via MasterBus	buzzer	buzzer
Cooling	passive	passive	passive	passive
Protection degree	IP23	IP23	IP20	IP20
Grounding	(-) terminal	(-) terminal	(-) terminal	(-) terminal
TECHNICAL SPECIFICATIONS				
Technology	MPPT (Max. Power Point Tracker)	MPPT (Max. Power Point Tracker)	PWM (Pulse Width Modulation)	PWM (Pulse Width Modulation)
Temperature range (ambient temp.)	-20 °C to 55 °C	-20 °C to 55 °C	-25 °C to 50 °C / 122 °F	-25 °C to 50 °C / 122 °F
Cable size	max. 10 mm² Litz wire	max. 35 mm² Litz wire	max. 16 mm² Litz wire	max. 16 mm² Litz wire
Protections	over-temperature, overload, high/low battery voltage, high/low PV voltage, short circuit, reverse polarity & HV transients	over-temperature, overload, high/low battery voltage, high/low PV voltage, short circuit, reverse polarity & HV transients	over-temperature, overload, high/low battery voltage, high/low PV voltage, short circuit, reverse polarity & HV transients	over-temperature, overload, high/low battery voltage, high/low PV voltage, short circuit, reverse polarity & HV transients
MasterBus compatible	no	yes	no	no
Relative humidity	95 % non-condensing	95 % non-condensing	95 % non-condensing	95 % non-condensing
SPECIFICATIONS BATTERY CHARGER				
System voltage (battery)	12/24 V auto select	12/24/48 V auto select	12/24 V auto select	12/24 V auto select
Battery types	AGM, gel, flooded, MLI	AGM, gel, flooded, MLI	AGM, gel, flooded, MLI	AGM, gel, flooded, MLI
Battery temperature sensor	yes	yes	yes	yes
Lithium Ion protection	via Multipurpose Contact Output, product code 77030500	yes, via MasterBus connection	n.a.	n.a.
Max. charge current at 40 °C	25 A	60 A	20 A	40 A
Switchable output (max. current)	25 A	via MasterBus	20 A	40 A
Energy consumption (night)	5 mA	< 1 mA	5 mA	4 mA
SOLAR INPUT (DC) SPECIFICATIONS				
Nom. PV current at 40 °C	18 A	50 A	20 A	20 A
PV start voltage 12/24 V	15 V/27 V	n.a.	12.8 V/25.6 V	12.8 V/25.6 V
PV start voltage 12/24/48 V	n.a.	15 V/27 V/51 V	n.a.	n.a.
Nom. PV voltage 12 V	15-66 V	13.2-115 V	n.a.	n.a.
Nom. PV voltage 24 V	30-66 V	26.4-115 V	n.a.	n.a.
Nom. PV voltage 48 V	n.a.	52.8-115 V	n.a.	n.a.
Max. PV voltage (Tmin)	75 V	145 V	50 V	50 V
Max. PV power 12 V	360 Wp	900 Wp	360 Wp	720 Wp
Max. PV power 24 V	720 Wp	1800 Wp	720 Wp	1440 Wp
Max. PV power 48 V	n.a.	3600 Wp	n.a.	n.a.
Max. efficiency	> 98 %	> 98 %	n.a.	n.a.
Static MPP efficiency	99.9 %	99.9 %	n.a.	n.a.
OPTION  USB Interface for Solar ChargeMaster *21730400*	n.a.	n.a.	option	option
USB Interface and DataControl software, for communication between your PC and the Solar ChargeMaster.				

MASTER TIP

The innovative technology in the Mastervolt MPPT charge regulators increases the efficiency of the solar panels. As a result, Mastervolt MPPT regulators charge the batteries up to 30 % faster.



When you wish to stay connected

Whether you are looking for a safe connection with the electricity grid or would like to automatically select the right energy source, Mastervolt has the solution. With our extensive range of high quality grid connections, cables, isolating transformers and transfer systems, a seamless power supply is guaranteed.

AC TRANSFER SYSTEMS

A Mastervolt transfer system regulates the power supply from various energy sources and automatically selects the right source at the right time.

128 MASS SYSTEMSWITCH

Complete system solution up to 16 kW, with automatic transfer system to prevent damage to your inverter. MasterBus compatible and also suitable for systems from other brands.

RECOMMENDED FOR:

128 MASTERSWITCH

The Masterswitch has two AC inputs and one or two outputs up to 25 kW. Model with automatic fuse available.

RECOMMENDED FOR:

ISOLATION TRANSFORMERS

Professional galvanic isolation prevents corrosion of metal parts and enhances safety. Mastervolt's isolation transformers help protect your valuable investment and provide solid earthing.

132 MASS GI

Lightweight and highly compact with a high yield and low heat generation. With Soft Start function and parallel switching for higher capacities.

RECOMMENDED FOR:

132 IVET

High-quality isolation transformers for built-in installation, suitable for capacities from 2.5 kW to 22 kW. Also available with Soft Start and automatic transfer system.

RECOMMENDED FOR:

Connect

POWER CABLES AND ADAPTERS

Mastervolt provides a comprehensive range of products for high-quality connections to the grid with a focus on safety, reliability and ease of installation.

136 POWER CABLES, EXTENSION CABLES

Wear-proof, UV-proof and equipped with integrated plugs. The power cables feature integrated LED power indicators. Available in lengths of 15 and 25 metres.

RECOMMENDED FOR:

136 GRID CONNECTIONS

Mastervolt's stylish and easy-to-install stainless steel grid connections are available for 16 A/230 V and 32 A/230 V.

RECOMMENDED FOR:

137 ACCESSORIES

Mastervolt offers various accessories to complement your cables, including plug adapters and splitters, with or without power indicators. The 16 A power cables are supplied in a stylish bag with leather handles (also available separately).

RECOMMENDED FOR:

Mastervolt Transfer Systems: Manages AC Power Sources

A Mastervolt transfer system forms the heart of your AC system and regulates the power supply from the electricity grid, generator or inverter. It also automatically selects the right energy source at the right time.

Mass Systemswitch: The complete system solution

The Mass Systemswitch automatically transfers three available AC power sources to the right outputs. As well as providing more comfort on board, the automatic transfer also has a safety function: the transfer relay prevents short-circuiting between the various AC sources. The Mass Systemswitch 10 and 16 each have four outputs: 'generator only', 'power', 'shortbreak' and 'inverter only', while the Mass Systemswitch 6 has three outputs: 'power', 'shortbreak' and 'inverter only'.

- Three AC inputs; for example inverter, grid power and generator.
- Three or four outlets to AC power groups.
- Automatic switching.
- Power transfer from 4.5 kW to 16 kW, input/output from 25 to 63 A.
- Information source for central energy management via MasterBus network.
- MasterBus compatible.

Masterswitch: The simple solution

Masterswitch offers you the choice of two energy sources, such as the inverter or grid power, with one of the inputs always having priority. The Masterswitch is available in multiple capacities, and all models are suitable for use with a generator by means of an adjustable transfer delay.

- Two AC inputs; for example grid power and inverter.
- Adjustable transfer delay for generators.
- One outlet to AC power group.
- Automatic switching.
- Power transfer up to 25 kW, input/output from 20 to 125 A.
- The Masterswitch Fuses version includes circuit breakers.

QUOTE

"When we evaluate a potential supplier for one of our custom built yachts, we value technical excellence, innovation capabilities, reliable solutions and world class global service capabilities. After working with Mastervolt for more than 20 years, we at Baltic Yachts are confident about Mastervolt's ability to deliver on all these points."

OLAV AHLÖ, PURCHASER ELECTRICAL EQUIPMENT BALTIC YACHTS OY AB LTD., FINLAND

Smart Electronics

The intelligent electronics control the switching to ensure an optimal energy management. Its double pole relay is durable and extremely safe.

LED indications on Systemswitch

Read-out of the basic functions on the display, including indication of available power source, generator, grid power or inverter and 'load on inverter' function.

Central Energy Management

The EasyView 5 with intuitive controls and color touchscreen shows key system information at a glance. Provided with a multi-language menu, the home button gives easy access to your favorite pages. System alerts and alarms are tracked through the logbook feature.

Suitable for MasterBus

As the Mass Systemswitch is suitable for MasterBus, all information can also be read-out on, for instance, a EasyView display, including the status of the charge current and the inverter.

Specifications
AC Transfer Systems




	Mass Systemswitch 6 kW	Mass Systemswitch 10 kW	Mass Systemswitch 16 kW	Masterswitch 5 kW
Product code 230 V	*55008005*	*55008105*	*55008205*	*55006010*
Product code 120 V				*55106000 (3 kW)*
(check ■ mastervolt.com/transfer-systems for specifications)				
GENERAL SPECIFICATIONS				
Nominal input voltage	230 V (50/60 Hz)	230 V (50/60 Hz)	230 V (50/60 Hz)	230 V (50/60 Hz)
Input voltage range	200-250 V AC	200-250 V AC	200-250 V AC	200-250 V AC
Number of inputs	3	3	3	2
Number of outputs	3	4	4	1
Dimensions, hxwxd	340 x 261 x 144 mm 13.4 x 10.3 x 5.7 inch	340 x 261 x 144 mm 13.4 x 10.3 x 5.7 inch	340 x 261 x 144 mm 13.4 x 10.3 x 5.7 inch	200 x 110 x 115 mm 7.9 x 4.3 x 4.5 inch
Weight	4.4 kg / 9.7 lb	4.9 kg / 10.8 lb	5 kg / 11 lb	1.2 kg / 2.6 lb
TECHNICAL SPECIFICATIONS				
Connection for remote control	yes	yes	yes	no
MasterBus compatible	yes	yes	yes	no
LED indication on cabinet	indication voltage sources present and 'load on inverter' mode	indication voltage sources present and 'load on inverter' mode	indication voltage sources present and 'load on inverter' mode	no
Nominal input current generator	25 A	40 A	63 A	20 A
Nominal input current grid	25 A	25 A	40 A	20 A
Nominal input current inverter	25 A	25 A	25 A	n.a.
Earth leakage switch	no	no	no	n.a.
Generator input switch	continuous monitoring of voltage and frequency	continuous monitoring of voltage and frequency	continuous monitoring of voltage and frequency	no
Time delay generator input	0-10 sec (adjustable)	0-10 sec (adjustable)	0-10 sec (adjustable)	0-10 sec (adjustable)
Nominal current shortbreak output	25 A	25 A	25 A	n.a.
Nominal current power output	25 A	25 A	40 A	20 A
Nominal current generator output	n.a.	40 A	63 A	n.a.
Automatic circuit breakers	no, system dependent	no, system dependent	no, system dependent	no, system dependent
Power consumption (AC all inputs)	27 W	33 W	33 W	7 W
Power consumption (only inverter power)	<1 W	<1 W	<1 W	0 W
Temperature range (specified)	-5 °C to 60 °C	-5 °C to 60 °C	-5 °C to 60 °C	-5 °C to 60 °C
Temperature range (allowed)	-25 °C to 70 °C (may not meet the specified tolerancies)	-25 °C to 70 °C (may not meet the specified tolerancies)	-25 °C to 70 °C (may not meet the specified tolerancies)	-25 °C to 70 °C (may not meet the specified tolerancies)
Temperature range (storage/non operating)	-60 °C to 80 °C	-60 °C to 80 °C	-60 °C to 80 °C	-60 °C to 80 °C
Relative humidity	max. 95 %, non condensing	max. 95 %, non condensing	max. 95 %, non condensing	max. 95 %, non condensing
Transfer time	switch on 12-22 ms / switch off 4-19 ms	switch on 12-22 ms / switch off 4-19 ms	switch on 12-22 ms / switch off 4-19 ms	switch on 12-22 ms / switch off 4-19 ms
Frequency watch	yes	yes	yes	no
Cable size	0.5-10 mm² / AWG 20-7, remote control: 0.14-2.5 mm² / AWG 26-13	0.5-10 mm² / AWG 20-7, remote control: 0.14-2.5 mm² / AWG 26-13	0.5-10 mm² / AWG 20-7, remote control: 0.14-2.5 mm² / AWG 26-13	0.5-10 mm² / AWG 20-7
Protection degree	IP23	IP23	IP23	IP55

Advantages of the Mastervolt transfer system

- Activating and selecting 230 V sources: Grid power, inverter and generator (adjustable to amperage of grid power, for instance 6 A).
- Prevents parallel connection between inverter and other 230 V sources, avoiding damage to the inverter.
- Fully compatible with Mastervolt systems, and suitable for installations from other brands, other generators and/or inverters.

			
	Masterswitch 10 kW	**Masterswitch 25 kW**	**Masterswitch Fuses 5 kW**
	55006015	*55003500*	*55006060*
	55106100 (7 kW)		
	230 V (50/60 Hz)	230 V (50/60 Hz)	230 V (50/60 Hz)
	200-250 V AC	200-250 V AC	200-250 V AC
	2	2	2
	1	1	2
	200 x 110 x 115 mm 7.9 x 4.3 x 4.5 inch	291 x 241 x 168 mm 11.5 x 9.5 x 6.6 inch	200 x 255x115 mm 7.9 x 10 x 4.5 inch
	1.3 kg / 2.9 lb	3.8 kg / 8.4 lb	2.1 kg / 4.6 lb
	no	no	no
	no	no	no
	no	no	no
	40 A	125 A	16 A
	40 A	125 A	16 A
	n.a.	n.a.	20 A
	n.a.	n.a.	yes (1x)
	no	no	no
	0-10 sec (adjustable)	0-10 sec (adjustable)	0-10 sec (adjustable)
	n.a.	n.a.	6 A + 6 A + 6 A
	40 A	125 A	6 A + 10 A
	n.a.	n.a.	n.a.
	no, system dependent	no, system dependent	yes
	7 W	26 W	7 W
	0 W	0 W	0 W
	-5 °C to 60 °C	-5 °C to 60 °C	-5 °C to 60 °C
	-25 °C to 70 °C (may not meet the specified tolerancies)	-25 °C to 70 °C (may not meet the specified tolerancies)	-25 °C to 70 °C (may not meet the specified tolerancies)
	-60 °C to 80 °C	-60 °C to 80 °C	-60 °C to 80 °C
	max. 95 %, non condensing	max. 95 %, non condensing	max. 95 %, non condensing
	switch on 12-22 ms / switch off 4-19 ms	switch on 12-22 ms / switch off 4-19 ms	switch on 12-22 ms / switch off 4-19 ms
	no	no	no
	0.5-10 mm² / AWG 20-7	4-50 mm² / AWG 10-1/0	0.5-10 mm² / AWG 20-7
	IP55	IP55	IP55

A safe connection between grid power and your onboard network

A safe connection between vessel and shore installation is an essential part of your electrical system. A galvanic electrical isolation between shore power and the on board power prevents any electrical corrosion of metal parts while keeping you earthed.

Both the unique HF technology-based Mass GI and the reliable 50 Hz transformer-based IVET series offer you complete protection against galvanic corrosion. See page 248 for more information on this subject.

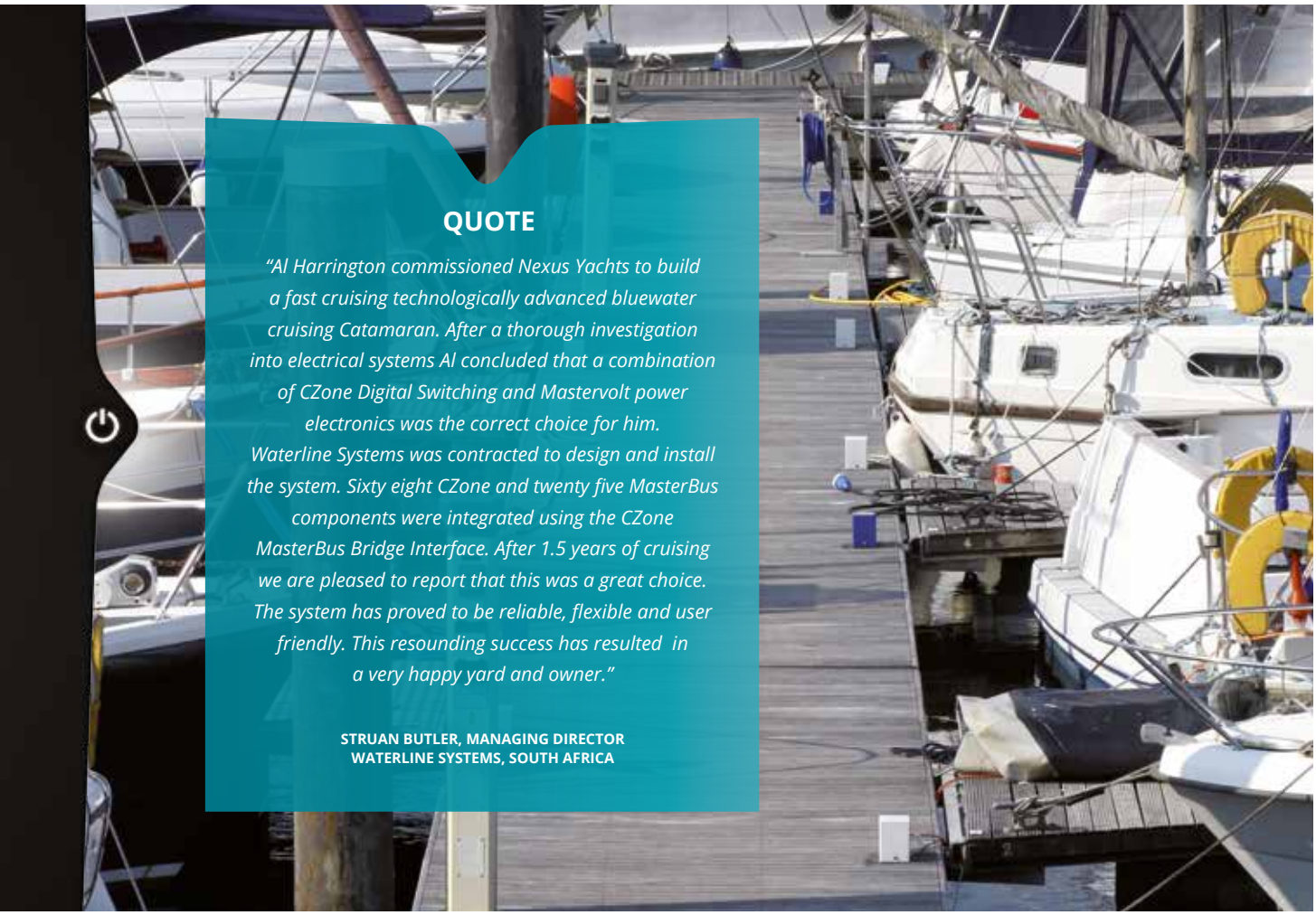
Select the right transformer for your system:

Lightweight Mass GI Transformer

- Ultra modern high-frequency electronic switch technology.
- Lightweight and compact.
- Integrated Soft Start function.
- Connect to voltages from 90 to 255 V and from 45 to 65 Hz.
- Units can be parallel coupled for higher capacity.
- Higher efficiency, limited heat development.

IVET Heavy-duty Series

- High-quality isolation transformers without casing for self installation (casing is optional).
- Optional Soft Start, in synthetic casing.
- Capacities of 2.5 kW to 22 kW.



QUOTE

"Al Harrington commissioned Nexus Yachts to build a fast cruising technologically advanced bluewater cruising Catamaran. After a thorough investigation into electrical systems Al concluded that a combination of CZone Digital Switching and Mastervolt power electronics was the correct choice for him. Waterline Systems was contracted to design and install the system. Sixty eight CZone and twenty five MasterBus components were integrated using the CZone MasterBus Bridge Interface. After 1.5 years of cruising we are pleased to report that this was a great choice. The system has proved to be reliable, flexible and user friendly. This resounding success has resulted in a very happy yard and owner."

STRUAN BUTLER, MANAGING DIRECTOR
WATERLINE SYSTEMS, SOUTH AFRICA

Soft Start for the IVET heavy-duty series

The Soft Start automatic switch suppresses the inrush current from the transformer and prevents the fuse from blowing.

Higher capacity via parallel switching

Parallel switching of the Mass GI units increases the AC power capacity. Two 16 A/3.5 kW units ensures 32 A/7 kW, four units give 64 A/14 kW.

Automatically adjust the grid power

Mastervolt supplies three automatic switching systems for capacities of 6, 9 and 13 kW that - combined with an IVET transformer - adjust grid power to the onboard system. As a result, a 230 V/50 Hz system can easily function with an American or Caribbean AC connection. Do ensure that the frequency on board (50 or 60 Hz) is the same as the frequency of the incoming current.

Modern transformer technology: Light, silent, reliable and easy

The Mass GI is supplied with the latest high-frequency switching technology as well as Soft Start for peak loads when connecting to the grid. LED lights on the casing indicate load and overload. The transformer can be remote controlled and has the option of automatically starting the generator when there is an AC current overload. The Mass GI is 75 % lighter and 60 % smaller compared to low frequency transformers.

Install anywhere

With its robust aluminium casing, this isolation transformer can be fitted in any position on wall or floor. No rubber mountings are necessary because the unit does not vibrate or hum. The Mass GI also features professional connections with strain relief cable glands.

MASTER TIP

- *Determine AC power and onboard current: 230 V, 120 V or both?*
- *Determine the capacity: maximum load with onboard power usage = amount of amps and kW.*

Specifications Isolation Transformers





	Mass GI 3.5	Mass GI 7	IVET 3.5	IVET 4.5	IVET 6
Product code	*88000355*	*88000705*	*85000350*	*85000450*	*8500060*
Product code with casing	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
INPUT					
Input voltage	90-255 V	90-255 V	110/220/240 V	110/220/240 V	110/220/240 V
Input frequency	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
Nominal input current at 230 V	16 A	32 A	16 A	20 A	26 A
No-load consumption	22 W	44 W	<10 W	<10 W	<10 W
Earth leakage protection	no	no	no	no	no
OUTPUT					
Output voltage (equal to input)	90-255 V, ± 5 %	90-255 V, ± 5 %	120/220/240 V, ± 5 %	120/220/240 V, ± 5 %	120/220/240 V, ± 5 %
Output frequency	equal to input	equal to input	equal to input	equal to input	equal to input
Soft Start	yes	yes	option	option	option
Switch off behaviour breaker	B-characteristic	B-characteristic	n.a.	n.a.	n.a.
Efficiency	> 93 %	> 93 %	> 93 %	> 93 %	> 93 %
GENERAL SPECIFICATIONS					
Power	3500 W (up to 4 units parallel = 14 kW)	7000 W	3500 W	4500 W	6000 W
Technology	high frequency	high frequency	E-core	E-core	E-core
Dimensions, hxwxd	340 x 261 x 144 mm 13.4 x 10.3 x 5.7 inch	340 x 261 x 250 mm 13.4 x 10.3 x 9.8 inch	330 x 200 x 185 mm 13 x 7.9 x 7.3 inch	330 x 240 x 185 mm 13 x 9.4 x 7.3 inch	380 x 240 x 215 mm 15 x 9.5 x 8.5 inch
Weight	6 kg / 13.2 lb	10 kg / 22 lb	30 kg / 66.1 lb	53 kg / 77.2 lb	49 kg / 108 lb
Approvals	CE, ABYC	CE, ABYC	CE, ABYC	CE, ABYC	CE, ABYC
Ambient temperature	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C
Switch off at	80 °C	80 °C	n.a.	n.a.	n.a.
Cooling	variofan	variofan	natural cooling	natural cooling	natural cooling
Operating humidity	max. 95 %	max. 95 %	max. 95 %	max. 95 %	max. 95 %
Protection degree	IP23	IP23	IP00	IP00	IP00
MasterBus compatible	yes	yes	no	no	no

OPTIONS						
	EasyView 5 *77010310*	option	option	n.a.	n.a.	n.a.
		Waterproof system monitor with 'daylight readable' colour display and intuitive multi-language touchscreen to show the key system information at a glance. There is also a logbook feature for warnings and alarms, along with a buzzer and alarm notifications. The home button gives access to favorite pages.				
	Soft Start 13 kW *55003300*	included	included	option	option	option
		Automatic switch that suppresses the inrush current from the isolation transformer to prevent the shore power fuse from blowing.				
	Soft Start 22 kW *55003400*	included	included	n.a.	n.a.	n.a.
		Automatic switch that suppresses the inrush current from the isolation transformer to prevent the shore power fuse from blowing.				

Specifications Transfer systems with Soft Start and automatic detection of the input voltage





	6 kVA	9 kVA	13 kVA	Soft Start 13 kVA	Soft Start 22 kVA
Product code	*55010600*	*55010900*	*55011300*	*55003300*	*55003400*
Voltage	120/230 V	120/230 V	120/230 V	230 V	230 V
Power	6 kW	9 kW	13 kW	2.5-13 kW	13-22 kW
Max. input current	60 A at 120 V 30 A at 230 V	80 A at 120 V 40 A at 230 V	130 A at 120 V 70 A at 230 V	n.a.	n.a.
Dimensions, hxwxd	400 x 300 x 210 mm 15.7 x 11.8 x 8.3 inch	400 x 300 x 210 mm 15.7 x 11.8 x 8.3 inch	400 x 300 x 210 mm 15.7 x 11.8 x 8.3 inch	200 x 180 x 115 mm 7.9 x 7.1 x 4.5 inch	200 x 180 x 115 mm 7.9 x 7.1 x 4.5 inch
Weight	12 kg / 26.5 lb	12.5 kg / 27.6 lb	13 kg / 28.7 lb	1.2 kg / 2.6 lb	1.5 kg / 3.3 lb

	IVET 8	IVET 10*	IVET 13	IVET 18	IVET 22
	85000800	*85001000*	*85001300*	*85001800*	*85002200*
	n.a.	*86001000*	*n.a.*	*n.a.*	*n.a.*
	110/220/240 V	110/220/240 V	110/220/240 V	110/220/240 V	110/220/240 V
	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
	35 A	44 A	57 A	78 A	96 A
	<10 W	<10 W	<10 W	<10 W	<10 W
	no	no	no	no	no
	120/220/240 V, ± 5 %	120/220/240 V, ± 5 %	120/220/240 V, ± 5 %	120/220/240 V, ± 5 %	120/220/240 V, ± 5 %
	equal to input	equal to input	equal to input	45-65 Hz	equal to input
	option	option	option	option	option
	n.a.	n.a.	n.a.	n.a.	n.a.
	> 93 %	> 93 %	> 93 %	> 93 %	> 93 %
	8000 W	10 kW	13 kW	18 kW	22 kW
	E-core	E-core	E-core	E-core	E-core
	430 x 280 x 210 mm 16.9 x 11 x 8.3 inch	430 x 280 x 240 mm 16.9 x 11 x 9.5 inch	490 x 320 x 230 mm 19.3 x 12.6 x 9 inch	490 x 320 x 260 mm 19.3 x 12.6 x 10.2 inch	490 x 320 x 290 mm 19.3 x 12.6 x 11.4 inch
	59 kg / 130 lb	75 kg / 165.4 lb	90 kg / 198.4 lb	110 kg / 242.5 lb	130 kg / 286.6 lb
	CE, ABYC	CE, ABYC	CE, ABYC	CE, ABYC	CE, ABYC
	0 °C to 40 °C, derating power > 40 °C	0-40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C	0 °C to 40 °C, derating power > 40 °C
	n.a.	n.a.	n.a.	n.a.	n.a.
	natural cooling	natural cooling	natural cooling	natural cooling	natural cooling
	max. 95 %	max. 95 %	max. 95 %	max. 95 %	max. 95 %
	IP00	IP00	IP00	IP00	IP00
	no	no	no	no	no
	n.a.	n.a.	n.a.	n.a.	n.a.
	option	option	option	n.a.	n.a.
	n.a.	n.a.	option	option	option

In addition to Mastervolt isolation transformers, we also supply ProMariner galvanic isolators, the ProSafe series.

For more information, please consult the ProMariner product catalogue and website.

ProMariner™

Electrical Cables and Adapters: Your life line to the grid

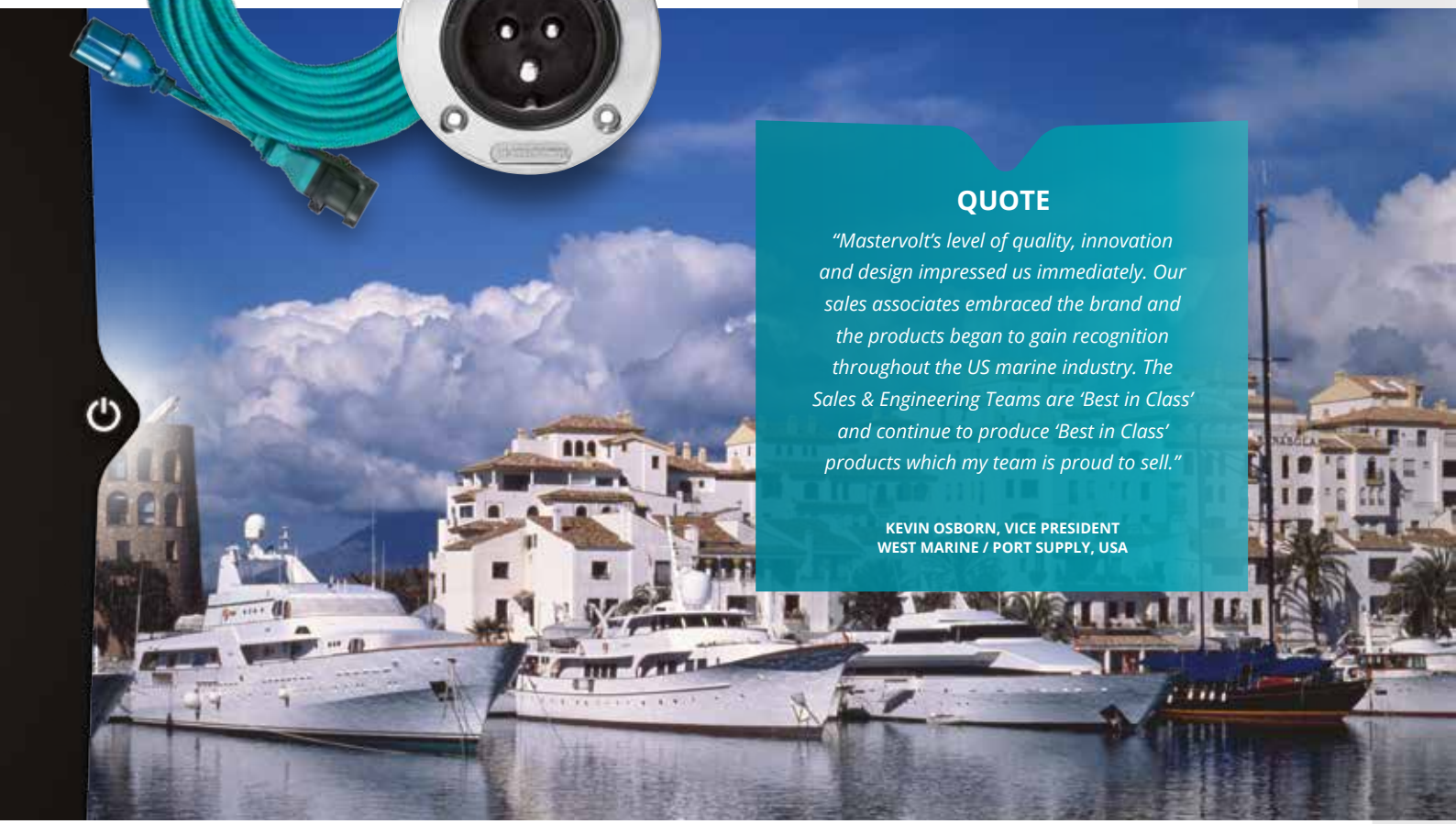
A safe and carefree power connection is your ticket to a comfortable and smooth onboard experience during your stay. The 230 V grid is the source to run your appliances and charge the batteries. Mastervolt offers you everything you need for a high quality grid connection, with safety, security and performance given the highest priority.

Practical tips

- Based on the maximum load for onboard power consumption, choose either a 16 A or a 32 A connection.
- For high loads choose multiple parallel connections to the grid.
- Choose the appropriate connection: Standard is an earthed two-pole plug or the more familiar blue CEE three-pole plug.

You need:

- Cable between the grid and application: Industrial, electric triple-core cable with European colour coding (brown, blue, yellow/green) with a thick synthetic sheath.
- An onboard connection: Perfectly protected easy lock system for grid power plug.
- Required safety measures.
- Shore Fix fuse/earth leakage circuit breaker; basic fuse between AC plug and onboard system (product code 124001000).
- High or low frequent isolation transformer (page 132). The safest solution for complete isolation of your network and the grid; prevents corrosion via electrolysis.



QUOTE

"Mastervolt's level of quality, innovation and design impressed us immediately. Our sales associates embraced the brand and the products began to gain recognition throughout the US marine industry. The Sales & Engineering Teams are 'Best in Class' and continue to produce 'Best in Class' products which my team is proud to sell."

KEVIN OSBORN, VICE PRESIDENT
WEST MARINE / PORT SUPPLY, USA

16 A models

Power Cable

Product code 15 m	121160150
Product code 25 m	121160250

- UV-proof and wear-proof
- Moulded plugs
- Integrated LED power indicator
- 2.5 mm²
- Deliverd in sturdy canvas bag with leather handles.

Extension Cable

Product code 15 m	121160151
Product code 25 m	121160251

- UV-proof and wear-proof
- Moulded plugs
- Integrated LED power indicator
- 2.5 mm²

RVS Inlet

Product code	121160000

- 230 V

Adapter CEE 7/7 - CEE

Product code	121160900

- From CEE-7/7 to CEE plug
- UV-proof and wear-proof
- Integrated LED power indicator

Adapter CEE - CEE 7/7

Product code	12116091 0

- From CEE to CEE-7/7 plug
- UV-proof and wear-proof

Splitter for CEE Plug

Product code	121160920

- UV-proof and wear-proof
- Integrated LED power indicator

32 A model

RVS Inlet

Product code	121320000

- 230 V

25 A model

Power Cable

Product code 25 m	121320250

- UV-proof and wear-proof
- Moulded plugs
- Integrated LED power indicator
- 4 mm²

OPTION

Mastervolt carrying case
121160930
Sturdy canvas bag with leather handles.

In addition to Mastervolt cables, we also offer an extensive range of Ancor cables.

For more information, please consult the Ancor product catalogue and website.

ANCOR

In addition to the Mastervolt power connections, we also supply the complete Marinco product range.

For more information, please consult the Marinco product catalogue and website.

MARINCO

QUOTE

"The KNRM is extraordinarily happy with being sponsored by Mastervolt. The combination of free delivery and service/ maintenance for a long time period is unique in its own right. But I am particularly pleased with the development even regardless of the free support. As a technical Inspector, I only want the best equipment on board. And Mastervolt has proven to be one of the best in the business. This partnership ensures that we have the best equipment at the best possible circumstances. The KNRM is very grateful to Mastervolt for its contribution to the life-saving work of our crew members!"

HANS VAN DER MOLEN,
TECHNICAL INSPECTOR AT KNRM

Courtesy of Flying Focus, the Netherlands.

Mastervolt has been working with the Royal Netherlands Sea Rescue Institution (KNRM) since 2015. Organisations like these are responsible for rescuing people and animals on the water throughout the world. In the Netherlands, the KNRM is a 100% volunteer organisation which is financed by donations. Mastervolt supports the 45 rescue stations of the KNRM with free products and services.

Systems

A Mastervolt System: Components that understand each other flawlessly...

When it comes to energy, it's wise to opt for Mastervolt: our systems are fully integrated, resulting in the smartest solutions that are completely independent of the grid. In other words, they give you the power to be independent.

Battery chargers, inverters, batteries, digital switches; with Mastervolt, all your components will be fully attuned to each other. This is a concept on which Mastervolt's engineers work every day with passion and dedication. The result is flawless operation for each system, maximum efficiency, and significant savings on installation costs thanks to our innovative CZone and MasterBus technologies. Regardless of the application, you will benefit from a balanced system with proven components which you can intuitively operate and easily monitor.

Mastervolt and its many partners worldwide will be delighted to help you devise the smartest possible system design. This is part of our all-inclusive approach, and we provide the support and assistance to match.

Thanks to our broad product portfolio, we can design a suitable system for any application.

QUOTE

"Orga is continually improving its product technology by working in close collaboration with customers to develop systems specifically adapted to their requirements. The use of innovative technology and the expert knowledge of its dedicated staff and reliable suppliers like Mastervolt are crucial to Orga's success."

MARTIJN VAN DE KAMP, BUSINESS ANALYST ORGA OFFSHORE, THE NETHERLANDS

Factors to consider

- **Space:**
  Is there enough room for system components?
- **Desired 230 V devices and 12, 24 or 48 V consumers:**
  What kind of equipment will be used and for how long?
- **Required capacity:**
  What is the total consumption in watts?
- **Peak load:**
  Does everything have to be able to function simultaneously? Do you use equipment that requires a power surge when starting up, like a refrigerator or airconditioning?
- **Required voltage:**
  12, 24 or 48 V DC and/ or 230 V AC?
  Or perhaps 120 V/60 Hz?
- **Availability of grid power:**
  Is there a frequent opportunity to connect to the grid? Do you have equipment that requires an uninterrupted power supply?

This knowledge will allow you to make an inventory of all the DC and AC equipment required, and the necessary capacity. Again, Mastervolt is happy to assist you with advice.

Is a generator required?

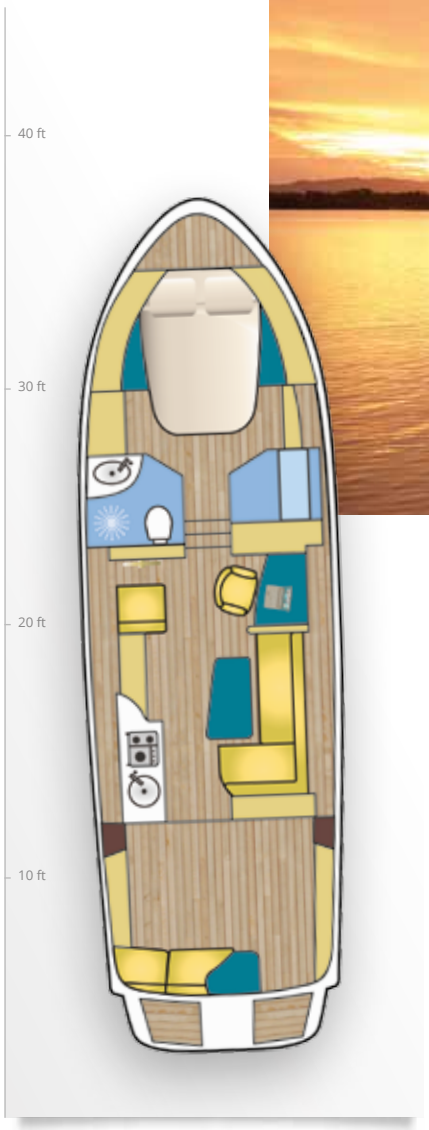
A generator is usually the simplest way to ensure an independent power supply – but sometimes there are more efficient solutions. How about a combination of batteries connected to an inverter, which convert DC voltage to 230 volts? Or a solar energy system for charging the battery? These solutions make the power system more comfortable and are also more environmentally friendly – after all, they do not require a continuously running diesel engine. And even if a generator does turn out to be necessary, you can still rely on Mastervolt because our systems are fully compatible with all mainstream generators.

A complete system saves time and money

There are also economic benefits to buying a complete, well-coordinated system, as builders, installers and end users can all confirm. The selection of components, the purchasing process, installation and documentation are much less time consuming for a complete system. And because everything is cleverly thought out, you will be choosing a tailor-made solution that perfectly suits your needs and requirements.

As our various system examples and references make clear, the possibilities are endless: from a simple setup to one of the supercritical systems developed by Mastervolt for the vessels participating in the Volvo Ocean Race 2017-18.

Complete comfort on the water



Application
35-40 ft motoryacht
Use
Longer weekend trips
Details
Comfortable onboard facilities

Sailing profile

You normally go sailing for a weekend or midweek, sometimes anchored without access to shore power so you need enough power to cruise for two days. You also desire a range of comforts onboard, including a large refrigerator, microwave/oven combination and high-end coffee/espresso machine. Internet and email facilities are on your wish list as is (partial) navigation using your laptop, a good sound system and occasionally watching your favourite TV show.

Energy consumption

DESCRIPTION	POWER	NUMBER X POWER X TIME	DAILY CONSUMPTION
Daily AC consumers (on inverter)			
Coffee machine	1000 W	1 x 1000 watt x 15 minutes	= 0.250 kWh
LED television	80 W	1 x 80 watt x 1 hour	= 0.080 kWh
Laptop	30 W	1 x 30 watt x 1 hour	= 0.030 kWh
Phone/tablet charger	20 W	1 x 20 watt x 3 hours	= 0.060 kWh
Daily DC consumers			
Interior lighting	20 W	4 x 20 watt x 3 hours	= 0.240 kWh
Refrigerator	50 W	1 x 10 watt* x 24 hours	= 0.240 kWh
Navigation electronics	20 W	1 x 20 watt x 8 hours	= 0.160 kWh
Total AC and DC consumers			**= 1.060 kWh**

* *The refrigerator runs for 1/5 of the time, resulting in an average of 10 watt.*

The basics

- Your navigation station includes a GPS, plotter, speedometer and depth gauge.
- Your yacht has several pumps for water, shower, toilet and bilges.
- You require optimum ease of operation; not only centrally located but also next to your bed or in the engine room.

System choice

One of the advantages of using a Mass Combi is the ability to power loads even when mains supply is limited by using energy from your batteries. For example, a 10 A load can be powered from a 4 A shore connection. In addition, the design of the Mass Combi is both unique and characteristic of Mastervolt. Rather than installing heavy transformers, our lightweight, high-frequency technology offers major benefits regarding size, weight and sound (no hum!). The technology also ensures an exceptionally high efficiency with a minimal conversion loss and a low no-load consumption. The included battery temperature sensor will make sure the batteries receive the best possible charge. The Mass Combi meets all your requirements and more!

Batteries: 3 x MVG 12/120 Ah

The total of AC and DC consumers requires around 1 kWh per day (2 kWh in total). Totally discharging the batteries is not advisable so opt for a maximum of 50 % discharge = 4 kWh. Taking into account the various appliances and required peak loads we suggest a 12 V system.
The required battery capacity is 4 kWh/12 V = ± 330 Ah.

Charger/inverter: Mass Combi 12/1600-60

280 Ah needs at least 25 % of the battery capacity for charging power, so in this case we chose for a 60 A charging power via the Mass Combi. The Mass Combi has a battery charger that allows you to safely, quickly and completely charge two battery banks; starter and service batteries can be separately charged. Additionally the Mass Combi can be used to convert the power for your AC applications, so using everything simultaneously is also possible.

Monitoring: EasyView 5

Waterproof system monitor with intuitive touchscreen. Thanks to the colour touchscreen and multi-language menu, the display is a pleasure to operate. Easily customizable favourite pages show all relevant system information at a glance.

Digital distribution

The products in this system communicate with each other via MasterBus. This brilliantly simple platform for communication and connections ensures that all components 'speak' the same language. The result is a single communication protocol with high-speed CANbus technology.

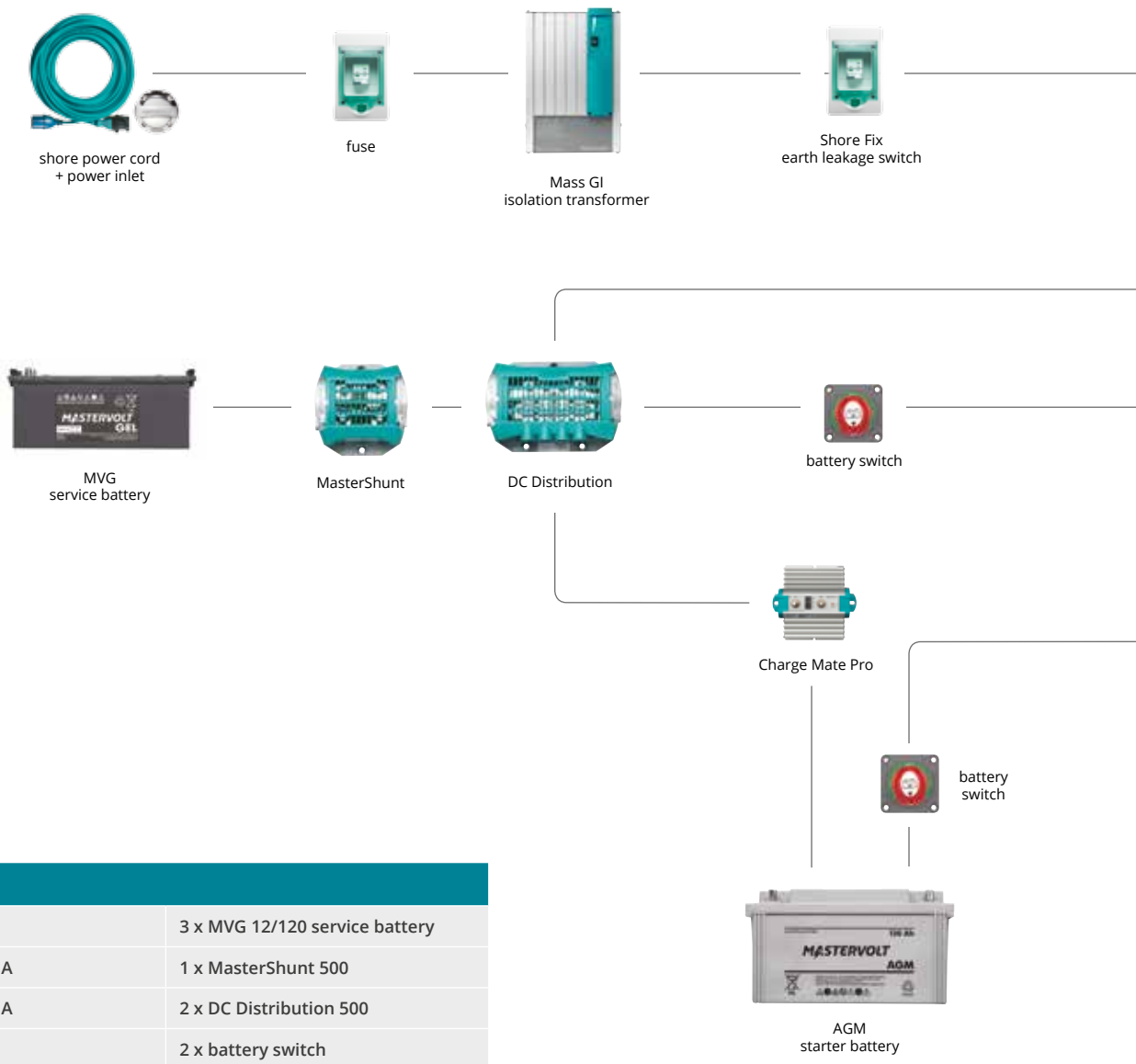
- **1 x MasterShunt 500**
  MasterBus integrated battery monitor, with detailed information on the status of your batteries for an optimised charging process, incl. voltage, current, time remaining and consumption capacity in percentage.
- **2 x DC Distribution 500**
  This distribution model connects up to four DC devices to the DC groups, such as a battery charger, inverter, alternators and solar panels.

Other system components

- 1 x AGM 12/130 starter battery;
- 1x Mass GI 3.5 kVA/16 A; lightweight isolation transformer for safely using shore power, vital for steel or aluminium vessels to avoid electrolysis and corrosion;
- 1 x Charge Mate Pro; the ultimate solution for charging the service batteries with the original alternator;
- 2 x Shore Fix, 16 A/30 mA earth leakage switches;
- 1 x fuse;
- 1 x shore power cord 16 A, 25 m;
- 1 x shore power inlet 2+PE, 16A/230V;
- 2 x battery switches for switching on and off the consumers attached to the battery;
- 1 x Spotlight Chrome; the most versatile, durable, consistent and easy-to-use spotlight on the market.

System drawing

Application
35-40 ft motoryacht
Use
Longer weekend trips
Details
Comfortable onboard facilities



Products used	
1 x EasyView 5	3 x MVG 12/120 service battery
1 x shore power cord, 16 A	1 x MasterShunt 500
1 x shore power inlet, 16 A	2 x DC Distribution 500
1 x fuse	2 x battery switch
2 x Shore Fix earth leakage switch	1 x Spotlight Chrome
1 x Mass GI 3.5 isolation transformer	1 x Charge Mate Pro
1 x Mass Combi 12/1600-60	1 x AGM 12/130 starter battery

Complete comfort on the water

EasyView 5

Mass Combi

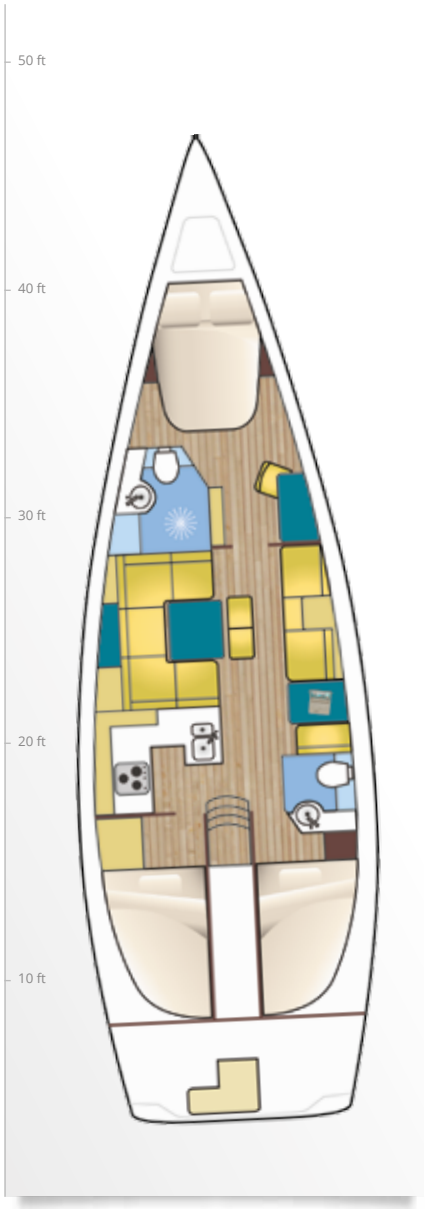
Shore Fix
earth leakage switch

Spotlight

DC Distribution

alternator

The wind in your sails for the day



Application
40-50 ft sailing yacht
Use
Extensive trips
Details
Normal onboard facilities

Sailing profile

What can be better than a nice day's sailing on the water? Relaxed after so much fresh air you head back to the harbour at the end of the day. Onboard you have the basic facilities, with the option to watch TV, listen to music, chill the white wine and charge your laptop or mobile phone.

Energy consumption

DESCRIPTION	POWER	NUMBER X POWER X TIME	DAILY CONSUMPTION
Daily AC consumers (on inverter)			
Coffee machine	1000 W	1 x 1000 watt x 15 minutes	= 0.250 kWh
Laptop	30 W	1 x 30 watt x 1 hour	= 0.030 kWh
Phone/tablet charger	20 W	2 x 20 watt x 3 hours	= 0.120 kWh
Hair dryer	1500 W	1 x 1500 watt x 15 minutes	= 0.375 kWh
Daily DC consumers			
Hifi installation	50 W	1 x 50 watt x 3 hours	= 0.150 kWh
Interior lighting	20 W	4 x 20 watt x 3 hours	= 0.240 kWh
Navigation electronics	20 W	4 x 20 watt x 24 hours	= 1.920 kWh
Navigation deck lights	20 W	2 x 20 watt x 8 hours	= 0.320 kWh
Refrigerator	50 W	1 x 10 watt* x 24 hours	= 0.240 kWh
Navigation displays	40 W	1 x 40 watt x 8 hours	= 0.320 kWh
Total AC and DC consumers			**= 3.965 kWh**

** The refrigerator runs for 1/5 of the time, resulting in an average of 10 watt.*

The basics

- As compact and lightweight is important, a combined inverter/charger has been selected.
- Simple operation via touchscreen control panel.

System choice

The Mass Combi Pro fits perfectly into a Mastervolt system. All components are easily connected via MasterBus and installation can be controlled and monitored intuitively, even with just one EasyView touchscreen. This will provide and manage all information about the Combi, the batteries and other sources such as the generator, grid or solar panels. The system is also suitable for Digital Switching, Mastervolt's decentralised digital switching system.

- A battery voltage of 24 V is selected for this system to allow for smaller cable sizes.

Batteries: 3 x MLI Ultra 24/5000

The total of AC and DC consumers requires around 4 kWh. The additional alternator can charge 1 kWh in half an hour. After four days, the batteries are discharged = 12 kWh (4x 4-1). Totally discharging the batteries is not advisable so opt for a maximum of 80 % discharge = 15 kWh. Taking into account the various appliances and required peak loads we suggest a 24 V system. The required battery capacity is 15 kWh.

Charger/inverter: Mass Combi Pro 24/3500-100

432 Ah (3x 80 % x 180 Ah) needs at least 25 % of the battery capacity for charging power, so in this case we chose for a 100 A charging power via the Mass Combi Pro. The Mass Combi Pro has a battery charger that allows you to safely, quickly and completely charge two battery banks; starter and service batteries can be separately charged. Additionally the Mass Combi Pro can be used to convert the power for your AC applications, so using everything simultaneously is also possible.

Monitoring: EasyView 5

Waterproof system monitor with intuitive touchscreen. Thanks to the colour touchscreen and multi-language menu, the display is a pleasure to operate. Easily customizable favourite pages show all relevant system information at a glance.

Digital distribution

The products in this system communicate with each other via MasterBus. This brilliantly simple platform for communication and connections ensures that all components 'speak' the same language. The result is a single communication protocol with high-speed CANbus technology.

- **2 x DC Distribution 500**

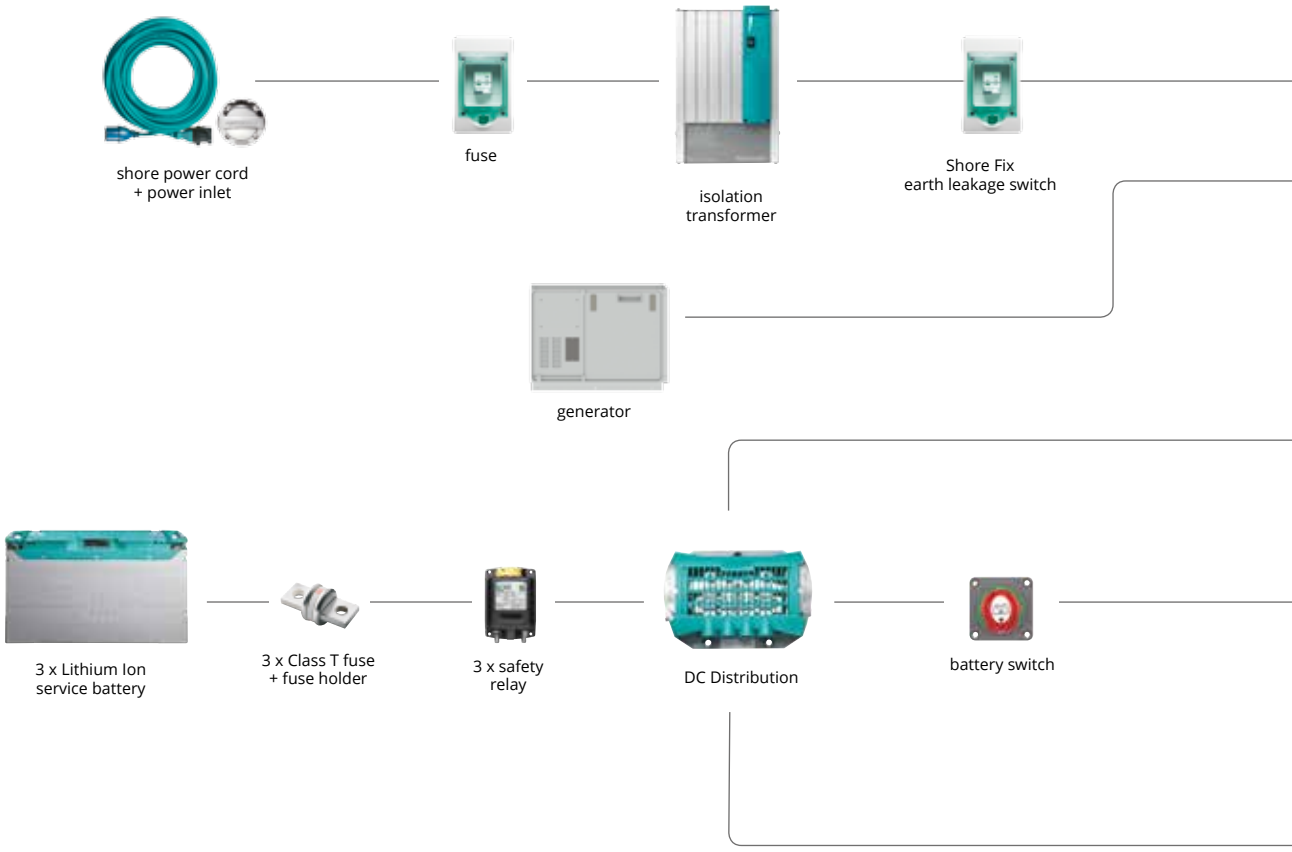
This distribution model connects up to four DC devices to the DC groups, such as a battery charger, inverter, alternators and solar panels.

Other system components

- 11 kW generator;
- 2 x AGM 12/90 starter battery;
- 1x Mass GI 3.5kVA/16A, lightweight isolation transformer for safely using shore power, vital for steel or aluminium vessels to avoid electrolysis and corrosion;
- 1 x Alpha 24/75 additional alternator;
- 1 x Alpha Pro charge regulator;
- 1 x 24V/12V DC-DC converter, each system has its own voltage. This microprocessor controlled unit converts 24 V into 12 V DC so you are able to use both voltages;
- 3 x Shore Fix, 16A/30mA earth leakage switches;
- 1 x fuse;
- 1 x shore power cord 16 A, 25 m;
- 1 x shore power inlet 2+PE, 16A/230V;
- 2 x battery switches for switching on and off the consumers attached to the battery;
- 3 x Class T fuse;
- 3 x safety relay 500 A.

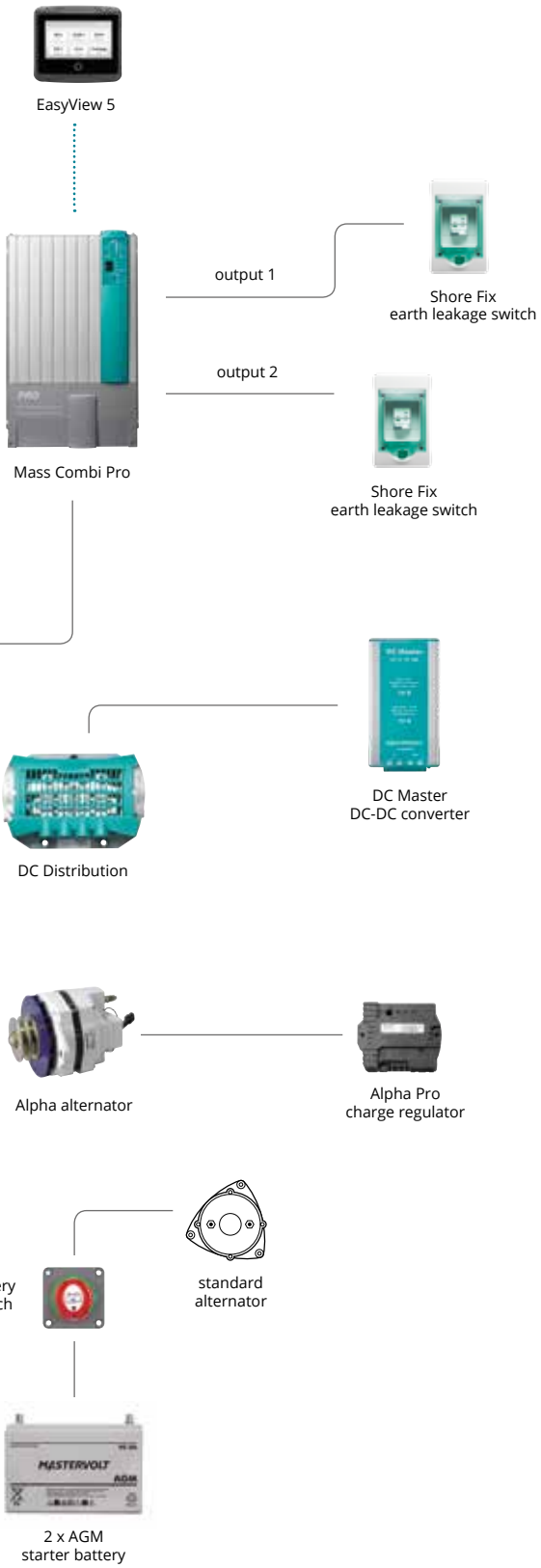
System drawing

Application
40-50 ft sailing yacht
Use
Extensive trips
Details
Normal onboard facilities

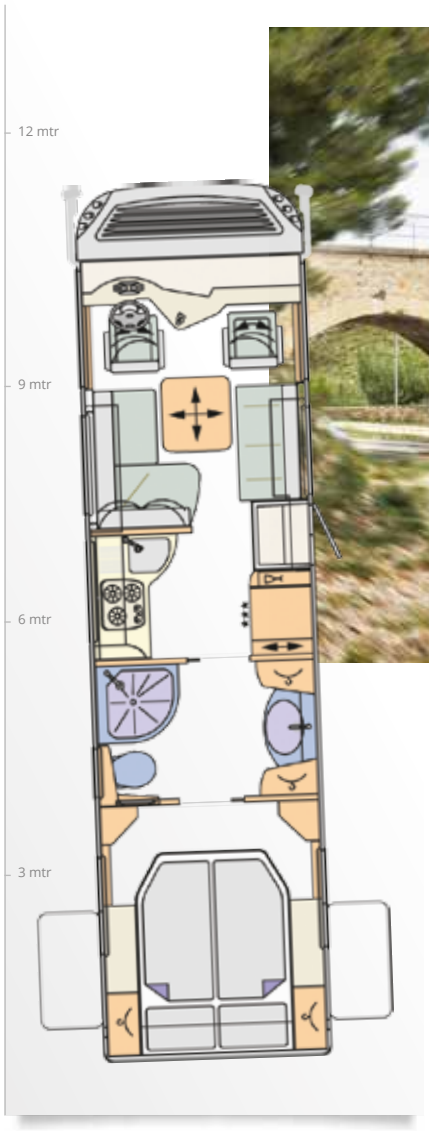


Products used	
1 x shore power cord, 16 A	3 x Class T fuse + fuse holder
1 x shore power inlet, 16 A	3 x safety relais 500 A
1 x fuse	2 x DC Distribution 500
3 x Shore Fix earth leakage switch	1 x DC Master 24/12 V
1 x Mass GI 3.5 isolation transformer	2 x battery switch
1 x Mass Combi Pro 24/3500-100	1 x Alpha 24/75 alternator
1 x EasyView 5	1 x Alpha Pro charge regulator
3 x MLI Ultra 24/5000 Lithium Ion battery	2 x AGM 12/90 starter battery

The wind in your sails for the day



Five-star luxury on the road



Application

Large motor home with all comforts

Use

Longer trips and extended periods without grid power

Details

Luxurious onboard facilities

System description

As you explore the world for weeks or even months at a time, a reliable source of electricity is essential for mobile independence. A made-to-measure power system provides you with a complete system to achieve this, with the Lithium Ion batteries as its heart, that can easily supply all AC consumers. Even when you use a lot of electricity, or require air conditioning, sensitive electronic equipment or internet access... The choice is yours!

Energy consumption

DESCRIPTION	POWER	NUMBER X POWER X TIME	DAILY CONSUMPTION
Daily AC consumers (on inverter)			
Air conditioning (> 6 kBTU)	1500 W	1 x 750 watt x 3 hours	= 2.250 kWh
Hair dryer	1500 W	2 x 1500 watt x 15 minutes	= 0.750 kWh
Coffee machine	1000 W	1 x 1000 watt x 30 minutes	= 0.500 kWh
Microwave	1500 W	1 x 1500 watt x 15 minutes	= 0.375 kWh
LED television	80 W	2 x 80 watt x 3 hours	= 0.480 kWh
Laptop	30 W	1 x 30 watt x 8 hours	= 0.240 kWh
Phone/tablet charger	20 W	2 x 20 watt x 8 hours	= 0.320 kWh
Daily DC consumers			
Hifi installation	50 W	1 x 50 watt x 8 hours	= 0.400 kWh
Refrigerator	50 W	1 x 10 watt* x 24 hours	= 0.240 kWh
Interior lighting	20 W	10 x 20 watt x 3 hours	= 0.600 kWh
Total AC and DC consumers			**= 6.155 kWh**

** The refrigerator runs for 1/5 of the time, resulting in an average of 10 watt.*

The basics

- The goal is to have complete luxury and comfort for as long as possible.
- You charge your batteries with heavy alternators on the main engine while driving, so seldom need grid power.

System choice

The additional Alpha 24/75 alternator will charge the batteries while driving/running your engine. This 24 volt 75 amps alternator is designed to provide maximum output, even at low engine speed (rpm). You will be able to charge roughly 24 x 75 = 1.8 kWh every hour the engine is running. This alternator gives you full independence!

Alternator: Alpha 24/75

Batteries: 3 x MLI Ultra 24/5000

Lithium Ion batteries have a high energy density and are perfect for cyclic applications. They offer savings of up to 70 % in volume and weight, with three times as many charging cycles (2000 full cycles). The Lithium Ion Ultra series includes integrated battery monitoring.
The total of AC and DC consumers requires around 6 kWh. For two days of independency without running the engine you need 12 kWh. Totally discharging the batteries is not advisable so opt for a maximum of 80 % discharge for Lithium Ion batteries, i.e. they should provide at least 13.3 kWh.

- A battery voltage of 24 V is selected to allow for smaller cable sizes.
- The required battery capacity is around 450 Ah.
- Three Lithium Ion batteries provide 540 Ah onboard.
- 3 x safety relay 500 A (mandatory).
- 3 x fuse holder plus 3 x Class T fuse 225 A.

Charger/inverter: Mass Combi Ultra 24/3500-100

In this case, 450 Ah needs 25 % of the battery capacity for charging power, so we chose for 100 A charging power via the Mass Combi Ultra. The Combi Ultra has a battery charger that allows you to safely, quickly and completely charge two battery banks; starter and service batteries can be separately charged. Additionally the Mass Combi Ultra can be used to convert the power for your AC applications, so using everything simultaneously is also possible. Without grid connection, the solar panels will maintain the batteries.

Monitoring: EasyView 5

Waterproof system monitor with intuitive touchscreen. Thanks to the colour touchscreen and multi-language menu, the display is a pleasure to operate. Easily customizable favourite pages show all relevant system information at a glance.

Digital distribution

The products in this system communicate with each other via MasterBus. This brilliantly simple platform for communication and connections ensures that all components 'speak' the same language. The result is a single communication protocol with high-speed CANbus technology.

- **2 x DC Distribution 500**

This distribution model connects up to four DC devices to the DC groups, such as a Combi, inverter, alternator and solar panels.

- **1 x MasterBus USB Interface**

The MasterBus USB Interface enables you to read and configure the MasterBus network via your PC.

Other system components

- 1 x AGM 12/130 starter battery.
- 2 x Shore Fix, 16A/30mA earth leakage switches.
- 1 x power cord 16 A, 25 m.
- 1 x power inlet 2+PE, 16A/230V.
- 2 x battery switches for switching on and off the consumers attached to the battery.

System drawing

Application
Large motor home with all comforts
Use
Longer trips and extended periods without grid power
Details
Luxurious onboard facilities

solar panels

power cord
+ power inlet

Shore Fix
earth leakage switch

3 x Lithium Ion
service battery

3 x Class T fuse
with fuse holder

3 x safety
relay

DC Distribution

Products used	
1 x EasyView 5	3 x fuse holder + Class T fuse 225 A
1 x MasterBus USB Interface	3 x safety relay 500 A
1 x power cord, 16 A	2 x DC Distribution 500
1 x power inlet, 16 A	2 x battery switch
2 x Shore Fix earth leakage switch	1 x Alpha 24/75 alternator
1 x Mass Combi Ultra 24/3500-100	1 x AGM 12/130 starter battery
3 x MLI Ultra 24/5000 Lithium Ion battery	

Five-star luxury on the road

EasyView 5

MasterBus
USB Interface

Mass Combi Ultra

Shore Fix
earth leakage switch

battery
switch

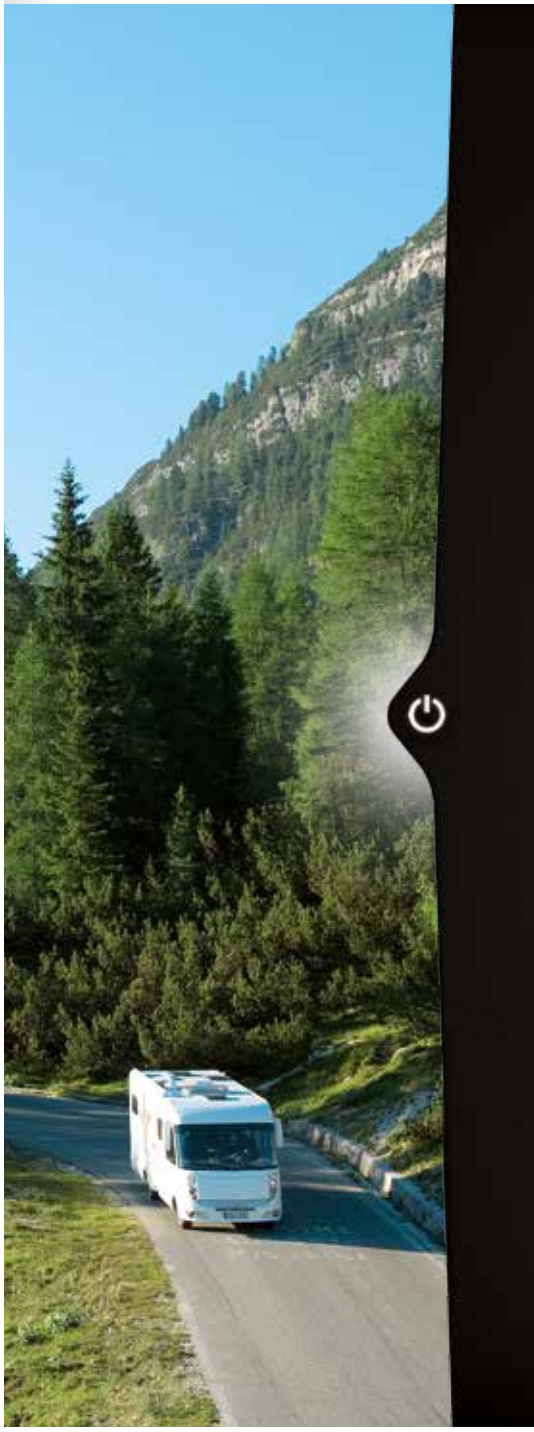
DC Distribution

Alpha alternator

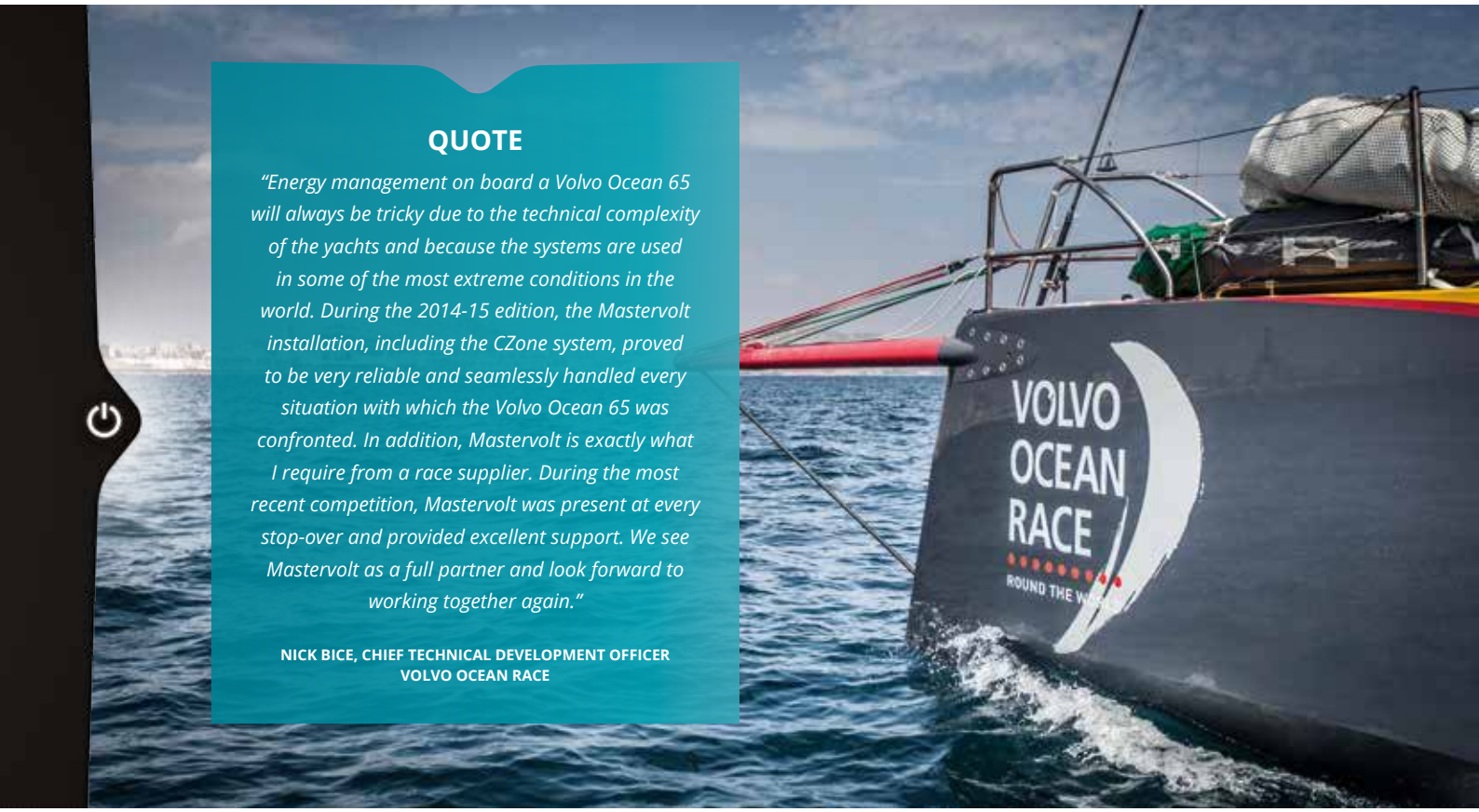
alternator

battery
switch

AGM
starter battery



The Volvo Ocean Race power system



QUOTE

"Energy management on board a Volvo Ocean 65 will always be tricky due to the technical complexity of the yachts and because the systems are used in some of the most extreme conditions in the world. During the 2014-15 edition, the Mastervolt installation, including the CZone system, proved to be very reliable and seamlessly handled every situation with which the Volvo Ocean 65 was confronted. In addition, Mastervolt is exactly what I require from a race supplier. During the most recent competition, Mastervolt was present at every stop-over and provided excellent support. We see Mastervolt as a full partner and look forward to working together again."

NICK BICE, CHIEF TECHNICAL DEVELOPMENT OFFICER VOLVO OCEAN RACE

Courtesy of Ainhoa Sanchez / Volvo Ocean Race.

The Volvo Ocean Race is the toughest and most competitive of all fully crewed, professional sailing events around the world. The 2017-18 edition promises to be even more intense with the fleet racing over greater distances and making more stopovers.

Based on its excellent service provision and proven technologies, it is no surprise that Mastervolt has again been selected as official supplier. Our sustainable installations provide all systems with electricity, from the canting keel to the watermaker and media centre.

MASTERVOLT
OFFICIAL SUPPLIER

VOLVO OCEAN RACE
ROUND THE WORLD

Previous races provided valuable technical information: the alternators rotated some 88.2 million times during the competition, while the advanced Lithium Ion batteries were discharged 275 times. Although the lifespan of these batteries is three times as long as traditional batteries, their use is carefully analysed. The engineers at the Mastervolt R&D Lab in Amsterdam evaluate the performance of each component to further refine the equipment and ensure even greater reliability in their functioning in extreme temperatures and humidity.

Following developments

The Volvo Ocean 65 One Design fleet offers more space to the latest product developments from Mastervolt and CZone®, specifically developed for Digital Switching. Each installation must be identical on every yacht: from the smallest screw to the cable binders. This means that only the performance of the crew will make any difference in the use and control of the electrical system. In addition, the Combination Output Interface (COI) from CZone will replace the existing Output Interface module, making the charging system smarter.

Keep it simple!

There is a major emphasis on keeping the Mastervolt system as simple and intuitive as possible. The crews consist of top athletes who want to spend as little time as possible on managing the electrical systems on board.

The CZone digital control and monitoring network simplifies the system as it allows complex wiring to switching and fuse panels to be replaced by robust, modern connections. It also provides the option of automating complex control and monitoring functions. NMEA cables are replaced by the Ancor version for better water resistance, and the new waterproof CZone Touch 5 touchscreen with Wi-Fi provides full control and monitoring. All major components are also monitored remotely and the generated data allows Mastervolt to constantly improve its products.

Courtesy of Maria Muina/MAPFRE.

For the 2017-18 race each yacht will be equipped with an extra water-powered charging system. The output of this device and all other charge point inputs can be monitored in real time via the Power Project monitoring page on the official Volvo website.

Energy consumption

DESCRIPTION	POWER	NUMBER X POWER X TIME	DAILY CONSUMPTION
24 V DC consumers			
Electric-hydraulic canting keel pump	2500 W	1 x 2500 watt x 30 minutes	= 1.250 kWh
Canting keel PLC controller	150 W	1 x 150 watt x 4 hours	= 0.600 kWh
Port and starboard water ballast pumps	1200 W	1 x 1200 watt x 30 minutes	= 0.600 kWh
Navigation & deck lights	60 W	1 x 60 watt x 6 hours	= 0.360 kWh
Cabin lights	30 W	1 x 30 watt x 6 hours	= 0.180 kWh
Watermaker	250 W	1 x 250 watt x 2 hours	= 0.500 kWh
12 V DC consumers			
Communication (VHF, AIS, LAN, etc.)	150 W	1 x 150 watt x 12 hours	= 1.800 kWh
Navigation & media	150 W	1 x 150 watt x 12 hours	= 1.800 kWh
Total DC consumers			**= 7.090 kWh**

The total of DC consumers requires around 7.1 kWh. In this case, we chose for two MLI Ultra 24/5000 batteries in parallel, resulting in 10 kWh battery power. Totally discharging the batteries is not advisable so opt for a maximum of 80 % discharge, i.e. at least 8 kWh.

System choice

The Volvo Ocean Race power system is divided into two clear sections:

1 **MasterBus section,** including:

- 2 x MLI 24/5000, Lithium Ion battery;
- 2 x 24/150 A alternator;
- 2 x Alpha Pro charge regulator;
- 2 x Magic DC-DC converter 24/12-20;
- 1 x MasterBus USB Interface;
- 1 x Multipurpose Contact Output;
- 2 x 500 A safety relay;
- 1 x DC Distribution 500;
- 1 x MasterShunt 500.

2 **CZone section,** including:

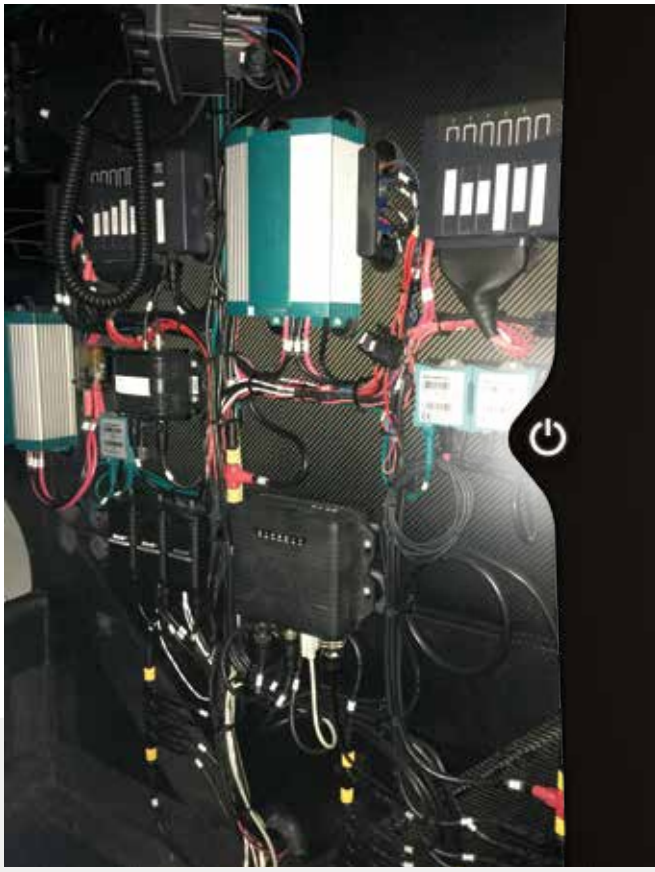
- 1 x Combination Output Interface (COI);
- 1 x Touch 5, touchscreen;
- 5 x Output Interface;
- 2 x Signal Interface;
- 1 x Meter Interface;
- 1 x CZone MasterBus Bridge Interface;
- 1 x CZone Network Bridge Interface.

What the system needs to power and control:

- Port and starboard water ballast pumps;
- Sat C (satcom messaging and positioning);
- All lighting (both internal and external);
- Fleet broadband 250 and 500;
- Cockpit and navigation MFDs;
- LAN network;
- B&G multifunctional displays;
- Gas alarm;
- Radar;
- Bilge pumps;
- Two onboard PCs;
- VHF radio;
- AIS (Automatic Identification System);
- Watermaker;
- Freshwater pumps;
- Electric-hydraulic keel pump and PLC controls;
- Media equipment for the onboard reporters.

Both sections are connected through a CZone MasterBus Bridge Interface and collectively run the majority of the boats' electrical requirements. The system enables monitoring and control of just about everything though the CZone Touch 5.

Courtesy of Ian Roman/Volvo Ocean Race.



Specifications

- The participating Volvo Ocean 65 boats are each powered by two MLI Ultra 24/5000 Lithium Ion batteries, giving a total battery power of 10 kWh.
- The batteries have a primary source of charging via two 24/150 A Mastervolt alternators, regulated by two Alpha Pro charge regulators, which can fully charge the Li-ion batteries in one hour. In addition, all boats are equipped with a water-powered charging system.
- Each boat is equipped with a DC distribution 500, that fuses the DC cables and can generate an alarm over the network, when a fuse blows.
- Battery monitoring is provided via the MasterShunt and the internal shunts fitted within the batteries. These components provide critical system data that is communicated via MasterBus and the CZone Bridge onto the CZone Touch 5, and the displays located at the navigation station and in the cockpit.
- There is comprehensive system monitoring provided via the CZone network, which will also emit audible and visual alarms when actions are required.
- The CZone network also powers the navigation, communication and hydraulic systems fitted within the vessel.
- When the boats are in port, charging is provided by a Mastervolt ChargeMaster 24/30-3. Regardless of the available mains (90-265 V, 50 or 60 Hz), the ChargeMaster can charge the batteries anywhere in the world.
- Detailed system diagnosis and troubleshooting are provided remotely by the Mastervolt technical team, via Master Adjust, CZone Configuration Tool and Mastervolt QS.

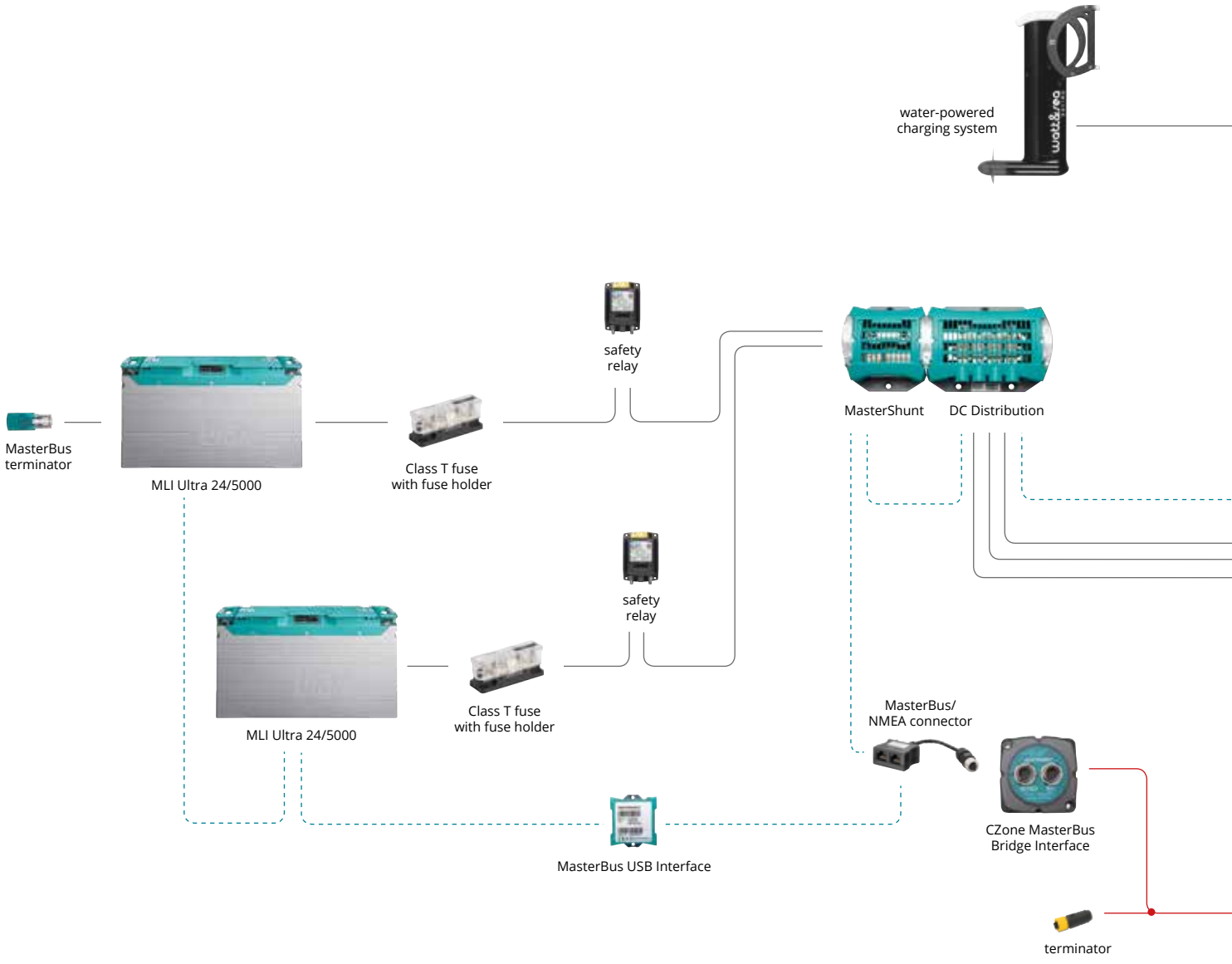
Courtesy of Alnhoa Sanchez / Volvo Ocean Race.

QUOTE

"As a Dutchman, I'm extra pleased to have Mastervolt on board, a Dutch brand like AkzoNobel. From experience on my own boat, I know that Mastervolt is super-reliable, which is exactly what we need in the Volvo Ocean Race. Rather than worrying about the electrical system we need to be able to fully focus on the sailing itself. With Mastervolt on board, I am sure that will be the case."

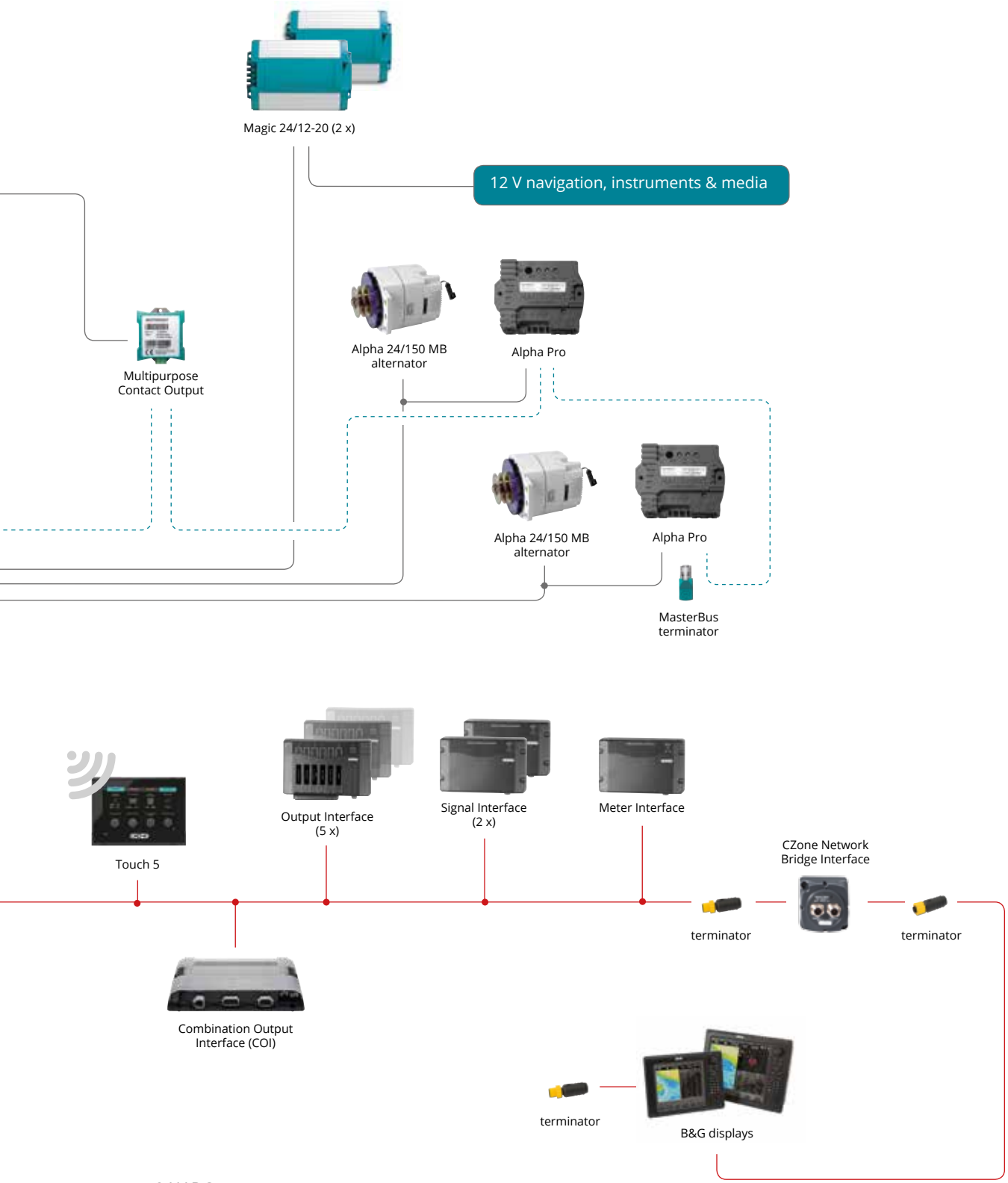
SIMEON TIENPONT, SKIPPER TEAM AKZONOBEL
VOLVO OCEAN RACE 2017-18

System drawing



Products used		
2 x MLI Ultra 24/5000 battery (in parallel)	1 x MasterBus/NMEA connector	1 x Touch 5
2 x Class T fuse + fuse holder	1 x CZone MasterBus Bridge Interface	1 x Combination Output Interface (COI)
2 x safety relay 500 A	1 x Multipurpose Contact Output	5 x Output Interface
1 x MasterShunt 500	2 x Magic 24/12-20 DC-DC converter	2 x Signal Interface
1 x DC Distribution 500	2 x 24/150 A alternator	1 x Meter Interface
1 x MasterBus USB Interface	2 x Alpha Pro charge regulator	1 x CZone Network Bridge Interface

Volvo Ocean Race power system



Innovative electrical system for VW Crafter Special Command Unit

German vehicle modification specialist Bösenberg creates mobile command vehicles that are equipped in a way that perfectly matches their specialised use and ensures absolute user-friendliness during operation. With its newest concept, Bösenberg raised the bar even higher. The new VW Crafter Mobile Command Unit makes the most of the capacities of the new Volkswagen Crafter by connecting Mastervolt's electrical power system with the vehicle's own CANbus. Combined information from both sources is visible on the dashboard screen.

Responding to a request by Volkswagen Commercial Vehicles, Bösenberg and Mastervolt joined forces to develop a firefighting command vehicle based on the new Volkswagen Crafter. The interior was designed and built by Bösenberg and equipped with a dedicated Mastervolt electrical system, with our Lithium Ion Ultra battery powering all the mission-critical AC and DC equipment on board.

QUOTE

"By linking the vehicle's data to the Mastervolt system and vice versa we have created the possibility to control and monitor the electrical system via the car's navigation screen. It is a very innovative example of smart system integration that is unique in the market. Mastervolt's Amperian also gives us the possibility of remote service."

MICHAEL STEINER, MANAGING DIRECTOR WALTER BÖSENBERG GMBH, GERMANY

Apart from the custom interior, Mastervolt and Bösenberg were asked to make use of one of the new Crafter's most interesting features – the ability to have the electrical and other systems monitored and controlled from the vehicle's dashboard and/or via a smartphone app. To facilitate this, the two companies designed the first ever integration of a Mastervolt electrical system with a vehicle's own CANbus system. The resulting system sets a new standard in its class in terms of interior layout, in-vehicle automation and ease of use.

For Mastervolt, this development is a crucial step in our mission to be the market leader in autonomous power systems that offer unprecedented ease of use. With electrification and smart connectivity being two of the main trends in the professional automotive market, this extraordinary partnership with Bösenberg and Volkswagen Commercial Vehicles sets the tone for other upcoming innovations.

The basics

- Absolutely fail-safe components and straightforward communication in all circumstances.
- Operation and monitoring of the electrical system via dashboard touchscreen and/or smartphone app.
- Full integration of the vehicle's own CANbus system with Mastervolt's electrical system.
- Connection to the new Volkswagen Crafter's customer-specific function module for the control and monitoring of components such as lighting via the vehicle's navigation display.

Energy consumption

The system was designed to enable life-saving missions without the engine running and without 230 V grid connection.

DESCRIPTION	POWER	NUMBER X POWER X TIME	CONSUMPTION PER MISSION
AC consumers			
Printer	25 W	1 x 25 watt x 5 hr	= 0.125 kWh
General AC socket	35 W	1 x 35 watt x 5 hr	= 0.175 kWh
DC consumers			
Blue and warning lights	45 W	2 x 45 watt x 5 hr	= 0.450 kWh
Interior lights	5 W	8 x 5 watt x 5 hr	= 0.200 kWh
Portable equipment charger	20 W	1 x 20 watt x 5 hr	= 0.100 kWh
Communication system	120 W	1 x 120 watt x 5 hr	= 0.600 kWh
Workstations	60 W	2 x 60 watt x 5 hr	= 0.600 kWh
Total AC and DC consumers			**= 2.25 kWh**

System choice

Battery: MLI Ultra 12/2500

The use of MLI Ultra 12/2500 Lithium Ion technology ensures the longest possible autonomy for the mobile command vehicle within the existing weight restrictions. This allows the command vehicle to fulfil its lifesaving missions without keeping the engine running on location.

Inverter/charger combination: Mass Combi 12/1600-60

The combined inverter/charger allows the vehicle's batteries to be charged with a plug-in connection on site, or the system to run on AC power during a mission. At the same time it ensures that firefighters always have a live AC socket available inside the vehicle, even when running fully on batteries. Everything is optimised to be as lightweight as possible.

Monitoring: EasyView 5

In addition to the full system information being available on the vehicle's dashboard screen and on the commander's smartphone, an EasyView 5 display has been installed in the back of the vehicle where the command station workplaces are placed. This ensures that all the relevant data is always within reach there too.

Monitoring: Amperian Interface

Mastervolt's internet-based Amperian platform is a powerful digital assistant that keeps an eye on your Mastervolt power system. Mastervolt recently designed a new interface to access the benefits of Amperian which connects to the internet using a secure Ethernet or WiFi connection. The Amperian Interface can reach every individual MasterBus device within a system, enabling continuous remote access. Moreover, Amperian can be set to alert users automatically in case of any issues.

DC-DC charger: Mac Plus 12/12-50

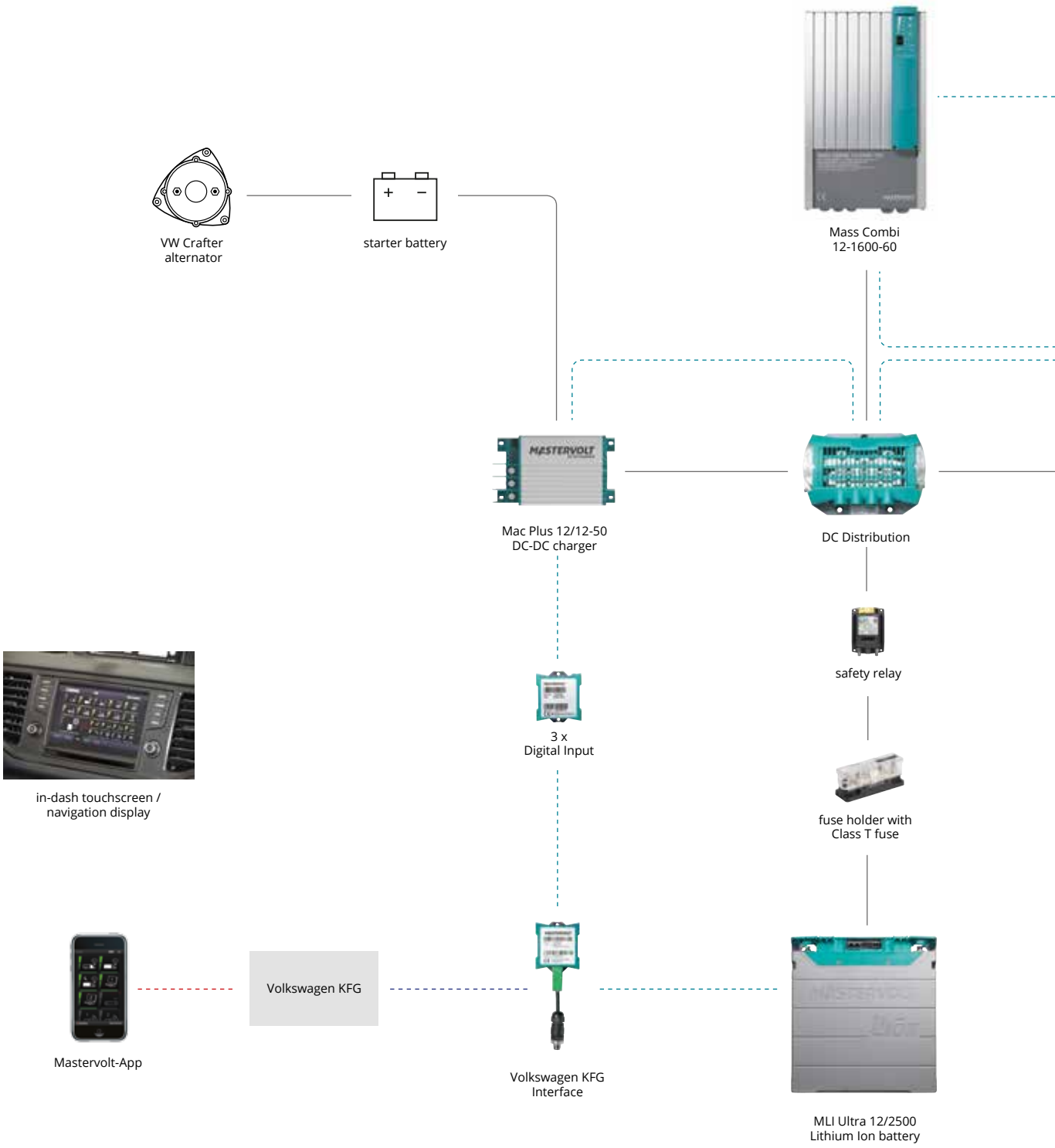
This DC-DC charger is Mastervolt's latest innovation, and is the Euro 5/6-compliant solution for proper charging of the Mastervolt Lithium Ion battery which powers the command station. The Volkswagen Crafter carries a smart alternator to comply with the latest Euro 6 emission standards, and this makes it challenging to get a secondary battery fully charged while driving in case of a traditional system. Our DC-DC charger solution brings an end to this problem.

Other system components

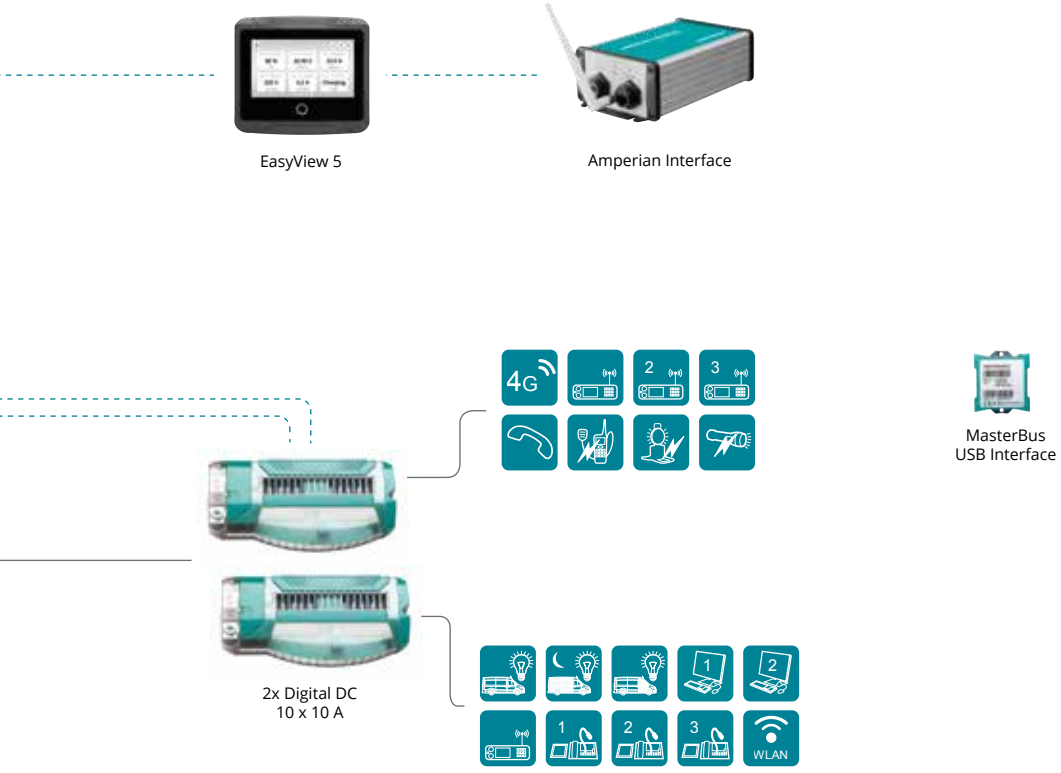
- 2 x Digital DC 10x10A;
- 1 x DC Distribution 500;
- 1 x safety relay;
- 1 x Class T fuse with fuse holder;
- 1 x Volkswagen KFG Interface;
- 1 x MasterBus USB Interface;
- 3 x Digital Input.


FEUERWEHR

System drawing



Electrical system for Special Command Unit

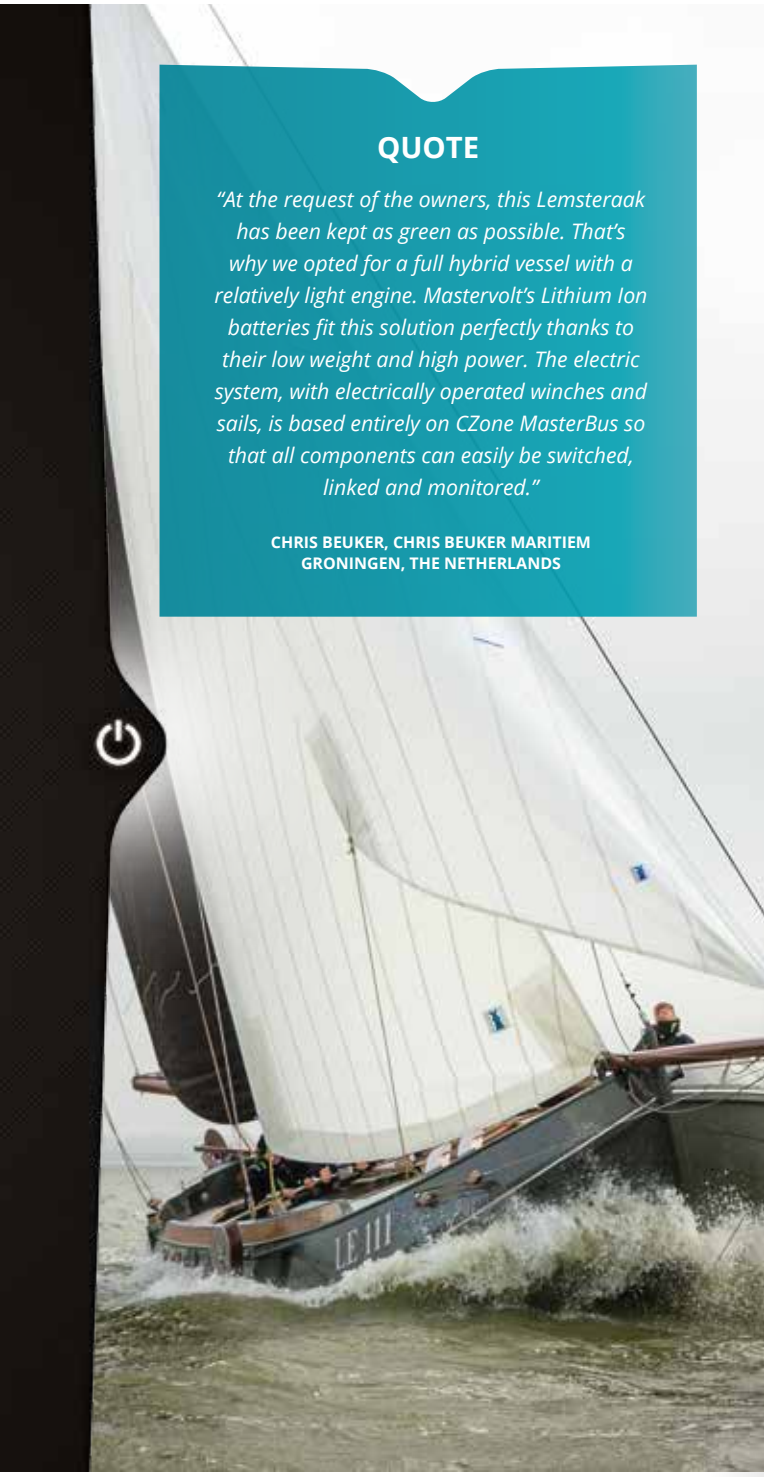


12 V network
MasterBus network
CANbus network
WiFi communication

Products used	
1 x Mass Combi 12/1600-60	1 x MasterBus USB Interface
1 x EasyView 5	1 x safety relay
1 x Amperian Interface	3 x Digital Input
1 x Mac Plus 12/12-50 DC-DC charger	1 x Class T fuse with fuseholder
1 x DC Distribution	1 x MLI Ultra 12/2500 Lithium Ion battery
2 x Digital DC 10 x 10 A	1 x Volkswagen KFG interface

Contemporary hybrid solutions
Ultramodern electrical system for traditional fishing vessel

Chris Beuker Maritiem in Groningen was commissioned by Jos Jellema in 2016 to build a cutting-edge new Lemsteraak. This 12.85-metre vessel had to fully meet the needs of the client, with the basic concept being a boat that could be sailed by the owners "until we're 70".



QUOTE

"At the request of the owners, this Lemsteraak has been kept as green as possible. That's why we opted for a full hybrid vessel with a relatively light engine. Mastervolt's Lithium Ion batteries fit this solution perfectly thanks to their low weight and high power. The electric system, with electrically operated winches and sails, is based entirely on CZone MasterBus so that all components can easily be switched, linked and monitored."

CHRIS BEUKER, CHRIS BEUKER MARITIEM GRONINGEN, THE NETHERLANDS

Lemsteraken are traditional fishing vessels, and maintaining this distinctive appearance was an important part of the brief. As the many admiring articles written about this vessel – including in the leading magazine Spiegel der Zeilvaart – show, the designers, builders and owners ultimately did an excellent job. The result is a slimmer, more elegant vessel which combines extraordinary speed with a great deal of comfort.

In keeping with the spirit of the times, the vessel has a hybrid propulsion for quiet electric sailing, and accordingly has a Mastervolt Lithium Ion battery bank (6 x MLI 24/5000, suitable for 48 V with 15 kW capacity), enough for 4.5 hours of sailing at five knots. The battery bank can be fully charged again within 2.5 hours.

A CZone MasterBus system was fitted throughout the vessel in cooperation with Karyvo Sneek, who took care of the complete installation and control of all electronic components. All the necessary software is centrally accessible via a large touchscreen on the engine box. In addition to its other functions, the CZone system ensures that all winches (to operate the vessel and sails) are fully in compliance with the owner's requirements and can be operated from the cockpit.

An additional 12/2500 Mastervolt Li-ion battery was selected to supply the 12-volt consumers. This battery is separately charged with a ChargeMaster 12/50, which is connected to the switched output of the Mass Combi Ultra. Because the owners have a maximum shore supply of 16 A at their permanent berth, two shore connections were fitted, both feeding a 48-volt Mass Combi Ultra. This gives a charging capacity of 100 A and a total of 7 kW of inverter power for consumers such as a hob and a cooker.

The owners are very pleased with both the system and the magnificent traditional vessel for guaranteeing silent and comfortable sailing. Moreover, the CZone system means that they can sail the boat alone, easily and without significant effort, and into their old age.

The basics

- The boat had to be set up in a way that would allow it to be easily sailed by an older person, which is why elements like winches and sails can be electrically operated.
- At the request of the owners, the vessel was made as green as possible, hence the light engine and electric primary propulsion.
- The electric sailing time of 4.5 hours at five knots is quite long. The battery bank can be fully charged again with the help of the engine.

System choice

Inverter/charger combination: 2 x Mass Combi 48/3500-50

The Mass Combi Ultra is a 50 A battery charger, 3500 W inverter and AC transfer system in one. The Combi can be used for all energy sources such as the generator, shore power and batteries. It automatically controls and distributes power, seamlessly connecting the available sources. As a result, batteries are always sufficiently charged and there is a stable AC voltage for the use of electrical equipment on board. This all-in-one solution provides optimal ease of installation and comfort. The hybrid drive led to a choice of a 48-volt system in this case.

Battery: 6 x MLI Ultra 24/5000

The MLI Ultra Series offers the best lithium-ion technology for the toughest conditions. To ensure they can handle high charge/discharge current, humid environment, mechanical shocks and vibrations, the MLI Ultra batteries have a rugged, waterproof casing and a smart Battery Management System (BMS), in addition to a selection of the best lithium-iron phosphate cells.

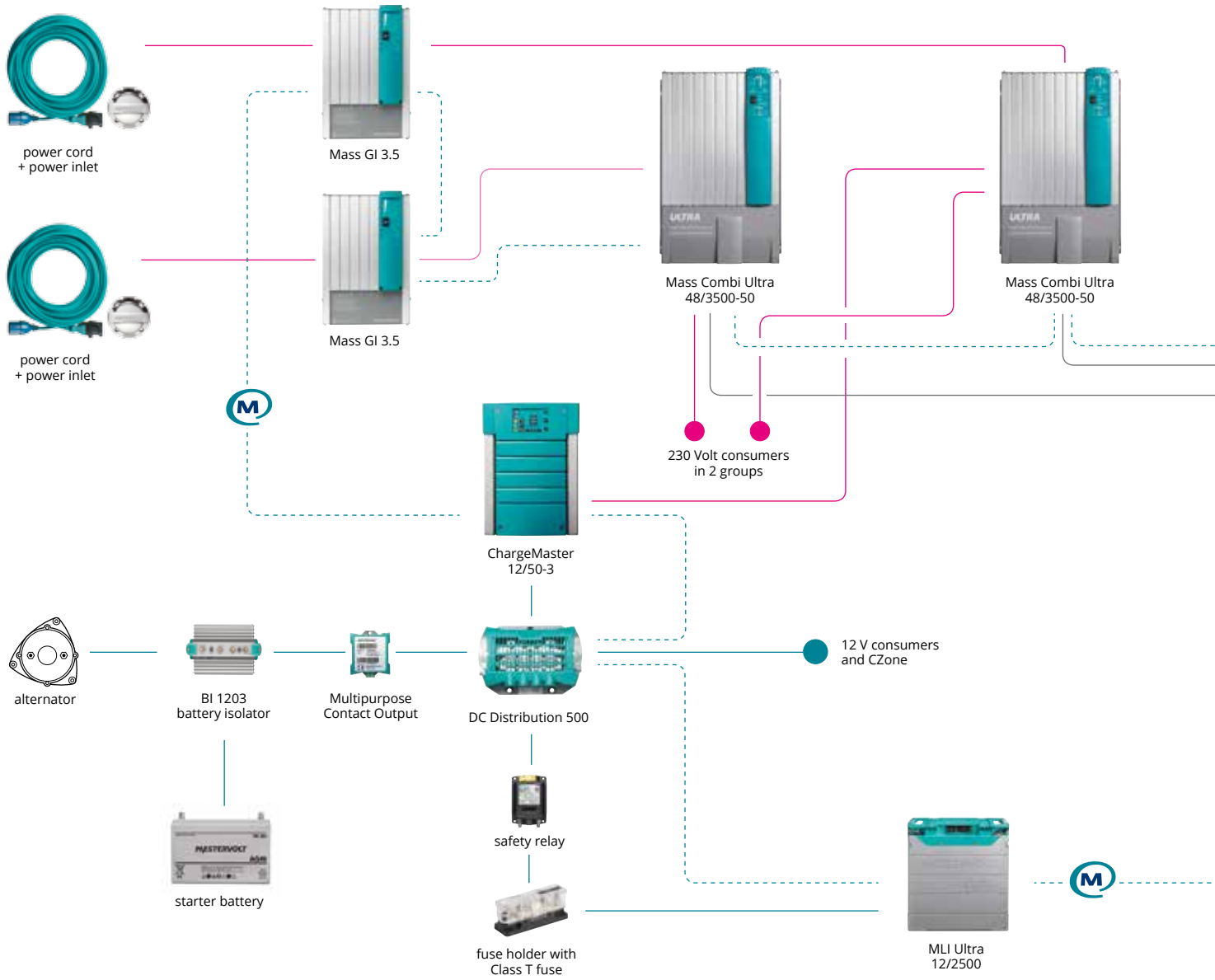
Operation: Wireless Interface + WI MasterBus connector

Using the Wireless Interface and freely downloadable Mastervolt app, the entire system can be monitored and controlled via iPad. The Wireless Interface creates a wireless connection between the iPad and the Mastervolt system and can also function as ‘client’ of the main router. The benefit here is that you can log in to a single WiFi network to use the internet and other applications.

Other system components

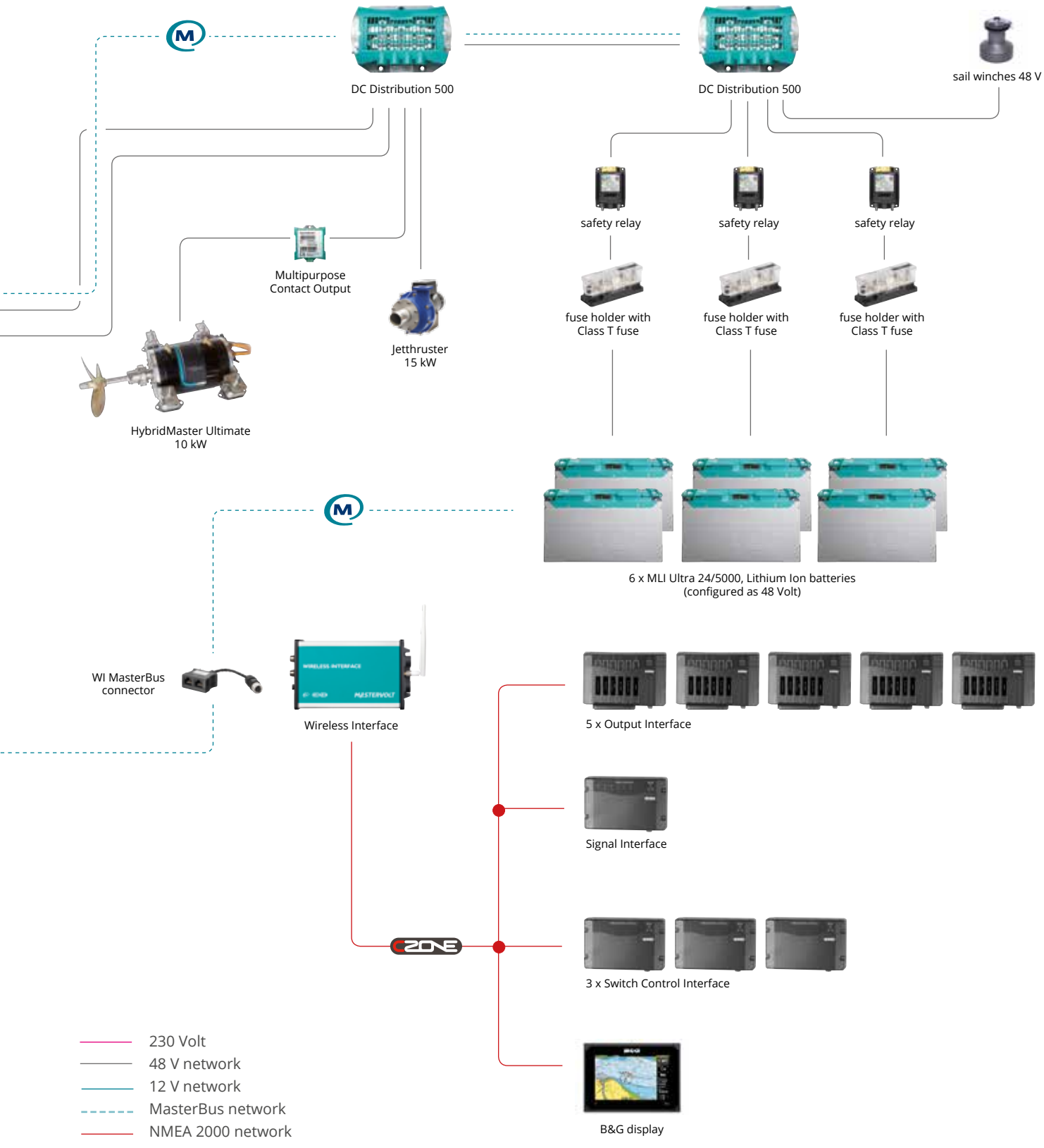
- 2 x 16 A power cable, 25 metres;
- 2 x power inlet 2+PE, 16 A/ 230 V;
- 2 x Mass GI 3.5kVA/16A, lightweight isolation transformer for the safe use of shore power; very important for preventing electrolysis and corrosion of steel or aluminium boats;
- 3 x DC Distribution 500, connects a maximum of four DC devices to each DC group;
- 1 x ChargeMaster 12/50-3 battery charger;
- 1 x MLI Ultra 12/2500 Lithium Ion battery, for the 12-volt consumers;
- 1 x starter battery AGM 12/90;
- 1 x BI 1203-S battery isolator, for the charging of the starter battery with the original alternator;
- 2 x Multipurpose Contact Output;
- 4 x safety relay;
- 4 x Class T fuse with fuse holder;
- 1 x HybridMaster Ultimate, hybrid drive for electric sailing;
- 5 x Output Interface;
- 1 x Signal Interface;
- 3 x Switch Control Interface.

System drawing



Products used		
2 x power cord + power inlet	3 x DC Distribution 500	1 x WI MasterBus connector
2 x Mass GI 3.5	4 x safety relay	1 x Wireless Interface
2 x Mass Combi Ultra 48/3500-50	4 x fuse holder with Class T fuses	5 x Output Interface
1 x ChargeMaster 12/50-3	1 x AGM 12/90 starter battery	1 x Signal Interface
1 x BI 1203 battery isolator	1 x MLI Ultra 12/2500, Lithium Ion battery	3 x Switch Control Interface
2 x Multipurpose Contact Output	6 x MLI Ultra 24/5000, Lithium Ion batteries	

Lemsteraak system



Hybrid applications

Mastervolt aims to contribute to a green future with electric and hybrid drives. The careful use of Mastervolt components makes it possible to electrically power systems which are normally (hydraulically) driven by combustion engine PTOs.

Brief peak capacities that provide power from the batteries via inverters make the system more efficient and prevent any unnecessary use of often oversized generators, which are both polluting and require expensive maintenance.

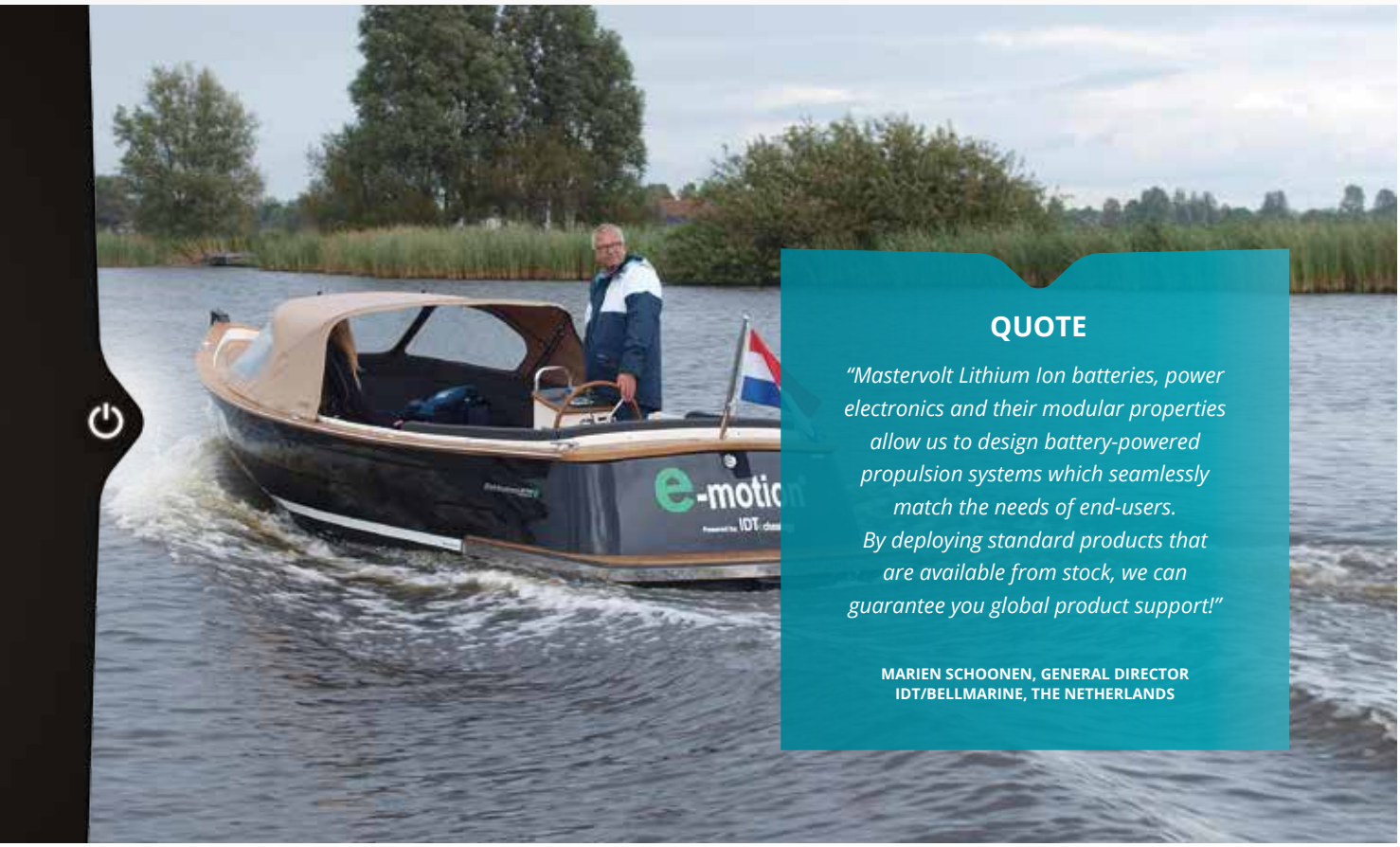
In its place we have a smart system that efficiently supplements the limited generator capacity (peak shaving) or even makes it entirely redundant. The use of efficient and high-energy Lithium Ion batteries means it is even possible to charge the batteries using brake power and solar panels.

Tailored advice

Mastervolt works closely on electric engines and controllers with partners who have a solid reputation for battery-powered propulsion technology. Together with Mastervolt, these specialists will be pleased to explain the best propulsion solutions and related prices and delivery details. In this way, Mastervolt provides a contemporary solution for composing bespoke propulsion systems!

The power of electric and hybrid propulsion

Mastervolt is a specialist in the conversion, storage and management of electric power. Our battery chargers, inverters, digital switching systems, Combis and Lithium Ion batteries are global market leaders. Combined with your electric propulsion, these components represent the perfect building blocks for a safe and fully reliable electric system. Our smart solutions are super-quiet, exceptionally clean and can be fully integrated with any system.



QUOTE

"Mastervolt Lithium Ion batteries, power electronics and their modular properties allow us to design battery-powered propulsion systems which seamlessly match the needs of end-users. By deploying standard products that are available from stock, we can guarantee you global product support!"

MARIEN SCHOONEN, GENERAL DIRECTOR IDT/BELLMARINE, THE NETHERLANDS

MORE INFORMATION ■ BELLMARINE.NL

An example is the hybrid system solution shown above, which we developed in cooperation with FrieslandCampina. To achieve the emission targets that Campina set for itself, it developed a hybrid version of a milk truck in partnership with Van der Mierden transport, De Burgh Acht, ID-Technology and Mastervolt.

In this system, the pumps which move milk from the tanks at the farm into the tanker truck are electrically driven by 48 V motors. The power is provided by two Mastervolt MLI 24/5000 Lithium Ion batteries, which are in turn charged by a 48 V generator (electric motor) mounted on the moving vehicle, as well as by solar panels fitted on the tanker. The generator transforms braking energy produced by the vehicle into electricity.

Conventional milk pumps are driven by hydraulic engines on the vehicle's PTO, which makes the system hugely inefficient and means the engine requires far more maintenance due to contamination. This hybrid system now saves about 30 % in fuel consumption, reduces engine maintenance costs by some 15-20 %, and in practice hugely decreases the cleaning costs linked to soot in the engine.

The Selders system
Tim Selders' Mercedes Sprinter: not just another motorhome

Tim Selders, the owner of a self-built motorhome based on a four-wheel drive Mercedes Sprinter, is an adventurer and a perfectionist. He did a great deal of research before deciding on the final shape of his ideal motorhome, even creating a full cardboard mock-up of his interior design in a container.

QUOTE

"As I designed and built most of my Mercedes camper myself, I did lots of research into the electrical system on the internet and during visits to exhibitions. I was looking for a better and more robust system than anything readily available on the market. This is how I came across Mastervolt, and eventually had my system setup designed by Mastervolt's engineers and their service partner Amrit Watersport in Arnhem."

TIM SELDERS, THE NETHERLANDS
OWNER OF MERCEDES SPRINTER 4X4 MOTORHOME

The electrical system was subject to the same level of consideration and scrutiny by Selders. It had to be better and more robust than most of the systems he had seen during many visits to motorhome exhibitions. Searching the internet he came across Mastervolt, and ultimately had his system designed by our engineers along with service partner Amrit Watersort in Arnhem.

It was clear from the get-go that this electrical system would, in addition to having reliable and solid components, have to be exceptionally smart and have the option to be operated from an iPad. The solution for meeting this particular set of requirements was Mastervolt's intelligent network technology: MasterBus and CZone. Linking these two network structures together via the Wireless Interface created a flexible network with endless automation and monitoring possibilities for Selders' Mercedes. Together with a balanced choice of components, this resulted in a well thought-out power system, one that was more than sufficient to function without mains power for quite a while.

Full control

Based on the premise that the various components can communicate with each other, highly convenient modes of operation were created in consultation with the owner. This placed full control of an activity or group of activities at the fingertips of the driver or travel companion. A good example is the 'Camping' button, which launches a series of actions:

- The blinds adopt a suitable position.
- The window on the side door is darkened with a special kind of film, which turns clear or dark depending on the voltage to which it is subjected.
- All internal electronics adapt to the camping position.

All system consumers can also of course be separately switched on and off via the iPad. The tablet also provides information about outdoor & indoor temperature and the available drinking water and wastewater capacity.

The basics

- Monitoring and operation via a single display, in this case an iPad. The tablet also provides readouts of data such as battery status and inverter capacity.
- The capacity to create handy modes of operation: complete convenience at the press of a button.
- Long periods of independence from the grid.
- Charging grid power without thinking: as soon as there is a mains connection, the Combi links it directly to the AC consumers while also charging the Lithium Ion battery in parallel.

Energy consumption

The biggest daily AC consumers in the Mercedes include several LED groups for lighting, a refrigerator, kitchen appliances, a smart screen and underfloor heating. The design of the system also takes into account a number of 'free' consumers to be determined.

System choice

Battery: MLI Ultra 12/2500

The battery is the heart of the electrical system in this motorhome. Given the space limitations, both the size and capacity of the battery were highly relevant. This is why the owner and installer opted for the highly compact MLI Ultra 12/2500 Li-ion battery providing no fewer than 180 amp-hours. Thanks to this mini power station, the motorhome can spend a night in a place without any mains connection – ideal for independent and adventurous travel, with no prior arrangements necessary.

Inverter/charger combination: Mass Combi 12/1600-60

This battery charger and inverter in one has an inverter capacity of up to 1600 watts. That means there is always energy for heavy AC consumers, such as the TV and Nespresso coffee machine.

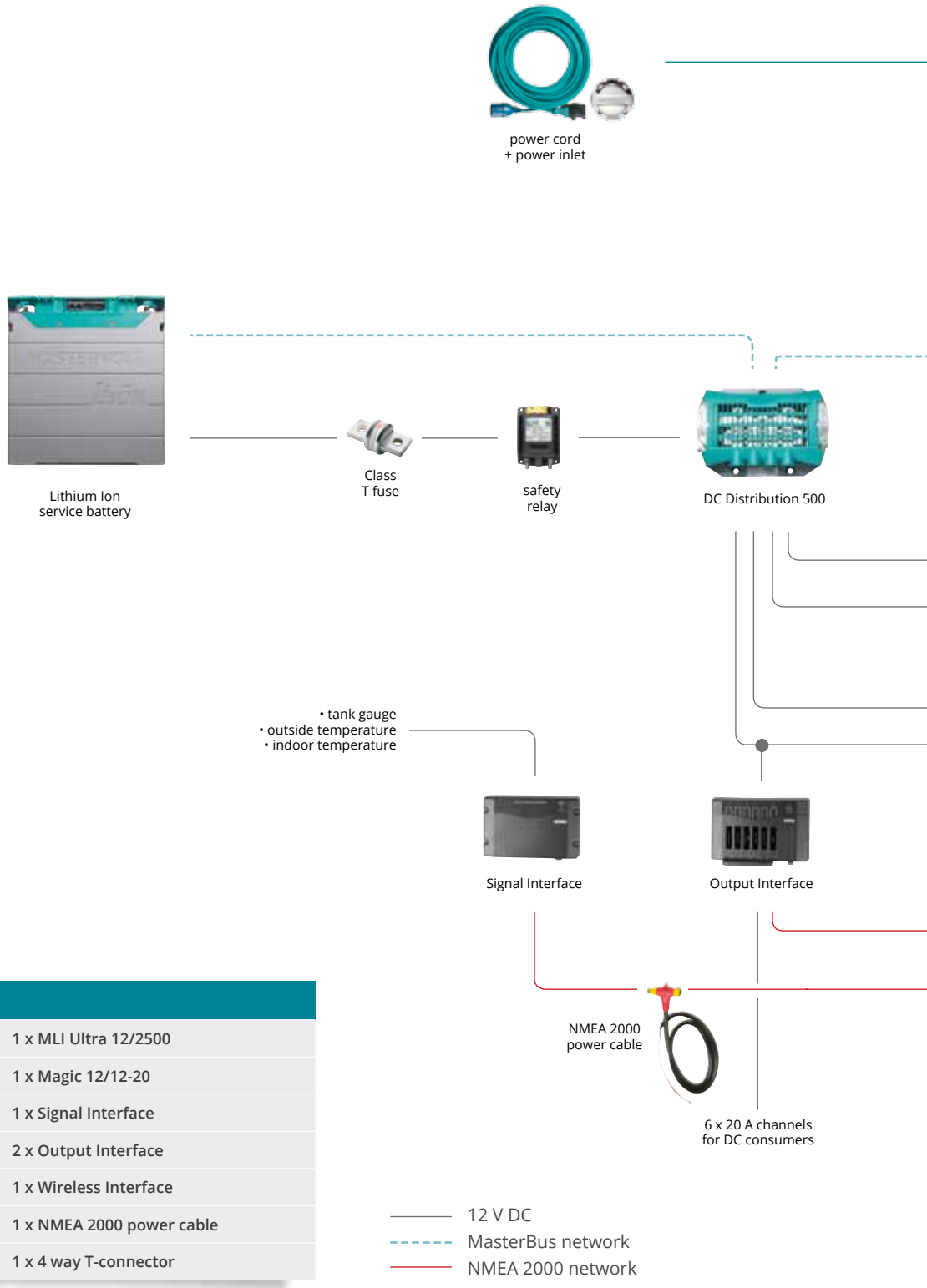
Digital switching: Wireless Interface

The Wireless Interface and free downloadable app allow the entire system to be monitored and operated via iPad. The Wireless Interface provides for a wireless connection between the iPad and the Mastervolt system, and can also act as a client for the main router. This has the advantage of letting users log onto one wireless network to use both the internet and other applications.

Other system components

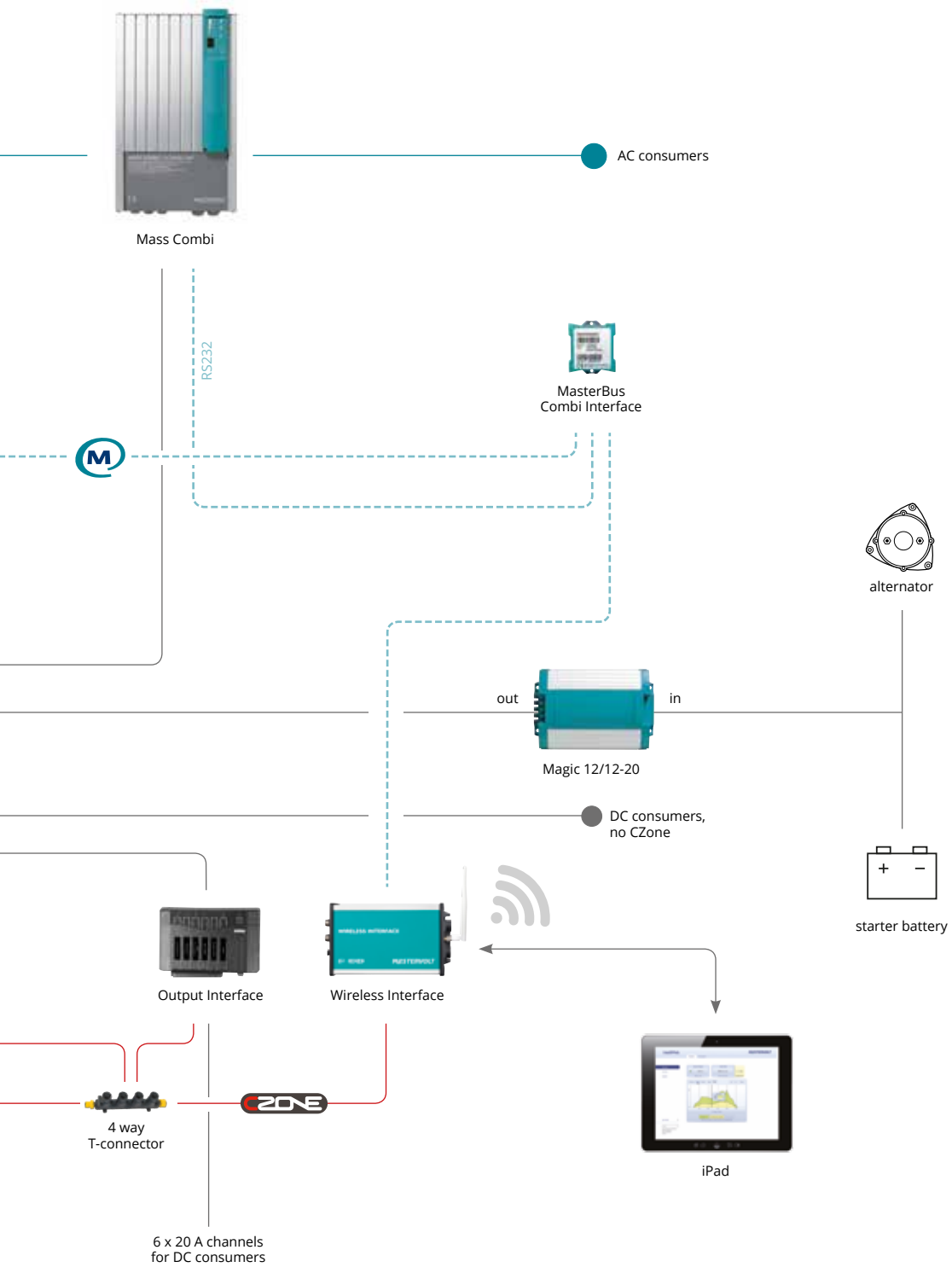
- 1 x power cord, 16 A, 25 metres;
- 1 x 16 A/230 V power inlet;
- 1 x MasterBus Combi Interface;
- 1 x DC Distribution 500;
- 1 x safety relay;
- 1 x Class T fuse;
- 1 x Magic 12/12-20;
- 1 x Signal Interface;
- 2 x Output Interface.

System drawing



Products used	
1 x power cable 16 A, 25 mtr	1 x MLI Ultra 12/2500
1 x power inlet 16 A/230 V	1 x Magic 12/12-20
1 x Mass Combi 12/1600-60	1 x Signal Interface
1 x MasterBus Combi Interface	2 x Output Interface
1 x Class T fuse	1 x Wireless Interface
1 x safety relay	1 x NMEA 2000 power cable
1 x DC Distribution 500	1 x 4 way T-connector

Motorhome Tim Selders



The FLiDAR system
Measuring the power of the sea with Navex Elektro Belgium

The FLiDAR measurement buoy represents a major breakthrough for the offshore wind industry, enabling major cost reductions for offshore wind resource assessments. Development companies considering the deployment of new marine renewable technologies such as offshore wind, wave and tidal energy will find the FLiDAR very useful. It can be deployed in one day and delivers highly accurate data throughout the project development, with real-time data access. It has been proven to measure wind potential with an accuracy equivalent to fixed offshore met masts, regardless of the sea state.

The business concept of FLiDAR is based on a rental model with data service agreement, minimising financial risk and maximising flexibility for the customer. As quality, dependability and full-time availability are key aspects, the developers of FLiDAR turned to Navex Elektro and Mastervolt for the onboard energy supply.

Energy consumption

DESCRIPTION	NUMBER	AVG. POWER	HOURS/DAY	DAILY CONSUMPTION
AC consumers				
Wireless broadband communication (Iridium Pilot)	2	31 W	24 hr	1.490 kWh
4G router	1	14.6 W	24 hr	0.350 kWh
Solid State PC's	3	8.3 W	24 hr	0.600 kWh
Remote wind measurement system (LiDAR)	1	65 W	24 hr	1.560 kWh
Satellite positioning (Septentrio)	1	10 W	24 hr	0.240 kWh
Other	1	18 W	24 hr	0.430 kWh
Total AC consumers				**= 4.670 kWh**
Sources				
Solar panels	21	50 W	8 hr	0 to 8.400 kWh
Wind generators	4	40 W	24 hr	3.840 kWh
Grid connection	1	7000 W		
Total sources				**= 3.840 to 12.240kWh**

The basics

- To ensure full-time operation at sea, long periods of autonomous power supply must be guaranteed, even when solar and wind power generation are far below average.
- All power needs to be supplied at either 12 V or 24 V DC.
- Measuring and controlling all (redundant) onboard energy consumers and sources remotely, again to ensure full-time operation and, if necessary, timely service.

System choice

A crucial decision for this application was the type of batteries to be used.

Batteries: 12 x MLI Ultra 24/5000

Lithium Ion technology was chosen for its low weight, volume and, most importantly, extremely high 'round-trip efficiency'. Storing energy in these batteries and subsequently using that same energy for the onboard consumers has an efficiency of > 90 %, meaning that energy losses are reduced by up to a factor of three compared to traditional batteries. To ensure the FLiDAR buoy will maintain its measurements and communication even during periods of cloudy days and little wind, it was decided to install two battery banks each of six MLI Ultra 24/5000s with a combined capacity of 60 kWh. This battery capacity means the buoy can operate for approx. two-week periods with no sun or wind at all, or a period of two months of average wind and no sun.

Digital distribution

To remotely monitor and control the various onboard energy sources and consumers, all necessary system information is combined using MasterBus. A combination of digital switching products and Tank Level Interfaces (measuring current through a custom interface) ensures that all power flows are measured and switchable while environmental properties like temperature and humidity are also calculated.

For redundancy purposes, the two battery banks can be separately switched by using 500 A safety relays controlled by Multipurpose Contact Output interfaces. This can all be done remotely by the integration of a GPRS Module in the MasterBus system.

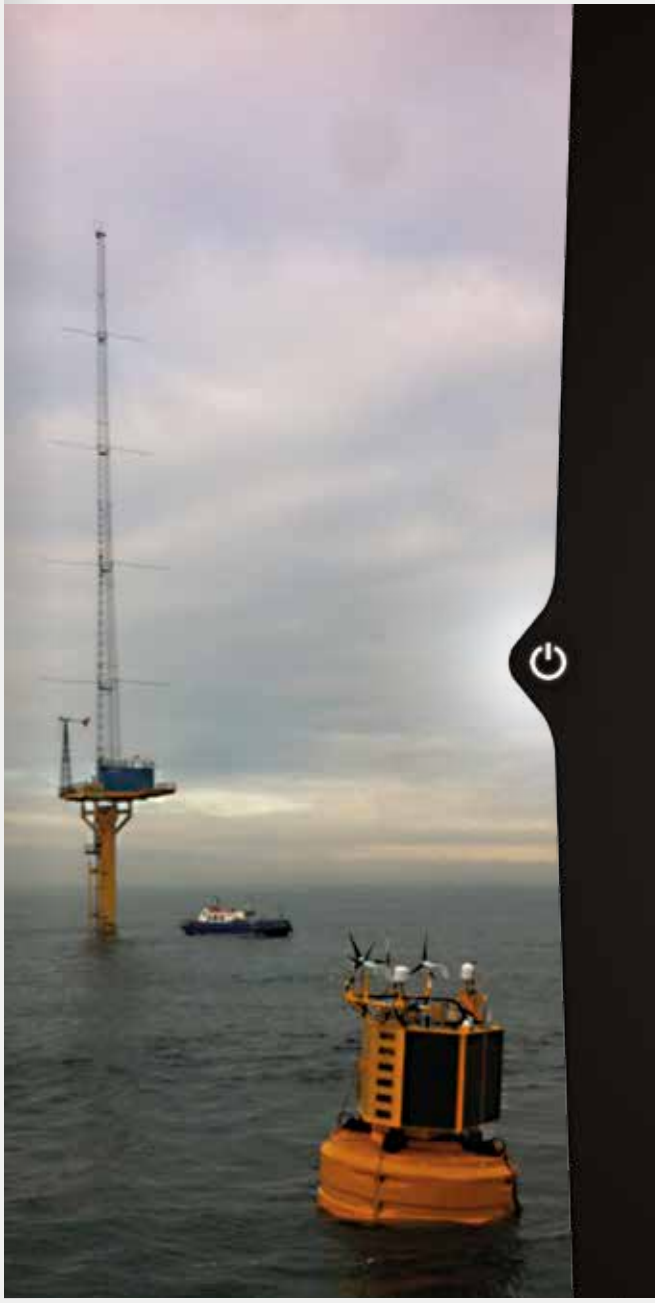
- 2 x MasterShunt 500
- 2 x DC Distribution 500
- 8 x Digital DC 10x10A
- 20 x MasterBus Tank Level Interface
- 1 x Digital Input
- 1 x GPRS Module
- 4 x Multipurpose Contact Output

Voltage conversion: 5 x DC Master24/12-12A

The 24 V consumers are supplied directly by the batteries, a set of five DC Master 24/12 (DC-DC converters) convert the voltage to supply the 12 V consumers.

Battery charger: 3 x ChargeMaster 24/100

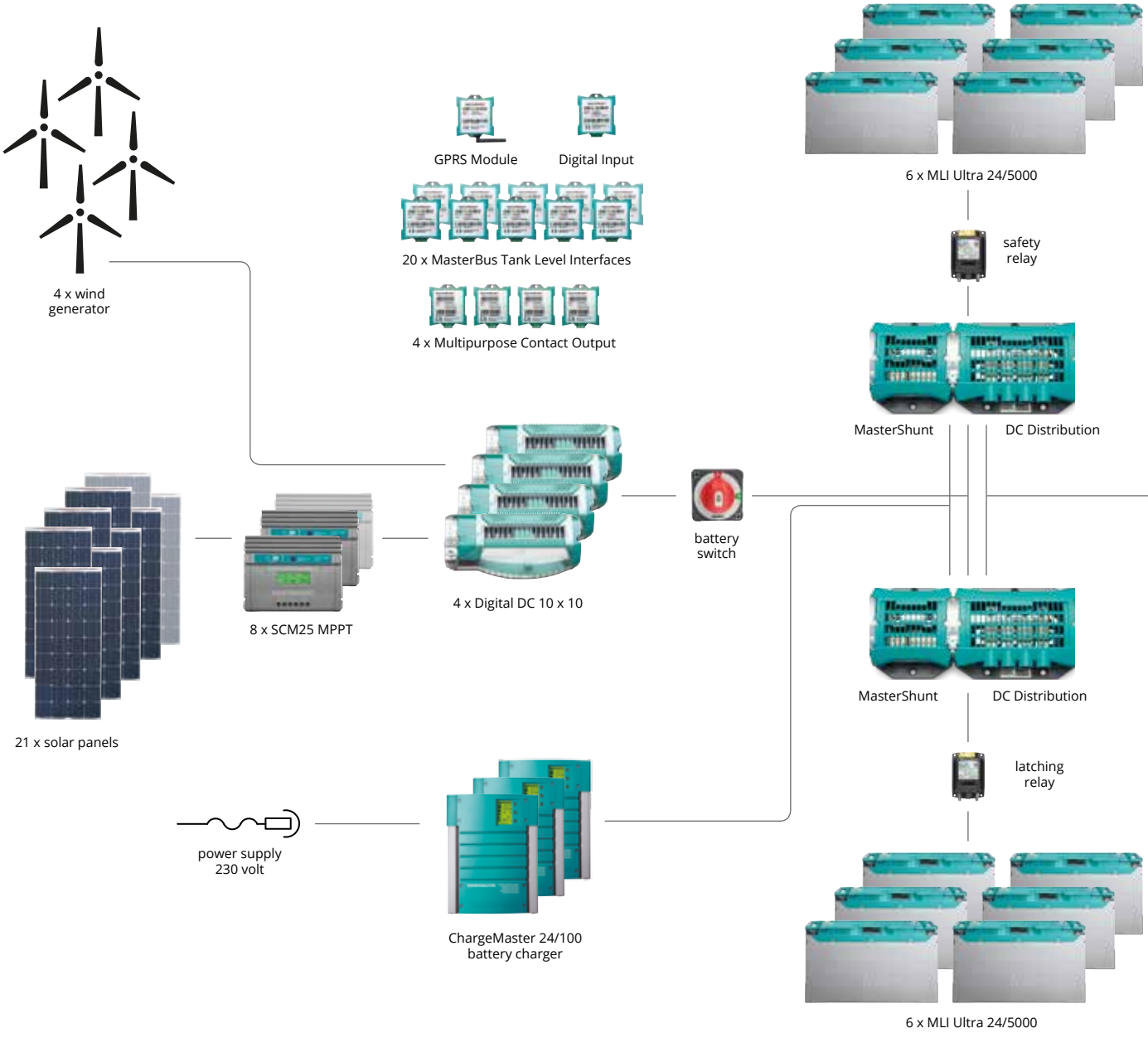
The buoy can be plugged into the grid when not at sea, charging the MLI Ultra batteries through a set of ChargeMaster battery chargers.



Other system components

- 8 x SCM25 MPPT solar charge regulator; to efficiently charge the Lithium Ion batteries via the solar panels.
- 14 x safety relay 500 A
- 2 x Pro Installer 400A EZ-Mount on/off battery switch

System drawing



Products used		
1 x GPRS Module	14 x safety relay	2 x Pro Installer battery switch
1 x Digital Input	5 x DC Master 24/12-12A	8 x SCM25 MPPT solar charge regulator
20 x MasterBus Tank Level Interface	8 x Digital DC 10x10A	3 x ChargeMaster 24/100
4 x Multipurpose Contact Output	2 x DC Distribution 500	
12 x MLI Ultra 24/5000	2 x MasterShunt 500	

FLiDAR system

battery switch

DC Master 24/12-12A

DC Master 24/12-12A

DC Master 24/12-12A

2 x Digital DC 10 x 10

2 x Digital DC 10 x 10

wireless broadband communication

satelite communication

solid state PC

satelite positioning

Lidar measurement device

The Maisonneuve system
Lower costs and more eco-friendly milk collection for Maisonneuve

In France, as in other European countries, the dairy sector needs to constantly improve its productivity and competitiveness. It is currently going through a major restructuring. In order to reduce costs, the latest tanker trucks – such as those built by Maisonneuve – can hold up to 29,500 litres.

The trucks collect milk from various farms and deliver it on the same day. Originally they were equipped with a hydraulic pumping system, which was usually driven by the vehicle's engine. To optimise milk collection, Maisonneuve changed the pumping system to make it battery-driven, which means it can now be operated with the engine off.

Electric pumping has many benefits over hydraulics. The new system reduces energy consumption and maintenance costs and operates with less noise and gas emissions, while ensuring the same or better performance and quality standards as hydraulics.

Energy consumption

- Electric motor of the 24 V pump = 200 A.
- Measuring devices for the volume of milk transferred, sample collection, preheating = 5 A.

History

The first tests for a new pumping system were carried out in 2012 with lead batteries. The batteries had to be replaced every six months due to intensive use and the high number of charge/discharge cycles, however.

With the technical support of TECMAR, a Mastervolt distributor, and DP Fluide, which specialises in fluid transfer, Maisonneuve engineers instead developed a new, reliable and economical solution, which is now the most successful pumping system in Europe. The Mastervolt products were chosen for their quality and robustness in a challenging environment

To date, more than 150 vehicles have been equipped with this Mastervolt-based electrical pumping system, which Maisonneuve uses not only for the collection of milk but also for the distribution of other products such as concrete admixtures, AdBlue fuel additives and molasses.

The basics

- Ample autonomy.
- Fast charging while driving.
- Life cycle and intensive cycling up to 1000 cycles/year.

QUOTE

"The milk collection can be done through a hydraulic system, while the engine of the vehicle is off, which means less noise and exhaust emissions, and less maintenance. This system fully respects the environment and also the population of the farms. A simple, reliable and efficient system, with a touchscreen which can easily manage the pumping operations and the Lithium Ion battery. We are very happy with the choice of products we made, and the support of the Mastervolt team."

PATRICE HALAIS, SALES MANAGER MILK LOGISTICS MAISONNEUVE GROUP, FRANCE

System choice

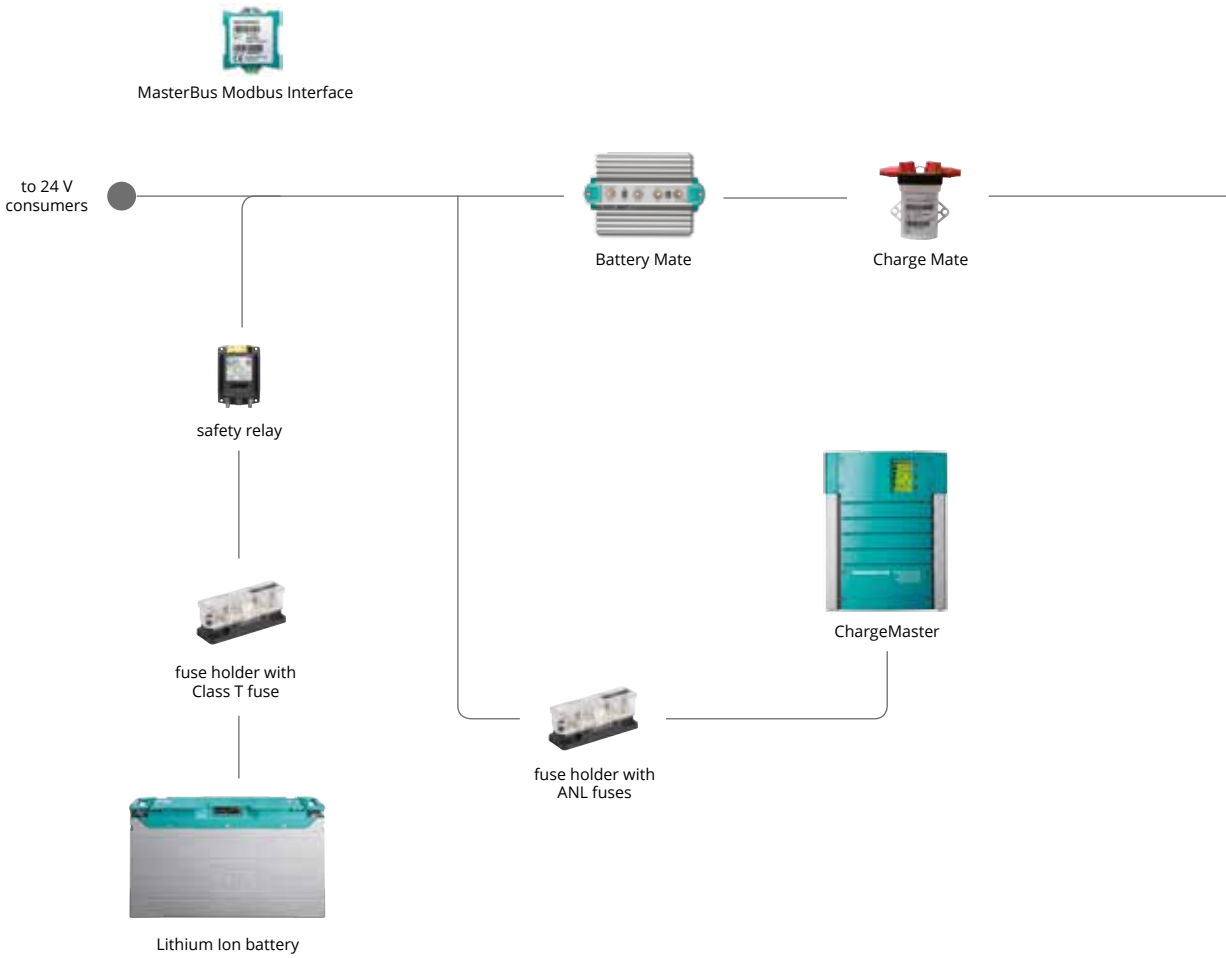
Battery: MLI Ultra 24/5000

This sturdy and highly efficient Mastervolt battery was chosen because it provides at least 2000 cycles at 80 % discharge depth and is a perfect solution for its role. Thanks to its very stable voltage, the power for the pump is consistent, allowing the performance to be improved by 10 %. In addition, the weight savings compared to lead batteries have allowed the payload of the tank to be increased, while the integrated electronic management (Battery Management System) ensures perfect operation safety.

Other system components

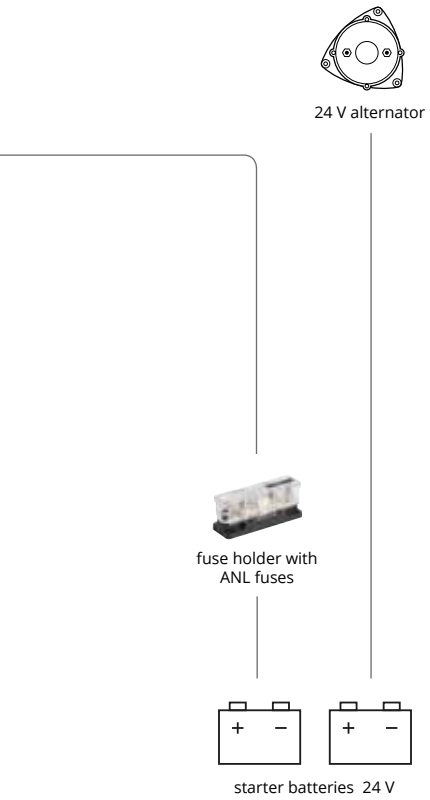
- 1 x ChargeMaster 24/80;
- 1 x safety relay 24 V;
- 1 x Battery Mate 2503;
- 1 x Charge Mate 2502;
- 1 x MasterBus Modbus interface;
- 1 x Class T fuse + fuse holder;
- 2 x ANL fuses + fuse holder.

System drawing



Products used	
1 x MasterBus Modbus Interface	1 x ChargeMaster 24/80
1 x Battery Mate 2503	1 x Class T fuse + fuse holder
1 x Charge Mate 2502	2 x ANL fuse + fuse holder
1 x safety relay 24 V	1 x MLI Ultra 24/500 Lithium Ion battery

Eco friendly truck



Mastervolt's Volvo Ocean Race system convinces Privateer Trawler owner

Mr Bol, owner of the beautiful Privateer Trawler 50 Bolwerk, did not take just anyone's advice when looking for the perfect electrical system. After consulting his project manager Henk Boer, he was referred to Arjen van Gent, shore manager of the Brunel Team in the 2015-16 Volvo Ocean Race. The basic principle for the system was to implement the same Lithium Ion Mastervolt technology that was used on the VOR boats.

Against this background, the owner and builder together sought out the most compact solutions which would nevertheless provide ample independence from grid power. Another important user requirement was fast charging time, which would keep the running time of the generator to a minimum: this led to the choice of an all-electric on board system. Based on the recommendation of Arjen van Gent, Bowlerk's owner was quickly convinced that all Li-ion batteries, right down to the one powering the sternthruster, should be made by Mastervolt.

The basics

- A state-of-the-art electric system that is convenient to monitor and operated intuitively, including links to the B&G navigation screens.
- High charging capacity: the entire service battery bank of six MLI 24/5000 (linked in parallel) charges up to 100% from the shore or from the generator in a very short time.
- Limited running time for the generator: two Alpha alternators power the connected consumers in parallel with the battery charging, further reducing the time that the generator is active.
- The charging sources receive all required battery information from the Lithium Ion batteries. This system is conceived to preserve the battery: overcharging is prevented and even cable losses are monitored and compensated during charging. This results in a 100 % efficient load every time.
- To save space, the battery charger, inverter and AC transfer system are combined within one casing.
- Due to the large loads, battery voltage is 24 V.
- Navigation, system data monitoring and power electronics are operated via a single display.

System choice

Inverter/charger: 3 x Mass Combi Ultra 24/3500-100

The system on board the Privateer Trawler 50 Bolwerk comprises three Mass Combi Ultras connected in parallel, giving a total inverter capacity of 10.5 kW and total battery charge of 300 amperes. Mastervolt's Mass Combi Ultra is a battery charger, inverter and AC transfer system in one. All energy sources, such as the generator, shore power or batteries, can be connected. The Combi regulates and distributes power automatically, seamlessly connecting the available power sources. This ensures that the batteries are always charged and users can count on a stable AC voltage on board.

Batteries: 7 x MLI Ultra 24/5000 *(of which one for the sternthruster)*

The high charging capacity of the system ensures that the entire user battery bank of six MLI 24/5000 batteries connected in parallel (30 kWh/1080 Ah) can charge to 100 % within a very short time. Thanks to the ingenious internal AC transfer system included in the Mass Combi Ultra, the battery bank can also be charged fully automatically, both from the shore and with the generator. This means that Bolwerk has a kind of floating power plant on board. Lithium Ion technology was also chosen for the sternthruster because of its low weight, small dimensions and extremely high efficiency.

QUOTE

"We wished to adapt the same Li-ion technology in our yacht – newly built by the Dutch yard Privateer Yachts – that is used on Volvo Ocean Race boats. We looked for a compact solution that would still give us broad autonomy: Mastervolt's technical experts at the headquarters in Amsterdam were very convincing so we opted for this Mastervolt system."

MR BOL, PROUD OWNER OF THE PRIVATEER TRAWLER 50 BOLWERK, THE NETHERLANDS

Power generation: 2 x Alpha 24/150 alternators + 2 x Alpha Pro charge regulator

Two high output alternators by Mastervolt, each with 150 amperes, are installed on the two propulsion engines. The corresponding Alpha Pro charge regulators ensure efficient three-step charging so that the batteries can be charged and maintained with 300 amperes also while underway. The alternators can also supply power to the connected consumers in parallel with the battery charging, allowing the running time of the generator to be reduced further.

MasterBus

Thanks to communication via MasterBus, the Lithium Ion batteries can easily be linked to all Mastervolt charging sources, providing those sources with all relevant information on the batteries. As a result, the batteries are charged safely and efficiently at all times. This unrivalled system concept preserves batteries, which cannot be overcharged as their status is continuously monitored. Even cable losses are passed on by the batteries and compensated for by the charging sources to ensure an exceptionally efficient charging process.

Digital switching: 5 x Output Interface, 4 x Signal Interface, 2 x Switch Control Interface, 1 x CZone MasterBus Bridge Interface, 1 x CZone Network Bridge Interface

The Privateer 50 Bolwerk is equipped with an advanced CZone digital transfer system, allowing the entire system to be controlled with only a few buttons.

- The CZone system ensures, for example, that the generator automatically comes online to charge the battery bank whenever it is almost empty.
- Fans in the engine compartment are automatically switched on by CZone when the temperature becomes too high.
- B&G navigation screens are integrated with the system. This makes it possible to operate and monitor the CZone digital transfer system and the Mastervolt power system entirely from these screens. CZone and MasterBus are linked through a CZone MasterBus Bridge Interface, with optimal transparency guaranteed!

Monitoring: EasyView 5

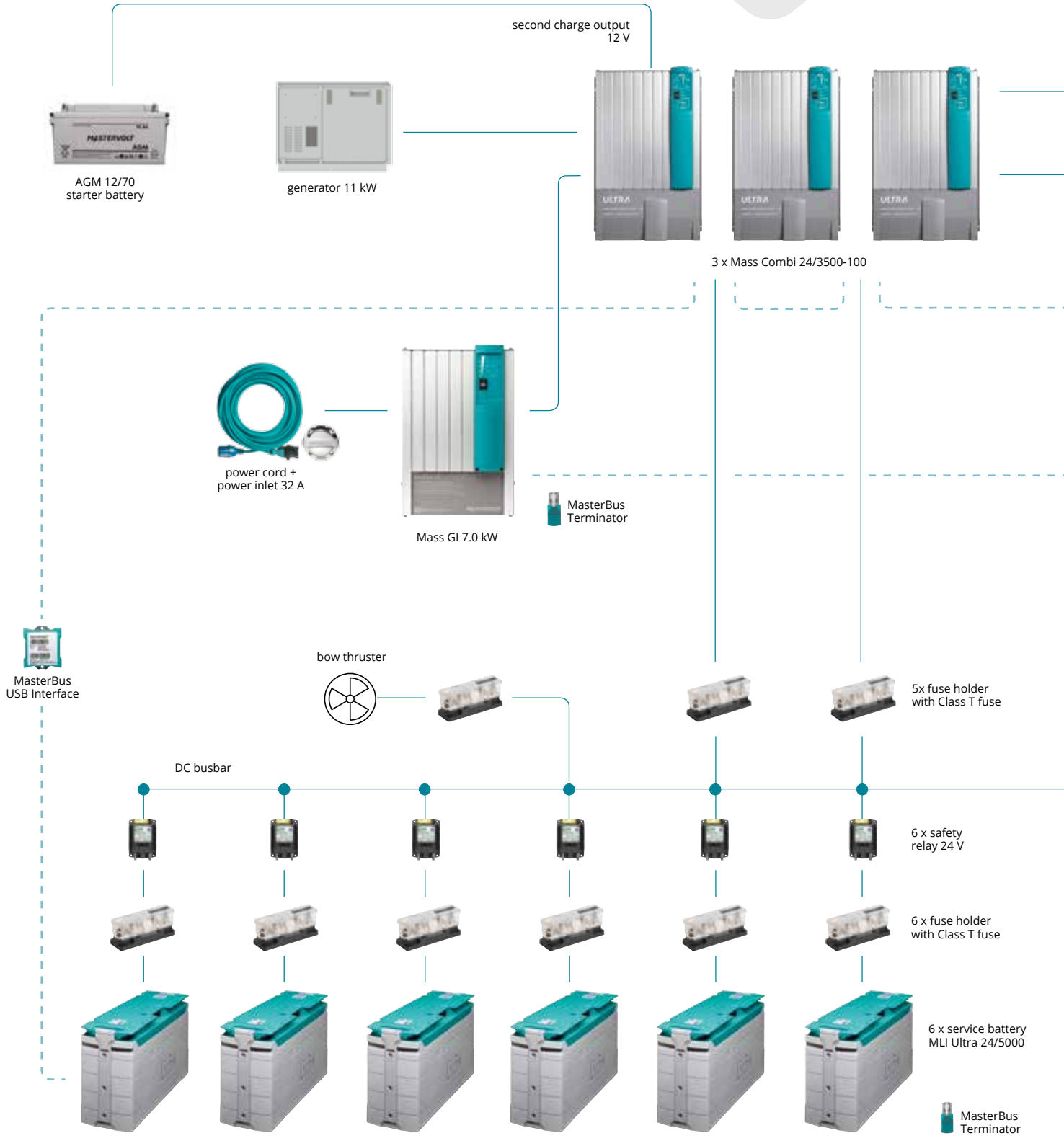
This waterproof system monitor with a screen that is legible in daylight is easy to read and operate. Thanks to the colour touchscreen and multilingual menu, the screen is a pleasure to use. The easily customisable 'favourites' pages display all relevant system information at a glance.

Other system components

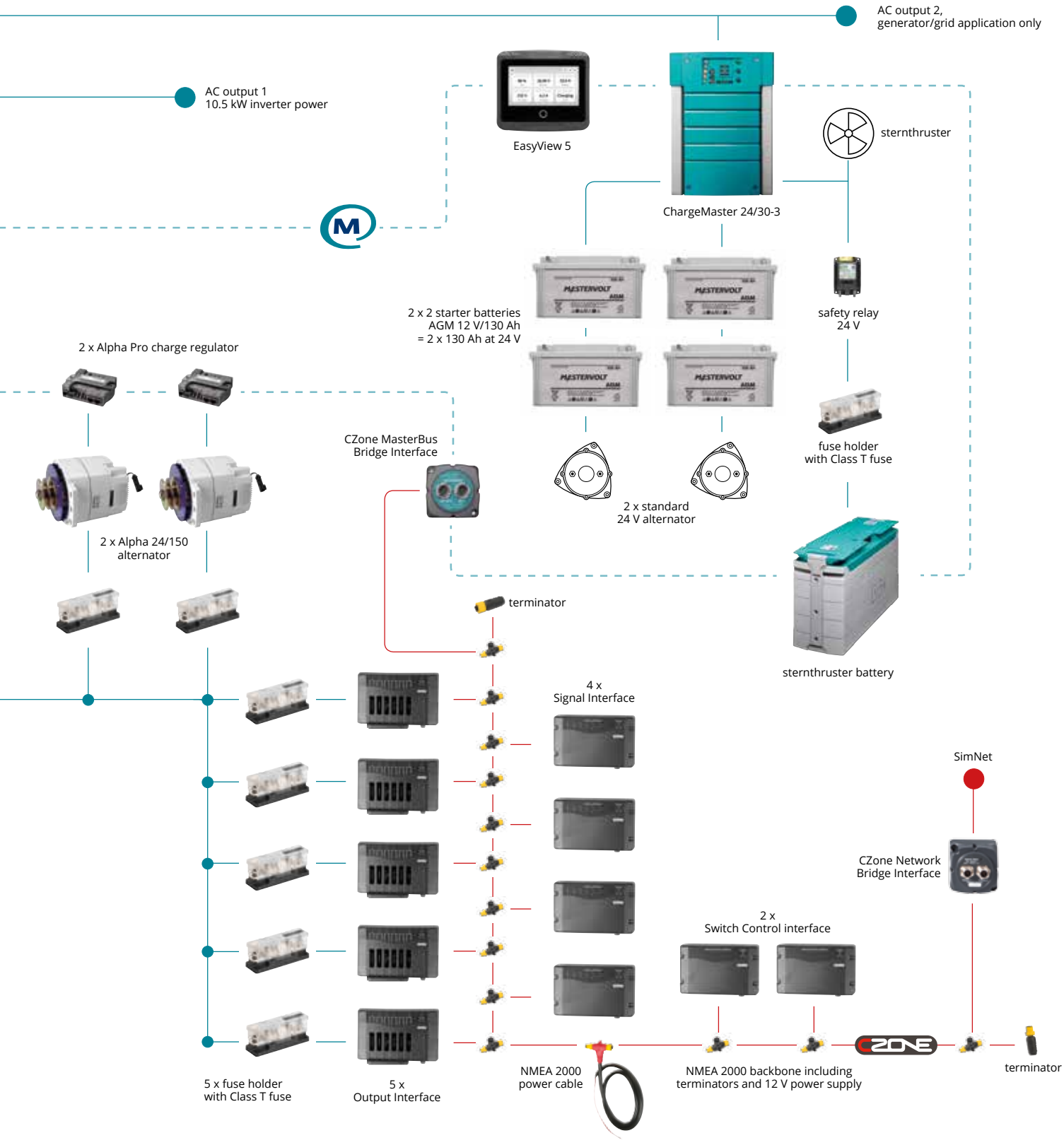
- 11 kW generator;
- 1 x AGM 12/70 starter battery;
- 4 x AGM 12/130 starter batteries;
- 1 x ChargeMaster 24/30-3 for charging and maintenance of sternthruster battery and starter batteries;
- 1 x Mass GI 7; lightweight isolation transformer for the safe use of shore power, vital in preventing electrolysis and corrosion;
- 1 x MasterBus USB Interface;
- 1 x power cord 32 A, 25 m, 4 mm^2;
- 1 x stainless steel shore power inlet, 2+PE, 32 A/230 V;
- 7 x 500 A safety relay: the installation of an external safety relay is necessary and ensures the safety of your battery system;
- 17 x fuse holders with Class T fuses.

Products used (system drawing on page 188-189)	
1 x AGM 12/70 starter battery	1 x Masterbus USB Interface
3 x Mass Combi 24/3500-100	7 x MLI Ultra 24/5000
1 x EasyView 5	2 x MasterBus Terminator
1 x ChargeMaster 24/30-3	1 x CZone MasterBus Bridge Interface
1 x power cord + power inlet 32 A	5 x Output Interface
1 x Mass GI 7 kW	4 x Signal Interface
2 x Alpha Pro charge regulator	2 x Switch Control Interface
4 x AGM 12/130 starter battery	1 x CZone Network Bridge Interface
7 x safety relay	1 x NMEA 2000 power cord
18 x fuse holder with Class T fuses	2 x CZone terminator

System drawing



Volvo Ocean Race system for Privateer Trawler



E-NA project
Creating the link between technology and the ecosystem

Implemented in France, the E-NA project stands for Nomadic and Autonomous Living Space. This highly ambitious project aims to give access to energy to people who lack it anywhere in the world. E-NA can be commercialised via non-governmental organisations, for military use or various construction works.

QUOTE

"The conception and development of the E-NA project allowed us to create the company ZEST, which today offers its products and systems all over the world. We chose Mastervolt for the reliability of its products, especially in harsh environments."

MATTHIEU DELASTRE, R&D MANAGER ZEST, FRANCE

Each building will be equipped with 10 kWp of solar panels, with six SCM60 MPPT solar charge regulators providing optimal charging for five Lithium Ion 24/5000 batteries. Two Mass Combi Ultra 24/3500 generate 7 kW to supply energy for the whole building. This installation provides a few days of energy autonomy.

Groupe Brunet needed a reliable partner for this ambitious project. "We chose Mastervolt because of the quality of its products, the functionalities that can be integrated in its systems and its ability to supply all the elements required by the installation," explained Matthieu Delastre, R&D manager. He added that he was very happy with the support given by the Mastervolt France team.

Electrical dimensioning

- 10 kWp of solar panels;
- 20 kWh of autonomy;
- 7 kW AC power.

The basics

- Autonomous in electricity;
- Autonomous in the production of water;
- Recycles waste;
- Can be easily moved by truck;
- Can be built and installed in two days with two technicians.

System choice

Batteries: 5 x MLI Ultra 24/5000

An autonomous modern energy system deserves the best battery technology available today: Lithium Ion by Mastervolt. These batteries offer three times the lifespan of traditional batteries and are charged extremely fast without wasting energy. In addition, Mastervolt uses only the safest Lithium Ion technology available, lithium-iron phosphate (LiFePO4). This is a must in rugged environments.

Charger/inverter: 2 x Mass Combi Ultra 24/3500-100

The Mass Combi Ultra series comprises several models ranging from 3000 W to 3500 W. For higher capacities up to 35 kW the Combi Ultra can be used in parallel or 3-phase configurations. An efficient and integrated solar charge regulator helps make the most of the installed solar panels. The inverter part of the Combi supplies 7 kW for the connected AC consumers.

Digital distribution

The products in this system communicate with each other via MasterBus. This platform ensures that all components speak the same language, and can be monitored via the EasyView 5 touchscreen.

- **2 x MasterShunt 500**
  MasterBus integrated battery monitor; in this case used for measuring the current and voltage of the solar charge regulators. This information can be read out on the EasyView 5 touchscreen.
- **2 x DC Distribution 500**
  This distribution model connects up to four DC devices, such as a battery charger, inverter, alternators and solar panels, to the DC groups.
- **1 x MasterBus USB Interface**
  The MasterBus USB Interface enables you to read and configure the MasterBus network via your PC.

Solar charge regulator: 6 x SCM60 MPPT-MB

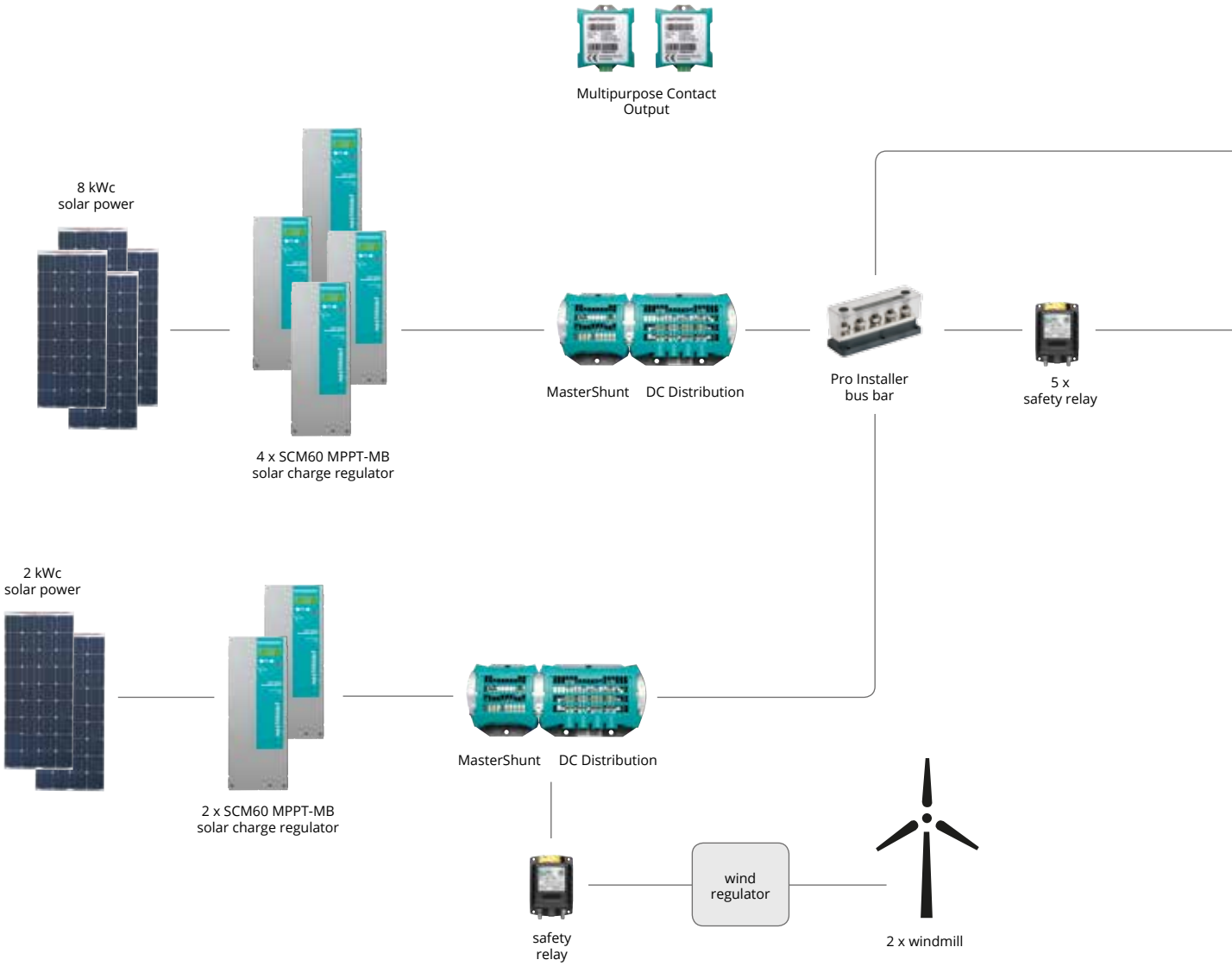
The generated solar energy is stored in five Lithium Ion batteries via a MPPT solar charge regulator. Mastervolt's knowhow of solar energy in the grid connected solar sector has helped to develop a super-efficient MPPT solar charge regulator.

Compared to most solar charge regulators on the market, the MPPT offers up to 30% more yield from solar panels, which adds extra value to the system setup of the E-NA project.

Other system components

- 1 x EasyView 5, waterproof system monitor with intuitive touchscreen for detailed system information – for example the yield of the solar panels in kWh;
- 1 x GPRS Module, communicate with your system via mobile phone;
- 2 x Multipurpose Contact Output; this free programmable contact can be customised and programmed to give your MasterBus network unprecedented possibilities;
- 6 x safety relay;
- 5 x Class T fuse + fuse holder;
- 2 x ANL fuse + fuse holder;
- 1 x Pro Installer bus bar.

System drawing



Products used		
2 x Multipurpose Contact Output	2 x DC Distribution 500	5 x MLI Ultra 24/5000
1 x EasyView 5	1 x Pro Installer bus bar	1 x MasterBus USB Interface
2 x Mass Combi Ultra 24/3500-100	6 x safety relay	1 x GPRS Module
6 x SCM60 MPPT-MB	2 x ANL fuse + fuse holder	
2 x MasterShunt 500	5 x Class T fuse + fuse holder	

E-NA project

EasyView 5

2 x Mass Combi Ultra 24/3500-100

AC consumers
7 kW output power

2 x fuse holder with ANL fuse

5 x fuse holder with Class T fuse

5 x MLI Ultra 24/5000 Lithium Ion battery

generator

MasterBus USB Interface

GPRS Module

230 V AC
24 V DC
MasterBus network

Romotech and Mastervolt supply silent green power

Romotech from Papendrecht (the Netherlands) is an importer of Kohler & Lombardini combustion engines and parts, and a producer of compact generators and water pumps and hybrid energy systems, including the Rohyb hybrid genset. The Rohyb system is mainly intended for remote locations and conditions in which power is – temporarily or permanently – unavailable yet required, and a constantly running conventional generator is undesirable.

In these cases, the Rohyb hybrid generator supplies silent green power that consumes over 50 % less fuel, makes up to 50 % less noise and produces up to 50 % fewer emissions. In consultation with Mastervolt, Romotech decided to equip this hybrid generator with optional solar panels with an MLI Ultra 24/5000 Lithium Ion battery for power storage, combined with Mastervolt's renowned battery charger/inverter, the Mass Combi Ultra 24/3500, and the Solar ChargeMaster SCM60 charge regulator.

An important principle was that the set had to be suitable for the type of peak loads associated with the energy supply of construction trailers/mobile office units and power plants.

In these conditions, lots of energy is needed when employees start their working day and switch on lighting, heating, computers, coffee makers and other equipment. Most consumers are switched off when the morning comes to an end, resulting in a considerably lower energy demand. The application of a hybrid system is very suitable for this strongly varying energy demand as the generator automatically switches off when demand falls and the energy supply is realised via the inverter component of the Mass Combi. This results in less running time and wear, lower fuel consumption and reduced pollution.

The Rohyb system is also suitable for mobile applications and can even be built-in 'underfloor' (for example in a truck) thanks to its limited height of just 65 cm.

The basics

- Reliable storage via an MLI Ultra 24/5000 Lithium Ion battery.
- Quick charging time required: fully charged in under an hour.
- Less running time for the generator resulting in reduced fuel consumption, low noise and less maintenance.
- Smart and transition-free switching between grid connection, generator and inverter. The batteries can as an option also be charged via the solar panels.

QUOTE

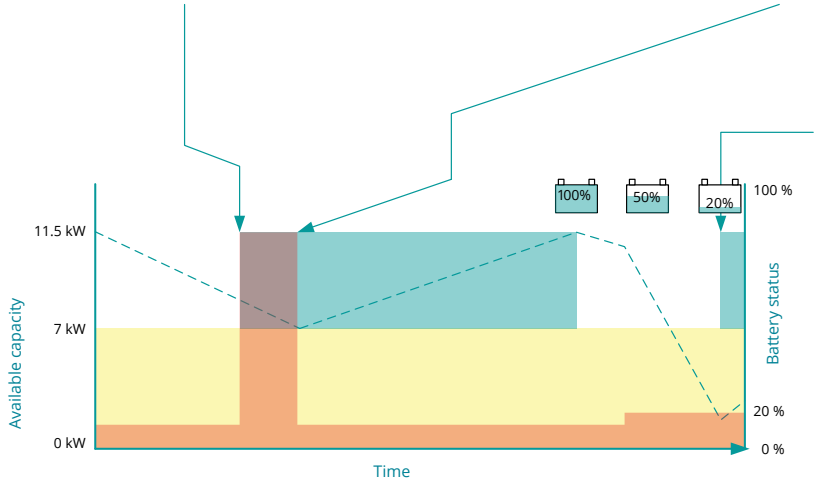
"I chose Mastervolt for the reliability of its components and the fact that everything can be controlled and monitored via a single MasterBus CANbus system. I am also very satisfied with our cooperation. The generator sets that have now been introduced to the market were developed in close collaboration with Mastervolt and meet client expectations in every way."

LEO VERSTEEG, MANAGER
ROMOTECH, THE NETHERLANDS

Energy consumption

The load jumps to a capacity that is larger than the inverter can supply. The generator starts automatically to supply the extra 4.5 kW capacity – the power boost function of the Mass Combi Ultra.

The Rohyb can now supply a total capacity of 11.5 kW. When the load is reduced, the generator can charge the battery bank parallel to feeding the load.



The battery reaches a low status of 20 %. The generator starts automatically to charge the battery.

- Generator capacity 4.5 kW
- Inverter capacity 7 kW
- Connected load capacity
- Battery status 0-100 %

System choice

■ Battery: Mastervolt MLI Ultra 24/5000

The very best Lithium Ion technology for extreme conditions (high charge/discharge current, humidity, mechanical shocks or vibrations). Includes an alert Battery Management System which ensures an optimal use of each individual cell, even when charging and discharging quickly, and integrated battery monitoring for constant insight into the current battery status.

■ Inverter/charger: Mass Combi Ultra 24/3500

The Mass Combi Ultra is available in 12, 24 and 48 V models with associated charging and inverter capacities. For higher capacities up to 35 kW the Combi Ultra can be used in a parallel or 3-phase configuration.

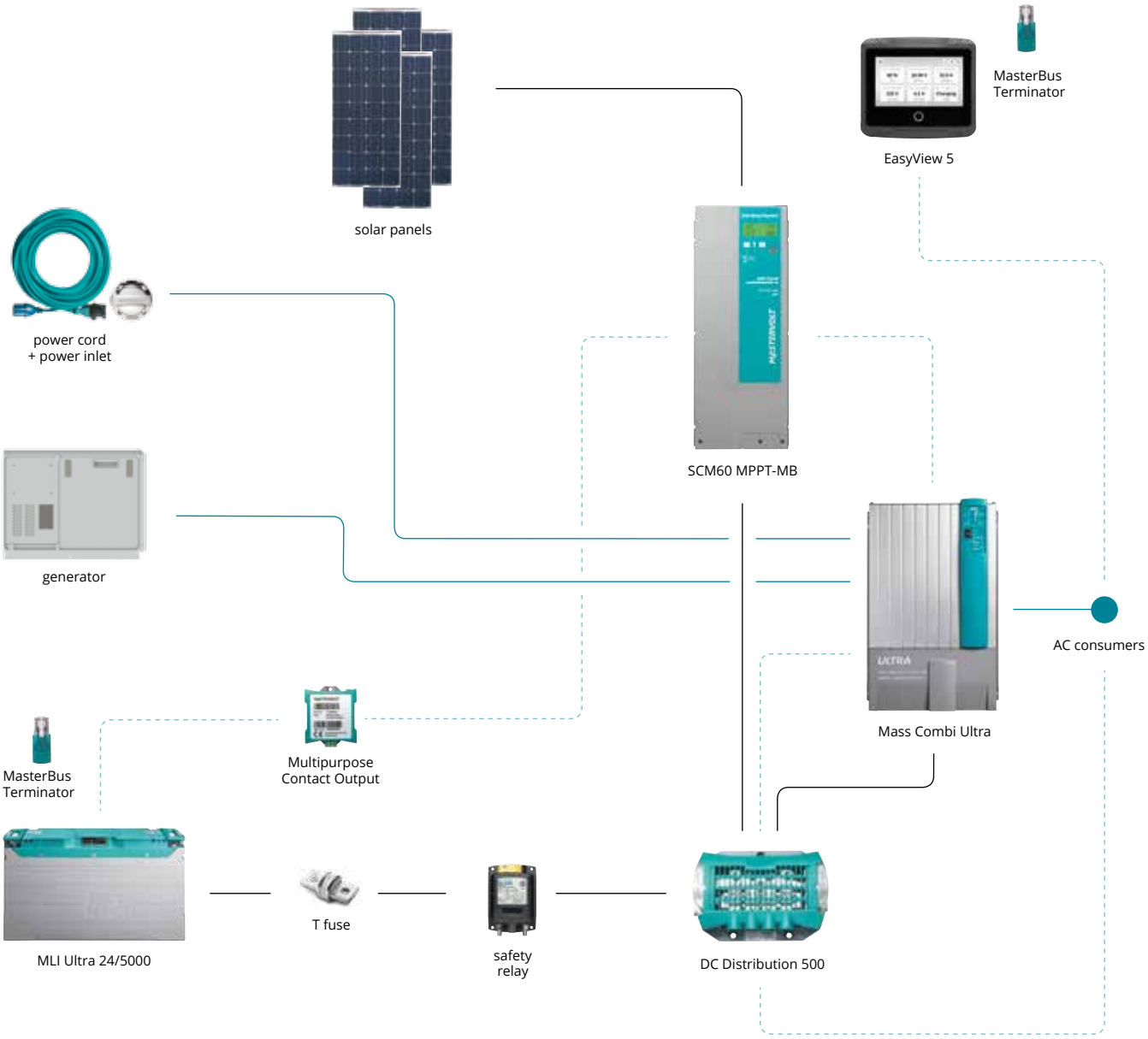
■ Charge regulator: SCM60 MPPT-MB

The SCM60 MPPT-MB is the largest MPPT solar charge regulator by Mastervolt. With a connection capacity of 600 to 3600 Wp in solar panels, a connection for 12, 24 and 48 Volt battery banks, and an integrated MasterBus connection, this charge regulator is ideal for medium and large systems such as Romotech's hybrid generator set. The innovative technology in the Mastervolt MPPT charge regulators also increases the yield of the solar panels. Compared to PWM regulators, the SCM60 MPPT-MB charges your batteries up to 30 % faster with the same number of panels.

Overige systeemcomponenten

- 1 x power cord + power inlet;
- 1 x DC Distribution 500;
- 1 x T fuse;
- 1 x safety relay;
- 2 x MasterBus Terminator;
- 1 x Multipurpose Contact Output;
- 1 x EasyView 5;
- 1 x generator;
- solar panels (optional).

System drawing



Products used	
1 x EasyView 5	1 x Multipurpose Contact Output
2 x MasterBus Terminator	1 x MLI Ultra 24/5000
1 x power cord + power inlet	1 x T fuse
1 x SCM60 MPPT-MB	1 x safety relay
1 x Mass Combi Ultra 24/3500	1 x DC Distribution 500

AC voltage
DC voltage
MasterBus network

Delta Powerboats flagship

Delta Powerboats is a Swedish yacht builder with a proud Scandinavian background. It combines modern design concepts with unparalleled craftsmanship, resulting in a series of unique luxury sports yachts for demanding sailors made from 100 % carbon fibre. This extremely strong and lightweight material is 30 % lighter than fibreglass, providing substantial fuel savings.

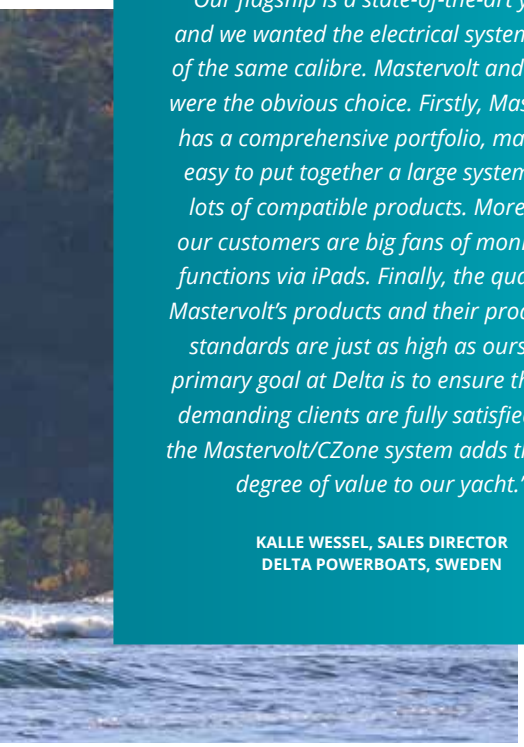
The company's latest design is the Delta 88, the new flagship of the series. Thanks to its three Volvo Penta IPS engines, this well-appointed, state-of-the-art boat – in appearance almost the opposite of a sports yacht – can effortlessly reach speeds of 38 knots while remaining easy to manoeuvre thanks to its lightweight carbon construction. The yard demanded that all on board systems be of an equally high quality, which is where Mastervolt came into play. As well as sharing Delta's love of innovation, our CZone system is the only truly integrated solution for digital switching, control and monitoring that can be used on a glass bridge installation.

How Mastervolt proved to be the best choice...

The Delta Powerboats system designer wanted a fully digital power system that could easily be updated and checked via the internet. Another requirement, as befits this premier class, was the possibility to fully automate the system via programmable events. One example is setting the generator to automatically start when the batteries are low.

In addition, the system had to be fully accessible for operation and control via a glass bridge and iPad interface. The prestigious Showboats International magazine dedicated a noteworthy article to this system, writing: "While not the first boat to use iPads to control temperature and lights – or check fuel and water levels – this boat has an iPad Pro integrated right into the console. Smart systems include trim tabs for a bit of extra lift aft, a gyrostabilizer for comfort and the CZone monitoring system by Mastervolt."

Mastervolt Finland was responsible for the comprehensive energy plan and the installation of 11 Lithium Ion batteries, four sine wave inverters, two Combis, six battery chargers and an extensive CZone system with more than 75 components! A year after installation everything is working to the users' full satisfaction. We are still very proud of the commission and the end result, which turned out to be a very prestigious vessel.



QUOTE

"Our flagship is a state-of-the-art yacht, and we wanted the electrical system to be of the same calibre. Mastervolt and CZone were the obvious choice. Firstly, Mastervolt has a comprehensive portfolio, making it easy to put together a large system with lots of compatible products. Moreover, our customers are big fans of monitoring functions via iPads. Finally, the quality of Mastervolt's products and their production standards are just as high as ours. The primary goal at Delta is to ensure that our demanding clients are fully satisfied, and the Mastervolt/CZone system adds the right degree of value to our yacht."

KALLE WESSEL, SALES DIRECTOR
DELTA POWERBOATS, SWEDEN

The basics

- The design and construction of a 28-metre motoryacht with unrivalled performance.
- A carbon fibre construction with an emphasis on low weight.
- Access to a worldwide service network.
- No unnecessary system components and features, and use of all equipment like at home.
- An average load of 20 kW.
- The heavy alternators on the main engines charge the batteries while sailing so there is rarely need for shore power. When not sailing the generator is used for recharging.
- The navigation station has advanced equipment such as GPS, VHF, plotter and speed, wind & depth gauges. This must continue to work flawlessly under all circumstances, taking into account possible 'dips' in the power supply due to the use of electric winches and/or bowthruster.
- Optimal ease of monitoring and operation, not just in a central place but also in the cabin or engine room, for instance.

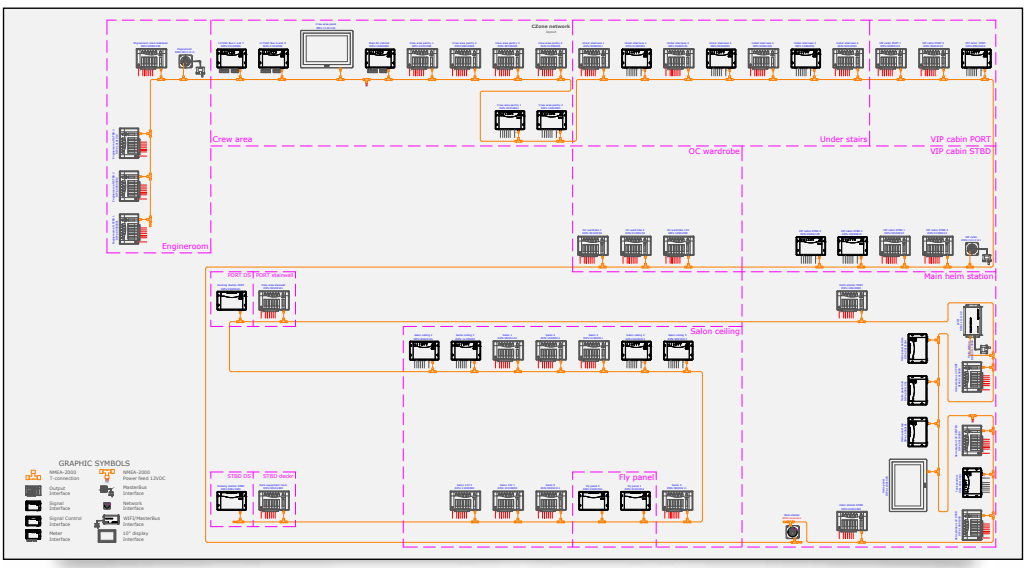
Energy consumption

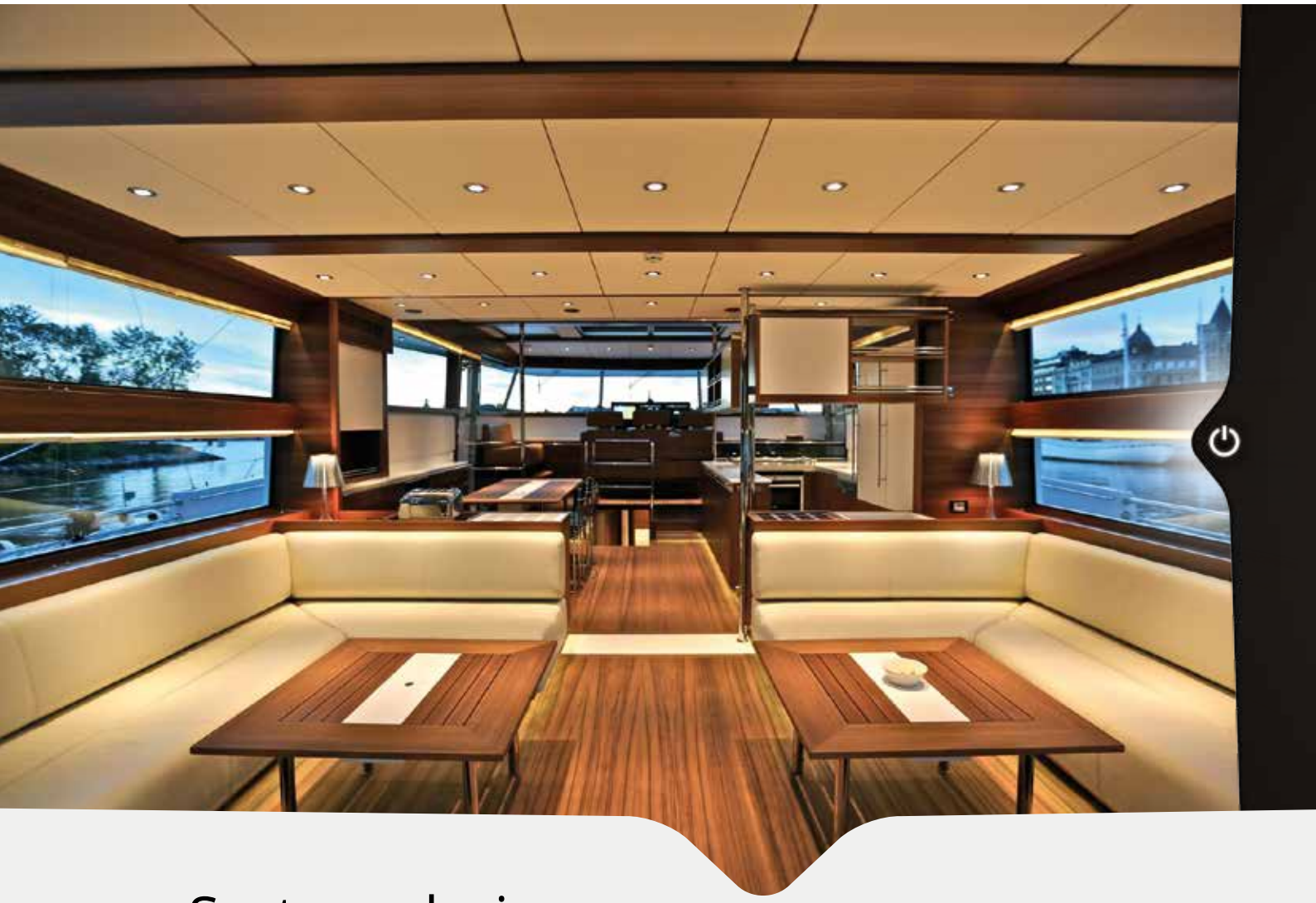
DESCRIPTION	POWER	RUNNING HOURS/24HR	DAILY CONSUMPTION
AC consumers (via shore/generator)			
Air-conditioning > 155.000 BTU	10000 W	18 hr	180.00 kWh
Ventilation engine room	2000 W	18 hr	36.00 kWh
Ventilation cabin	500 W	24 hr	12.00 kWh
Stabilizer	1000 W	24 hr	24.00 kWh
Battery chargers	14000 W	3 hr	42.00 kWh
Audio/video	2000 W	8 hr	16.00 kWh
Electricity outlets	1500 W	3 hr	4.50 kWh
Dive compressor	3000 W	4 hr	12.00 kWh
Blinds	500 W	30 minutes	0.25 kWh
Lighting	200 W	5 hr	1.00 kWh
Cooker	3000 W	8 hr	24.00 kWh
Oven	7000 W	2 hr	14.00 kWh
Hob	5000 W	3 hr	15.00 kWh
Microwave	2000 W	10 minutes	0.20 kWh
Coffee machine	2500 W	30 minutes	1.25 kWh
Water pump	1000 W	30 minutes	0.50 kWh
Dishwasher	1500 W	3 hr	4.50 kWh
Washing machine	1500 W	2 hr	3.00 kWh
Refrigerator/freezer	600 W	6 hr	3.60 kWh
Icemaker	1200 W	10 hr	12.00 kWh
Dryer	1500 W	2 hr	3.00 kWh
Towel dryer	500 W	12 hr	6.00 kWh
Vacuum cleaner	2000 W	2 hr	4.00 kWh
Water maker	2500 W	3 hr	7.50 kWh
Toilets	500 W	2 hr	1.00 kWh
Extraction systems	500 W	8 hr	4.00 kWh
Outdoor grill	3000 W	2 hr	6.00 kWh
			437.30 kWh
DC consumers 12 V			
Navigation	500 W	8 hr	4.00 kWh
VHF	25 W	24 hr	0.60 kWh
Alarm	30 W	24 hr	0.72 kWh
			5.32 kWh
DC consumers 24 V			
Navigation	800 W	8 hr	6.40 kWh
Lighting	200 W	8 hr	1.60 kWh
Hydraulics	2000 W	30 minutes	1.00 kWh
Pumps	500 W	2 hr	1.00 kWh
120 V sine wave inverters	10000 W	1 hr	10.00 kWh
			20.00 kWh
Total AC and DC consumers			**= 462.62 kWh**

The energy balance shows that there have been no compromises regarding the comfort on board, with a home-from-home electrical power installation providing the ultimate feeling of freedom. And although today's generators are very quiet, clients want them turned off while the vessel is anchored in a beautiful bay to facilitate complete rest. With a total battery capacity of more than 50 kWh, this yacht can easily go a whole day without using a generator. These solutions are only possible thanks to Lithium Ion technology: incorporating over eight years of experience, the Mastervolt MLI battery offers the ideal solution.

As switching from generator to inverter operation takes place in a split second (one millisecond at most), even the most critical users such as computers and operating systems are not interrupted (and there will certainly be no more flashing lights!).

A schematic impression of the setup of the complex CZone system installed on the all-carbon Delta 88:





System choice

Inverter/charger:
2 x Mass Combi Ultra 24/3500-100

Linked in parallel, the Combis supply 7 kW of power, enough to seamlessly switch all the critical and most commonly used consumers from shore or generator power to inverter operation (autonomously from the batteries). The switch is so fast that the computers and PLC systems needed to steer the vessel are not disrupted in any way, ensuring that the vessel always operates in a reliable way.

The inverter technology used by Mastervolt offers a uniquely low standby consumption, while a high-speed processor provides seamless switching among all the available energy sources. Power Assist relegates voltage variations and blown mains fuses to the past, even with a weak electrical connection or a small generator. In addition, all Mass Combi Ultra models are equipped with MasterBus, ensuring that all devices in the network speak the same language to each other.

Batteries and battery chargers:

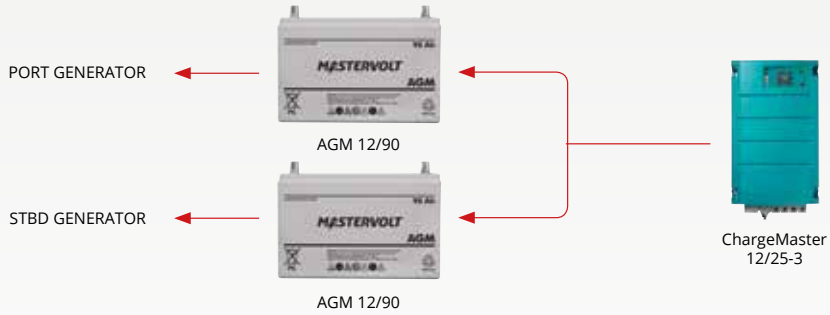
When demands are high, as they are on the Delta 88 powerboat, it is crucial to have the best of the best: heavy lithium-ion batteries, like the Mastervolt MLI Ultra 24/5000. These batteries are ideal for heavy loads during long periods, and have a short charging time (less than 30 minutes). By choosing Mastervolt MLI Li-ion batteries, Delta saves up to 70 % in space and weight.

8 x MLI Ultra 24/5000 +
2 x Mass 24/100 battery charger

Eight MLI Ultra 24/5000 batteries feed some of the AC consumers (which require a total yield of 440 kWh) so there is always a backup if the generators are not running. Two reliable Mass 24/100 chargers ensure that these batteries are always 100 % charged.

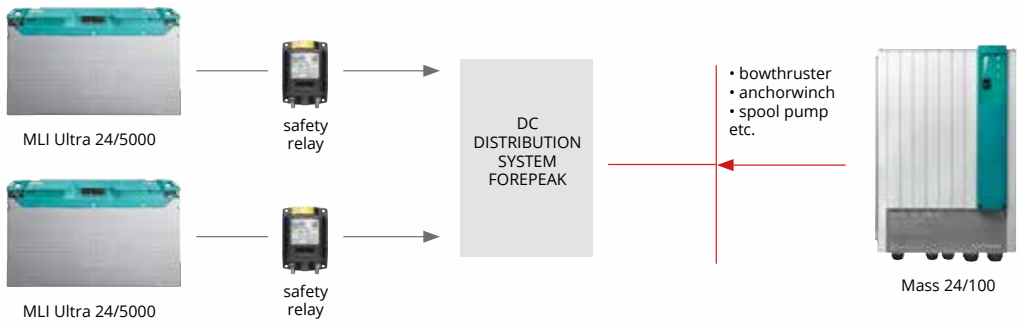
2 x AGM 12/90 Ah + 1 x ChargeMaster 12/25-3

Two AGM batteries of 90 Ah each are used to start the port and starboard generators.
The small model from the ChargeMaster series, the 12/25-3, is used to recharge these batteries.



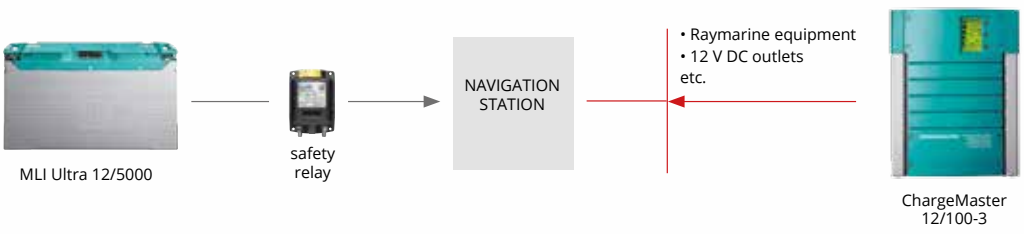
2 x MLI Ultra 24/5000 + 1 x Mass 24/100

Two MLI Ultra 24/5000 batteries are used as a power source for the DC distribution system in the forepeak, connected to heavy consumers such as the bowthruster, anchor winch and various pumps. A Mass 24/100 battery charger ensures that these batteries are always full.



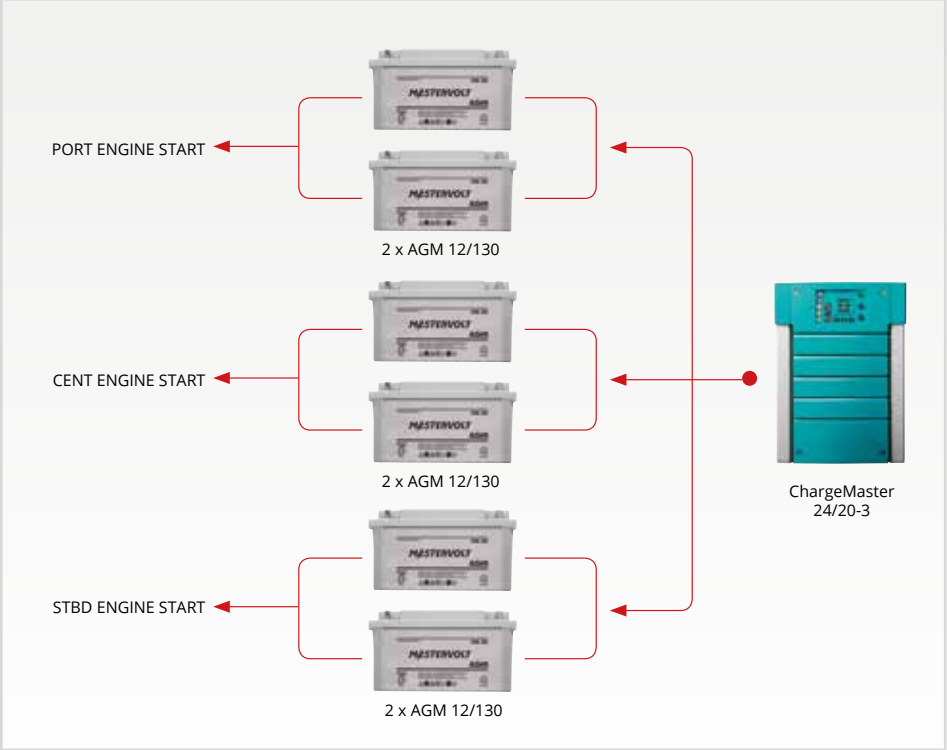
1 x MLI Ultra 12/5000 + 1 x ChargeMaster 12/100-3

Safety always comes first! The navigation and communication equipment is supplied with power by means of a separate supply and charging system. The robust MLI Ultra 12/5000 takes care of this important task. The ChargeMaster 12/100-3 ensures that this 12-volt circuit is always on standby.



6 x AGM 12/130 Ah + 1 x ChargeMaster 24/20-3

These batteries are connected in series so that they can start the three 24-volt engines if necessary. A ChargeMaster 24/20-3 has sufficient capacity to recharge these batteries.



Digital switching: CZone® digital switching system

The CZone digital control and monitoring network simplifies the installation of electrical systems. This network replaces complex wiring and switchboards with smart robust interfaces and an NMEA 2000 network cable, which increases operational reliability. In addition, CZone also offers an advanced solution for the automation of complex control and monitoring functions on modern marine systems. The CZone system includes built-in timers, dimmers (including support for halogen lighting), alarms, voltage reducers and load shedding. It provides so much more than digital switching.

The owner/captain can receive alarm messages anywhere via an internet connection, even when not on board. Bilge alarm or the charging of batteries when the shore power is disconnected are just two examples of operations that can be conveyed via email or smartphone so that appropriate action can be taken.

Complete system control and monitoring via iPad: 1 x Wireless Interface + 2 x Touch 10

The Wireless Interface and free Mastervolt app allow the entire system to be monitored and controlled via an iPad. The Wireless Interface provides a wireless connection between the iPad and the Mastervolt system and can also function as a 'client' for the main router, with the advantage that you log on to a single wireless network to use the internet and other applications. Opening the garage hatch from the jetty becomes a lot safer, for instance, and monitoring the tank during refuelling prevents any spilling of fuel.

The yacht is also equipped with the latest Touch 10 CZone control panels in order that the system can also be operated via cable connections. Reliability is guaranteed!

System components Mastervolt section:

- 4 x Mass Sine 24/2500 sine wave inverter;
- 1 x MasterBus USB Interface, for service and configuration purposes.

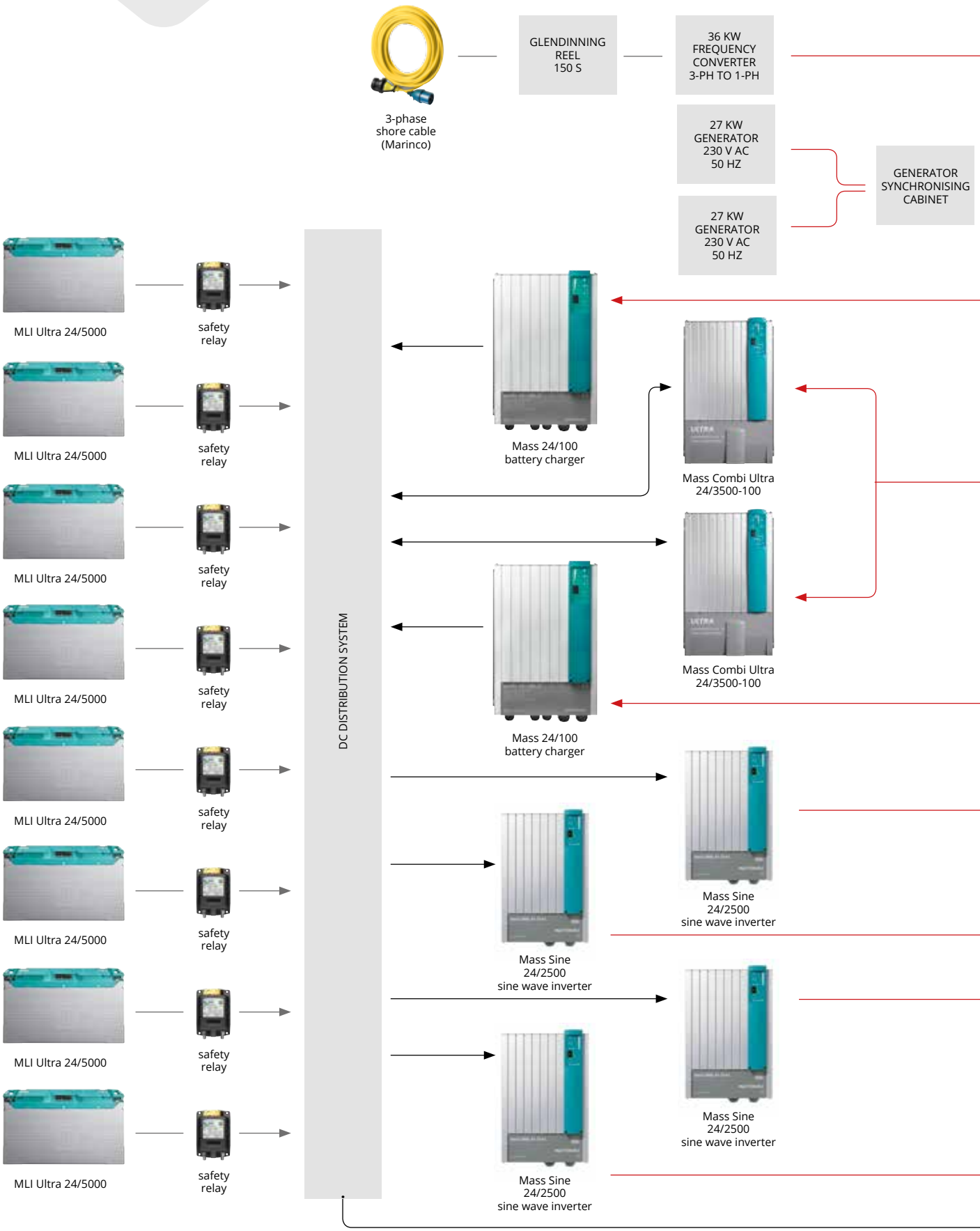
System components CZone section:

- 1 x WI MasterBus connector;
- 1 x CZone Network Bridge Interface;
- 1 x CZone USB CAN Adapter;
- 15 x NMEA 2000 single T-connector;
- 21 x NMEA 2000 two-way T-connector;
- 10 x NMEA 2000 four-way T-connector;
- 33 x Output Interface;
- 8 x Switch Control Interface;
- 13 x Signal Interface;
- 3 x Meter Interface;
- 5 x CZone ultrasonic tank sender;
- 3 x MasterBus/CZone interface.

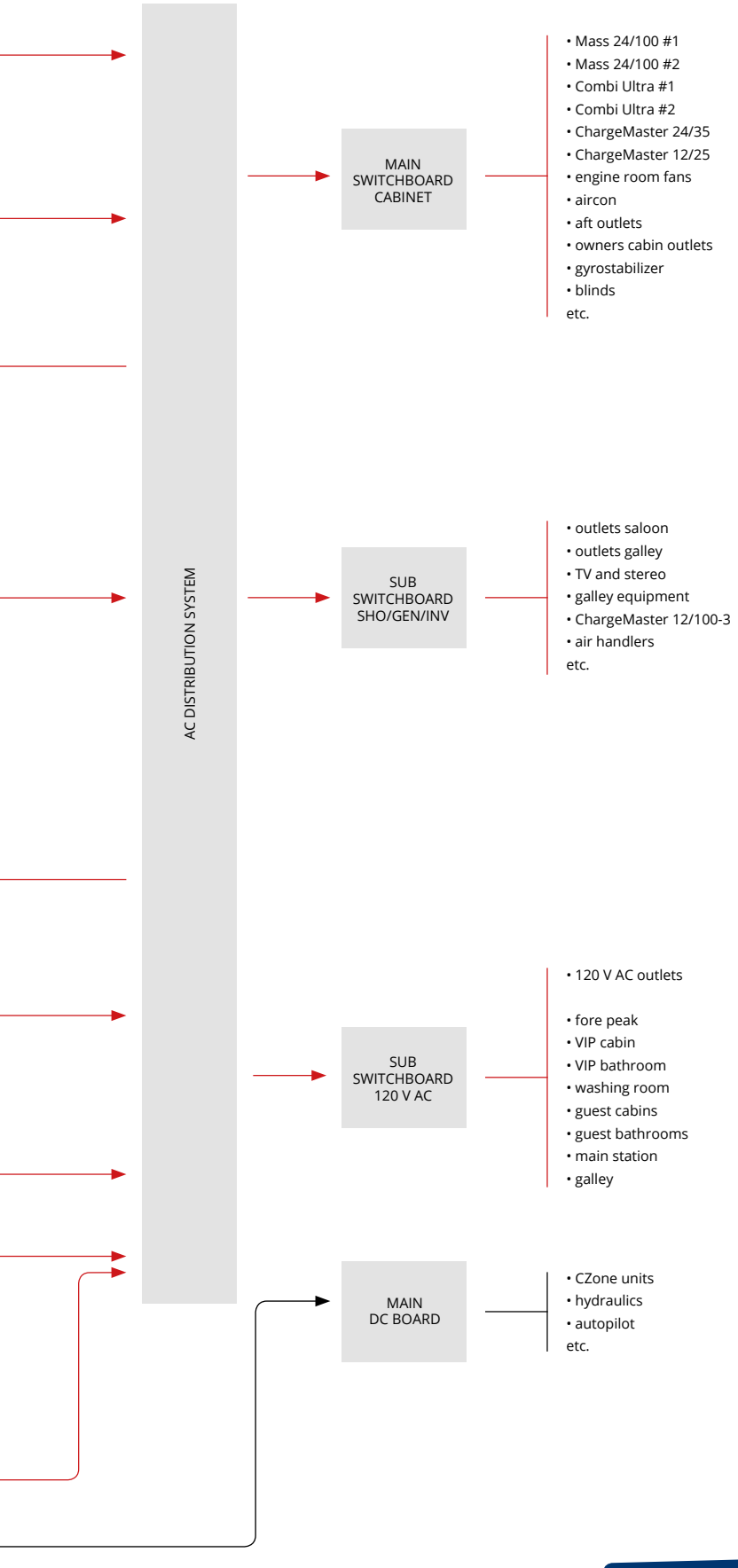
Other system components:

- 2 x generator 27 kW;
- 11 x safety relay (Blue Sea Systems);
- 1 x shore power cable 5 x 16mm^2, 50 mtr (Marinco);

System drawing



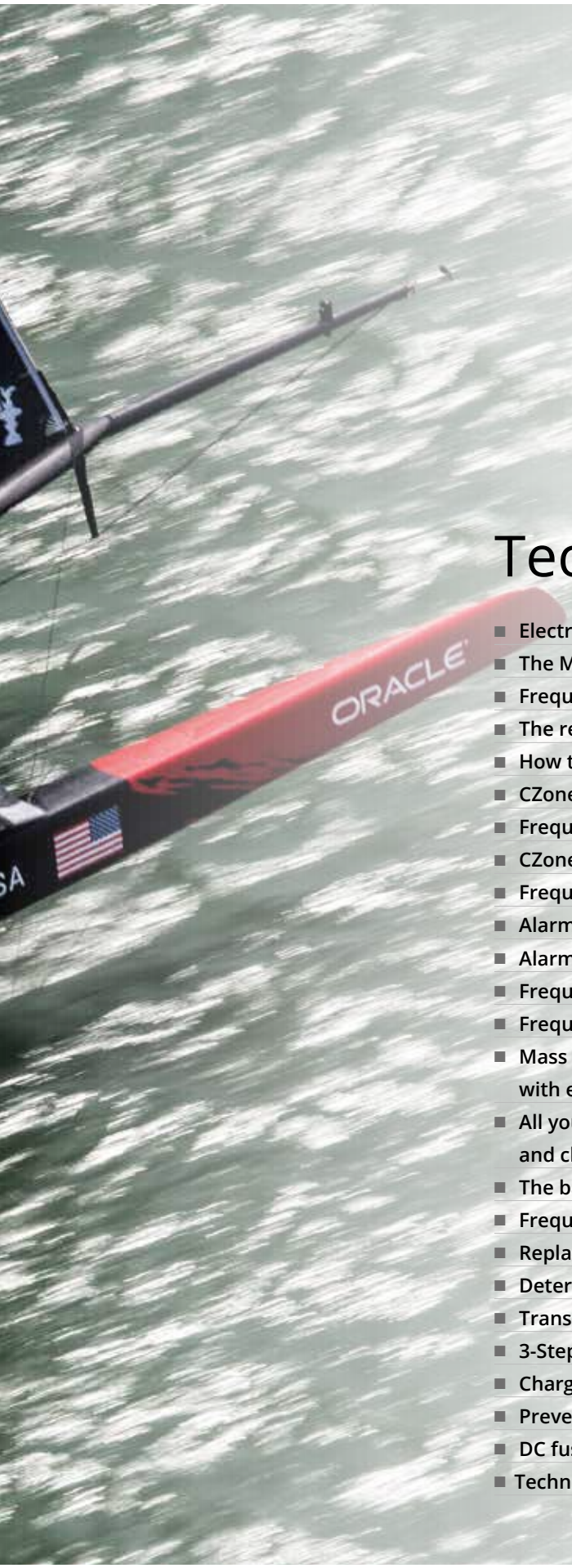
Delta Powerboat system



Products used
1 x 3-phase shore cable
8 x MLI Ultra 24/5000 Lithium Ion battery
8 x safety relay
2 x Mass 24/100 battery charger
4 x Mass 24/2500 sine wave inverter
2 x Mass Combi Ultra 24/3500-100

230 V network
12 V network


ORACLE
PUMA
TAG HEUER
17
ORACLE TEAM US
YANMAR



Technical background

Electricity: How does it work?

As electricity cannot be seen, smelled or heard (when all is well), it is a technology that can be more difficult to grasp than, say, mechanical engineering or architecture. Nevertheless, over the past century we have come to increasingly rely on electrical energy. It only takes a power cut for us to all realise how much we depend on electricity for our luxury, safety and comfort.

The luxury, safety and comfort we take for granted at home and at work is also appreciated onboard a yacht or in a camper. The same goes when working in locations with no connection to a power plant, including on tugboats, Rhine barges or during road works.

For more than 20 years, Mastervolt has specialised in supplying reliable electrical power in places without utility facilities. To offer a better understanding of our products, let us first give a short explanation of the main terms.

Voltage and current provide power

The main activity of Mastervolt is power conversion. And the main variable that can be converted in the field of electricity is voltage. The electrical voltage is the potential difference between two points in an electrical circuit.

We distinguish two types of voltage: Alternating Current (AC) and Direct Current (DC). Voltage is expressed in volt (V), and AC frequency is expressed as hertz (Hz), the rate at which voltage alternates.

■ ***Alternating Current*** (voltage) is the electricity that comes out of home sockets and is used for most appliances. In Europe this is 230 V 50 Hz, in the USA 120 V or 240 V 60 Hz.

■ ***Direct Current*** is supplied by a battery or solar panels. Batteries are vital because they offer a practical possibility to store electrical energy. Battery voltages are commonly 12 V or 24 V. Another possibility is 48 V, which is usually exclusive to electric propulsion.

While direct current is stored in batteries, we actually need alternating current to power our household appliances. This requires conversion from DC voltage to AC voltage.

Another term we use is ■ ***current (I)***, measured in ■ ***amps (A)***.
Current 'flows' through the onboard wiring when there are electric appliances in use. The amount of current that flows through the wiring can vary greatly (depending on the connected load and used voltage). This is why the correct cable thickness is so important – overheating electric wires can have serious consequences.

A running river, a wire that conducts electrical current, or a cyclist biking against the wind... All experience resistance.

In the field of electricity, this ■ ***resistance (R)*** is indicated in ■ ***ohm (Ω)***.
Resistance is important because it causes losses in the form of heat, and we need to take this into account. Voltage loss takes place in wires and, if it is not dealt with, there will be insufficient voltage at the end of the wire to power the appliance we want to use.

The mentioned variables all provide ■ ***power (P),*** which is expressed in ■ ***watt (W).*** Every electric device refers to its output in watt; microwaves of 900 W, light bulbs of 60 W, generators of 4000 W and washing machines of 2500 W.

To keep the terminology and discussion simple, we refer to kilowatts (kW), in which 1000 W equals 1 kW. To link consumption to a consumption period, we use a time unit in which electrical power is generated or consumed, namely one hour. Together they make kilowatt hours (kWh).

Formulas

The relationship between these units is expressed in formulas that represent the 'laws' of electricity.

V = potential difference expressed in voltage (V)
I = current in units of amps (A)
R = resistance in units of ohm (Ω)
P = power in units of watt (W)

Ohm's Law is the most important formula. V = I x R
Voltage [V] = current [I] x resistance [R]

Because we often use the term power, the formula below is frequently used to determine power: P = V x I
Power [P] = voltage [V] x current [I]

The right wiring

Having the right wiring is crucial for safety and efficiency. Incorrect diameters can lead to overheated cables and cause a fire. This is not just theory; vessels and RV's are lost every year due to onboard fires that are often caused by faulty wiring.

As well as being safer, a proper cable thickness also ensures that your battery charger and inverter perform to their best. Using thinner cables than recommended between the battery charger and inverter and battery (set) could lead to excess voltage loss through the cables, resulting in an excessively low charge voltage on the battery terminals. This in turn means the batteries are insufficiently charged, which has a negative impact on their lifespan. Using thinner cables than recommended for the inverter will prevent you from using the maximum capacity of the batteries. In this case the high (cable) losses cause the DC input voltage of the inverter to be (much) lower than the actual battery voltage, which makes the inverter switch off too soon and not use the full battery capacity. This is why people often use thicker cables than required.

Connection wire dimensions:

Conductor diameter (mm ²)	Current acc. to rule of thumb DC	Current acc. to rule of thumb AC	American Wire Gauge AWG
0.5	1.5 - 2 A	3 - 4 A	20
0.75	2 - 3 A	4 - 6 A	18
1	3 - 4 A	6 - 8 A	17
1.5	4 .5 - 6 A	9 - 12 A	15
2.5	7.5 - 10 A	15 - 20 A	13
4	12 - 16 A	24 - 32 A	11
6	18 - 24 A	36 - 48 A	9
10	30 - 40 A	60 - 80 A	7
16	48 - 64 A	96 - 128 A	5
25	75 - 100 A	-	3
35	105 - 140 A	-	2
50	150 - 200 A	-	0
70	210 - 280 A	-	2/0
95	285 - 380 A	-	4/0

As lower voltages also involve higher currents, it is even more important to use the correct cable thickness.

The current (A) is higher because direct current with 12 V or 24 V is lower than alternating current with 230 V while the (required) power stays the same.
As a result the current will increase as P = V x I.

The rule of thumb below can be used:

- For 12 or 24 V DC systems, 3 amps power per 1 mm² cable diameter applies.
- For 230/120 V AC systems, 6 amps power per 1 mm² cable diameter applies.

Example: If a battery or battery charger provides an expected current of 75 amps, you require a cable of at least 25 mm².

Generating electrical power

There are various ways to generate power:

- With an onboard petrol or diesel generator (usually AC, also available in DC).
- By the alternator(s) on the main engine.
- Grid (AC).
- Solar panels (DC).
- Wind generator (AC or DC).

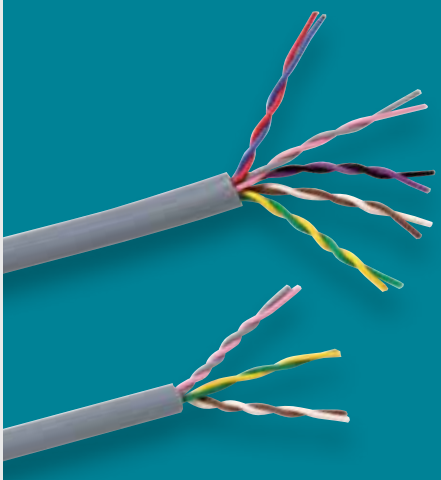
Conversion

Generated energy can be used immediately or stored in the batteries using a battery charger. A battery charger converts the AC voltage into DC voltage. An inverter usually converts a low DC voltage of 12/24 volt into an AC voltage of 230/120 volt, 50 or 60 Hz.

You may also encounter DC-DC converters; these devices convert DC voltage into another DC voltage, for instance 24 V from a battery to 12 V to power your navigation equipment.

Please note:

Designing a complete electrical system requires detailed knowledge, experience and information (the subject has filled entire encyclopaedias!). The specialised Mastervolt dealers are at your disposal.



The MasterBus revolution

Mastervolt is your ideal system supplier. The products we supply fit seamlessly together and communicate easily to ensure a top system performance. Optimal operation is also provided by Mastervolt's in-house developed communication and network platform: MasterBus.

The masterful MasterBus:

- Complete system integration.
- Simple to operate.
- Easy installation.
- Save on installation time and costs.
- Easily expandable.
- Perfect to monitor.
- Ready for the future.

MasterBus is unique for the way a wide range of products, recognisable by the MasterBus symbol, are fitted with the same communication port. This results in a mine of information on all connected components. Everything becomes clear and easy to operate via one central touchscreen panel. Operation from multiple locations is also possible, for example via PC/laptop or SMS. Installation is also incredibly simple and the minimal amount of cabling significantly reduces the chance of failures.

Reliable

Thanks to galvanic isolation, nearly all Mastervolt devices can supply power to the MasterBus, ensuring a safe and stable network. Each MasterBus product has an 'intelligence' of its own and can function independently. This feature reduces the dependency of individual products and enhances the overall reliability of your system.

Flexible

New equipment can easily be added to your existing MasterBus network by simply extending the network. This means the MasterBus network has an enormous degree of flexibility, not just today but also in the future. Moreover, Mastervolt supplies various interfaces with which you can also connect equipment that does not have a MasterBus link. For example, we supply the MasterBus NMEA 2000 Interface for the integration of navigation equipment.

Complete system

MasterBus is a network that makes use of CANbus technology, which already has a proven track record in the automotive and maritime markets. MasterBus controls the supply for all connected equipment, including the inverter, battery charger, generator and much more besides. This makes an intelligent system performance possible.

- ***A practical example:*** The generator is instructed to start automatically when the batteries are almost empty.

Easy to install

MasterBus makes an electrical installation far less complex by reducing the number of cables. Each system component has two MasterBus communication ports. As soon as two or more devices are connected to each other via these communication ports they form a local data network - what we call a MasterBus network. As this requires very few communication cables you enjoy considerable savings in space, material costs and installation time.

Using your PC

The MasterBus USB Interface allows you to monitor, control and configure the entire MasterBus network from a Windows PC or laptop. The galvanic isolation of the interface ensures you safe operation in all situations. The required MasterAdjust software can be easily downloaded from ■ ***mastervolt.com***

Central operation

Mastervolt offers various control panels (touchscreen and otherwise) for the display and operation of the connected equipment, giving you a complete overview of the status of your electrical system. Control is at your fingertips and the full colour EasyView 5 panel allows you to read all information on one central panel. All control panels are suitable for the display, operation and configuration of all connected MasterBus devices.

Remote control

Communicating via your cell phone is no longer a pipe-dream. Using MasterBus you can request information and control onboard equipment via SMS. If desired you can even set the interface to inform your cell phone when an alarm goes off onboard.

Frequently asked questions about MasterBus

1 What is MasterBus?

MasterBus is a protocol for exchanging information between the connected components within an electric system. MasterBus is also the standard for a plug & play information system for (de)centralised operation, service and monitoring. MasterBus ensures you a simple, logical and reliable energy system.

2 What can I do with MasterBus?

The MasterBus system is incredibly flexible and can be designed and extended to any size. Using several handy interfaces, it is also possible to connect all sorts of conventional products to MasterBus. Via the MasterBus USB interface, for example, you can connect a PC or a laptop to the system.

3 Can I connect other products to the MasterBus?

Yes, that is possible. Although MasterBus is a Mastervolt-specific protocol, non -Mastervolt products can still be connected to the system. Equipment with maritime standard NMEA 2000 connections can be easily connected via the MasterBus NMEA 2000 Interface. In addition, the MasterBus network can be integrated within your own central system by means of the MasterBus Modbus Interface or the MasterBus Firecan Interface.

4 Is MasterBus an open source?

No, MasterBus is a closed protocol. This allows Mastervolt to guarantee that a MasterBus system works safely and without interference, with a uniform data supply and no unwanted interruptions. Components from other suppliers can be connected via the communication interfaces specially designed by Mastervolt. They ensure a safe and pure transition to the protocol and operate as a firewall against data interference and voltage conflicts. This ensures that the MasterBus network is always safe and reliable.

5 What is the basis of MasterBus?

MasterBus hardware is based on CANbus V2.0 technology. The software communication protocol was designed by Mastervolt to maximise the performance of an electrical power system.

6 How many Mastervolt products can I connect to a MasterBus?

You can connect a maximum of 63 products within a MasterBus data network.

7 What is the maximum cable length?

- 250 m with less than 10 connected products.
- 150 m with up to 25 connected products.
- 100 m with up to 50 connected products.

Or use a MasterBus Repeater.

8 What cables should I use?

We advise using the green Mastervolt cables, but MasterBus also works with high quality UTP cables.
A Mastervolt DIY kit contains all you need to make the cables for a complete system of any desired length.

9 How do I connect a MasterBus?

The MasterBus data network lifeline is the cable which runs as a chain from component to component. Both ends of the cable should be provided with a MasterBus terminator. On each MasterBus product are two equal communication ports for connection. By connecting a MasterBus cable to each of the ports you add the product to the chain. The terminators at both ends of the cable ensure interference-free operation, prevent reflection of data signals and ensure high communication speeds.

10 Do components always have to be connected as a chain?

The MasterBus network requires that all components together create a chain with terminators at both ends. Circular configurations or branch systems may interrupt the data supply and power supply, damaging the connected equipment.

11 What might be the causes of a malfunctioning MasterBus network?

- One or both terminators are missing on the outside components in the chain.
- One of the cables is disconnected or incorrectly connected: Check whether you see an open communication port.
- One of the plugs is not properly connected to the cable.

12 Do I need an additional power supply for MasterBus components?

No. A number of the connected components, such as the MasterShunt and the Mass battery charger, can supply the necessary MasterBus power. Other components such as interfaces and MasterView panels consume this power. The MasterBus cable is simultaneously responsible for data communication and power provision.

13 Can I connect different batteries to the same MasterBus circuit?

Yes. As all power supply sources within a MasterBus circuit are galvanically isolated, all connections are completely safe.

More on the next page...

14 Do I need additional accessories for the MasterBus system?

Not for Mastervolt products. All MasterBus products come with the necessary accessories included.

15 What happens if the MasterBus data network fails?

The electrical onboard system will not shut down. Mastervolt components such as the inverter and battery charger will default to normal autonomous operation. You will be able to operate the equipment itself and still have power onboard. A malfunction in the MasterBus network causes two distribution points that no longer work together, although they still work independently.

16 Can I adjust a MasterBus system while it is in operation?

Yes, that is possible. However, do remember that the communication network is only complete and able to function properly when all connections and terminators have been added to the network chain again. N.B. Events may 'pass' without reaching the right equipment.

17 Why do I have terminators left over after installing a complete system?

All MasterBus products are supplied with one terminator as standard. As there are only two terminators required within one system, you may have one or more terminators left over. Keep them as spares.

The remarkable simplicity of MasterBus events

Every MasterBus system can be set to your requirements - in essence, it's like welcoming your own personal butler onboard. And MasterBus 'events' are how you train the butler. For example, you can set the generator to start automatically when the batteries are almost empty. Use MasterBus events to configure your system so that each component can activate another. MasterBus: At your service!

Example of an event

In the given example you set the following event: The batteries/battery monitor tell(s) the generator to start.

Say that you use the MasterShunt as a battery monitor within the MasterBus network. In this scenario the MasterShunt is the initiator or the 'source' and the generator is the 'target'. The commando = start or autostart. The data = on. By setting multiple events (source, target, commando + data) you can program the entire MasterBus network.

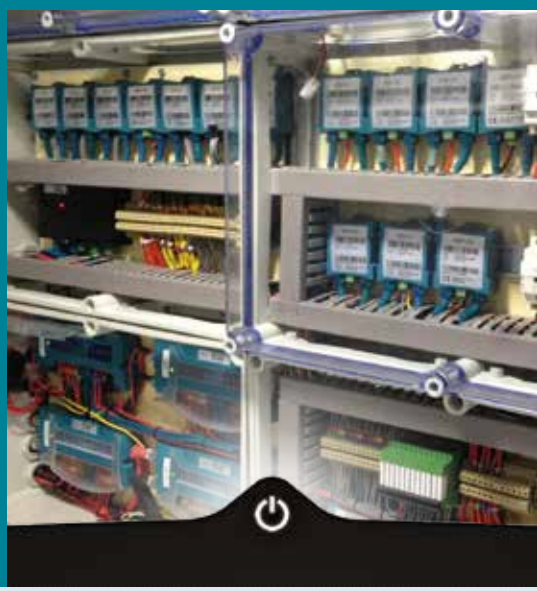
Digital switching with MasterBus

Another example of a MasterBus event is the use of Digital Switching. The pressing of a light switch, for instance, activates the lighting. The source is the switch, the target the lamp. One source can also be used to control multiple targets, such as the lamps in this example.

Endless possibilities

Thanks to the underlying communication between all the equipment connected to the MasterBus network, the configuration of events offers you endless possibilities. If you wish, the switch in the example can, for instance, activate not only the lights but also the inverter that provides power to your TV.

All this and much more is available without the installation of extra components.



Summary

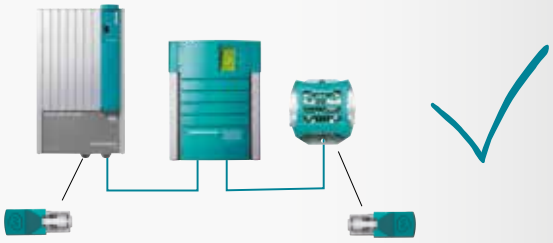
Within every MasterBus network all available sources for your connected products can be linked to all available targets. The manuals of the products concerned provide a clear overview of available sources and targets and simplify the configuration of events.

How to create a MasterBus network

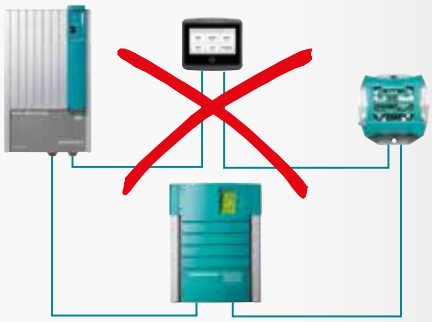
All devices that are suitable for the MasterBus network are equipped with two communication ports. As soon as two or more devices are connected with each other via these ports, they form a local data network.
When creating a MasterBus network, follow the guidelines given here:

Connections between your devices can be made by using the Mastervolt UTP cables. The electricity needed for the network is supplied by the connected devices. At least one in every four devices in each network must be able to supply power to the MasterBus. For eight devices there must be two power suppliers, etc.

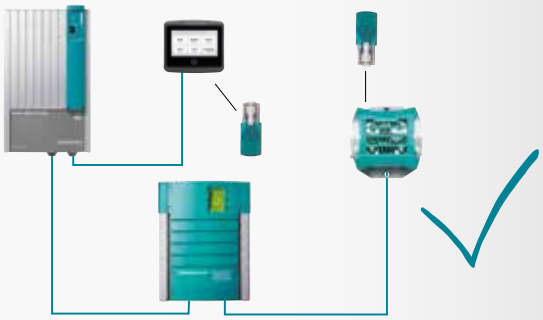
As with all high speed data networks, MasterBus needs a terminator at both ends of the network.



You need two terminators to close both ends of the network - communication cables in-between connect a chain of components.

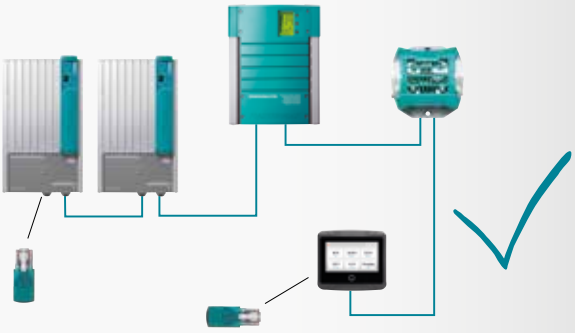


The network should not be circular.



The chain ends at both ends with the terminators.

Do not make T-connections with so-called splitters:
A network should always be a chain.



Networked monitoring system

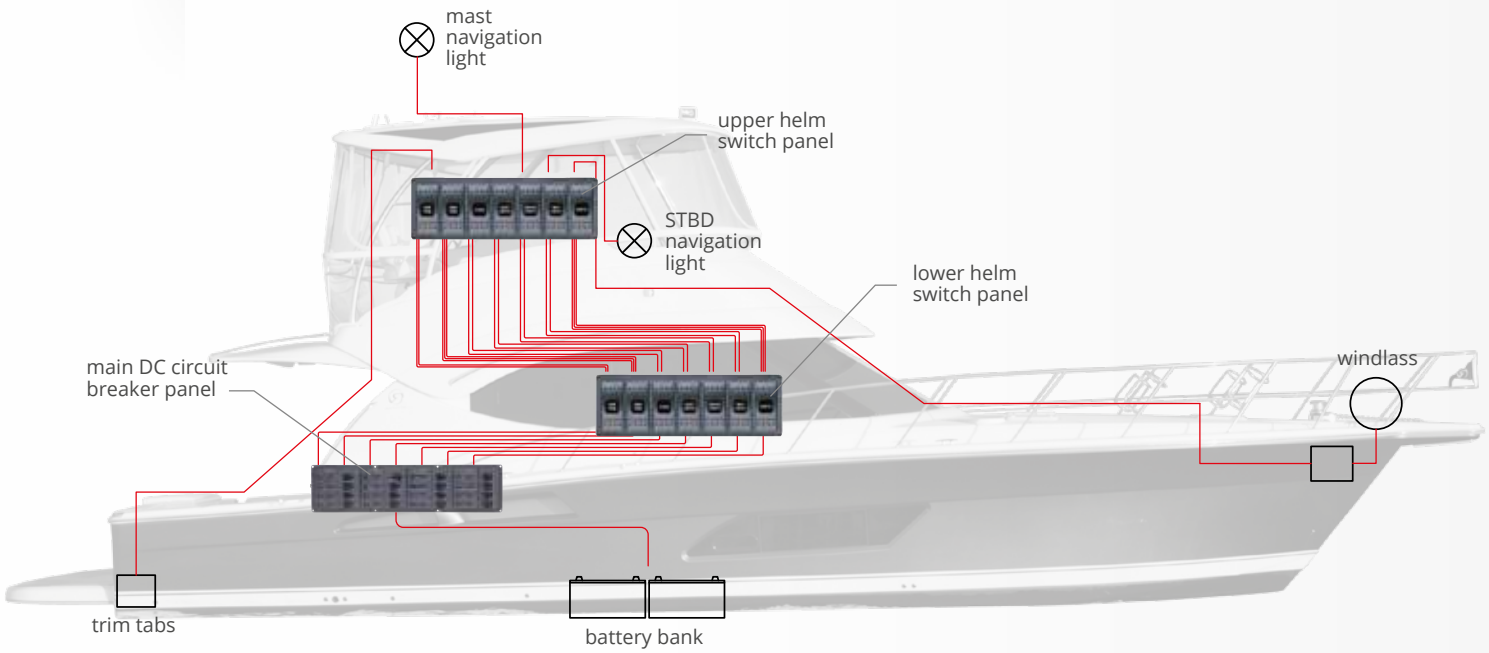
The CZone® digital control & monitoring network simplifies installation of electrical systems through the replacement of complicated, cumbersome wiring to switch and fuse panels, with state-of-the-art, robust interfaces and light NMEA 2000 network cable. It also provides a sophisticated solution via the automation of complicated control and monitoring issues associated with today's onboard systems.

Installers recognise an immediate benefit with reductions in cable usage, harness weights and installation times. The CZone system also integrates many standalone components into one intuitive system. Wiring is dramatically simplified as the CZone system is designed to remove complex switching clusters and wiring runs. Modules can easily be added into the system to best suit the OEM and end-users' needs.

Traditional electrical DC wiring

Wiring DC systems can be complex and installation time can be extensive. The larger the system, the more wire is required, which creates weight and space concerns, not to mention increased cost and complexity of design and manufacturing. Basic maintenance and trouble shooting of traditional wiring systems can be difficult to manage.

- Switch panel wiring is complicated and extremely labor intensive to install.
- Cable runs are long and have multiple conductors.
- Switching of common circuits is complex.
- Long wire runs require larger cable, adding weight, increasing cost and reducing space.

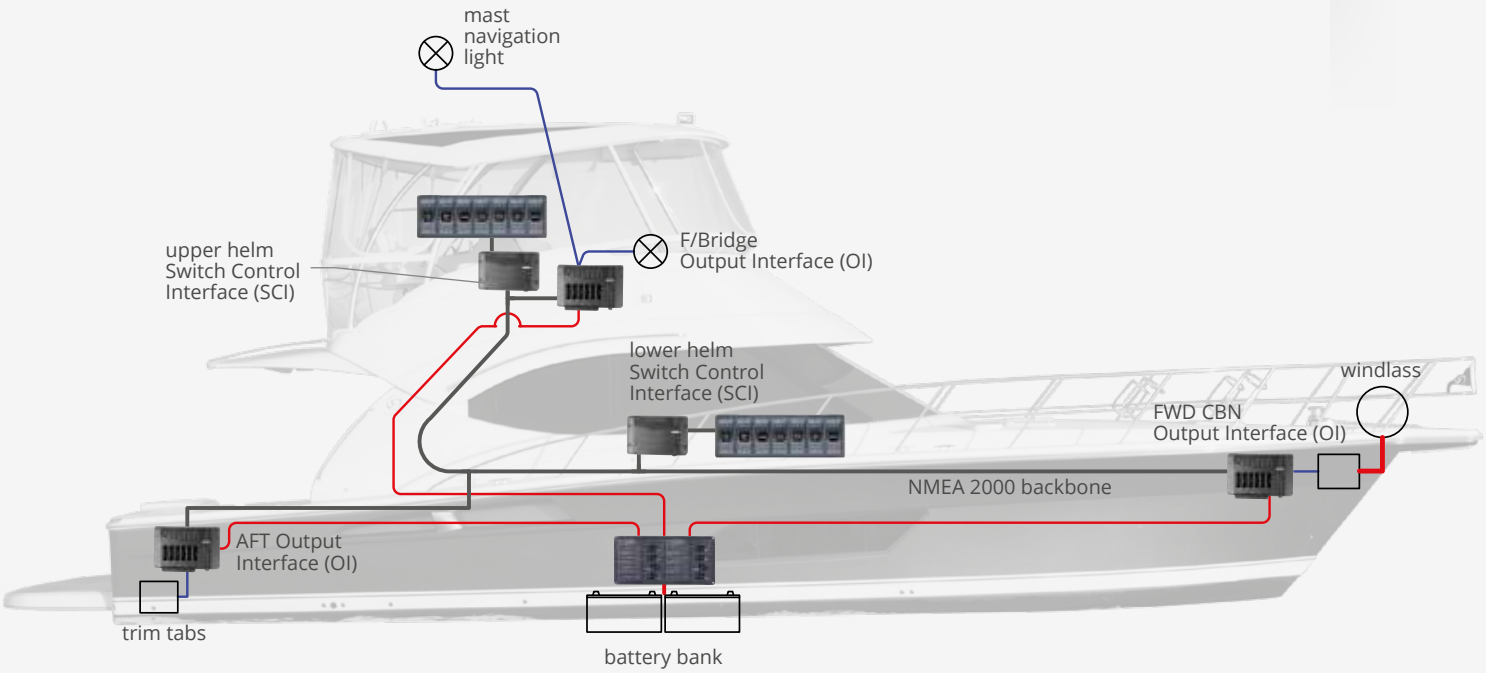


CZone® DC wiring

The CZone system decentralises the DC power distribution system, locates circuit control and protection modules closer to loads to shorten cable runs and reduce the size of conductors, significantly decreasing the cost and weight of the electrical wiring harness. The system replaces complex wiring with a single data wire.

Benefits

- Complex switch panel wiring removed, replaced with single data cable connection.
- The grouping of multiple loads into common areas (zones) with Output Interfaces is the key to the system.
- Results in less working hours and installation materials, plus fewer and thinner cables.



Frequently asked questions about CZone®

1 What is NMEA 2000?

NMEA 2000 is a plug and play electronics communication standard based on Controller Area Network (CAN). The network carries data sentences for commands as well as messaging (tank levels) between NMEA 2000 devices.

2 What is a PGN?

All data transmitted on an NMEA 2000 network are organised into groups. These groups are identified by a parameter group number (PGN) that describes the type of data contained in the group. The CZone system can share certain monitoring PGN's with other NMEA 2000 compliant devices, such as engine temps, pressures, SOG, battery monitoring etc.

3 How many devices can I have on the NMEA 2000 network?

No more than 50 NMEA 2000 devices can be connected to any one NMEA 2000 network. It is also important that there is no more than 3 V voltage drop from the power source to the device located farthest from the power source. In case there are more than 50 devices or the voltage drop exceeds 3 V, a CZone Network Bridge Interface can be installed to expand the network to a maximum of 252 devices.

4 How do I connect an NMEA 2000 network?

The main communication channel of the NMEA 2000 network is the backbone to which your NMEA 2000 devices connect. Each NMEA 2000 device connects to the backbone with a T-connector. The NMEA 2000 backbone must be connected to 12 V DC power, and terminators must be installed at both ends of the network to function correctly. Daisy chaining is not allowed.

5 What are the power requirements on the NMEA 2000 network?

Your NMEA 2000 network must be connected to a 12 V DC power supply. Do not connect the network to any other voltage source, such as a 24 V DC power supply. Supply power as close to the middle of the backbone run as possible. Do not connect the NMEA 2000 network to power in more than one location unless a CZone Network Bridge Interface is used.

6 What cables should I use?

We advise using the NMEA 2000 cables supplied by Mastervolt. These NMEA 2000 Mini cables have a greater current carrying capacity than the standard Micro cables. This reduces voltage drop on the longer backbone runs expected on a CZone network.

7 What is the maximum length for a drop cable?

The maximum length of a single drop cable to a NMEA 2000 device is 6 m (20 ft).

8 Can I connect other devices to the CZone NMEA 2000 network?

Yes, that is possible. CZone devices are NMEA 2000 certified, so other NMEA 2000 compatible or certified devices can connect and communicate together on the same network.

9 What happens if a CZone module is damaged?

All CZone modules offer a true 'plug and play' installation. This means that, if a CZone module is physically damaged and needs replacing, you can just copy the DIP switch setting to the new module and plug it into the system. The system will recognise the module by its DIP switch setting and configure it automatically.

10 What happens if the CZone network fails?

In the event the CZone network fails, all loads that are controlled through CZone can still be powered by locating the (Combination) Output Interface, and putting the hardware fuse into the bypass position.

11 How do I configure the CZone system?

The CZone system can be easily configured from a Windows PC or laptop connected to the network with the CZone USB CAN Adapter.

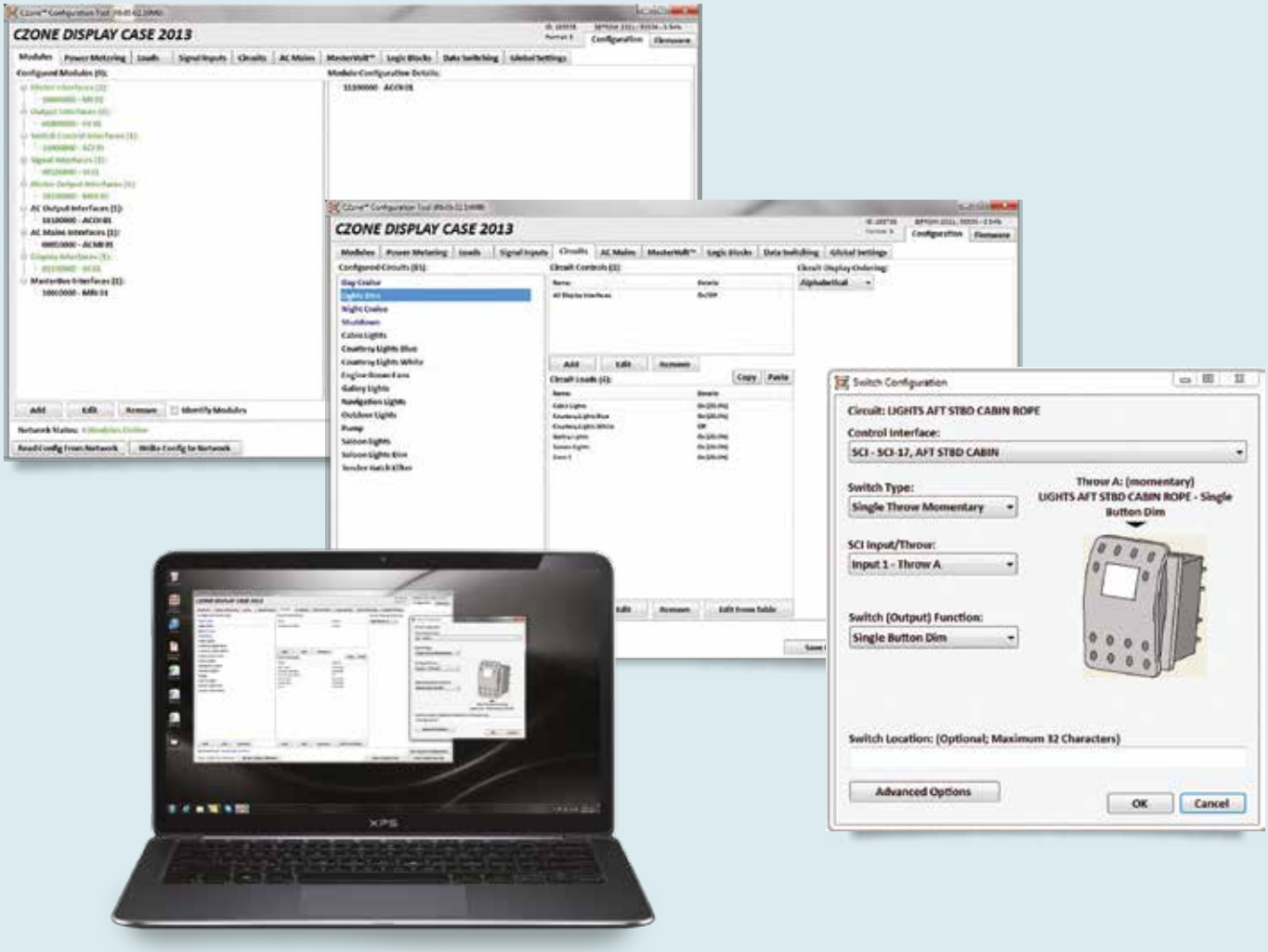
12 Can CZone be connected to MasterBus?

Yes, that is possible with a CZone MasterBus Bridge Interface or Wireless Interface.

Configuration made easy

Historically, generating a configuration for and programming a system is a chore that requires a significant amount of training. The Configuration Tool of the CZone system offers simple, straightforward programming that is easy to learn and to use.

The CZone system Configuration Tool allows the installer to set up programming parameters on a standard PC (use an USB CAN Adapter, product code 80-911-0044-00), upload a saved configuration into the CZone network and simultaneously program every interface onboard. Changes and customisations can also be made from the Display Interface and downloaded back to the PC overriding the master configuration. The master template file is now ready to go and can be used on multiple vessels or vehicles during installation.



Frequently asked questions about battery chargers

What factors should I consider when choosing a battery charger?

1. How many battery banks will you be charging? Take into account service battery, starter, bowthruster, etc. Also consider any possible future extension of your system *(= sufficient battery charger outputs)*.
2. The battery charger must have the same voltage as the battery, i.e. 12 V battery voltage = 12 V battery charger. And 24 V battery voltage requires a 24 V battery charger.
3. Charging the batteries safely and quickly requires sufficient charge current (measured in amps). See the battery charger specifications in this Powerbook for the recommended capacity.

Example:

A 200 Ah Gel battery requires a battery charger of at least 25 amp. When multiple loads are connected during the charging process (e.g., heaters, refrigerator, lighting) a battery charger of 50 amp is needed. If the battery charger is powered via a generator instead of the grid, a battery of 100 amp would be recommended. A larger battery charger shortens the charge times and allows the generator to operate for shorter periods. This enhances comfort levels and is better for the environment.

4. For the simple and often cheaper battery chargers, the charge current is specified for the nominal battery voltage (= 12 or 24 V). Charging a battery requires a higher charge voltage, namely 14.4 or 28.8 V. If the charge current drops at this (higher) charge voltage, it will take much longer for the battery to be charged. This results in a shorter lifespan of the battery or a longer generator time (if the battery charger is powered by a generator).

Battery chargers from Mastervolt provide a full charge current, even at a high charge voltage and high ambient temperatures. This ensures short charging times and an optimal lifespan for your batteries.

What type of battery can I charge?

Mastervolt battery chargers are suitable for all types of batteries. Full details can be found in the battery charger specifications under 'Charge characteristic'. Mastervolt recommends choosing a battery charger with sufficient capacity and, if possible, connecting it to a battery temperature sensor and battery voltage sense. Always connect Lithium Ion batteries in accordance with the supplied instructions and follow the installation guidelines carefully (temperature compensated charge is not needed).

Can I charge different types of Lithium Ion batteries?

Most Mastervolt battery chargers can charge Lithium Ion batteries. When using the modern Mastervolt Lithium Ion batteries (MLI and MLS series), free downloadable configuration software (MasterAdjust) allows you to simply adjust the battery charger. Other charge characteristics can also be easily installed. Do note that all Lithium Ion batteries should be installed in accordance with the manufacturer's instructions.

Can a Mastervolt battery charger remain connected throughout the winter?

Yes, that's not a problem. Mastervolt battery chargers are safe to use and it is even better for the batteries themselves. The charge voltage is regulated in accordance with the battery temperature to ensure the batteries remain in optimum condition, increasing their lifespan. The 3-step+ charging method ensures a monthly absorption cycle so the battery stays active.

I sometimes have a limited fuse rating via the AC grid. Can I still use a large battery charger?

Yes, you can. All Mastervolt battery chargers and Combis are fitted with the latest electronics, reducing their power consumption by about 40 % compared to conventional battery chargers. For example, the power intake of Mastervolt 12-volt battery chargers is summarised below for 230 V models. The levels of current specified are relevant to maximum capacity operation, i.e. at the moment the battery charger supplies its full capacity.

ChargeMaster 12/10	0.9 amperes
ChargeMaster 12/15	1.2 amperes
ChargeMaster 12/25	1.9 amperes
ChargeMaster 12/35	2.5 amperes
ChargeMaster 12/50	3.8 amperes
ChargeMaster 12/70	5.2 amperes
ChargeMaster 12/100	7.4 amperes
EasyCharge Portable 1.1A	0.3 amperes
EasyCharge Portable 4.3A	0.8 amperes
EasyCharge 6A	0.5 amperes
EasyCharge 10A	0.8 amperes

In addition, each battery charger with a charge current higher than 15 A (12 V) can be equipped with a remote control panel. This is not useful for smaller battery chargers as the current consumption will be minimal. Using a remote control panel allows you to further reduce the outgoing charge current, as a result of which the battery charger uses even less power from the grid. This prevents fuses from blowing, but will slightly increase the charge time.

Can I install my battery charger in the engine room or compartment?

Mastervolt battery chargers can easily be installed in the engine room. Even at high temperatures, Mastervolt battery chargers provide the maximum charge current, safely and quickly charging the batteries. The output current will be automatically reduced if the ambient temperature becomes very high.

Can I charge batteries separately?

A number of models are fitted with three outputs, allowing three battery banks to be charged independently of each other. Most Mastervolt battery chargers have an additional output for a starter battery. This output supplies for example the starter battery with a maintenance charge. It is also possible to charge multiple battery sets via a battery isolator (also known as a diode splitter). The resulting voltage loss is compensated by a setting in the battery charger or by connecting the battery sense cables.

Can the battery charger be connected to the same battery isolator as the alternator?

Although this is possible, it is better and more convenient to fit two separate battery isolators. If this should be problematic, use the battery isolator for both. In this case, make sure that the battery isolator or Battery Mate is powerful enough to simultaneously handle both the battery charger and alternator current.

What should the cable diameter be between the battery charger and the battery?

When calculating the required diameter of these cables follow this rule of thumb: 1 mm² of cable thickness for every 3 amps. A battery charger of 50 amps, for instance, calls for a cable of 50:3 or 16.6 mm². The standard cable closest to this is 16 mm². This applies when the distance is three metres at most. For longer distances you will require a thicker cable.

What is the maximum distance allowed between the battery charger and the batteries?

In general, three metres is the maximum length when you are using the calculation method described earlier. A cable length of 6 metres is also possible, but thicker cables must then be used. The previously provided example would require 25 mm² cables.

Can I parallel connect a battery charger to the alternator?

It is possible to parallel switch the battery charger to an alternator of, for example, the propulsion engine. This situation occurs when the engine is running and a 230 V generator is started simultaneously.

How long will it take before my batteries are fully recharged?

The charging time of a battery is directly related to the ratio of battery to charger capacity. Other important factors that decide how long it takes for an empty battery to completely recharge are the battery type and the power consumption of the potential consumers.

As a rule of thumb for lead acid batteries, divide the battery capacity by the maximum charge capacity and add four hours. The four hours are for the absorption time, during which the battery determines how much more current is necessary and the battery capacity increases from approx. 80 % to 100 %.

Of course, this rule does not consider the power consumption of other connected equipment: If loads such as a refrigerator or lights are connected, their power consumption needs to be subtracted from the available charge capacity.

Example:

Take an empty 200 Ah battery, a 50-amp battery charger and a connected load consuming 10 amps. Charging time in this case would be around 200/(50-10) = 5 h, or 9 h in total including four hours of absorption time. If the batteries are only half-discharged, the recharge time would be 100/(50-10) = 2.5 + 4 h, 6.5 h in total. The absorption time is shorter with Gel and AGM batteries – around two to three hours. These types of battery will therefore recharge faster than conventional ones (see also 'Charging batteries').

What is voltage sense?

No matter how thick, every cable has some resistance, resulting in a certain amount of voltage being lost between the battery charger and the batteries. This voltage loss depends on the thickness of the cable and the battery charger current. A battery charger measures as standard the voltage at its output terminals. Due to the cable losses the voltage is higher than the battery voltage. The output voltage of the battery charger minus the voltage loss across the cables is the battery voltage. When a lot of voltage is lost on the cables, the battery charger might switch to the absorption phase too early, which means that the battery will not become fully charged or charging time will increase. To compensate for voltage loss via the cables, sense wires have to be connected between the battery charger and the batteries. These (thin) cables ensure that the battery charger measures the voltage directly on the positive and negative terminal of the battery instead of on the output terminals of the battery charger. The voltage lost during charging is compensated and the batteries are charged quickly and effectively. The voltage drop over, for example, a diode splitter (battery isolator)can also be compensated in this way.

What is 3-step+ charging technology?

Mastervolt's 3-step+ charging technology is the fastest and safest way to charge gel, AGM, Lithium Ion and open flooded type batteries. It consists of the following phases:

First step: BULK phase

In the bulk phase, the battery charger delivers its maximum current, e.g. 50 amps for a ChargeMaster 12/50 and battery voltage increases. The duration of this phase depends on the battery capacity, charger capacity and any consumers connected to the battery during charging. The bigger the battery, the longer this step takes; the larger the charger, the shorter the stage. If consumers such as a refrigerator is connected, they will also need to be powered by the charger, reducing the charge current going into the batteries and increasing the time necessary for charging.

Second step: ABSORPTION phase

The second step, the absorption phase, begins once the battery has reached its maximum voltage. At this point the battery is around 80 % full, and the charge current begins to slowly decrease.

At 25 °C, the maximum voltage is 14.25 volts for a 12 V battery and 28.5 volts for a 24 V one. In this stage the battery is charged to the full 100 %, which takes approximately three to four hours, depending on the battery type, the battery charger and the charge amount.

Third step: FLOAT phase

Once the battery is fully charged at the end of the absorption phase, the float phase begins. The Mastervolt battery charger switches over to a maintenance voltage so that the battery remains fully charged and in optimum condition. Any existing consumer loads are also powered. The charger remains in the float phase until the battery voltage falls due to a major load, or the battery charger is unplugged because the power connection was removed.

What is a temperature sensor for?

When charging the battery, the exact charge voltage is of the essence. The charge voltage must be adjusted to the temperature of the battery. When the battery is cold, the charge voltage must be slightly higher to charge the battery fully. In high ambient temperatures the charge voltage must be reduced to ensure the battery is not overcharged. Mastervolt battery chargers are set as standard to a battery temperature of 25 °C.

When the temperature sensor is connected to the charger, the output voltage will vary by 0.03 V per °C for a 12-volt system and 0.06 V per °C for a 24-volt system. This is in accordance with the advice of most battery manufacturers. At a temperature of 15 °C for instance, the maximum charge voltage for a 12-volt system is 14.55 volt, and at 30 °C it is 14.1 volt. The corresponding values for a 24-volt system are 29.1 and 28.2 volt. At a temperature of 12 °C the voltage is not further increased to protect the connected loads from excess voltage. At 50 °C the charge voltage will be reduced to 12 or 24 V to protect the battery in these high temperatures. The connection of a temperature sensor ensures that the battery is quickly and safely charged with the right voltage.

PLUS phase

Most Mastervolt battery chargers are equipped with an extra step, the PLUS phase. During periods when the battery is resting, an absorption cycle lasting one hour will take place every 12 days to ensure that the battery stays in perfect condition.

Return Amps

During the absorption phase, the battery accepts progressively less current. Once the charge current remains under a certain level for a given period of time, the battery is considered to be fully charged. This maximum charge current is called the Return Amps, and the corresponding period the Return Amps Time. The battery charger takes this as a signal to switch over to the next step, the float phase. Just like many other parameters of the battery charger, Return Amps and Return Amps Time can be set by the installer with the help of software that is freely available on the Mastervolt website. In fact, the installer can use this software to customise the battery charger to your onboard system requirements.

How can I charge batteries with limited power?

When multiple large battery chargers are parallel switched, the available 230-volt connection is often insufficient. Connect one of the battery chargers to prevent the AC connection from overloading. Although this will increase the time needed for charging, you are normally connected to the grid for a longer period of time (overnight) anyway. Both battery chargers can be powered if the generator is running, as the generator usually delivers more output than a power connection. The two battery chargers will not cause the power connection to be overloaded. Another possibility is equipping the vessel or vehicle with two 230-volt connections.

Which battery charger is necessary for a battery capacity of 200 Ah and a 100 Ah starter battery?

The starter battery is generally not considered when calculating the charger capacity – it is only used for starting the engine and will therefore tend to be only partially discharged if at all. While you are using the engine, the alternator recharges the battery and when connected to the grid, it is charged via the second output of the Mastervolt battery charger. As a rule of thumb, a charge capacity of 25 % (up to 50 % for Gel batteries) of the battery capacity is sufficient to charge the battery quickly and safely, and also power the onboard systems. For a battery of 200 Ah, for instance, a battery charger of 50 amps would be appropriate.

Is having 10 % of my battery capacity as charge capacity sufficient?

Definitely not. You can assume 25 % and up to as much as 50 % with Mastervolt batteries. The old 10 % rule was common in the days when battery chargers had no current and voltage regulation, and too high a current could overcharge the batteries. Mastervolt battery chargers have perfect current/voltage regulation and are also equipped with a temperature sensor that ensures the voltage is regulated according to the battery's temperature. Several loads are connected while charging the batteries and these loads are also powered by the charger so the available charge current for the batteries will be reduced.

Can multiple battery chargers be parallel connected?

In addition to simply being chargers, Mastervolt battery chargers also provide power for the 12 or 24-volt onboard system. They can easily be parallel connected should you wish to increase capacity. In fact, this is often the only way to power your 12 or 24-volt system with the 230 or 400-volt power connection. Similarly, should you need a charge current higher than 100 amps, several battery chargers can be parallel connected. A parallel system with multiple battery chargers does not require any special equipment. It can be installed in exactly the same way as a single charger, except that each charger will have its own cables leading to the battery or the DC distribution.

Wiring for the voltage compensation is also connected separately for each charger. The temperature sensor for each charger needs to be separately connected to the battery that you expect to reach the highest temperature. If the chargers and sensors are properly linked, the charge current will be evenly distributed over the connected chargers.

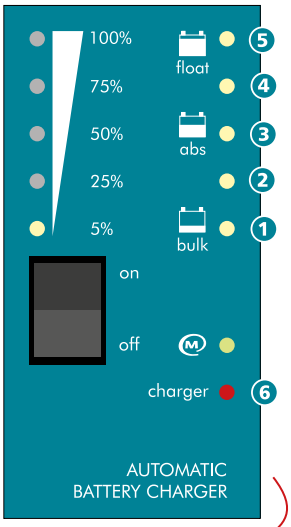
The possibility remains that one of the chargers will switch to the absorption phase sooner than the others. This is a perfectly normal phenomenon caused by tolerances in the adjustment, with no effect on charge time and charger operation. When parallel connecting multiple battery chargers, we recommend that they be of the same model, type and charge capacity. For instance, when a 100-amp charger is linked parallel to a 50-amp charger, the charge current will not be evenly distributed over both. Although this will not affect the charging process or be detrimental for the chargers, it is more efficient to install two chargers of 75 amps each.

Alarms for Mass battery chargers

The Mass battery chargers come standard with alarms. The following alarm signals are indicated on the Read Out Module on the front of the Mass chargers via LED combinations:

1 + 6 =	Voltage sense error
2 + 6 =	Battery charger temperature too high
3 + 6 =	Short circuit on output
4 + 6 =	Battery voltage too high/low
5 + 6 =	Battery temperature sensor error

In addition to these visual alarms, all Mass battery chargers have a potential-free relay contact.



A

Charger Status Interface (CSI) with combined DC alarm, active as standard

Relay contact is activated (no alarm) if:

- Charger on (AC on input, switch turned to ***'on'***).
- Temperature sensor within range.
- DC voltage within range.
- No short-circuit on output.
- Voltage sense (cable loss ***less*** than 3 V).

Relay contact is disabled (alarm situation) if:

- Charger off (no AC on input, switch turned to ***'off'***).
- Temperature sensor out of range.
- DC voltage out of range.
- Short-circuit on output.
- Voltage sense (cable loss ***more*** than 3 V).
- General malfunction of the charger.

The DC alarm only works if the battery charger is switched on. If you require a permanent DC alarm, regardless of whether the charger has input voltage and/or the charger is turned on, select the DC Alarm setting.

Optional: *A separate CSI alarm is optionally available for the Mass battery chargers and is placed in the connection box (if you require multiple alarms).* ***Product code 21702000.***

B

DC alarm, active after programming DIP switch

Relay contact is activated (no alarm) if:

- DC voltage is within range

Relay contact is disabled (alarm situation) if:

- DC voltage is out of range

The DC alarm works whether or not the charger has input voltage and/or the charger is turned on or off. Programming of the DIP switch is marked with continuous monitoring mode (ContMon).

Optional: *A separate DC alarm is available for all Mass battery chargers and is placed in the connection box (if you require multiple alarms).* ***Product code 21702100.***

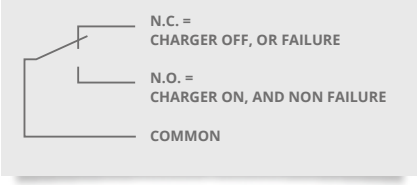
Internal alarm contact

Alarm options/settings:

A

Non continuous mode

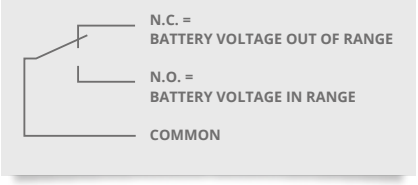
C.S.I. / DC alarm



B

Continuous mode

DC high / low alarm



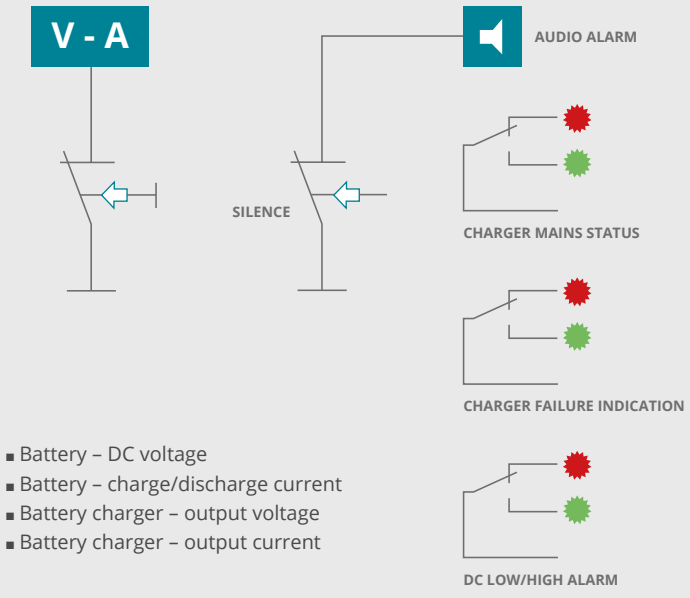
Mass Charger Interface

Every Mass battery charger can be equipped with an intelligent front panel. The Mass Charger Interface combines the following functions:

- ***LCD display:*** DC voltage and charge/discharge current.
- ***Alarm functions:*** DC high/low voltage alarm visual/acoustic and potential-free contact.
- ***Alarm functions:*** AC alarm, no input voltage AC visual/acoustic and potential-free contact.
- ***CSI alarm:*** Charger Status Interface, charger error visual/acoustic and potential-free contact.

The Mass Charger Interface makes your Mass battery charger suitable as a power supply/battery charger for devices such as GMDSS emergency systems for seagoing vessels and yachts. The alarm settings, charge current and charging method can easily be adapted using the LCD display and control button, and the front display can be easily and quickly installed on the charger. The Mass Charger Interface is optional and is delivered complete with shunt and detailed manual. The battery charger needs to be separately ordered.

Operating principle:



- Battery – DC voltage
- Battery – charge/discharge current
- Battery charger – output voltage
- Battery charger – output current

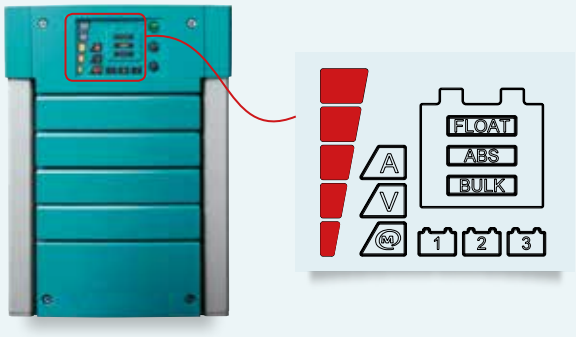
For professional use: GMDSS

For the professional user, there is a front display with alarm functions according to GMDSS available. The GMDSS ("Global Maritime Distress and Safety System") is a global maritime communication system which is part of SOLAS (Safety Of Life At Sea), using DSC and satellite communications.

Alarms for ChargeMaster battery chargers

The ChargeMaster 12/35-3, 12/50-3, 24/20-3 and 24/30-3 are equipped with simple alarms using LEDs on the front panels.

Above models are protected against overload, short circuit, over heating and under and over voltage. If a fault condition occurs, a load bar segment on the display illuminates red. The LED position indicates the failure cause.



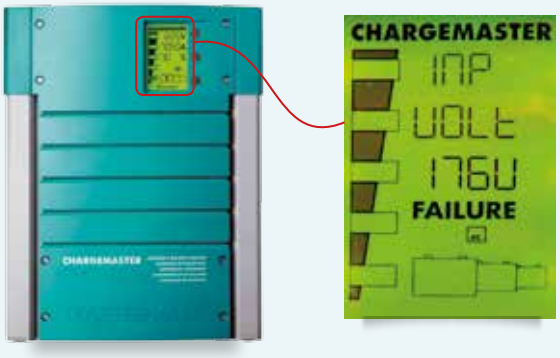
* *The **POWER** button is blinking.*

** *At '**Battery low**' the battery bank number concerned is blinking. Selecting another bank is still possible then, the display will return after 5 seconds.*

LOAD BAR	FAULT CONDITION
	Wrong AC voltage*
	Charger failure*
	Battery voltage too high*
	Internal temperature too high*
	Battery low, short circuit** *Blinking: AC not available*

The larger models such as the ChargeMaster 12/70-3, 12/100-3, 24/40-3, 24/60-3, 24/80-3 and 24/100-3, use the digital front panel of the battery charger for error notifications.

Should an error occur, **FAILURE** is shown on the display. The origin of the error is displayed by means of an error code.



ERROR CODE	FAULT CONDITION
INP FREQ	AC Input frequency too high or too low
INP VOLT	AC Input voltage too high or too low
HIGH VOLT	Battery voltage too high
LOW VOLT	Battery voltage too low
BATT LOW	Battery voltage too low
TMP SD	Temperature shutdown

MASTER TIP

In general, error codes indicate problems with the wiring, fuses or a poor grid quality. Check these thoroughly before contacting your installer or supplier.

Frequently asked questions about inverters

How much battery capacity do I need with an inverter?

As a rule of thumb, the minimum required battery capacity for a 12-volt system is around 20 % of the inverter capacity. For 24-volt inverters, it is 10 %. The battery capacity for a 12-volt Mass Sine 12/1200, for instance, is 240 Ah, while a 24-volt Mass Sine 24/1500 inverter would require at least 150 Ah. The indicated battery capacity is only for the inverter. The capacity required for other loads should be added to it.

How much power does an inverter consume?

Mastervolt sine wave inverters have an output efficiency of more than 92 %, which is the maximum that can be achieved with modern technology. If you connect an 850 W coffee maker to a Mass sine wave inverter, consumption will be 850 W divided by the onboard voltage of 12 volt, approx. 70 A. Of course, a coffee maker will only be in use for a short period of time, so the consumption measured in Ah will be relatively modest (76 x 5 min. = 6.5 Ah). As a rule of thumb you should divide the connected capacity by 10 for 12 volt and by 20 for 24 volt. This also includes all the power losses in the cables, fuses and the inverter.

Is there a stand-by switch on the inverter?

Definitely! Although the no-load consumption is extremely low, most Mastervolt inverters and Combis are even equipped with two energy saving solutions. Activating the Economy mode reduces battery consumption by an extra 10 %. This function requires an adjustment to the dipswitch/jumper settings, which can possibly be realised via the free downloadable software. The economy mode ensures that the output voltage drops slightly to 208 V, which also reduces the power consumption from the battery. Low-load devices like microwaves and DVD clocks function as normal at this lower voltage.With some inverter models it is even possible to activate a stand-by mode. In this mode the inverter sets a tiny pulse on the 230-volt installation, checking for any connected appliances. As soon as the pulse detects consumption, voltage returns to normal strength to power the connected equipment. The economy mode ensures that the power consumption of the inverter stays at virtually zero.

Can I power a computer with an inverter?

Yes, you can. All Mastervolt sine wave inverters can easily and safely supply a computer without the slightest problem or risk. In fact, the output voltage from an inverter is often better than that from the electricity grid or shore power. This is why Mastervolt inverters, combined with a battery charger and a battery set, are often used as a back-up system in places where the grid connection is unreliable. Laptops can also be powered by a Mastervolt inverter.

Can a microwave be powered with an inverter?

Any microwave model can be connected to a Mastervolt inverter. Bear in mind that an 800-watt microwave consumes about 1200 to 1300 watt from the 230-volt system, and that the capacity of the inverter and battery must be able to handle this.
Apart from that, the total consumption of the microwave-inverter combination is moderate: Using the microwave for five minutes will use around 12 Ah on a 12-volt system and 6 Ah on a 24-volt system.

Are there any appliances that cannot be powered by an inverter?

You can connect almost any appliance to an inverter, with a few practical exceptions. In practice you must be careful with equipment that consumes a lot of power, such as electrical heaters or air conditioning. While the inverter itself has no problems with these loads, the battery capacity is often too limited for long-term usage of these loads. Appliances that are only used for a limited time period, such as washing machines, driers or a small hotplate, should be fine as long as the battery has sufficient capacity. In these cases it is advisable to use a power source such as an alternator, which also powers the battery. Keep in mind that heavy users such as engines, pumps, air conditioning and fridges have a starting current that is between 5 to 12 times higher than the nominal absorbed capacity. The inverter has to be able to supply accordingly. Mastervolt inverters are developed to provide high peak currents.

How much current will an inverter draw from my batteries?

This depends on the equipment connected to the inverter. There is a simple method to calculate how much power your inverter is using: For 12-volt inverters, divide the connected load by 10; for 24-volt inverters, divide by 20.

Example:

How much does an inverter consume with a 400 W load connected?

For a 12 V inverter such as a Mass Sine 12/1200, consumption will be 400/10 = approx. 40 amps. For a 24 V inverter, say a Mass 24/1500, the corresponding figure is 400/20 = approx. 20 amps. It is important to remember that this is only an approximation: The actual consumption will tend to be some 5 to 15 % less, depending on the load type.

How thick should my battery cables be?

Using the method described above, calculate how much power your inverter will be drawing at maximum capacity (120 amps in the case of a Mass Sine 12/1200, for example). Then count 3 amps per mm². In the above example this is 120 divided by 3 = 40 mm². The standard cable thickness closest to that is 35 mm². This rule applies to cables up to three metres in length. If the inverter is further away from the battery, choose the next size up (50 mm² for instance).

Does an inverter need a lot of ventilation?

An inverter needs very little ventilation - two approx. 60 cm² ventilation openings are usually enough. Larger inverters, from 1500 W upwards, need twice that size. Inverters used in high ambient temperatures, and those expected to be operating at full capacity for a long period, require openings that are four times as large.

Can an inverter be used in parallel with the generator or the grid?

No, stand-alone inverters cannot function in parallel with a generator or grid connection. A Mastervolt Mass Combi is the solution if you need more power than is available from the grid connection or the generator. These models can compensate for the lack of grid or generator power using the batteries. A Masterswitch or Systemswitch needs to be installed when grid or generator power is connected to the onboard grid simultaneously with an inverter. The main function of the Masterswitch is the automatic and safe switching between grid, generator and inverter power.

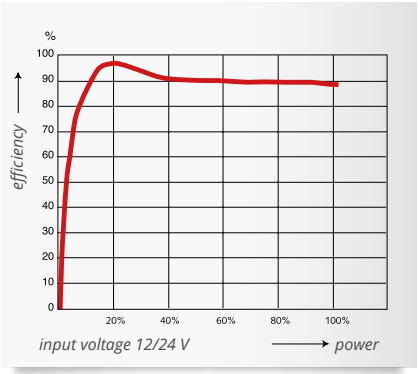
What is no-load?

No-load is the amount of current used by the inverter when no loads are switched on, while the inverter is switched on.

What is efficiency?

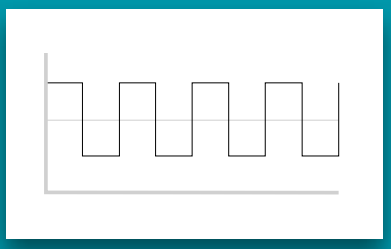
An inverter uses a small amount of energy during the conversion process. The difference between the input power and the output power is expressed in percentages. The efficiency of modern inverters is more than 92 %. This means that a maximum of 8 % of the power consumption is used to convert battery voltage to 230V/50Hz. A connected load of 250 watt, for instance, requires less than 270 watt to be supplied by the batteries.

Efficiency versus output power:

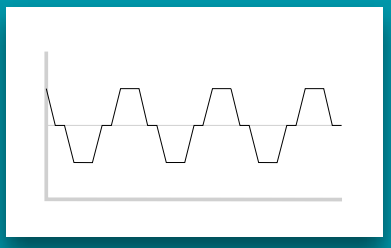


What are trapezoidal or square wave inverters?

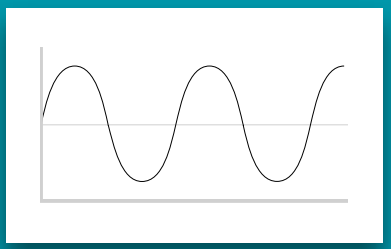
Square wave and trapezium inverters are often available in DIY shops and supermarkets at low prices. These cheap inverters are not suitable for all loads, however, and therefore not safe to use. Modern inverters generate a sine wave-shaped output current similar to or even better than that of the public grid and perfectly suited to powering sensitive equipment. Trapezoidal inverters, also called modified sine wave, are the ancestors of the modern sine wave inverters. As the name suggests, they generate an output voltage in the shape of a trapezium. This type of voltage is inappropriate for sensitive equipment. The square wave inverter is the predecessor of the trapezoidal inverter and represents the first generation of inverters. It is also very unsuitable for delicate equipment.



Square wave



Trapezoidal or modified sine wave



Sine wave

Can I power an air conditioning system via the inverter?

It is perfectly possible to power a small air conditioning installation of, for instance, 4500-6000 BTU via an inverter. While it is important to remember not to leave the air conditioning running for too long, cooling down a cabin before going to sleep is fine as long as the battery bank and inverter are correctly sized. Also remember to pay attention to the start-up current, which can be up to eight or twelve times higher than nominal capacity. A 6000 BTU air conditioning uses approximately 700 watts. For a 230 V system this means a current consumption of approximately 35 amperes. Cooling down a cabin within two hours requires 70 Ah for a 24 V system and 140 Ah for a 12 V system. It is important to make sure that the inverter is large enough to provide the starting current for the air conditioning, and the battery also needs to be able to supply the required capacity within two hours as well.

Can I cook with electric appliances using an inverter?

Cooking is definitely possible with an inverter as long as the battery set is reasonably large and the inverter has a capacity of at least 2 kW. The preparation of a complete meal will, in general, require the generator to be activated or power to be plugged in. Switching on the generator to heat up a cup of soup or cook a steak or an egg is rather wasteful, since the generator will not even warm up properly before it is turned off again. This is bad for the generator and the environment. Instead, we recommend that you power only one or two of the hotplates via the inverter – a snack can then still be prepared or heated without needing to start the generator. After using the cooker, recharge the battery fully via the battery charger or alternator.

Inverter selection table

AC appliances	AC Master 300 W	AC Master 500/700 W Mass Sine 800 W	AC Master 1000/1500 W Mass Sine 1200/1500 W	AC Master 2500/3500 W Mass Sine 2000/2500 W	Mass Sine Ultra 4000 W Mass Sine 5000 W
TV/DVD/audio	■	■	■	■	■
NiCad battery charger	■	■	■	■	■
Laptop/desktop PC	■	■	■	■	■
Small drill	■	■	■	■	■
Fluorescent LED lights	■	■	■	■	■
Small kitchen appliances	■	■	■	■	■
Small refrigerator	□	■	■	■	■
Small microwave	◪	□	■	■	■
Coffee maker	□	□	■	■	■
Hairdryer (1000 W)	□	◪	■	■	■
Vacuum cleaner	□	□	■	■	■
Refrigerator/freezer	□	■	■	■	■
Small power tools	□	□	■	■	■
Water pump	□	◪	■	■	■
Electric tools	□	□	■	■	■
Combi microwave	□	□	■	■	■
Washing machine 3 kg	□	□	□	■	■
Oven	□	□	□	□	■
Air conditioning/electric hob (limited)	□	□	□	■	■
Electric hob (complete / 3-phase)	□	□	□	■ (AC Master)	■ (Mass Sine Ultra)
Turbine pump/electric motor (3-phase)	□	□	□	■ (AC Master)	■ (Mass Sine Ultra)
Battery capacity 12 V/min.	60-80 Ah	100-150 Ah	250-350 Ah	300-500 Ah	
Battery capacity 24 V/min.	30-50 Ah	50-80 Ah	120-180 Ah	200-300 Ah	400-600 Ah

■ Appliance can operate continuously if connected to inverter, battery capacity decides operation time.
◪ Appliance or tool can operate for a reasonable amount of time (not continuously).
□ Use next model.

Frequently asked questions about Combis

What battery capacity do I need to fit a Mass Combi 12/2000 or 24/2000?

A simple rule of thumb states that a 12-volt system needs a minimum battery capacity of around 20 % of the inverter capacity, while the corresponding figure for 24-volt inverters is 10 %. The battery capacity required for a 12-volt Mass Combi 2000 is therefore at least 400 Ah, while a 24-volt Mass Combi 2000 needs at least 200 Ah.

How much power does a Combi use?

The efficiency of Mastervolt equipment is very high due to the application of high frequency (HF) technology. If the Mass Combi needs to power a Senseo coffee machine (1450 watt) for instance, power consumption will be 1450 watt divided by the onboard voltage of 12 volt = 120 amps. Making a cup of coffee takes less than a minute, so consumption in Ah can be considered fairly small at 120 x 1 min = 2 Ah. The power used by the inverter itself is negligible.

Does the Combi need a lot of ventilation?

The Combi (if installed in a cabinet) needs very little ventilation – two approx. 80 cm² (9 x 9 cm) ventilation openings are the minimum required. Combis that are used in high ambient temperatures, or are expected to be operating at full capacity for a long period, require openings that are at least four times as large.

How thick should the battery cables be?

To calculate the right cable size, determine the highest possible current which will flow through the cable. For the Combi this is the inverter current. When running at full capacity, a 2000 W inverter for instance draws around 200 amps from the batteries (100 amps for a 24-volt system). The rule is simple: For every 3 amps you need 1 mm² in cable thickness. The advice for a Combi 12/2000 would be 70 mm² cable thickness and 35 mm² for a 24-volt version.

Is the Mass Combi noisy?

HF technology has rendered large low frequency transformers obsolete, so you no longer have the irritating humming sound generated by equipment with a large transformer. Ultra quiet and temperature-regulated ventilators take care of the cooling, ensuring that noise levels are kept low. The only remaining sound is the soft hum of the cooling air. A Mass Combi can therefore be installed virtually anywhere.

Can I reduce the power intake in situations where power is limited?

Yes. The Mass Combi comes with Power Sharing and Power Support function. Power Sharing ensures that the battery charger in the Combi automatically switches to a lower capacity as soon as a given preset value is reached.

This value usually corresponds to the available AC power fuse or generator capacity. The current required by the battery charger and the current required to power connected equipment are added up. Should the total exceed the pre-set critical value, the battery charger current will be automatically reduced to the extent where grid or generator power intake is equal to the pre-set value. The battery charger can even be set to operate at zero-amps charge current. If the output load of the Combi exceeds the preset value of, for instance, the AC power fuse, the system will quickly switch back to the inverter: This prevents the power fuse from blowing or the generator from becoming overloaded. Once the current required to power the connected equipment becomes lower – when a number of appliances have been turned off, for example – then the system will switch back to incoming current and the batteries will be recharged again.

Do I need a transfer system?

A transfer system is not needed.
In case you have only one 230-volt connection, using a Mass Combi brings an integrated transfer system between the incoming current and the inverter current. Incoming 230-volt power current is automatically directed to the outlet and the batteries are charged. The inverter will immediately take over should the 230-volt input drop or be switched off, resulting in virtually no interruption.

The Mass Combi Ultra even allows you to directly connect two 230-volt connections; a mains/grid connection and an AC generator. The Combi Ultra automatically switches between all power sources, including the inverter.

Can I power a computer with a Combi?

Yes, the Mass Combi can easily and safely supply a computer without the slightest problem or risk. The Mass Combi Ultra can even function as an emergency power system. If, for instance, the 230-volt grid drops, the Combi will automatically switch over to inverter operation.

As the switching time is very short and the inverter was already keeping up with the incoming voltage in standby-mode, the computer will continue to work normally. Once the mains is restored, the system switches back to charger operation and the incoming voltage from the grid or generator again powers the computer. The Mass Combi MasterAdjust software allows you to set the minimum level of grid/generator voltage at which the Combi is switched on.

Does the Mass Combi work with washing machines?

The Mass Combi can easily power a washing machine. One whole washing cycle will, on average, take 80-100 Ah (with a 12-volt system), and 40-50 Ah (with a 24-volt system). Most of the energy is used to heat up the water, so consumption is properly correlated to the water temperature. Washing your laundry will put considerable strain on your battery for a short period of time, so it is important that battery capacity be sufficient: 600 Ah should be enough for a 12-volt system and 300 Ah for a 24-volt one.

The value for maximum power intake can be adjusted via the optional remote control panels or by DIP switches in the equipment.

Can a Combi power a microwave?

Yes, all microwave models can be connected to a Mastervolt Combi. Bear in mind that an 800-watt microwave consumes 1200 to 1300 watt from the 230-volt system, and that the capacity of the Combi (inverter) must be able to handle this. Apart from this, the total consumption of the microwave is modest: Five minutes of microwave use will consume around 8 Ah on a 12-volt system and 4 Ah on a 24-volt system. A combination microwave with oven and grill can also be connected to the Mass Combi. As power consumption will be high when the oven and the microwave are used simultaneously, you will need a robust battery of at least 600 Ah for 12 volt and 400 Ah for 24 volt.

Can I parallel connect Mass Combis?

Yes, the Mastervolt Mass Combi 2500 W and Mass Combi Ultra can be parallel connected without any problem. The Mass Combi Ultra can even be connected in parallel up to ten units. Such a set-up means that you double the inverter capacity as well as the charger capacity. With more batteries or a need to power more equipment, parallel connect a second Combi to the existing one. This doubles the available inverter and charge capacity. No additional equipment is required, apart from the connection of a few signal cables. It will, however, be necessary to adapt wire and cable diameters in the system to cope with the increased capacity.

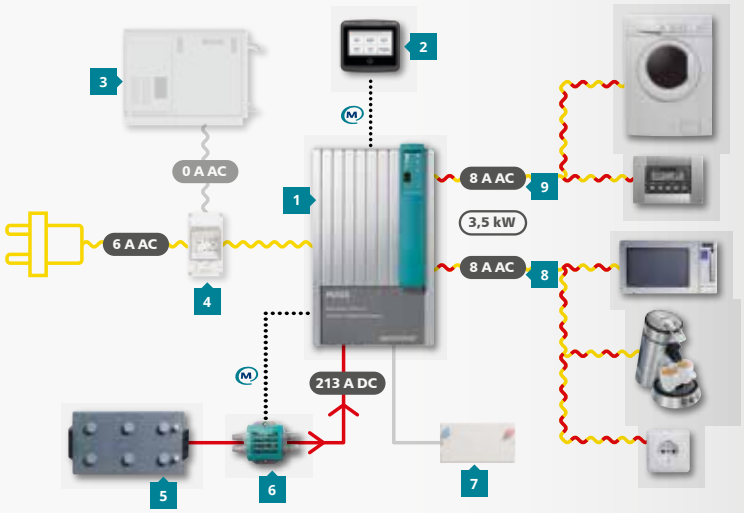
What is the Power Assist function?

Mastervolt Mass Combis are equipped with an extremely advanced system to prevent the AC power fuse from becoming overloaded. The output current of the battery charger is reduced as soon as there is a risk of this happening. If this proves insufficient, the system rapidly switches to inverter operation so that the battery temporarily powers a part of the connected load. Since the inverter will already have been synchronised and the switching is so fast, computers will continue functioning, as will clocks and timers on, for instance, microwave ovens. Once the load decreases, the system switches back to power and the battery charger returns to charging the batteries. Your Combi can therefore also function as an efficient emergency power system.

1. Mass Combi (Ultra) inverter/ charger combination.
2. EasyView 5, control panel for all devices in a MasterBus network.
3. Generator.
4. Masterswitch transfer system.
5. Service battery, gel.
6. MasterShunt.
7. Starter battery, AGM.
8. Inverter output.
9. High Power output.
10. Lithium Ion battery.

Example 1 - Mass Combi

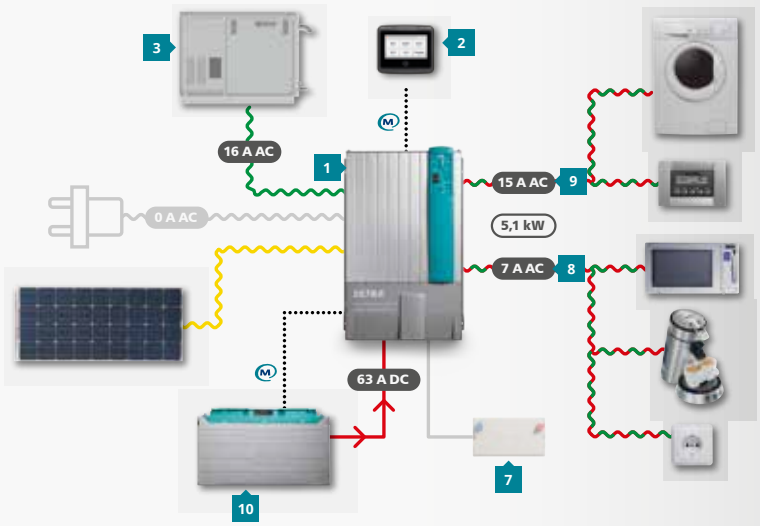
Higher consumption than available from the grid.



The electrical system is connected to the grid. The circuit breaker is limited to 6 amps. Several 230 V appliances are switched on, consuming 3.5 kW. A total of 16 amps is required. The additional 230 V (10 A) is supplied via the service battery and the Mass Combi. Automatic switching off prevents excessive discharge of the batteries. You can program the setting via Power Sharing in the Mass Combi, or remotely using the EasyView 5 panel.

Example 2 - Mass Combi Ultra

No grid - only generator and battery power.



In this case your power sources are a generator and the grid connection. Both sources can charge the batteries and provide power to the connected consumers. The Mass Combi Ultra regulates supply and demand and can optionally even start the generator through MasterBus. In case of large power demand, the Mass Combi Ultra provides additional AC power from the Lithium Ion battery, in parallel with either the generator or the grid connection. This way you can operate larger loads without overloading the generator or blowing the main fuse.

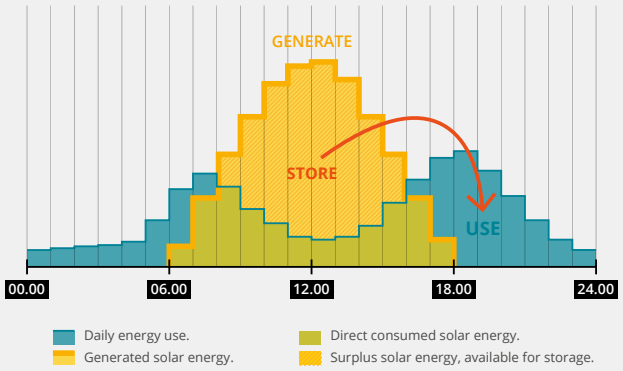
Mass Combi in a grid-connected solar power system with energy storage

The use of local energy storage combined with a grid connected system with solar panels in a home or company is increasingly popular.

Using energy storage significantly increases the self-consumption (i.e., the amount of generated solar energy that is actually used). Benefits include cost savings through reduced power consumption from the electricity grid, the certainty of using self-generated green energy, and increased autonomy. Another relevant benefit is the back-up function in case of power failures in the electricity grid.

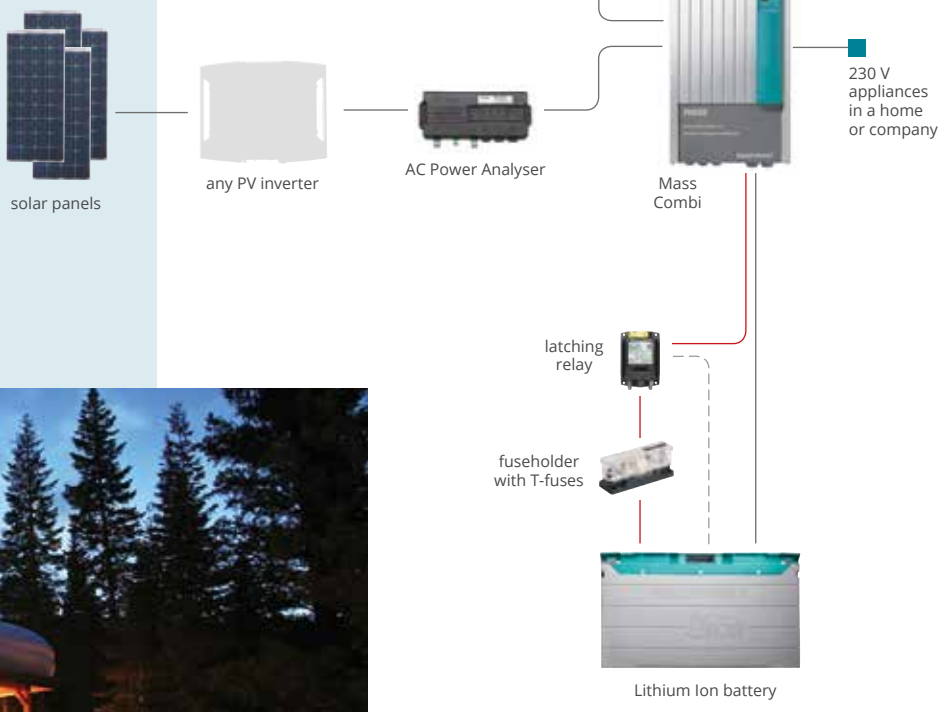
Below is an example of a grid-connected solar energy system with energy storage. The Mastervolt products in this system are aligned via MasterBus to ensure that power consumption via the electricity grid is reduced to a minimum. When the sun shines, the system will use the solar energy in the following priority order:

1. Powering the AC loads.
2. Charging available batteries.
3. Returning the surplus solar energy to the electricity grid.



Generated solar energy that is not immediately consumed is stored in the batteries for use in the mornings and evenings when the consumption is (usually) higher than the available solar energy.

When there is less solar energy available than needed, the energy stored in the batteries will be used first. Only when the batteries are 'empty' (= the minimal state of charge required for maintaining their lifespan) power from the electricity grid will be used. This means you always use as much locally generated energy as possible and are ensured of a reliable power supply. In case of a failure in the electricity grid, the Mass Combi will simply take over the power supply via autonomous/stand-alone operation.



All you need to know about alternators and charge regulators

To quickly charge the batteries while the engine is running, we recommend an additional 'high output' Mastervolt alternator on the engine.

Standard alternators, originally designed for the car industry, only deliver sufficient energy to both charge the batteries and power the various onboard consumers when they reach a very high rpm.

These alternators also tend to be temperature-sensitive: In a higher ambient temperature, such as is common in an engine room, their output quickly falls by 50 % or more. This is not a problem in cars as the small amount of energy used during, for instance, starting can be recharged in no time, and windscreen wipers, ventilators, etc. do not need a great deal of power. In general, a car engine also runs at a far higher rpm than a boat's engine, and the temperature under the bonnet is lower due to the cooling effect of the head wind.

Why a Mastervolt alternator?

Mastervolt Alpha alternators are specially designed for ships and professional mobile applications to provide sufficient power even with a low rpm. A pulley ratio of 1:3 and an engine idle speed of around 700-800 rpm will generate substantial current for charging the battery sets and powering the connected equipment. Mastervolt alternators are also resistant to the high temperature of the engine room, allowing the engine to serve as the energy source for onboard consumers and as a quick charger for the service batteries.

Make sure you do not choose your alternator too small.

A larger one will ensure that the battery is charged faster and engine hours are kept to a minimum – we suggest choosing an amperage between 30 and 50 % of the battery capacity.

The standard alternator designed for road vehicles has a voltage regulator mounted to the back of the alternator and set to a single charge voltage of 14 or 28 volt. This is sufficient for a car battery, which is rarely (if ever) discharged. Furthermore, the voltage regulator of an automotive alternator is often temperature sensitive and in high temperatures regulates the voltage even further down, often to 13.5 or 26.5 volt. This is much too low for sufficiently recharging a discharged battery. The maximum achievable battery capacity for these voltage levels is around 60 to 70 %. The lifespan of a battery is significantly lower if it is never properly charged. In order to adequately recharge a partially empty or completely flat battery at 25 ºC, voltage need to be 14.25 volt for a 12-volt battery and 28.5 volt for a 24-volt one. Once the battery is 100 % full, this voltage must be reduced to 13.25 or 26.5 volt (float phase) to prevent the batteries from becoming overcharged.

Ungrounded – also for aluminium vessels

Mastervolt alternators are delivered ungrounded, i.e. the negative pole of the alternator is not connected to the alternator casing but has a separate connection. This means that they are also suitable for aluminium boats, where the negative needs to be separated from the hull.

More output

Mastervolt alternators offer a much higher output than the alternators supplied with engines. As a result, the standard single belt is insufficient to transfer the power from the engine to the alternator. Two belts are required and the pulley of the engine will often need to be changed as well. Your engine supplier can help you choose an appropriate double pulley and give advice on setting up the alternator. In order to handle the high output you will also have to adjust the alternator support.

More information on alternators and installation diagrams are available at ■ **mastervolt.com/alternators**

Benefits of the Alpha Pro charge regulator

The Alpha Pro charge regulator maximizes the output of Mastervolt Alpha alternators or any other alternator by regulating the alternator in a way that the batteries receive the optimum charge. The proven 3-step+ charge method used by all Mastervolt battery chargers guarantees fast and safe charging of your batteries.

The charge regulator is designed as a 'fit all' solution, just one unit is needed for both 12 and 24 V applications, with a simple selector switch to set the regulator to the right voltage. The unit can also be used on any other brand of alternator that has a standard Bosch connector; an optional connection cable is available (product code 45510500. Easy operation LEDs on the body of the regulator indicate the charge phase.

The Alpha Pro is also fully connectable to the MasterBus CANBus system, allowing easy monitoring via a EasyView touchscreen. In a MasterBus system the voltage drop over the battery cable will be compensated automatically, as well as the battery temperature, improving the charging time without having to install additional cabling.
The MasterBus communication also ensures a safe and efficient charge of the Lithium Ion batteries.

The Alpha Pro helps to cut emissions by requiring less run time because it maximises the power from any alternator. A battery can be charged quickly even at very low RPM, especially when connected to an Alpha series alternator. By connecting the Alpha alternator to a Battery Mate or battery isolator, several battery banks can be charged simultaneously.

Alpha Pro charge regulator, supplied with a Mastervolt alternator as standard.

The battery as power source

There are different kinds of rechargeable batteries. The most common type is the lead-acid battery. A less familiar one is the nickel-cadmium (NiCad) battery, which can still often be found in old emergency power systems. Due to the high charge voltage required by a NiCad battery, and the fact that they are very environmentally unfriendly, these batteries are not suitable for use onboard a vessel or car/truck.

Principle of the lead-acid battery

A battery is a device that stores electric power in the form of chemical energy. When necessary, the energy is again released as electric power for DC consumers such as lighting and starter motors. A battery consists of several galvanic cells with a voltage of 2 volt each. For a 12-volt battery, six cells are linked in series and fitted inside a single casing. To achieve 24 volt, two 12-volt batteries are linked in series. Each cell has positive oxidised lead plates and negative lead metal plates, and has an electrolyte consisting of water and sulphuric acid. During discharging, the lead oxide on the lead plates is converted into lead. The acid content decreases because sulphuric acid is required for this process.

To recharge the battery, an external power source - such as a battery charger, alternator or solar panel - with a voltage of around 2.4 V per cell must be connected. The lead sulphate will then be converted back into lead and lead oxide, and the sulphuric acid content will rise. There are limits set for the charge voltage to prevent the release of an excessive amount of hydrogen. A charge voltage of more than 2.4 V per cell, for instance, releases a lot of hydrogen gas, which can form a highly explosive mixture with the oxygen in the air.

The upper limit on charge voltage for a 12 V battery is 14.4 V, and the corresponding value for a 24 V battery is 28.8 V at 20 °C. The relationship between how full a battery is and the specific gravity of the water/sulphuric acid mixture is as follows:

percentage charged	battery voltage	specific gravity	percentage discharged
0 %	11.64 V	1.100	± 100 %
20 %	11.88 V	1.140	± 80 %
40 %	12.09 V	1.175	± 60 %
60 %	12.30 V	1.210	± 40 %
80 %	12.51 V	1.245	± 20 %
100 %	12.72 V	1.280	0 %

Different types of battery – in terms of the thickness and number of plates per cell – correspond to different applications. The maximum current that can be delivered is determined by the total plate surface. The number of times that a battery can be discharged and recharged – the number of cycles – depends on the thickness of the plates. A battery can feature either many thin plates or a few thick ones.

The starter battery

A starter battery has many thin plates per cell, leading to a large total plate surface. This type of battery is, therefore, suitable for delivering a high level of current over a short period of time.

The number of times that a starter battery can be heavily discharged is limited to around 50-80. But as starting the engine uses only a small part of the energy stored (around 0.01 %), the battery lasts for many years. This type of battery is generally unsuitable for cyclic use.

The Lithium Ion battery

Until recently, Lithium Ion batteries were mainly available as chargeable batteries with a small capacity, which made them popular for use in mobile phones and laptops. Mastervolt offers Lithium Ion batteries with large capacities. Our Lithium Ion batteries have a high energy density and are perfect for cyclic applications. Compared to traditional lead-acid batteries, Lithium Ion batteries offer savings of up to 70 % in volume and weight, while the number of charging cycles is three times higher than semi-traction lead-acid batteries. An added benefit is that Lithium Ion batteries can supply a constant capacity, regardless of the connected load.

The available capacity of a lead-acid battery is reduced in case of higher discharge currents. Lithium Ion batteries can be discharged to 80 % without affecting their lifespan, whereas lead-acid batteries are more affected by deep discharge.

Lasts longer

Compared to traditional open or lead acid batteries, the Lithium Ion batteries offer even more benefits, such as a much larger power density and a longer lifespan.

And because lithium is the lightest metal, Lithium Ion batteries are also more lightweight. They can also be charged at any time, while nickel-cadmium batteries require complete discharge for an optimal performance and to prevent memory effect. Furthermore, Lithium Ion batteries can be charged with a very high current, up to 100 % of the capacity, resulting in a very short charging time and no memory effect.

Battery Management System

Mastervolt Lithium Ion batteries are equipped with a Battery Management System. The system keeps all the individual cells perfectly balanced, resulting in a higher capacity and longer lifespan.

The flooded traction battery

(Mastervolt does not have this type of batteries in its portfolio)

This type of battery has even fewer, but very thick, flat or cylindrical plates. It can therefore be discharged many times and fairly completely (1000-1500 full cycles). This is why flooded traction batteries are often used in forklifts and small electrical equipment such as industrial-grade cleaning machines.

But flooded traction batteries require a special charge method. Because these batteries are mostly tall, they are sensitive to the accumulation of sulphuric acid at the bottom of the battery container. This phenomenon is called stratification and occurs because sulphuric acid is denser than water. Acid content increases in the lower part of the battery, locally intensifying plate corrosion, and decreases in the upper part, reducing capacity.

The battery is discharged unevenly, significantly reducing its lifespan. In order to spread out the acid evenly again, the battery has to be purposefully overloaded using excessive voltage. This generates a large amount of hydrogen gas, which will form a dangerous mixture with oxygen in the air. The voltage required to recharge these batteries is around 2.7 volt per cell, or 16.2 volt for a 12 V system and 32.4 volt for a 24 V system. These high levels of voltage are extremely dangerous for the connected equipment and the large amount of gas generated makes these batteries unsuitable for use in vessels and vehicles, except for propulsion.

The semi-traction battery

A semi-traction battery has fewer but thicker plates in each cell. These batteries supply a relatively lower starter current, but can be discharged more often and to a greater extent (200 to 600 full cycles). This kind of battery is highly appropriate for the combined function of starter and service battery.

Frequently asked questions about batteries

How long will it take before my battery is discharged?

This depends on its capacity and the amount of power consumed by the connected equipment. As a rule, the faster a battery is discharged, the less power it supplies. This also works the other way around: The longer it takes before a battery discharges, the more energy you can get from it. A 100 Ah lead-acid battery supplies a current of 5 amps for 20 hours, during which time the voltage does not drop below 10.5 volt. This amounts to 100 Ah. If a load of 100 amps is connected to the same battery, the battery will be able to power it for only 45 minutes. After this time the battery voltage will fall to 10.5 volt and the battery will be empty, having supplied no more than 75 Ah. In contradiction to the lead-acid batteries, the capacity of Lithium Ion batteries will not be effected by the load connected. A Li-ion battery will always supply 100 % capacity, independent of the connected load.

How long will my battery last?

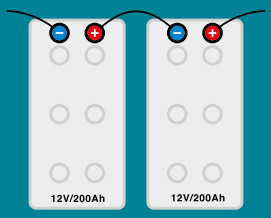
The lifespan of a battery is related to how often and to what extent it is discharged. Proper charging with the right charger is also crucial. At a normal use for holidays and weekends, a lifespan of between five and seven years is quite common for Gel and AGM batteries. When batteries are frequently discharged you will need to adjust the capacity. There is also an option to use 2 volt cells. A lifespan of 15 years is not exceptional for this type of battery as long as they have the right capacity and are properly charged. Lithium Ion batteries are top of the bill. You can discharge and recharge them super-fast and they last up to three times as many cycles than other types of batteries.

For more information, see chapter 'Determining lifespan'.

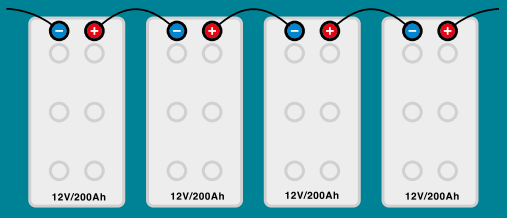
What is series connection and parallel connection?

Series connection

A series connection is used to increase voltage, while keeping capacity at the same level. Two serially connected 12 V/120 Ah batteries make a combined battery set of 24 V/120 Ah. In a series connection, the positive pole of one battery is connected to the negative pole of the other, with the poles that remain at the ends being connected to the system. Batteries with different capacities should never be linked in series.



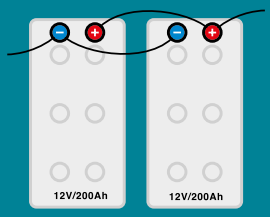
Series connection 24 V/200 Ah.



Series connection 48 V/200 Ah.

Parallel connection

Parallel connection is used when you need to increase your capacity. The positive leads are connected together, as are the negative leads. The cabling from the battery to the system should be: Positive from battery 1 and negative from battery 2 (or the last in the parallel connection).

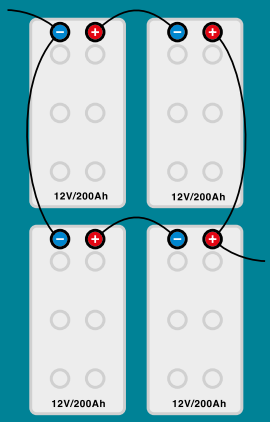


Parallel connection 12 V/400 Ah.

Series/parallel connection

If you need a 24 V battery set with a higher capacity, you can combine series and parallel connections. The cables from the battery to the system must be crossed: Positive from battery 1 and negative from battery 2 (or the last in the parallel connection).

- ***Mastervolt also supplies 2 V, 6 V and 24 V batteries; the principle of series and parallel connecting remains the same.***



Series/parallel connection 24 V/400 Ah.

MASTER TIP

Make sure there is sufficient space between the batteries when installing multiple batteries: There should be a 'finger' of space between them to allow the heat to be diverted.

What *NOT* to do with Gel, AGM and Lithium Ion batteries

- Incorrect charge voltage. Too low a voltage means that the battery cannot charge to 100 % - the sulphate then hardens on the plates and the battery loses its capacity. Excessive voltage causes the batteries to generate gas, leading to water loss and drying out.
- Excessive discharging. Discharging a battery further than its capacity shortens its lifespan.
- Too large ripple on the charge voltage. Cheap and old-fashioned chargers often have a significant voltage ripple (voltage variation) in the output voltage.
- The use of an alternator without 3-step regulator, a high ambient temperature or charging without temperature compensation.
- The MLI battery should not be charged without measures such as a safety relay.

Can I keep my batteries connected during winter?

This is no problem for any Mastervolt battery, and can even be a benefit as the lower temperature extends battery life considerably. The batteries should be fully charged, however, and disconnected from any consumers.

Make sure to consider hidden consumers such as voltmeters, clocks and the car radio memory. If the battery is connected to a Mastervolt battery charger with 3-stage+ charge characteristic, the battery is recharged every 12 days to ensure it stays in optimal condition. If you disconnect the battery we recommend disconnecting all consumers and connecting the power once every two to three weeks to ensure the batteries are recharged. If you don't have access to power in winter, we recommend fully charging the batteries and disconnecting the battery terminals to ensure they are not discharged by small devices. We also recommend fully charging your batteries every two months and before they are reused. Wet batteries should be recharged regularly to prevent them from freezing.

How should I maintain gel, AGM and Lithium Ion batteries?

Gel, AGM and Lithium Ion batteries as opposed to traditional open batteries do not need maintenance, which means they can be installed anywhere. However, we recommend checking all the connections once a year to make sure that they are properly attached, and to clean the top surfaces with a slightly moist cloth. The batteries also need to be completely charged every time for a maximum lifespan.

Which battery is suitable for my application?

Mastervolt offers various types of maintenance-free batteries, each with its own specific characteristics. More information hereafter about the properties of gel, AGM and Lithium Ion batteries.

The Gel battery

With flooded lead-acid batteries, which use a liquid electrolyte of water and sulphuric acid, the water is separated into hydrogen and oxygen during charging, mostly at the end of the charging cycle. These gases subsequently escape through the filler cap. This means water is used and distilled (battery) water needs to be added. The electrolyte in a Gel battery is a gel that binds the water with the acid. While the batteries are being filled, the gel is heated and liquefies.After the battery has been filled with the liquefied gel, the gel cools and solidifies. This process results in tiny hairline cracks in the gel between the plates.

During the charging process, oxygen O_2 is generated on the positive plate and hydrogen H_2 on the negative plate. The cracks in the gel let the gases combine to create water. The gel then

absorbs the water so that no water disappears from the system and no gases are produced.

Gel batteries are not a new technology and have been in use since the late 1950s. The most important applications are in emergency power systems, telecommunications systems, power supply and, for the last 20-25 years, as service batteries in various systems. Gel batteries come in two different versions. The 12-volt design is appropriate for regular use and available in capacities up to 200 Ah.

2 V Gel battery

The second design is a 2-volt traction battery, available in capacities up to 2700 Ah and highly suitable for systems with frequent and significant discharging where a long lifespan is needed. For a battery of 12 or 24 volt, six or twelve Gel batteries need to be connected in series to provide the required voltage.

Major benefits of Gel batteries include very limited self-discharging, the possibility of a short charging time, and the lack of gas production under normal circumstances. All of this makes Gel batteries very suitable for heavy cyclical applications.

The AGM battery

A different type of lead-acid battery is the AGM (Absorbed Glass Mat) battery. In this model, the electrolyte (water and sulphuric acid) is absorbed into an extremely delicate glass fibre mat. Just like with any other battery, charging generates hydrogen gas and oxygen, which are transported through the capillary tubes of the glass fibre mat. Once the two gases are recombined, water is once again obtained and subsequently reabsorbed into the glass fibre mat. The recombination process is then complete.

The glass fibre mat also serves as insulation between the plates, allowing the plates to be close together and leading to very low internal resistance. This means that a high discharge current is no problem. The charge current could be a little lower than with Gel batteries (approx. 30 %) because the glass fibre mat is also an efficient heat insulator, and heat generated by charging is gradually conducted to the outside of the case. This requires the charge current to be somewhat restricted and results in a slightly longer charging time.

AGM batteries are highly suitable for applications requiring a high discharge current, such as a bowthruster or winches and for medium cycle use.

The AGM battery is entirely closed and therefore maintenance-free. If the AGM battery is overcharged, for instance due to the use of a (cheap) unregulated battery charger, a small amount of hydrogen gas is formed. This gas escapes through a special vent in the battery casing that is designed to prevent oxygen from entering the battery. Incorrect charging will reduce the battery's lifespan.

The Lithium Ion battery

Mastervolt's Lithium Ion batteries are based on Lithium Ion iron phosphate, which has an energy density three times higher than that of lead-acid batteries. Although there are materials with an even higher energy density, these are generally considered less safe. The Mastervolt Lithium Ion batteries are therefore considered one of the safest batteries of their type.

A unique feature is their built-in Battery Management System (BMS). The system monitors the cells and guarantees optimal safety. Mastervolt Lithium Ion batteries are MasterBus compatible, and up to 15 % more efficient compared to other Li-ion batteries available.

This gives you:

- Shorter charging times.
- Less generator time required for charging.
- More power than from a traditional battery of the same dimensions.
  A normal open lead-acid battery, for example, has a DOD (depth of discharge) of 50 %. This means that you can only use up to 200 Ah from a 400 Ah battery. A Mastervolt Lithium Ion has a DOD of 80 %, almost 60 % more usable battery capacity. With this percentage, a battery of 400 Ah supplies 320 Ah, or 120 Ah more.

- MLI batteries are ideally suited for electric and hybrid propulsion, and can be connected unlimited in parallel or up to ten units in series (series connection is not possible for the MLI-E model).
- MLS batteries are not suitable for series connection, but can be configured unlimited in parallel (see manual for more information).
- Another benefit is that Lithium Ion batteries weigh less and require less space.

Replacing traditional lead-acid with Lithium Ion

Conclusions and recommendations

The low internal resistance of AGM batteries makes them highly suitable for powering winches, windlasses and bowthrusters, for starting engines, and for limited cyclic use.

Gel batteries are highly suitable as service batteries due to the fact that they can be quickly charged and have a long lifespan, even with many charge/discharge cycles. For a service battery you can choose for either a 6-volt, 12-volt or 24-volt version or the 2-volt model.

Lithium Ion batteries save up to 70 % in space and weight, last three times longer and can be recharged and discharged very quickly, 2000 charge cycles in normal use.

Mastervolt batteries are completely maintenance-free and in normal circumstances do not release acid or generate dangerous gas. They are easy to install anywhere onboard, such as next to the bilge or in the engine room (the latter may lead to reduced lifespan due to higher temperatures). Special battery cases or external ventilation are usually unnecessary as natural ventilation will suffice.

The substantial benefits that Lithium Ion technology offer over lead-acid technology means that using Lithium Ion batteries is becoming an ever more popular choice.

When considering replacing an existing lead-acid battery bank by a Lithium Ion battery bank one needs to take a couple of things into consideration. Although the term ‘drop-in replacement’ is occasionally used in this case, it is actually never as simple as that.

To get the most from the Lithium Ion batteries stay within the recommended operating conditions. Although the batteries are set up to do this automatically and safely, taking proper care of your new batteries will prevent nuisances during use such as Lithium Ion batteries disengaging themselves (by a safety relay). Things to take into consideration are:

- ***The charge voltage of the battery bank needs to be checked and possibly changed.*** Where low charge voltage will result in incompletely charged batteries, overly high charge voltage will potentially push the Lithium Ion batteries outside their allowed operating conditions.

MLI & MLS series	**preferable settings**	
	12 V	**24 V**
Bulk/Absorption voltage	14.25 V	28.5 V
Float voltage	13.5 V	27 V

- ***Battery monitoring needs to be shunt (Ah counting) based, not voltage based.*** Some basic battery monitoring products base the battery status fully on voltage measurement. In case of Lithium Ion batteries this will result in unreliable readings, potentially leading to deep discharges. Only shunt-based monitoring devices that incorporate a Lithium Ion battery type setting should be used.

The MLI Ultra series has an external safety relay (battery disconnect switch) and integrated battery monitoring, requiring proper installation and commissioning by a qualified installer. Setting this up correctly, including alarms and events through the MasterBus network, results in a safe and intuitive user interface.

The MLS products have an integrated safety relay. This results in a Lithium Ion battery that is as close as possible to a ‘drop-in replacement’ for lead-acid, as long as the above considerations are kept in mind.

Determining lifespan

The lifespan of a battery will vary considerably with how it is used, how it is maintained and charged, the temperature and other factors. Also the type of battery will determine its lifespan.

12-volt Gel or AGM batteries

If kept in a charged state when unused, the common lifespan of a 12-volt Gel or AGM battery is up to six years. After five or six years of float voltage at an average ambient temperature of 25 ºC, the battery still retains 80 % of its original capacity. Higher average temperatures will shorten the lifespan of the battery. The number of charge and discharge cycles of a 12-volt battery is strongly correlated to its structure and quality. Mastervolt's 12-volt Gel batteries can take around 500 full cycles of being discharged down to 20 % and charged back to full capacity.

Most manufacturers consider batteries to be spent at a remaining capacity of 80 %. This does not, however, mean that the battery has to be replaced immediately. For example, the battery can still be used if only 50 % of the battery capacity is actually required. It is therefore not necessary to replace the battery after six years or 500 full cycles. An average use of seven years is perfectly normal for 12-volt Gel or AGM batteries.

2-volt traction Gel batteries

The lifespan for 2-volt traction Gel cells is at least 15 years and the maximum number of full cycles is 1000-1500 when discharging to 20 % of capacity. These batteries are therefore highly suitable for larger systems that require intensive use and a very long lifespan.

Lithium Ion batteries

Mastervolt Lithium Ion batteries have a lifespan of more than 2000 cycles, which is three times longer than most standard lead-acid batteries. They have an extremely long lifespan due to aspects such as the battery management, very low self-discharge, the lack of memory effect and a discharge of up 20 %.

Courtesy of Flying Focus, the Netherlands.

Transport

Transportation of Mastervolt Gel and AGM batteries

Mastervolt Gel and AGM batteries are considered non-spillable batteries. This means that they are exempt from Dangerous Goods Regulations which cover transport by road, rail, sea freight or air. This way they can be sent to any destination in the world quickly and relatively cheaply.

Transportation of Mastervolt Lithium Ion batteries

Extra care is to be taken for proper transport of Lithium Ion batteries. Mastervolt's Lithium Ion batteries and their packaging have undergone all the required safety testings as prescribed by the United Nations and the transport authorities (both road, rail, sea and air) to achieve this. Below you will find the technical details of what this means.

The Mastervolt Lithium Ion batteries have been tested according to the UN Handbook of Tests and Criteria, part III, sub section 38.3 (ST/SG/AC.10/11/Rev.5). For transport the batteries belong to the category UN3480, Class 9, Packaging Group II and have to be transported according to this regulation. This means that for land and sea transport (ADR, RID & IMDG) they have to be packed according to packaging instruction P903 and for air transport (IATA) according to packaging instruction P965.

The original packaging of the Mastervolt Lithium Ion batteries satisfies these instructions.

3-Step+ charging

This modern charging technology allows a battery to be quickly and safely charged in three phases (steps).

The first step is the ***BULK PHASE***, in which the battery is charged quickly. The output current of the battery charger is at maximum (100 %) during this phase and the battery voltage depends on the charging degree of the battery. The duration of this phase depends on the ratio of battery to charger capacity, and on the degree to which the batteries were discharged to begin with.

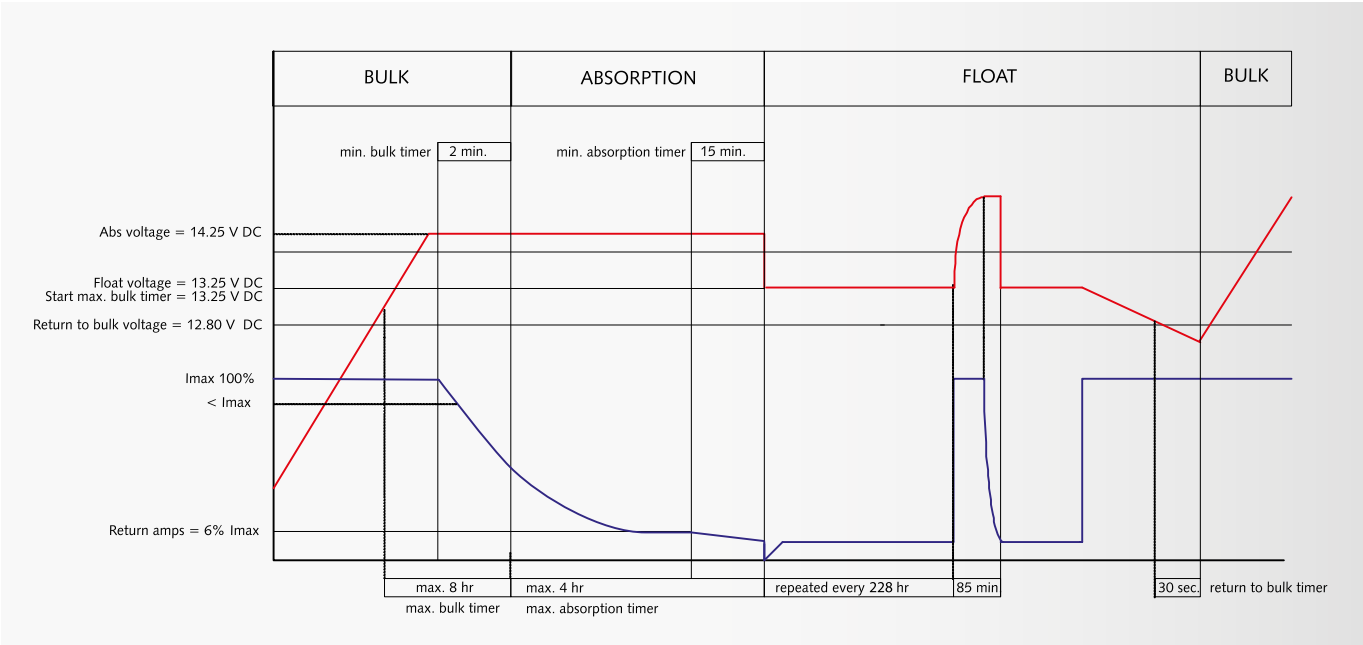
The bulk phase is followed by the ***ABSORPTION PHASE***, which begins once a battery has been charged to ± 80 % (90 % for Gel and AGM batteries), and ends when the battery is completely full. Battery voltage remains constant throughout this stage, and the charging current depends on the degree to which the battery was initially discharged, the battery type, the ambient temperature, and so on. With a flooded battery this phase lasts some four hours, with Gel and AGM batteries around three. This does not apply to Lithium Ion batteries as these are charged to 100 % with full current.

Once the battery is 100 % charged, the Mastervolt charger automatically switches to the ***FLOAT PHASE***.
In this step, the batteries are kept in optimal condition and the connected users are supplied with power. If power consumption is higher than can be supplied by the battery charger, the remaining power is supplied by the battery. The battery is then (partly) discharged and the charger automatically switches back to the bulk phase.
If consumption is reduced, the charger will start charging the battery again via 3-step+ charging. A battery charger with 3-step+ charging can remain connected to the battery, even in winter, and ensures a long lifespan for your batteries as well as being safe for the connected equipment.

Absorption time

The duration of the second phase in the charging of a battery. The battery will, in general, be charged from 80 to 100 % during this phase, which lasts around four hours with a flooded lead battery, and three hours with Gel and AGM batteries. With Lithium Ion batteries the absorption time is very short as they can be charged to 100 % with full current. This phase is automatically set for Mastervolt battery chargers.

3-Step+ charging characteristic (IUoUo)



Charge factor

The charge factor indicates the efficiency of a battery. The efficiency of the average flooded battery is approx. 80 %, which means it must be recharged 1.2 times the eventual capacity in Ah to get the same capacity. This translates into a charge factor of 1.2. The lower the charge factor or the higher the battery efficiency, the better the quality. Mastervolt's Gel and AGM batteries have an efficiency of > 90 % and a low charge factor of 1.1 to 1.15 and offer the very best quality.

Discharge factor

This is also known as Peukert's Law, and allows you to determine how long a battery can be used at a given load before it needs recharging.

Cycle

A battery only lasts a certain number of charge/discharge cycles, depending on its type and quality. In theory one charge/discharge cycle is the process of discharging a battery to 0 % of capacity and recharging it back to 100 %. Twice recharging after discharging to 50 % is also one cycle, as is four times discharging to 75 % and recharging. A starter battery, for instance, can take around 50 to 80 cycles, which may seem little but is in practice more than sufficient: While the current used for starting an engine is high, it only lasts a short time and represents 0.001 of a cycle. In other words, an engine can be started 80,000 times before a battery is worn out. A high-quality semi-traction battery lasts for around 250 to 300 cycles.

If the battery is only discharged to 50 % of capacity, 600 cycles are available. Assuming 25 weekends of use (50 days) plus 20 days of holiday and discharging only to 50 %, the battery will go through 70 half cycles or 35 full cycles.

Charging batteries

Charge voltage

Mastervolt gel (2 V, 12 V) and Mastervolt AGM (6 V, 12 V) batteries should be charged with a voltage of 14.25 V for 12 V systems and 28.5 V for 24 V systems. The absorption phase is followed by the float phase (see 3-step+ charging characteristic on page 242) in which the voltage is reduced to 13.8 V for 12 V systems and 27.6 V for 24 V systems. These figures assume a temperature of 25 °C.
For wet lead-acid batteries, the absorption voltage is 14.25 V for 12 V systems and 28.5 V for 24 V systems. The float voltage for this type of battery is 13.25 V for 12 V and 26.5 V for 24 V systems. All of these figures are for 25 °C.

Lithium Ion batteries are charged with an absorption voltage of 14.25 V for 12 V, and 28.5 V for 24 V systems. The float voltage is 13.5 V for 12 V and 27 V for 24 V systems.

Charge current

A rule of thumb for gel and AGM batteries states that the minimum charging current should be 15 to 25 % of the battery capacity. During charging, you usually continue to supply power to connected devices, and this power consumption should be added to the 15-25 %.

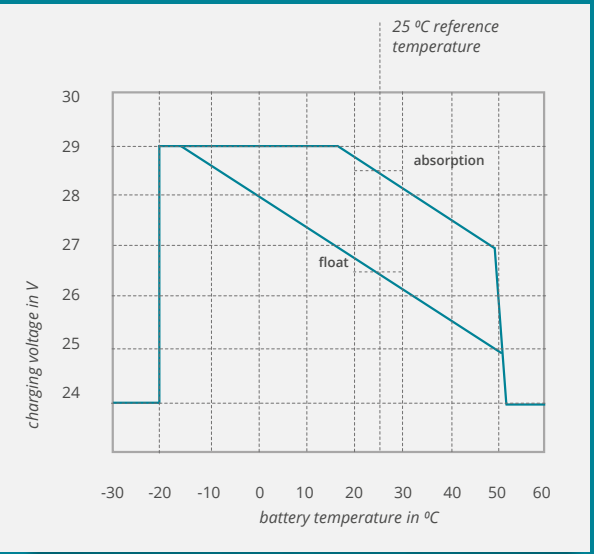
This means that a 400 Ah battery bank and a connected load of ten amperes requires a battery charger capacity of between 70 and 90 amperes in order to charge the battery in a reasonable time.

The maximum charging current is 50 % for a gel battery, and 30 % for an AGM battery. Mastervolt Lithium Ion batteries can be subjected to much higher charge currents. However, to maximise the lifespan of the Lithium Ion battery, Mastervolt recommends a maximum charging current of 30 % of the capacity. For a 180 Ah battery, for instance, this means a maximum charge current of 60 amperes.

A battery charger with temperature compensation for optimal protection

Ensuring the longest possible lifespan for gel, AGM and Lithium Ion batteries requires a modern Mastervolt battery charger with a three-step+ charge characteristic. These battery chargers continuously regulate charge voltage and charge current.

For wet gel and AGM batteries, it is recommended to have a sensor for measuring the temperature of the battery. This adjusts the charge voltage to the temperature of the battery, extending its lifespan. We call this 'temperature compensation'.



Temperature compensation curve

Because devices such as refrigerators are always drawing power from a battery, even while it is being charged, Mastervolt's temperature compensation includes a maximum offsetting effect to protect the connected devices. The compensation is at most 14.55 V for a 12 V system, and 29.1 V for a 24 V system.

At very high (> 50 °C) and low (<-20 °C) temperatures, wet gel and AGM batteries may no longer be charged. Outside of these limits, the Mastervolt battery charger will continue to supply the connected consumers but not charge the batteries.

Adjusting the voltage to a higher or lower temperature is not required for Lithium Ion batteries.

The formula below is used to calculate the charging time of a Gel or AGM battery:

$$Lt = \frac{Co \times eff}{Al - Ab} + 4h$$

The formula below is used to calculate the charging time of a Lithium Ion battery:

$$Lt = \frac{Co \times eff}{Al - Ab} + \cancel{4h}$$

Lt = charging time
Co = capacity drawn from the battery
eff = efficiency; 1.1 for a Gel battery, 1.15 for a AGM battery and 1.2 for a flooded battery
Al = battery charger current
Ab = consumption of the connected equipment during the charging process

Calculating charging time

Calculating the charge time of a battery should take into account the following:

The first consideration is the efficiency of the battery. In a standard wet battery, this is around 80%. This means that if 100 Ah are discharged from the battery, 120 Ah need to be charged in order to be able to extract 100 Ah again. With gel and AGM batteries, the efficiency is higher – 85 to 90 % – so there is less loss and the charge time is shorter in comparison with wet batteries. In Lithium Ion batteries, the efficiency is as high as 97 %.

Another thing that needs to be kept in mind when calculating charge time is that the last 20 % of the charging process (from 80 to 100 %) takes around four hours with wet, gel and AGM batteries (this does not apply to Lithium Ion batteries). In the second phase, also called the absorption or after-charge phase, the type of battery determines how much current is being absorbed, independently of the capacity of the battery charger.

The after-charge phase phenomenon again does not apply to Lithium Ion batteries, which are charged much faster.

The harmful effects of ripple voltage on batteries

A battery can become prematurely defective due to the ripple voltage produced by battery chargers. To prevent this, the ripple voltage caused by a charger should remain as low as possible.

The ripple voltage results in ripple current. As a rule of thumb, the ripple current should remain below five per cent of installed battery capacity. If navigation or communications equipment such as GPS or VHF devices is connected to the battery, the ripple voltage should be no more than 100 mV (0.1 V). Any more could cause the equipment to malfunction.

Mastervolt battery chargers are equipped with excellent voltage regulation and the ripple voltage they produce is always lower than 100 mV.

Another advantage of low ripple voltage is to prevent damage to the system if, for example, a battery terminal is not properly secured or is corroded. Thanks to its low ripple voltage, a Mastervolt battery charger can even supply the system without being attached to a battery pack.

Finding the state of charge of a battery

The adjacent explanation regarding the Peukert exponent shows that the state of charge of a battery cannot simply be determined based on, for instance, measuring battery voltage.
The best and most accurate manner to check the state of charge is to use an amp hour meter (battery monitor). An example of such a meter is the Mastervolt MasterShunt, BTM-III or BattMan battery monitor.
In addition to the charge and discharge current, this monitor also indicates battery voltage, the number of amp-hours consumed, and the time remaining until the battery bank needs recharging.

One of the things that set the Mastervolt battery monitor apart from other suppliers is the availability of historical data. This shows, for example, the charge/discharge cycles of the battery, the deepest discharge, the average discharge, and the highest and lowest measured voltage.
On page 247 you will find more information on the benefits of the Mastervolt battery monitor.

Peukert's Law

On the surface it seems easy to calculate how much longer a battery will continue to supply sufficient power. One of the most common methods is to divide battery capacity by discharge current. In practice, however, such calculations often turn out to be wrong. Most battery manufacturers specify battery capacity assuming a discharge time of 20 hours.
A 100 Ah battery, for instance, is supposed to deliver 5 amps per hour for 20 hours, during which time voltage should not drop below 10.5 volt (1.75 V/cell) for a 12 V battery. Unfortunately, when discharged at a current level of 100 amps, a 100 Ah battery will deliver only 45 Ah, meaning that it can only be used for less than 30 minutes.

This phenomenon is described in a formula – Peukert's Law – devised more than a century ago by the battery pioneers Peukert (1897) and Schroder (1894). Peukert's Law describes the effect of different discharge values on the capacity of a battery, i.e. that battery capacity is reduced at higher discharge rates. All Mastervolt battery monitors take this equation into account so you will always know the correct status of your batteries.

Peukert's Law does not apply for Lithium Ion batteries as the connected load will have no effect on the available capacity.

The Peukert formula for battery capacity at a given discharge current is:

$$Cp = I^n t$$

Cp = battery capacity available with the given discharge current

I = the discharge current level

n = the Peukert exponent = $\frac{\log T2 - \log T1}{\log I1 - \log I2}$

T = discharge time in hours

I1, I2 and T1, T2 can be found by carrying out two discharge tests. This involves draining the battery twice at two different current levels.

One high (I1) – 50 % of battery capacity, say – and one low (I2) – around 5 %. In each of the tests, the time T1 and T2 that passes before battery voltage has dropped to 10.5 volt is recorded. Carrying out two discharge tests is not always simple. Often, no large load will be available or there will be no time for a slow discharge test. You can retrieve the data necessary for calculating the Peukert exponent from the specifications of the battery.

Ventilation

Under normal conditions, gel, AGM and Lithium Ion batteries produce little or no dangerous hydrogen gas. The little gas that escapes is negligible. However, just like with all other batteries, heat is generated during charging. To ensure the longest possible lifespan, it is important for this heat to be removed from the battery as quickly as possible. The following formula can be used to calculate the ventilation required for Mastervolt battery chargers.

$$Q = 0.05 \times I \times f1 \times f2 \times n$$

Q = required ventilation in m³/h
I = maximum charge current of the battery charger
f1 = 0.5 reduction for Gel batteries
f2 = 0.5 reduction for closed batteries
n = number of cells used
(a 12-volt battery has six cells of 2 volt each)

Returning to the example of a 12 V/400 Ah battery set and an 80-amp charger, the minimum ventilation necessary will be:
Q = 0.05 x 80 x 0.5 x 0.5 x 6 = 6 m³/h

This air flow is so small that normally natural ventilation will be sufficient. If the batteries are installed in a closed casing, two openings will be needed: One on the top and one underneath. The dimensions of the ventilation opening can be calculated using the following formula:

$$A = 28 \times Q$$

A = opening in cm²
Q = ventilation in m³

In our case, this amounts to 28 x 6 = 168 cm²
(around 10 x 17 cm) for each opening.

Lithium Ion batteries do not produce any hydrogen gas and are therefore safe to use. When batteries are charged quickly there is some degree of heat production, in which case the above formula can be used to remove the heat.

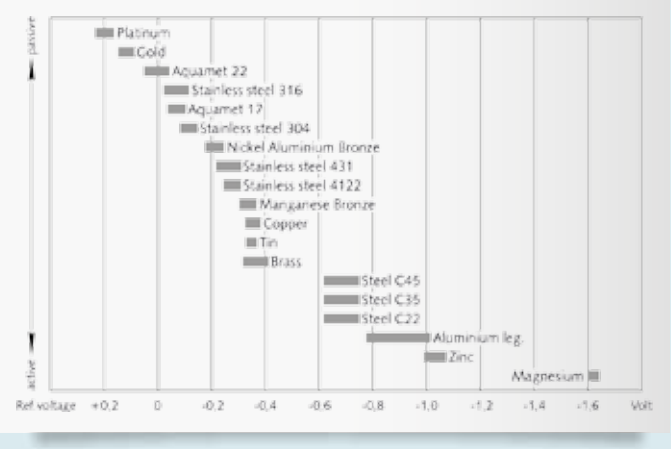
Contact your installer for larger systems with multiple battery chargers.

Seven good reasons for installing a Mastervolt battery monitor:

1. It will keep you truly informed, giving both a read-out in percentages and the relevant digital data.
2. It will give you exact information on the amount of Ampere-hours used per day/week/month or year. You can even control your kW/h consumption, just like at home.
3. It has a time remaining function, indicating the exact time, in minutes and hours, that the battery can be used.
4. It doubles as a digital voltmeter for one or two batteries (depending on model).
5. It will indicate the charge/discharge current of the entire onboard consumption.
6. It is 'intelligent' and will store the number of charge/discharge cycles and the intensity of the discharging and charging processes in its memory.
7. It can also function as an active warning system if fitted with a high/low voltage alarm. A potential-free contactor can give a signal to an acoustic alarm or even an automatic start/stop system for the generator.

Preventing corrosion onboard boats

Preventing galvanic corrosion is a vital consideration when installing an onboard electric system. Galvanic corrosion is the corroding of metal under the influence of an electric current. As you can see in the table, every type of metal has a difference in potential with respect to other metals. If components made of two different metals are dipped into a liquid (electrolyte) and short-circuited, a (low) current will flow. This will result in corrosion of the metal with the lowest potential, eventually dissolving it completely.



There are three situations that can cause two different kinds of metal to be submerged in electrolyte on a vessel. And it is important to remember that while saltwater is an excellent conductor, brackish water and freshwater can also conduct electricity.

1 Although the first situation is not directly related to the onboard power circuit as such, it is a major cause of corrosion, especially pitting. A propeller made of, for example, manganese bronze is connected to the hull via the propeller shaft, the engine and the negative pole of the battery. On a steel boat, this will result in a difference in potential between the hull and the propeller. The bottom of the boat is normally protected by paint and, therefore, insulated in theory. However, any scratch in the paint will result in two different metals being dipped in electrolyte and short-circuited, and an electrical current will immediately start flowing.

To solve this problem, you will need to fit a sacrificial anode made of a metal with a lower potential than the hull, such as zinc or aluminium. The difference in potential between the anode and the propeller ensures that the anode is corroded, not the hull.

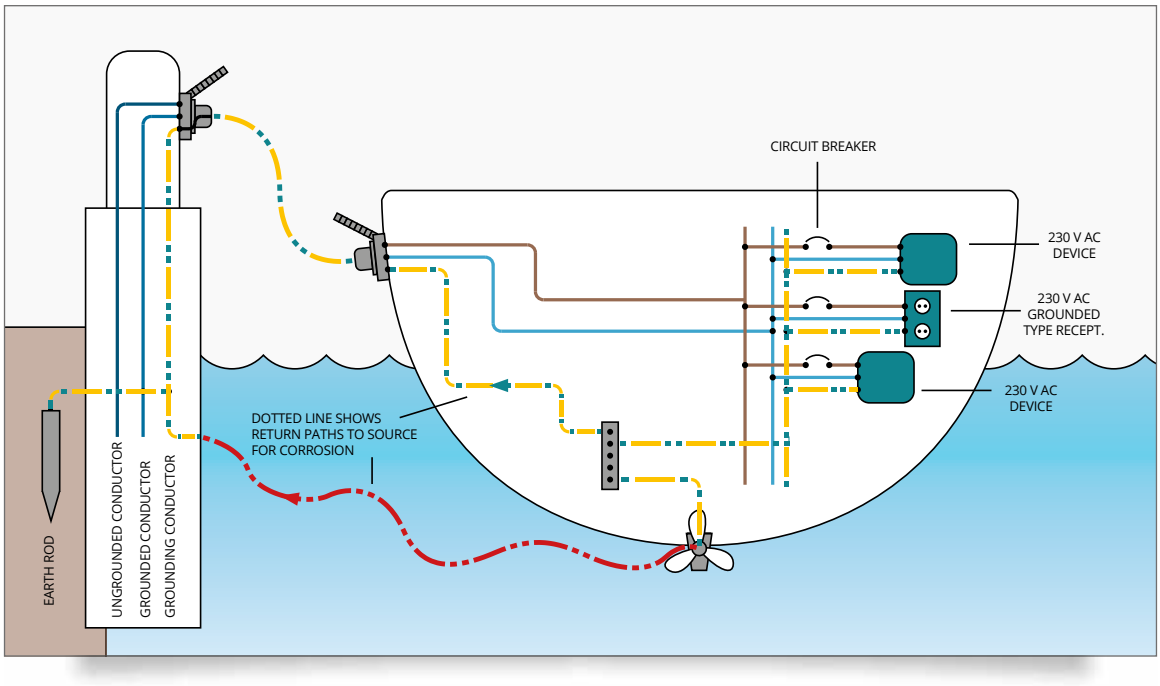
2 The second situation does concern the onboard power system. The negative pole of the battery is usually connected to the hull, via the engine for instance. If the boat is used as a conductor, perhaps because the negative pole of the lighting system is not wired directly to the battery but connected through the hull, a small difference in potential can arise between these two connections. This can also cause corrosion and the risk is especially high with aluminium boats if the hull is used as a conductor. In this case, all equipment, including engines, generators, alternators and navigation equipment, needs to be unearthed and the negative pole of the battery has to be connected with the hull at a single central point only.

3 The third relevant situation involves the shore power earth connection. In power installations, the neutral and protective earth are connected to each other at the power station and connected to groundwater via a thick steel rod. This means that all protective earth connections in a harbour are linked to each other. Steel sheet pile walls and quays are also connected to the protective earth via groundwater.

When an aluminium boat is moored next to one made of steel, for instance, the two different metals (steel and aluminium) are dipped in electrolyte (water) and a small difference in potential arises between them. If both hulls are connected to the protective earth, a short-circuit will arise and lead to corrosion.

The same can happen if a steel boat is moored next to a steel sheet pile wall. There will be a different potential caused by the different materials. And since they are connected via the protective earth, corrosion will be the result again.

The protective earth plays a very important role in securing your electric system, and cannot be omitted. In fact, current legislation (ISO 13297) legally requires a boat to be equipped with a sound earthing system.



Potentially dangerous situation, where galvanic corrosion can occur.

Using an isolation transformer

The risk of corrosion may mean you do not wish to fit your protective earth onto the hull of your boat. However, to ensure your power system is safe you will need to install an isolation transformer.

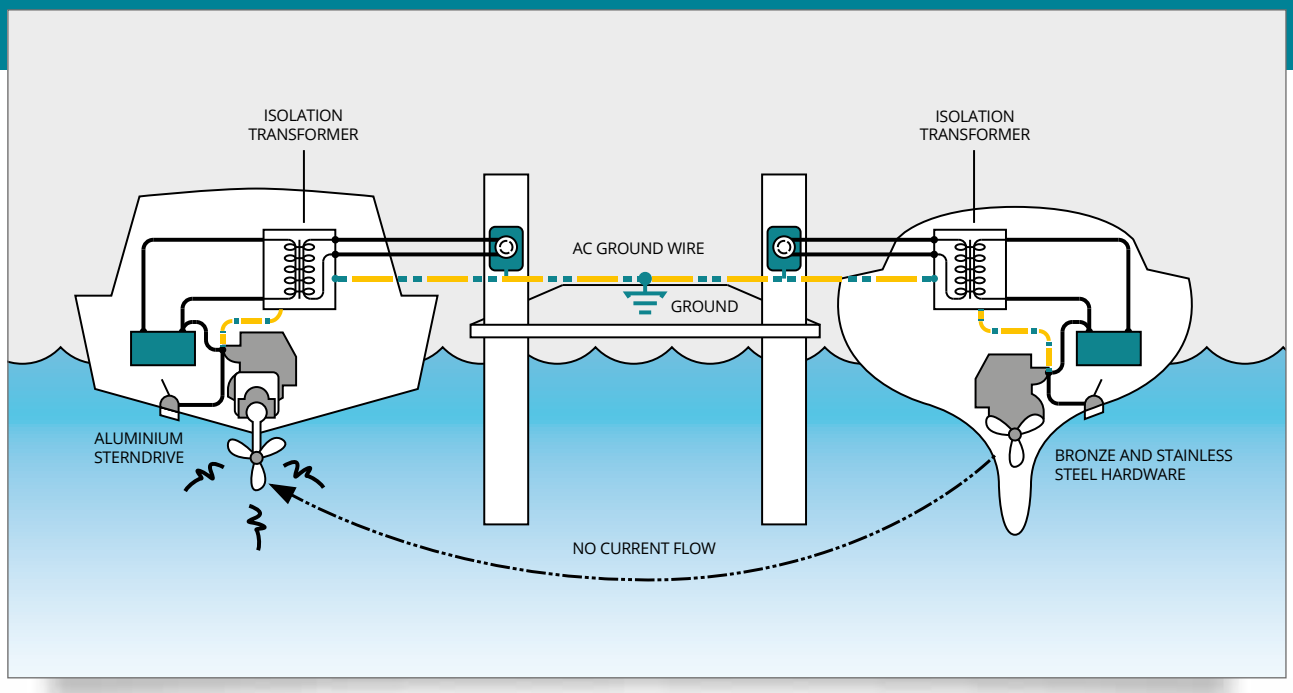
With an isolation transformer, the earth wire remains within the power cable for safety reasons but is not connected to the boat. The phase and the neutral of the power connection will instead be connected to the primary (shore) side of the transformer, which will 'convert' the voltage to the same or, if necessary, a different voltage.

A new phase and neutral, galvanically separated from the shore, will be available on the secondary (boat) side of the transformer.

The neutral will be connected to the onboard protective earth system, which will now have nothing to do, electrically, with the protective earth of the power connection. This way the connection between two different metals (or two different types of the same metal) is blocked, eliminating the risk of electrolytic corrosion.

The neutral connection of the other power suppliers onboard, such as the generator and the inverter, also needs to be linked to the onboard protective earth system. An earth leakage switch is prescribed by directive ISO 13297 for recreational craft up to 24 metres. The various options for earth leakage switches and isolation monitoring are subject to this directive.

Consult an expert for more details.



By the proper use of an isolation transformer, galvanic corrosion can be avoided.

DC fuses

To protect the DC wiring from overloading, fuses need to be used as overloaded cables or wires can cause fire and hazardous situations.

Overloaded wiring can be caused by faulty equipment or by simply too much equipment connected to the same wiring. Ingress of water in the navigation lamps is an example of a possible overload.

A fuse protects the cable, not the connected equipment. Usually a fuse will be installed with a slightly lower value than the cable allows. The table below provides an overview of the maximum current without overloading the cables, plus the required value of the fuse. For example, a cable of 6 mm² has a maximum load of 50 amperes so the value of the fuse should be 50 amperes at most. Installing a larger fuse would be dangerous as it could cause the cable to ignite. A smaller fuse can result in unnecessary failure of the connected equipment.

wire size	max. current	fuse required	preferred type
0.75 mm²	12 A	10 A	ATO/ATC (car type)
1 mm²	18 A	15 A	ATO/ATC (car type)
1.5 mm²	21 A	20 A	ATO/ATC (car type)
2.5 mm²	30 A	30 A	ATO/ATC (car type)
4 mm²	40 A	40 A	ANL Blade type
6 mm²	50 A	50 A	ANL Blade type
10 mm²	80 A	70 A	ANL Blade type
16 mm²	100 A	100 A	NH (knife type) or T-fuse
25 mm²	140 A	125 A	NH (knife type) or T-fuse
35 mm²	185 A	160 A	NH (knife type) or T-fuse
50 mm²	230 A	224 A	NH (knife type) or T-fuse
70 mm²	285 A	250 A	NH (knife type) or T-fuse
95 mm²	330 A	315 A	NH (knife type) or T-fuse
120 mm²	400 A	400 A	NH (knife type) or T-fuse
150 mm²	430 A	425 A	NH (knife type) or T-fuse
240 mm²	710 A	630 A	NH (knife type) or T-fuse

Please note that fuse and cable ratings are subject to local regulations, consult your supplier for more detailed advice and installation.

There are many fuses available and the most common for smaller loads is the ATO/ATC (car type) fuse. This fuse can protect wiring up to 2.5-4 mm². Although these fuses are available with a rating of more than 30 amps, this will not be recommended as the heat production will be high and a premature failure of the fuse might be expected. For higher loads or loads that are continuously powered, so called ANL or plate fuses will often be installed. These fuses are commonly used for currents of approx. 20 to 100-125 amps, but higher ratings are available. For more professional or high power installations, like for example winches or bowthrusters, often the NH (knife type) or T-fuse will be installed. Although these fuses are sometimes, due to their physical size, not easy to install, they are very reliable. They are commonly used for currents of 50 amps and more.

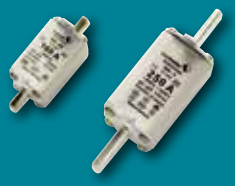
NOTE

When charging batteries, other criteria are applicable for selecting the correct cable sizes (see also page 175).

ATO fuse.

ATC fuse.

ANL fuse.



NH fuses (knife type).

T-fuse.

Technical terms - glossary

A

Absorption phase
The second stage in a modern 3-step+ charging process. Batteries are charged from around 80 % up to 100 % during this stage. Voltage is somewhat lower than the gas voltage of the battery, which is 2.4 volt per cell at 20 °C (or 14.4 volt for a 12-volt and 28.8 volt for a 24-volt battery). The absorption phase follows the bulk phase and is, in turn, followed by the float phase.

ABYC standards
The American Boat & Yacht Council is a non-profit organisation that represents American builders. It sets standards and gives recommendations for nautical equipment (including electrical equipment) on pleasure vessels with the goal of enhancing safety. The ABYC therefore issues certification for products.

AGM battery
Battery in which the electrolyte (a mix of water and sulphuric acid) is largely absorbed in glass fibre matting. As these batteries are entirely maintenance-free and do not normally produce gas, they can be fitted anywhere and ventilation is usually unnecessary. Thanks to their construction, AGM batteries can be swiftly discharged while providing a very powerful current. This makes them highly suitable for systems that require high levels of current, such as bowthrusters, winches and engine starting.

Alarm contact
A contact in a battery charger or inverter that is activated when an external or internal malfunction occurs.

Alternating current (AC)
AC is the electricity that for example comes out a socket in your home. Other terms used for AC include shore power, generator power or inverter power. AC voltage changes polarity with a given frequency: In Europe, for instance, the polarity of the electrical voltage is reversed 50 times per second. The supply therefore has a frequency of 50 hertz (Hz).

Amperian
Amperian is a powerful digital assistant that monitors your Mastervolt system anywhere in the world. Amperian allows you or your system provider to remotely operate and monitor your power system. The Amperian Interface makes all system data available online.

Amps (A)
The unit that measures the current following through a circuit. The current can be calculated by dividing the voltage by the resistance of the consumer. A resistance of 6 ohm and voltage of 12 volt gives a current of 2 amps.

Amp-hour (Ah)
The unit that denotes the capacity of a battery, calculated by multiplying current in amps by the duration of the discharge in hours. For example: If a battery delivers a current of 5 amps in 20 hours with the voltage constantly above 10.5 volt, this amounts to 20 x 5 =100 Ah. The capacity of a battery usually depends on the amount of lead and battery acid it contains.

B

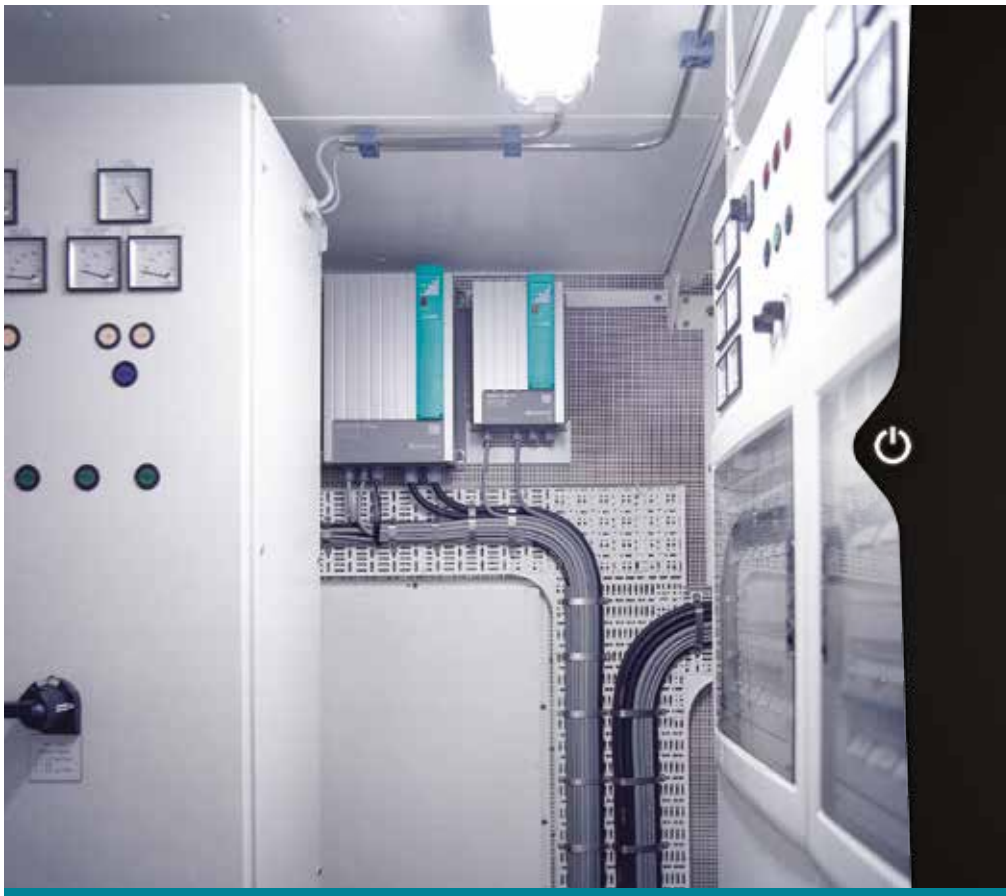
Battery
Converts chemical energy into electrical power and vice versa. The nominal voltage of a battery is 2 volt, and higher voltages are achieved by connecting several batteries in series. For instance, six 2-volt batteries can be combined to provide a nominal voltage of 12 volt.

Battery acid
An electrolyte that consists of water and sulphuric acid. The specific gravity of battery acid in a charged battery varies between 1.28 and 1.30.

Battery charger
Used to charge batteries. Its capacity should be at least 15 to 25 % of the battery capacity with a flooded battery and max. 30 % with an AGM battery, up to 50 % with a Gel battery and up to 100 % with a Lithium Ion battery.

Battery Management System
A natural phenomenon of Li-ion batteries is the natural imbalance between stronger and weaker cells. In the charging process, one or more cells will reach their maximum charge level faster due to this imbalance, while others do not get fully charged. The lower cells will be discharged faster, causing the battery to be empty sooner due to under-voltage and so reducing the lifespan of the battery. To prevent this, Mastervolt Lithium Ion batteries are equipped with a Battery Management System that automatically compensates for the imbalance between the cells and increases the lifespan and the total capacity of the battery.

Battery monitor
Indicates the battery status. Mastervolt offers a selection of 4 models. Firstly, the BattMan with spray-proof display and energy meter, which is available in two models. Next is the Masterlink BTM-III with detailed battery information via the LCD display and LED bar. The modern MasterShunt combined with the EasyView 5 provides detailed information on voltage, current, and historical and user data. It is easily installed within the MasterBus network, with touchscreen controls for all functions. See pages 114-115 in this Powerbook for more information on the battery monitors.



Bulk phase
The first stage in a modern 3-step+ charging system. The output current of the battery charger is 100 % during this stage, while voltage depends on the power remaining in the battery. The bulk phase is followed by the absorption phase.

BV approval
Bureau Veritas is a French classification society for shipping, passenger vessels and some large yachts. The requirements in terms of safety and functionality are stringent and approval is required by many insurance companies. Most Mastervolt equipment exceeds BV's rigorous standards.

C

Cable losses
A loss of voltage resulting from the resistance of the cable. The losses also depend on the current flow.

CE marking
Marking placed on a product by manufacturers or importers to declare that it meets EU safety, health and environmental requirements. These requirements are derived from European product directives, which have been incorporated into the national legislation of most EU member states. The CE mark therefore shows compliance with a law and is not informal advice. It should be visible on the outside of equipment and suppliers have to make available a declaration stating which requirements of the CE marking the equipment meets. All Mastervolt equipment exceeds these rigorous standards.

Charge voltage
Voltage used to charge batteries. On average, it amounts to 14.4 volt or 28.8 volt during the absorption phase and 13.25 volt and 26.5 volt during the float phase, both at 25 °C.

Combi
A device that combines a battery charger, an inverter and a transfer system in one.

Cos phi or power factor
Specifies in AC systems the degree to which current is out of phase with voltage: The lower this value, the larger the discrepancy. In a heating element, for instance, the current is in phase with the voltage, so the cos phi is 1. In a motor, however, there is a divergence, and cos phi tends to be 0.8 or sometimes 0.6. The lower the cos phi, the more current is required to supply a given amount of power.

Current
The flow of electrons through a circuit. Electric current is measured in amps.

Cycle
The theorectical discharging of a battery from 100 % to 0 %, and recharging back from 0 % to 100 % in one cycle. Twice discharging to 50 % and fully recharging is also one cycle, as is four times discharging to 75 % and fully recharging again. This is all theory however: In practice a battery is discharged not more than 50 %.

CZone®

A CZone system decentralises the DC power distribution system, locates circuit control and protection modules closer to loads to shorten cable runs and reduce the size of conductors, significantly decreasing the cost and weight of the electrical wiring harness. The CZone system replaces complex wiring with a single data wire.

D

Digital Switching

Digital Switching is a Mastervolt innovation that radically simplifies installation, configuration, control and monitoring of onboard electrical systems. This CAN-based platform is proven in the automotive industry and is fully compatible with most A-brand navigation systems. It offers you a range of luxurious and comfortable options, including remote control.

DIP switch

A tiny switch usually found on a printed circuit board and used to set the various functions of Mastervolt equipment.

Direct current (DC)

Current that only flows in one direction, such as that in a battery, solar panel, alternator or battery charger.

DNV GL approval

Det Norske Veritas is a Norwegian classification society for professional shipping and offshore activities. The requirements in term of safety and functionality are very strict, and approval is required by many insurance companies. Most Mastervolt equipment easily satisfies DNV's stringent standards.

Germanischer Lloyd is a German classification society for professional marine vessels. The requirements in terms of safety and functionality are very strict and this approval is often necessary for insurance purposes.

E

Earth

The electric no-load potential, also called reference potential. The negative pole of a battery is often connected to the steel chassis of a vehicle or boat, which then serves as the earth. In US English the term grounding is used.

Earth leakage switch

Monitors the onboard supply for electrical leakage, switching it off when leakage exceeds 30 milli-amps. An earth leakage switch protects you against an electric shock in the event of contact with a live component.

Efficiency

The efficiency of a power source is expressed in percentage terms (%). A device with an efficiency of 90 %, for instance, has 100 % power at the beginning and 90 % at the end. The 10 % that is lost is primarily transformed into heat. The higher the efficiency of an inverter, the longer the batteries will last.

Electrolyte

The liquid in batteries, composed of a mixture of sulphuric acid and water. Its specific gravity is 1.280 in a charged battery and 1.100 in a discharged one.

E-marking

A standard that indicates whether the relevant equipment can be used on vehicles such as ambulances and fire engines. In order to qualify for an E-marking, equipment has to satisfy strict requirements in terms of safety, EMC and suitability. Most Mastervolt battery chargers and inverters comply with these requirements.

EMC

Short for Electro-Magnetic Compatibility, EMC indicates how much, if any, electromagnetic interference a device may produce and whether it is sensitive to electromagnetic interference from the outside. A good example is that of a battery charger and a microwave oven. The microwave is not allowed to produce more interference than determined by the EMC standard, and the battery charger may not be affected by the interference generated by the microwave. Naturally, the opposite also holds true. Requirements in terms of EMC are established within the CE framework. Mastervolt equipment exceeds these strict requirements.

E-Propulsion

Electrical propulsion is growing in popularity and is compulsory in an increasing number of sailing and nature areas. A hybrid version is also available, allowing you to choose whether to sail using a diesel engine or electric motor.

F

Float phase

The final step in a modern 3-step+ charging process. Although the batteries are fully charged during this phase, they receive a maintenance charge, while the onboard DC circuit is supplied with power. Charge voltage is 2.25 volt per cell or 13.25 volt for 12-volt batteries and 26.5 volt for 24-volt ones at an ambient temperature of 25 °C.

Forced inverter

A function on the Mass Systemswitch. At the push of a button, a part of the onboard consumers are powered from the batteries via the inverter, while the battery charger stays connected to power.

The power intake of the battery charger can be regulated via the system panel, up to the point where the maximum for the AC fuse has been reached. The advantage of this system is that heavy-duty consumers such as hair dryers are powered via the inverter and cannot therefore overload the AC fuse. When such consumers are connected to the inverter, consumption from the batteries is usually higher than the battery charger can supply. This is rarely a problem as major consumers are usually used for a short time and the consumption measured in Ah tends to be low. After the consumer has been switched off the battery charger will recharge the battery automatically.

Frequency
The number of times per second that alternating current changes direction, expressed in hertz (Hz).

G

Galvanic isolation
A situation where two circuits are electrically connected without their grounding or earth coming in contact. Galvanic isolation is best achieved by means of a transformer.

Gas voltage
The voltage level at which a battery starts producing gas. At at an ambient temperature of 20 °C, the gas voltage is 2.4 V per cell or 14.4 V for a 12 V battery and 28.8 V for a 24 V one.

Gel battery
Batteries where the electrolyte (mix of water and sulphuric acid) is absorbed in a gel. As they are entirely maintenance-free and rarely produce gas, Gel batteries can be fitted anywhere. Extra gas extraction is not necessary. Gel batteries are highly suitable for lighting and as onboard service batteries, and can be charged very quickly thanks to their special construction. With normal use the lifespan of a 12-volt Gel battery is between six and seven years. For the 2 volt traction Gel version, 15 years is not uncommon. A Gel battery is very suitable for (deep) cycle usage.

H

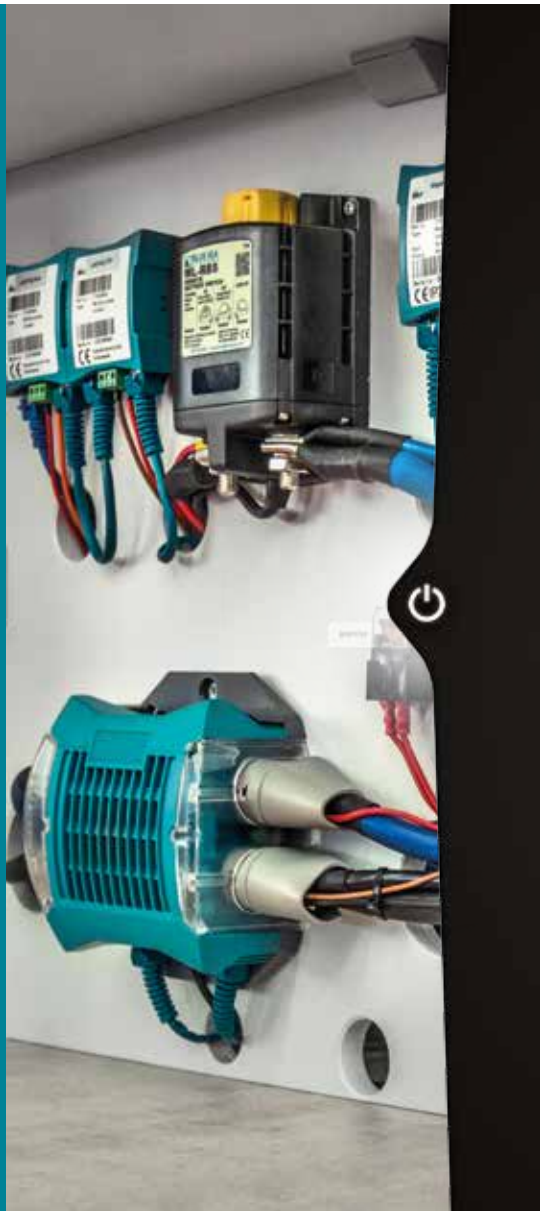
Hertz (Hz)
Unit that measures frequency, i.e. the number of times per second that an alternating current (AC) changes direction. In Europe this is 50 Hz, and in the USA 60 Hz.

High-frequency (HF) switch technology
This technology allows incoming alternating current to be rectified into direct current over a diode bridge. The resulting DC voltage is chopped into parts with a high frequency by means of an electronic switch that is turned on and off quickly. This creates a simulated alternating current with a high frequency, 35 kHz (35,000 Hertz) for instance. This AC can be converted to a higher or lower voltage via a very small transformer. The higher the frequency, the smaller the transformer can be. Mastervolt uses HF switch technology in all its equipment, offering major benefits in terms of compactness, weight and efficiency. Another advantage is that you say goodbye to the irritating hum of a transformer.

Hydrogen gas
Highly explosive gas mixture of hydrogen and oxygen formed during the charging of flooded batteries with an unsuitable charger. Extra ventilation prevents concentrations from becoming too high.

I

IEC approval
The International Electrotechnical Commission (IEC) is headquartered in Geneva, Switzerland, and develops general standards for the safety of electrical components and equipment. Although it proposes standards, the IEC is not responsible for their enforcement, which is usually carried out by independent test laboratories.



Inductive loads
These loads are, for example, the motors in air conditioning systems and diving compressors. They cause the current to flow out of phase with the voltage, a phenomenon also known as phase shift. The degree is indicated by a value, cos phi or power factor, which ranges from 0 to 1 and is inversely proportionate to the size of the lag. In a heating element (which is resistive load), current flows in step with voltage and cos phi is 1. In a motor, however, there will be a lag, as indicated by the typical value of 0.8 - or sometimes 0.6 - for cos phi. The lower the cos phi, the greater the lag, and the more current is necessary to supply a given level of power.

Inverter
Converts 12, 24 or 48 volt battery power to alternating current at 230 V/50 Hz (or 120 V/60 Hz). This allows appliances such as computers, microwave ovens and TVs to be powered without the need for a grid connection or generator.

Isolation transformer
Converts shore power voltage to a higher, lower or equal value to ensure that there is galvanic isolation between the shore power connection and the onboard electrical system. This prevents corrosion and increases safety.

K

Kilowatt (kW)
Unit for electrical power equivalent to 1000 watt. Ten 100-watt light bulbs consume one kilowatt.

Kilowatt-hour (kWh)
One kW of electricity used in one hour. This is the most common measurement of power consumption.

L

LED (light emitting diode)
Electronic light with very low power consumption. LEDs are generally available in many different colours and sizes. Mastervolt uses them as signal lights on battery chargers and inverters. The latest generation of LEDs can be used as lights as well and are very low in use of energy.

Lithium Ion battery
Lithium Ion batteries have a high energy density and are perfect for cyclic applications. Compared to traditional lead-acid batteries, Lithium Ion batteries offer savings of up to 70 % in volume and weight, while the number of charging cycles is three times as large. Another major benefit of the Mastervolt Lithium Ion battery is that it is equipped with an integrated Battery Management System. The system keeps all the individual cells perfectly balanced, and ensures a long battery lifespan.

Lloyd's approval
Lloyd's Register of Shipping is a British classification society for yachts, professional shipping, drilling platforms, etcetera. Numerous insurance companies require large vessels to be approved by Lloyd's. This means that the vessel and the onboard equipment have to satisfy stringent requirements.

M

MasterBus
MasterBus is Mastervolt's advanced standard for data communication and integration of Mastervolt components within your electric system. Advantages include complete system integration, easy operation and monitoring, and simple installation with fewer cables. A MasterBus network can be easily extended in a later stage.

N

NiCad batteries
Containing nickel and cadmium, this type of battery is unsuitable for use on boats due to the high charge voltage required. NiCad batteries will soon be banned because of their cadmium content. N.B. All NiCad batteries are considered to be chemical waste.

NMEA 2000
NMEA 2000 is a plug & play communications standard used for connecting marine equipment and displays within boats. Communication runs at 250 kb-per-second and allows any device to talk to any display, or other device compatible with NMEA 2000 protocols. NMEA 2000 is compatible with the J1939 CANbus network, used on road vehicles and fuel engines.

No-load consumption
Power consumed by an inverter when it is not powering any equipment. This is just a few watts with modern Mastervolt inverters and Combis. The lower the no-load consumption, the less power is used by the inverter.

Ohm
Unit for electrical resistance, indicated by the symbol Ω. The electrical resistance of an electrical conductor is the opposition to the passage of an electric current through that conductor.

O

Ohm's law
Gives the relationship between voltage (U), current (I) and resistance (R). In formula terms this is expressed as ***U= I x R***. If two of the three values are known, the third can be calculated.

Overload
A concept related to the safety of an inverter, generator or power connection. A fuse, for instance, ensures against overload. All Mastervolt inverters have electronic protection against overload.

Parallel connection
In a parallel connection the current can flow through multiple circuits. By parallel connecting batteries (positive to positive, negative to negative), the capacity of the battery set is increased, while voltage stays the same. For example, while two 12V/55Ah batteries connected in parallel have a voltage of 12 volt, the capacity is 55 + 55 = 110 Ah.

Peak power
The maximum current that can be supplied by an inverter for short periods of time. This is often necessary, as electric motors can consume up to ten times their nominal power when starting up. Mastervolt inverters can deliver a high peak current, often reaching two to three times their nominal capacity.

Peukert
The name of a German scientist who in 1897 observed that a battery supplies progressively less power as the discharge current increases. Peukert created a formula that gives the number of amp-hours a battery can supply at a given discharge current and time. Mastervolt battery monitors all take Peukert's law into account, ensuring that you always have a correct overview of your battery's status.

Power Sharing
This concept is related to the performance of the charger part of a Combi when connected to the grid or a generator. It involves the automatic power intake regulation of the battery charger when the power is very low. As soon as the power fuse is in danger of being overloaded, the battery charger automatically reduces its output current so that tipping of the power fuse is prevented.

Power Assist
A feature found in the Mass Combi Ultra. Power Assist ensures that the power supply to onboard consumers is partially provided by the batteries if the power is in danger of becoming overloaded.

It is activated after the battery charger's output has been reduced to zero via the power sharing system in the Combi.

RCM approval
Regulatory Compliance Mark (RCM). This means that the product complies with the requirements of Electrical Regulatory Authorities Council (ERAC) in Australia.

Recombination technology
Used in AGM and Gel batteries to make sure that the gas (oxygen and hydrogen) generated by charging is recombined into water. This means that the batteries can be entirely maintenance-free and sealed.

RRR approval
The Russian River Register sets standards for products and manufacturers in terms of quality, safety and environmental friendliness. Only products certified by the RRR are allowed onboard vessels sailing on the country's inland and coastal waters.

RMRS approval
The Russian Maritime Register of Shipping sets standards that products and manufacturers must meet in order to be allowed onboard vessels flying the Russian flag within Russian territorial waters (seas and inland waters). The institute is also responsible for related inspections.

S

Self-discharging
The decrease in the capacity of a battery that occurs when no load is connected. A flooded battery loses 1% per day, an AGM battery and Gel battery 2 % per month and a Lithium Ion battery less than 3 % per month. The higher the ambient temperature, the more self-discharging will occur. Current leakage due to intense pollution or humidity between the poles can also cause a higher level of self-discharging, so you should always keep the top of your batteries clean and dry.

Semi-traction battery
A semi-traction battery has fewer but thicker plates in each cell, compared to starter batteries. Semi-traction batteries supply a relatively lower starter current, but can be discharged more often and to a greater extent (200 to 500 full cycles). This kind of battery is highly appropriate for the combined function of starter/ service battery.

Series connection
A series connection (the positive pole of each battery is connected to the negative pole of the next) increases the voltage of the total battery set. For example, when two 12-volt batteries with a capacity of 55 Ah each are connected in series, the total voltage of the set will be 12 + 12 = 24 volt, while total capacity remains 55 Ah.

Sine wave
The alternation of voltage can be graphically indicated by a sine wave. This consists of a line that follows a wave pattern around a horizontal axis, which represents the passage of time and also the points at which voltage is zero. Once the line has traced one entire wave above the time axis and one entire wave below, a whole sine wave has been outlined.

Square millimetre (mm²)
Unit in which cable diameters are measured. With a direct current system of 12 or 24 volt, three amps should correspond to one mm² of cable thickness. For 230 volt systems allow 6 amps for each mm². Both apply for a maximum length of 3 metres.

Soft start
Device used to reduce the inrush current of transformers and motors.

Standby mode
In this mode the inverter emits a small pulse instead of the usual 230 volt output. It detects when an appliance is switched on and then automatically switches on, supplying 230 volt until the output current falls below a pre-set value. When there is little or no output current, this means that no load is connected and the inverter switches back to stand-by. This system saves a great deal of energy.

Starter battery
Mainly used to start engines. Although these batteries can deliver a high current, they should not be excessively or too frequently discharged and are therefore not appropriate for lighting purposes. AGM batteries are ideal to serve as starter battery and limited cyclic use.

T

Temperature correction
If the battery temperature is lower than 25 °C, the charge voltage should be adjusted upwards. When higher, the charge voltage needs to be reduced. This temperature correction is 30 mV per °C for a 12 Volt battery and 60 mV per °C for a 24-volt one. While this may seem insignificant, it is essential to ensure a long battery life.

Temperature sensor
A temperature sensor should be attached to the battery so that the charger can optimise charge voltage with respect to the battery temperature. The charge voltage depends on the battery temperature (see also Temperature correction).

3-Step+ charging
A modern charging technology that has been extended with an extra step in Mastervolt equipment, the Plus phase.

The three steps are:
- Bulk, where the charger supplies maximum power.
- Absorption, during which the charger delivers maximum charge voltage and the battery is charged from around 80 % to 100 %.
- Float, used for battery maintenance and delivering power to connected equipment.

The 'plus' phase is an automatic one-hour bulk phase once every 12 days when the battery is not being used.

Traction batteries
Used for propulsion, powering equipment and inverters, etc. They can be discharged often and completely, and in a Gel version are highly suitable for onboard use. Flooded cell batteries are only appropriate for forklifts, etc.

Transfer system
A (frequently automatic) system used to switch between multiple power sources, such as grid, generator and inverter.

U

UL approval
An American certification provided by Underwriters Laboratories that is similar to the European CE-mark and mainly focused on safety issues.

V

Volt (V)
Unit in which electric potential (voltage) is measured.

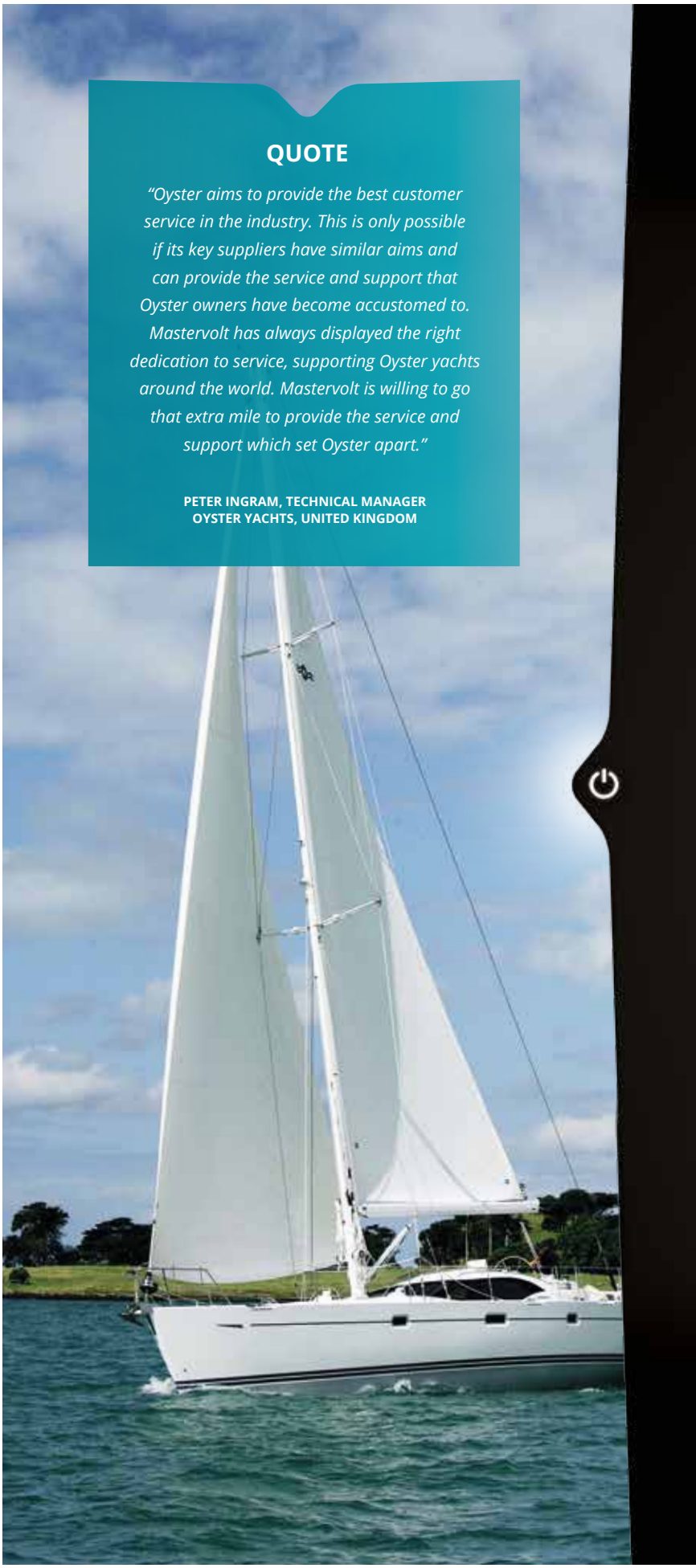
Volt-amps (VA)
Unit for measuring electrical power.

Voltage ripple
A voltage ripple is a small alternating current on top of a direct current, which results in a DC voltage that is not entirely smooth but ripples slightly.
While a battery delivers pure direct current without any ripple, this is not always the case with a battery charger. In an old-fashioned battery charger, 50 % of the voltage will contain ripples.
A large voltage ripple shortens the lifespan of a battery, which needs to be charged with direct (not alternating) current. In addition, a voltage ripple can interfere with onboard audio, navigation and communications systems. Mastervolt battery chargers supply a flat DC voltage with no more than 0.3 % of ripple voltage.

W

Watt (W)
Unit that measures the rate of energy, calculated by multiplying volts by amps.

Watt-hour (Wh)
Measure of electrical power in time. One watt-hour of electricity is equal to one watt of power consumed over one hour. A 10-watt light bulb uses 10 watt-hours of electricity in one hour (see also kWh).



QUOTE

"Oyster aims to provide the best customer service in the industry. This is only possible if its key suppliers have similar aims and can provide the service and support that Oyster owners have become accustomed to. Mastervolt has always displayed the right dedication to service, supporting Oyster yachts around the world. Mastervolt is willing to go that extra mile to provide the service and support which set Oyster apart."

PETER INGRAM, TECHNICAL MANAGER OYSTER YACHTS, UNITED KINGDOM

Sales and service, the Mastervolt way

Mastervolt products and components are designed to meet the most stringent demands of our customers. Our high-quality products are only supplied via specialists. These companies provide expert advice, carry out installation work if necessary and take care of service and maintenance.

Mastervolt offers its clients worldwide service via our global network. In case of a malfunctioning or defective product, we recommend contacting your local supplier or a Mastervolt dealer or service point in your region. You can find the Mastervolt dealers and service partners via the Dealer Locator on the Mastervolt site.

See www.mastervolt.com/dealer-locator for a complete overview of our dealers and service partners.

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THE POWER TO BE INDEPENDENT

Courtesy of Amory Ross / Team Alvimedica / Volvo Ocean Race.


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Colophon

This Powerbook is a result of a close co-operation between Mastervolt and the following companies:

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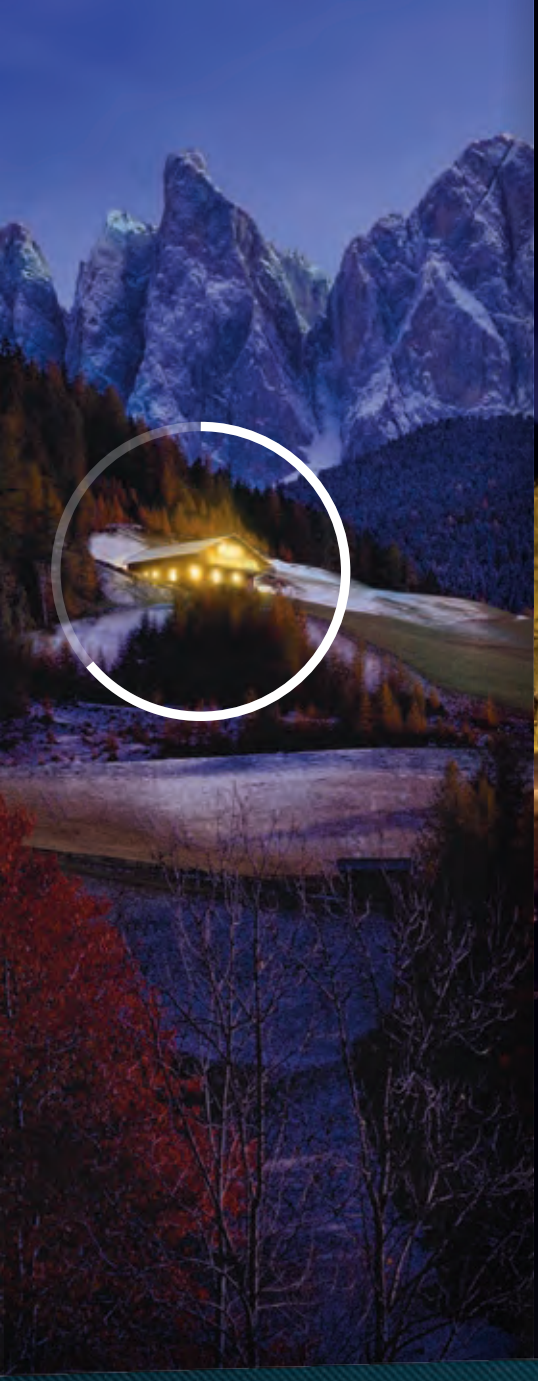

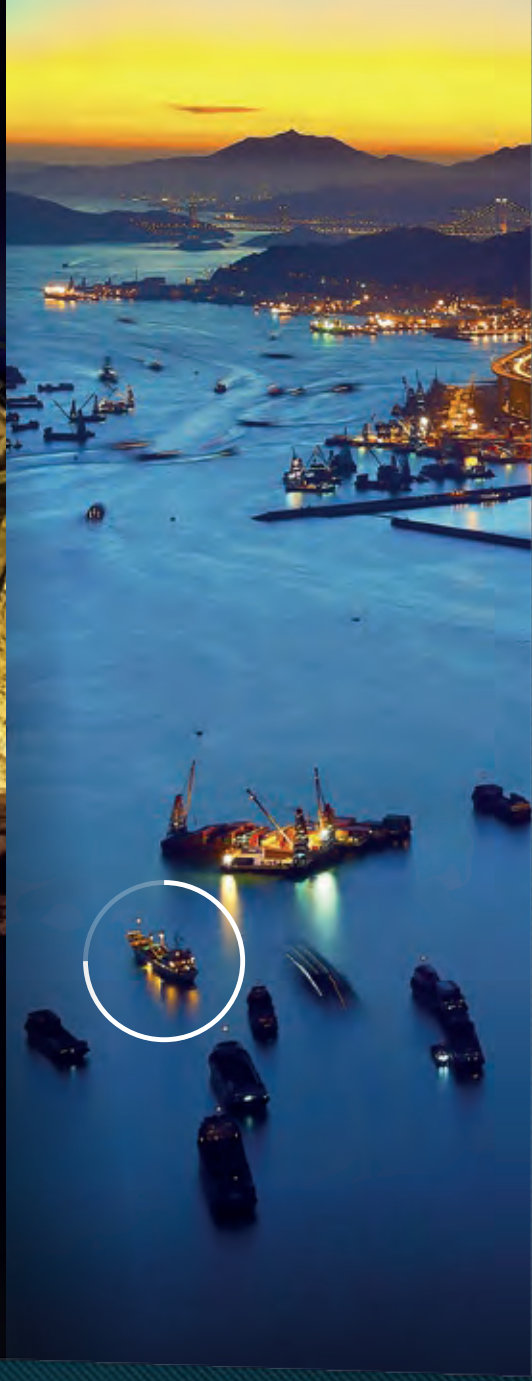

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