

POWERBOOK

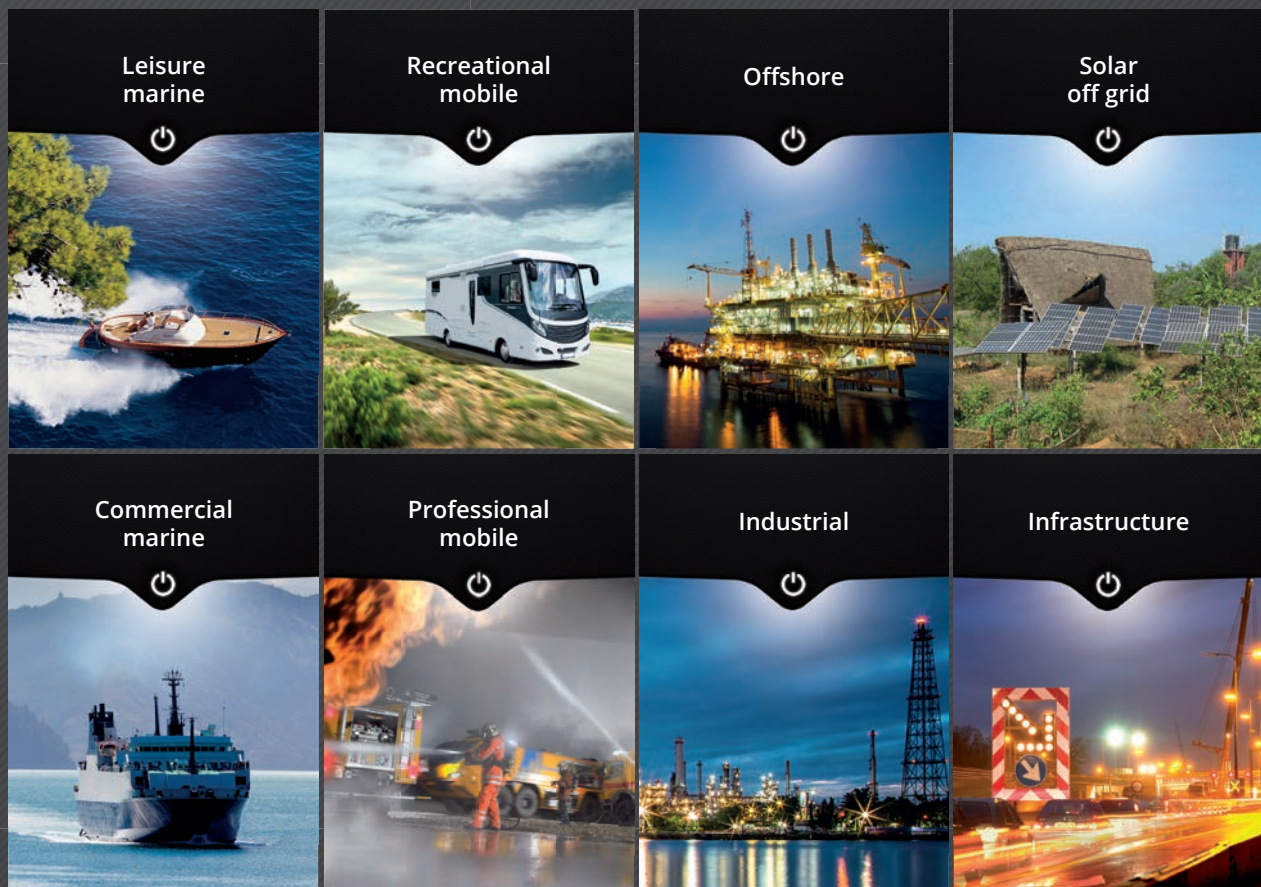


THE POWER
TO BE INDEPENDENT

2016

MASTERVOLT

Core segments



MASTERVOLT

Your undisputed leader in power electronics for 25 years.



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MASTERVOLT

THE POWER TO BE INDEPENDENT



MASTERVOLT'S MISSION

Developing and manufacturing power systems for autonomous use at remote locations, all over the world.

MASTERVOLT'S VISION

As a leading global brand, we aim to excel in everything we do.



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 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 to 40,000 watts. Our electric solutions are widely used in demanding markets such as marine, mobile, offshore, industrial, autonomous solar and infrastructure.

High 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 high 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.

The leading power
companies join forces.



MASTERVOLT

BEP

MARINCO

BLUE SEA SYSTEMS

ProMariner™

ANCOR

Mastervolt is part of Power Products, LLC, which includes various major brands within its Marine, Mobile & Industrial division. Ancor, BEP, Blue Sea Systems, Marincos, 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.



Why Mastervolt?

The Mastervolt philosophy is based on four pillars:

1

Innovation & product development

From power storage and conversion to digital network systems, throughout its history Mastervolt has continued to be at the forefront of technology. Pioneering research is in our DNA and Mastervolt's highly skilled engineers are responsible for translating tomorrow's technology into the ultimate performance today. With comprehensive engineering processes, Mastervolt's engineers source the best components and test those components as well as all new product designs to destruction, ensuring complete satisfaction by the time the finished products, technologies and systems are installed in active customer applications. In essence, you will get the best product at the highest quality.

Discover what our engineers have been working on at [■ mastervolt.com/new](https://www.mastervolt.com/new) where we proudly present our new arrivals.



2

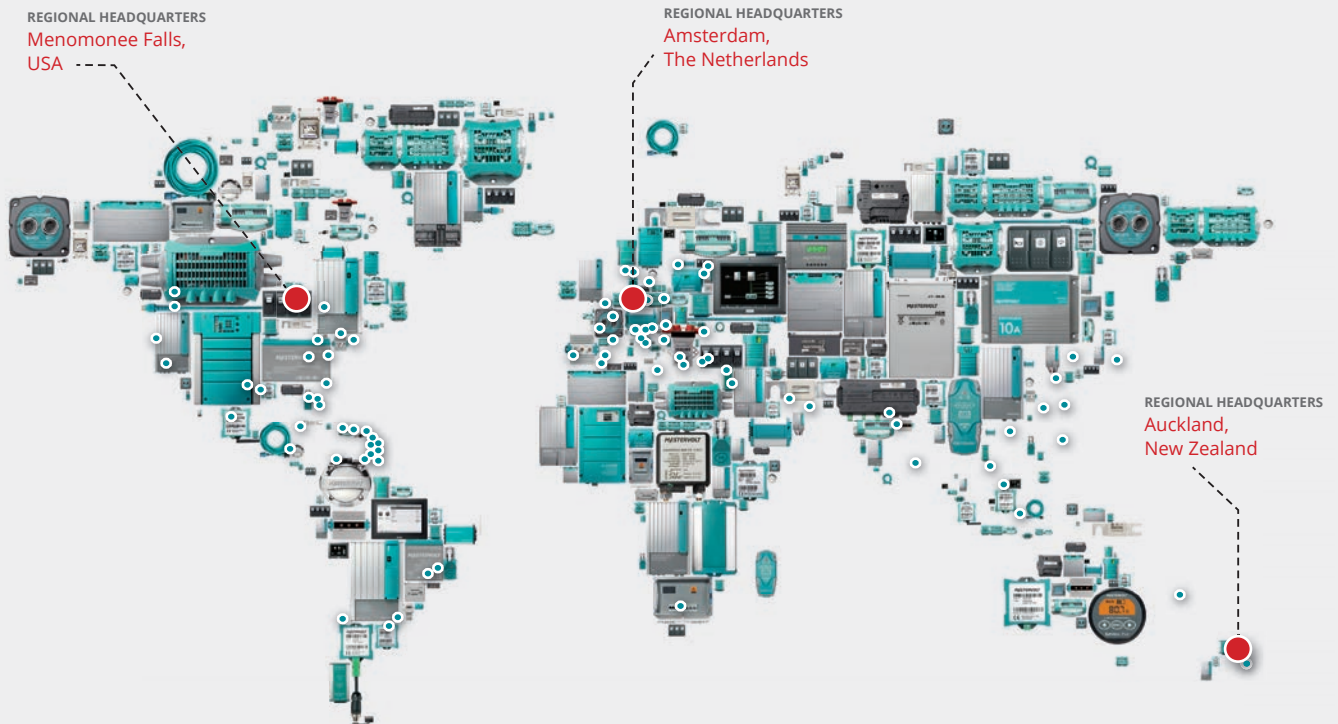
System solutions

Whatever the industry or application, Mastervolt is power solution focused, offering power components designed to easily integrate into comprehensive systems. From DC battery power to power conversion products designed for efficiency, to complete digital switching technologies, monitoring at the touch of a finger, our companies can provide the flexibility and customisable systems you desire for your applications.



Mastervolt is an ISO 9001:2008 certified company.





3

Worldwide network

Mastervolt proudly supports its customers with ongoing service. 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 information without delay and track the progress of any inquiry, whether simple or complex. In addition, Mastervolt continually provides educational training for all of our service providers to ensure an exceptional customer experience.

SEE [MASTERVOLT.COM/DEALER-LOCATOR](https://www.mastervolt.com/dealer-locator)
FOR A COMPLETE OVERVIEW OF OUR DEALERS
AND SERVICE PARTNERS.



4

Powerful marketing

Powerful, globally oriented marketing has always been an important pillar of Mastervolt's activities. It determines which markets we exploit 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. Our marketing team is always working to expand our global A-brand reputation.

In addition to exhibitions, online marketing, extensive PR, and high-end printing, the following pages provide an overview of our marketing activities.

VOLVO OCEAN RACE

ROUND THE WORLD
RACE SUPPLIER

Mastervolt, proud supplier of the Volvo Ocean Race

Mastervolt was exceptionally proud to support the 2014-2015 edition of the prestigious **Volvo Ocean Race**. The bespoke electrical system for the seven participating yachts was composed entirely of off-the-shelf Mastervolt products. As a result, the race was the ultimate product test for Mastervolt, and, after approximately 250,000 nautical miles, we can unequivocally state that we succeeded with flying colours. The Mastervolt system performed without a hitch, even in extreme weather conditions. Mission accomplished! For the complete story, go to poweredbymastervolt.com or see page 148 for a detailed description of the Volvo Ocean Race system.

Courtesy of Ainhua Sanchez / Volvo Ocean Race.



Volvo Ocean Race Festival in The Hague/Scheveningen

Saturday 20 June 2015 was a special day for Mastervolt in the Volvo Ocean Race. On 18, 19 and 20 June the participating yachts had a scheduled pit stop in The Hague; the final break before the finish in Gothenburg. We wanted to let the world know that we had almost achieved our goal, and invited some 100 guests to participate in the VIP segment of the Mastervolt Event in the Race Village. This included the press as well as a selection of our clients and staff. We wanted to show the intensity of the competition so far, the extreme conditions in which the yachts and sailors have to perform, and the role our products played in the race. It was an amazing day! Sailors spoke about the Mastervolt products with great enthusiasm, Nick Bice (picture) Head of The Boatyard expressed his gratitude, and the view of the start to Gothenburg, seen from the VIP pier, was spectacular.

Sponsor projects

In addition to our sponsorship of the Volvo Ocean Race, Mastervolt is also involved in commercial sponsoring. Our most recent and eyecatching sponsor project involved the **America's Cup** in 2014, in which Mastervolt supported both Team New Zealand/Emirates and the eventual winners of the race, Team USA/Oracle.

Those looking for a reason for our omnipresence on the water need look no further than our roots. And although Mastervolt has earned its reputation in the maritime world since long, we are also active in many other markets. In the coming years, we will be focusing on leading sponsor projects in those markets as well.



Mastervolt's social responsibility

Each year, Mastervolt supports one charity to express our social responsibility.

In 2014, we chose to sponsor **Het Vergeten Kind** ('The Forgotten Child'), a foundation focused on improving the living environment of children in shelters by enabling them to play, exercise and relax. One of the ways we raised funds was via our participation in the annual Dam to Dam run (a 16 km sponsor run from Amsterdam to Zaandam). It was a hefty challenge for some of our staff!



Mastervolt's Benelux sales team has been supporting the **'Live Your Dream'** foundation for several years. This foundation arranges events to provide chronically ill children with a fun day out on the water.



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.

In 2015 we supported the **KNRM**, the Royal Netherlands Sea Rescue Institution. This is one of many worldwide organisations responsible for the safety and rescue of people and animals on the water. In the Netherlands, the KNRM is an organisation consisting entirely of volunteers, financed by donations. Mastervolt's partnership with the KNRM recently became permanent: Mastervolt will support the 45 rescue stations of the KNRM with products and services, free of charge.

Mastervolt has a comprehensive product range. In addition to providing a guideline to help you select the proper equipment for your energy system, this Powerbook also serves as a technical manual with detailed information about technologies, applications and installation. Discover what Mastervolt can mean to you. Our experts are at your service!

Mastervolt battery chargers: A long life for your battery

You want to be able to charge your batteries safely, reliably and quickly, even if the grid power is of low quality. 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

The ChargeMaster is suitable for recreational and semi-professional use. It is easy to install and includes a detailed display and easy three-button controls. The ChargeMaster safely charges multiple battery banks at the same time.

NEW MODEL

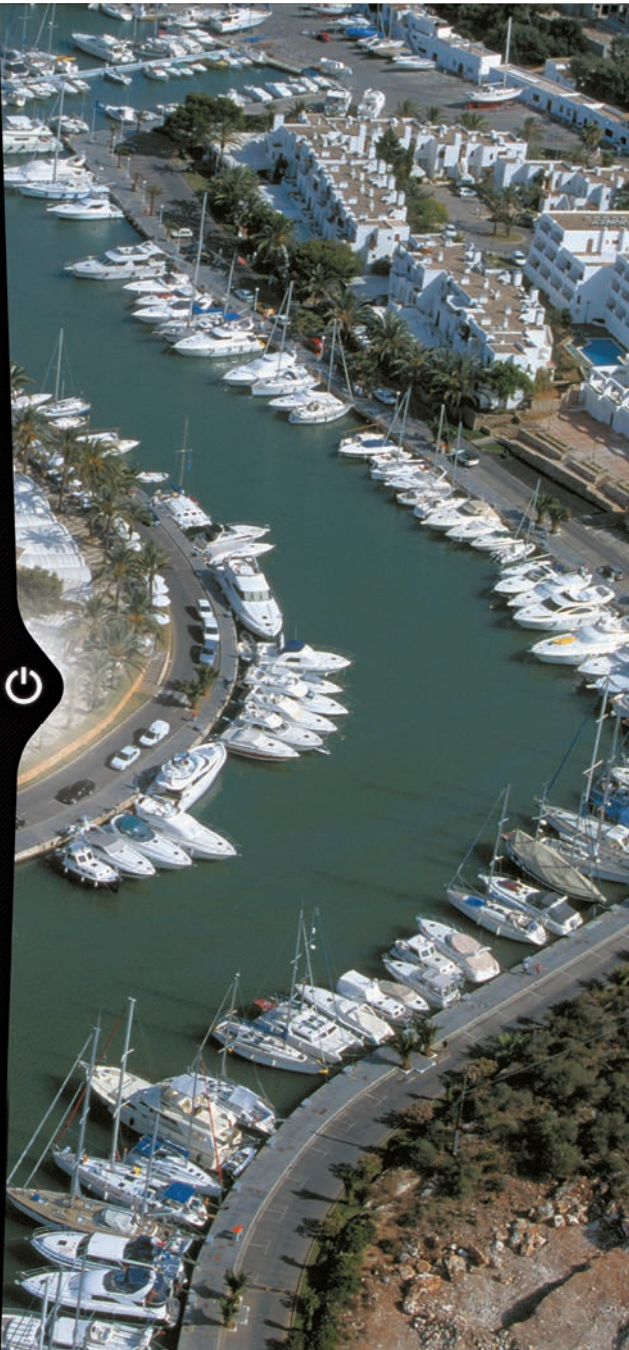
■ EasyCharge

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

NEW MODEL

■ 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

The ChargeMaster 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. The second outlet is used for the maintenance charge of your secondary battery. 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



Although Lithium Ion batteries are increasingly popular, there can be a lack of clarity when it comes to the charging process. This is not a problem with Mastervolt 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).

Make the most of the available power



The Current Control function allows you to reduce the battery charger power to prevent blowing the fuse, even when the voltage drops.

Robust connections



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

MasterBus compatible



Most 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.



Most Mastervolt battery chargers and inverters comply with these requirements.

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
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
Supplies your system without battery	yes	yes	yes	yes
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hxxwxd	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, RS	CE, ABYC A-31, RRR, RS	CE, ABYC A-31, DNV, RRR, RS	CE, ABYC A-31, DNV pending, RRR, RS
TECHNICAL SPECIFICATIONS				
Charge characteristic*	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion
Charge voltage Bulk (25 °C)**	28.5 V (8 hours)	28.5 V (8 hours)	28.5 V (8 hours)	28.5 V (8 hours)
Charge voltage Absorption (25 °C)**	28.5 V (4 hours)	28.5 V (4 hours)	28.5 V (4 hours)	28.5 V (4 hours)
Charge voltage Float - wet (25 °C)**	26.5 V	26.5 V	26.5 V	26.5 V
Charge voltage Float - gel/AGM (25 °C)**	27.6 V	27.6 V	27.6 V	27.6 V
Temperature compensation	-60 mV/°C	-60 mV/°C	-60 mV/°C	-60 mV/°C
Voltage compensation	voltage drop compensation in DC cables up to 3 volt	voltage drop compensation in DC cables up to 3 volt	voltage drop compensation in DC cables up to 3 volt	voltage drop compensation in DC cables up to 3 volt
DC consumption	< 1 mA	< 1 mA	< 1 mA	< 1 mA
Full load consumption (230 V AC)	550 W	880 W	880 W	1800 W
Cos phi	> 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, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage
MasterBus compatible	yes	yes	yes	yes
CSI/DC alarm (Charger Status Interface) Alarm on all errors or on DC errors only	integrated in the battery charger as standard	integrated in the battery charger as standard	integrated in the battery charger as standard	integrated in the battery charger as standard

* The charge characteristic can be set to your requirements.

** The battery charge voltage can sometimes be specified at 20 °C, so take temperature compensation into account.

OPTIONS		MasterView Read-out 77010050	option	option	option	option
	Remote panel for reading the charge status of your battery charger, including error notifications.					
		MasterView Easy 77010305	option	option	option	option
	Touchscreen panel for reading charge status, current fold-back and/or Power Sharing setting.					
		MasterShunt 77020100	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.						



**Mass
24/75**

40020756



**Mass
24/100**

40021006



**Mass
24/100-3ph**

40031006



**Mass
48/25**

40040256



**Mass
48/50**

40040506

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	25 A at 57 V	50 A at 57 V
1	1	1	1	1
n.a.	n.a.	n.a.	n.a.	n.a.
150-750 Ah	200-1000 Ah	200-1000 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	230 V (180-265 V) - 50/60 Hz	230 V (180-265 V) - 50/60 Hz
yes	yes	yes	yes	yes
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	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	4.6 kg / 10.1 lb	7.7 kg / 17 lb
CE, ABYC A-31, RRR, RS, Lloyds, DNV	CE, ABYC A-31, RRR, RS, Lloyds, DNV	CE, ABYC A-31, RRR, RS	CE, ABYC A-31, RRR, RS	CE, ABYC A-31, RRR, RS
IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion
28.5 V (8 hours)	28.5 V (8 hours)	28.5 V (8 hours)	57 V (8 hours)	57 V (8 hours)
28.5 V (4 hours)	28.5 V (4 hours)	28.5 V (4 hours)	57 V (4 hours)	57 V (4 hours)
26.5 V	26.5 V	26.5 V	53 V	53 V
27.6 V	27.6 V	27.6 V	55.2 V	55.2 V
-60 mV/°C	-60 mV/°C	-60 mV/°C	-120 mV/°C	-120 mV/°C
voltage drop compensation in DC cables up to 3 volt	voltage drop compensation in DC cables up to 3 volt	voltage drop compensation in DC cables up to 3 volt	voltage drop compensation in DC cables up to 3 volt	voltage drop compensation in DC cables up to 3 volt
< 1 mA	< 1 mA	< 1 mA	< 1 mA	< 1 mA
2600 W	3500 W	3500 W	1800 W	3500 W
> 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
vario fan	vario fan	vario fan	vario fan	vario fan
IP23	IP23	IP23	IP23	IP23
over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage
yes	yes	yes	yes	yes
integrated in the battery charger as standard	integrated in the battery charger as standard	integrated in the battery charger as standard	integrated in the battery charger as standard	integrated in the battery charger as standard

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

Specifications

ChargeMaster battery chargers

				
	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
Supplies your system without battery	no	no	yes	yes
Display/read-out	1 LED	1 LED	LED display	LED display
Dimensions, hwxwxd	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	with supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation
Approvals	CE, ABYC A-31	CE, ABYC A-31	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected
TECHNICAL SPECIFICATIONS				
Charge characteristic*	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion
Charge voltage Bulk (25 °C)**	14.25 V (6 hours)	14.25 V (6 hours)	14.4 V (8 hours)	14.4 V (8 hours)
Charge voltage Absorption (25 °C)**	14.25 V (6 hours)	14.25 V (6 hours)	14.25 V (4 hours)	14.25 V (4 hours)
Charge voltage Float - wet (25 °C)**	13.25 V	13.25 V	13.25 V	13.25 V
Charge voltage Float - gel/AGM (25 °C)**	13.8 V	13.8 V	13.8 V	13.8 V
Temperature compensation	no	no	-30 mV/°C	-30 mV/°C
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
Cos phi	> 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, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage
MasterBus compatible	no	no	yes	yes
CSI/DC alarm Alarm on all errors or on DC errors only	no	no	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.					
		MasterView Easy 77010305	n.a.	n.a.	option	option
	Touchscreen panel for reading charge status, current fold-back and/or Power Sharing setting.					
		MasterShunt 77020100	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), replacement of the CSI alarm contact.						


**ChargeMaster
12/50-3**

44010500


**ChargeMaster
12/70-3**

44010700


**ChargeMaster
12/100-3**

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
with supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation	with supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation	with supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation
CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected
IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion
14.4 V (8 hours)	14.4 V (8 hours)	14.4 V (8 hours)
14.25 V (4 hours)	14.25 V (4 hours)	14.25 V (4 hours)
13.25 V	13.25 V	13.25 V
13.8 V	13.8 V	13.8 V
-30 mV/°C	-30 mV/°C	-30 mV/°C
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, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, 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

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 battery charger of 50 amps 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.

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*

- * The charge characteristic can be set to your requirements.
- ** The battery charge voltage can sometimes be specified at 20 °C, so take temperature compensation into account.

Specifications

ChargeMaster battery chargers



	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
Supplies your system without battery	no	yes	yes	yes
Display/read-out	1 LED	LED display	LED display	LED display
Dimensions, hxxwxd	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	with the supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation	with the supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation
Approvals	CE, ABYC A-31	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected
TECHNICAL SPECIFICATIONS				
Charge characteristic*	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion
Charge voltage Bulk (25 °C)**	28.5 V (6 hours)	28.8 V (8 hours)	28.8 V (8 hours)	28.8 V (8 hours)
Charge voltage Absorption (25 °C)**	28.5 V (6 hours)	28.5 V (4 hours)	28.5 V (4 hours)	28.5 V (4 hours)
Charge voltage Float - wet (25 °C)**	26.5 V	26.5 V	26.5 V	26.5 V
Charge voltage Float - gel/AGM (25 °C)**	27.6 V	27.6 V	27.6 V	27.6 V
Temperature compensation	no	-60 mV/°C	-60 mV/°C	-60 mV/°C
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
Cos phi	> 0.95	≥ 0.98	≥ 0.98	≥ 0.98
Temperature range (ambient temp.)	-25 °C to 60 °C, > 40 °C derating power power	-25 °C to 60 °C, > 25 °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	natural cooling	vario fan	vario fan	vario fan
Protection degree	IP65	IP23	IP23	IP23
Protections	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage
MasterBus compatible	no	yes	yes	yes
CSI/DC alarm <i>Alarm on all errors or an DC errors only</i>	yes, open collector output	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
		MasterView Easy 77010305	n.a.	option	option	option
		MasterShunt 77020100	option	option	option	option
		DC Distribution 77020200	n.a.	option	option	option
		MasterBus USB Interface 77030100	n.a.	option	option	option
		Multipurpose Contact Output 77030500	n.a.	option	option	option

**ChargeMaster
24/40-3**

44020400

**ChargeMaster
24/60-3**

44020600

**ChargeMaster
24/80-3**

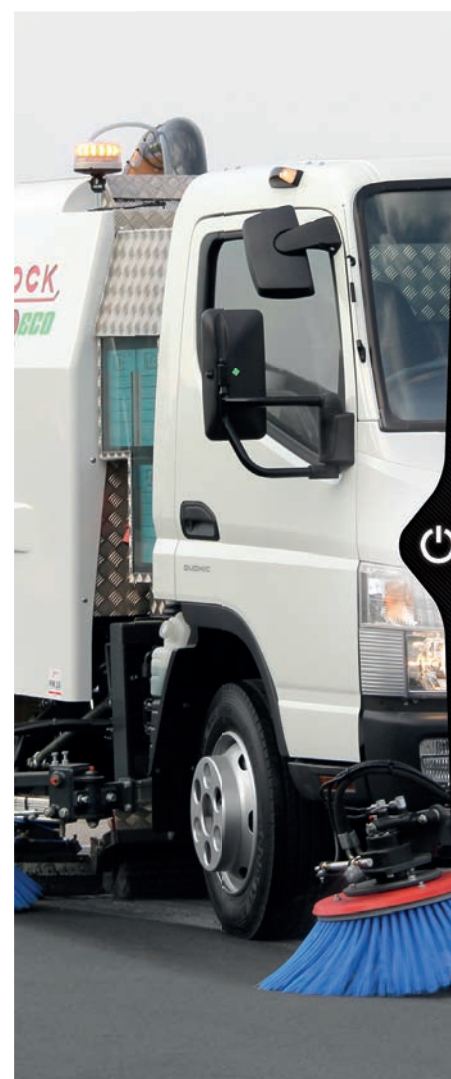
44020800

**ChargeMaster
24/100-3**

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
with the supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation	with the supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation	with the supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation	with the supplied mounting bracket or 4x screw for wall mounting or 4x screw for floor installation
CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected	CE, ABYC A-31, SAE J1171/ ISO 8846 ignition protected
IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion	IUoUo, automatic / 3-step+ for gel/AGM/wet/Lithium Ion
28.8 V (8 hours)	28.8 V (8 hours)	28.8 V (8 hours)	28.8 V (8 hours)
28.5 V (4 hours)	28.5 V (4 hours)	28.5 V (4 hours)	28.5 V (4 hours)
26.5 V	26.5 V	26.5 V	26.5 V
27.6 V	27.6 V	27.6 V	27.6 V
-60 mV/°C	-60 mV/°C	-60 mV/°C	-60 mV/°C
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 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
vario fan	vario fan	vario fan	vario fan
IP23	IP23	IP23	IP23
over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, 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

* The charge characteristic can be set to your requirements.

** The battery charge voltage can sometimes be specified at 20 °C, so take temperature compensation into account.

Specifications EasyCharge battery chargers

	NEW MODEL	NEW MODEL
		
	EasyCharge 6A	EasyCharge 10A
Product code	43310600	43321000
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, hwxwd	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/wet	IUoUo, automatic 3-step+ for gel/ AGM/wet
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

Specifications EasyCharge Portable battery chargers

	NEW MODEL	NEW MODEL
		
	EasyCharge Portable 1.1A	EasyCharge Portable 4.3A
Product code	43510100	43510400
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, hwxwd	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/wet	IUoUo, automatic 3-step+ for gel/ AGM/wet
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, over voltage, current limited, over temperature



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



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.

Complete range

Mastervolt offers a complete range of inverters from 300 watt to 40 kwatt in AC Master, Mass Sine and Mass Sine Ultra models.

The **AC Master** is ideal for small and medium-sized applications, while **Mass Sine** and the new **Mass Sine Ultra** inverters are mainly intended for larger systems and for professional purposes.

Mastervolt offers inverters for 230V/50Hz as well as 120V/60Hz (American voltage).

Proven technology

Mastervolt's Mass Sine sine wave inverters have proven themselves for twenty-five years in the most extreme conditions. 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. The Mastervolt AC Master inverters are small, lightweight and silent. Installation and operation are incredibly easy.

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 230 volt, 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.

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 lightweight to ensure easy installation.

High peak power during start up

The Mastervolt sine wave inverter can provide up to 200 % surge capacity to equipment that requires extra power during start 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.

New Mass Sine Ultra



Our new Mass Sine Ultra models extend the Mass Sine range. The latest V6 technology increases the efficiency and enables multiple units to work in parallel and 3-phase configuration.

MasterBus compatible



Every Mass Sine 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.

Specifications

Mass Sine sine wave inverters



	Mass Sine 12/800	Mass Sine 12/1200	Mass Sine 12/2000	Mass Sine 24/800
Product code 230 V	24010800	24011200	24012000	24020800
GENERAL SPECIFICATIONS				
Nominal battery voltage	12 V	12 V	12 V	24 V
Recommended battery capacity	> 100 Ah	> 150 Ah	> 200 Ah	> 50 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	800 W	1200 W	2000 W	800 W
Continuous power at 40 °C, cos phi 1	650 W	1000 W	1800 W	650 W
Peak load	1600 W	2400 W	4000 W	1600 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, hxxwxd	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 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
Weight	3.9 kg / 8.6 lb	8 kg / 17.4 lb	14.6 kg / 32.2 lb	3.9 kg / 8.6 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
Low battery voltage, switches off at	10 V, ± 0.5 V	10 V, ± 0.5 V	10 V, ± 0.5 V	19 V, ± 0.5 V
Low battery voltage, switches on at	11 V, ± 0.5 V	11 V, ± 0.5 V	11 V, ± 0.5 V	22 V, ± 0.5 V
High battery voltage, switches off at	15.5 V, ± 0.5 V	15.5 V, ± 0.5 V	15.5 V, ± 0.5 V	32 V, ± 0.5 V
High battery voltage, switches on at	14.5 V, ± 0.5 V	14.5 V, ± 0.5 V	14.5 V, ± 0.5 V	30 V, ± 0.5 V
Max. ripple on DC (battery)	5 % RMS	5 % RMS	5 % RMS	5 % RMS
Input current (nominal load)	73 A	110 A	183 A	36 A
No-load power consumption (ON mode)	470 mA – 5.6 W	450 mA – 5 W	480 mA – 6 W	240 mA – 5.6 W
No-load power consumption (energy saving mode)	65 mA – 0.8 W	43 mA – 0.5 W	50 mA – 0.6 W	35 mA – 0.8 W
Minimal DC fuse (slow blow)**	100 A	150 A	250 A	63 A
Minimal cable size	25 mm ²	50 mm ²	70 mm ²	16 mm ²
Harmonic distortion typical	< 5 %	< 5 %	< 5 %	< 5 %
Cos Phi	all power factors allowed	all power factors allowed	all power factors allowed	all power factors allowed
Transfer system	Masterswitch/Systemswitch can be connected to all sine wave inverters	Masterswitch/Systemswitch can be connected to all sine wave inverters	Masterswitch/Systemswitch can be connected to all sine wave inverters	Masterswitch/Systemswitch can be connected to all sine wave inverters
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, over load, short circuit, high battery, low battery	over temperature, over load, short circuit, high battery, low battery	over temperature, over load, short circuit, high battery, low battery	over temperature, over load, 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
		MasterView Easy 77010305	option	option	option	option
		Masterlink/MICC 70403105	option	option	option	option
		MasterBus USB Interface 77030100	option	option	option	option
		MasterBus Inverter Interface 77030700	option	option	option	option
		AC Power Analyser 77031200	option	option	option	option



**Mass Sine
24/1500***

24021500

**Mass Sine
24/2500***

24022500

**Mass Sine Ultra
24/4000**

26024000

**Mass Sine
24/5000***

24095100

24 V	24 V	24 V	24 V
> 150 Ah	> 200 Ah	> 350 Ah	> 400 Ah
230 V (± 5 %) – 50 Hz (± 0.01 Hz)	230 V (± 5 %) – 50 Hz (± 0.01 Hz)	230 V (± 2 %) – 50/60 Hz selectable (± 0.005 %)	230 V (± 5 %) – 50 Hz (± 0.01 Hz)
1500 W	2500 W	--	5000 W
1200 W	2000 W	4000 W	4000 W
2900 W	5000 W	7000 W	9000 W
true sine	true sine	true sine	true sine
internal	internal	internal	internal
92 %	92 %	≥ 92 %	92 %
LED display	LED display	LED display	LED display
no	no	yes, up to 10 standard	no
no	no	yes, up to 3x3	no
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	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
8 kg / 17.4 lb	14.6 kg / 32.2 lb	15 kg / 33.1 lb	19 kg / 41.9 lb
CE, E-mark, ABYC A-31	CE, E-mark, ABYC A-31	CE, ABYC	CE, E-mark, ABYC A-31
HF switch mode	HF switch mode	V6 HF switch mode	HF switch mode
19 V, ± 0.5 V	19 V, ± 0.5 V	19-22 V, dynamic window	19 V, ± 0.5 V
22 V, ± 0.5 V	22 V, ± 0.5 V	24 V, ± 0.5 V	22 V, ± 0.5 V
32 V, ± 0.5 V	33 V, ± 0.5 V	32 V, ± 0.5 V	32 V, ± 0.5 V
30 V, ± 0.5 V	31 V, ± 0.5 V	29 V, ± 0.5 V	30 V, ± 0.5 V
5 % RMS	5 % RMS	5 % RMS	5 % RMS
68 A	115 A	200 A	230 A
200 mA – 5 W	250 mA – 6 W	660 mA – 16 W	250 mA – 6 W
25 mA – 0.6 W	25 mA – 0.6 W	300 mA – 7 W	50 mA – 1.2 W
100 A	160 A	250 A	1x 250 A of 2x 125 A
25 mm ²	50 mm ²	70 mm ²	2x 70 mm ²
< 5 %	< 5 %	< 1 %	< 5 %
all power factors allowed	all power factors allowed	all power factors allowed	all power factors allowed
Masterswitch/Systemswitch can be connected to all sine wave inverters	Masterswitch/Systemswitch can be connected to all sine wave inverters	Masterswitch/Systemswitch can be connected to all sine wave inverters	Masterswitch/Systemswitch can be connected to all sine wave inverters
-25 °C to 80 °C; > 40 °C derating	-25 °C to 80 °C; > 40 °C derating	-25 °C to 60 °C; > 40 °C derating	-25 °C to 80 °C; > 40 °C derating
natural/forced	natural/forced	natural/forced	natural/forced
IP23	IP23	IP23	IP23
over temperature, over load, short circuit, high battery, low battery	over temperature, over load, short circuit, high battery, low battery	over temperature, over load, short circuit, high battery, low battery	over temperature, over load, short circuit, high battery, low battery
yes, using a MasterBus Inverter Interface or AC Power Analyser	yes, using a MasterBus Inverter Interface or AC Power Analyser	yes	yes, using a MasterBus Inverter Interface or AC Power Analyser

option	option	n.a.	option
option	option	option	option
option	option	n.a.	option
option	option	option	option
option	option	n.a.	option
option	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

- * Also available in 60 Hz:
 • 1500 W model: *product code 24121500*
 • 2500 W model: *product code 24122500*
 • 5000 W model: *product code 24195100*

- ** DC fuse depends on the cable size.

Specifications

AC Master

sine wave inverters



	AC Master 12/300	AC Master 12/500	AC Master 24/300	AC Master 24/500
Product code 230 V (universal socket)	28010300	28010500	28020300	28020500
GENERAL SPECIFICATIONS				
Nominal battery voltage	12 V	12 V	24 V	24 V
Minimum battery capacity	≥60 Ah	≥100 Ah	≥30 Ah	≥50 Ah
Output voltage (± 5 %)	230 V – 50 Hz (± 0.1 %)	230 V – 50 Hz (± 0.1 %)	230 V – 50 Hz (± 0.1 %)	230 V – 50 Hz (± 0.1 %)
Continuous power at 25 °C, cos phi 1	300 W	500 W	300 W	500 W
Continuous power at 40 °C, cos phi 1	250 W	400 W	250 W	400 W
Peak load	600 W	800 W	600 W	800 W
Output waveform	true sine	true sine	true sine	true sine
Efficiency	90 %	90 %	91 %	91 %
AC connection	universal	universal	universal	universal
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hxxwxd	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	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
Weight	1.16 kg / 2.55 lb	1.22 kg / 2.69 lb	1.16 kg / 2.55 lb	1.22 kg / 2.69 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
Low battery voltage, switches off at	10 V, ± 0.5 V	10 V, ± 0.5 V	20 V, ± 0.5 V	20 V, ± 0.5 V
Low battery voltage, switches on at	11 V, ± 0.5 V	11 V, ± 0.5 V	22 V, ± 0.5 V	22 V, ± 0.5 V
High battery voltage, switches off at	16 V, ± 0.5 V	16 V, ± 0.5 V	32 V, ± 0.5 V	32 V, ± 0.5 V
High battery voltage, switches on at	14.5 V, ± 0.5 V	14.5 V, ± 0.5 V	29 V, ± 0.5 V	29 V, ± 0.5 V
Max. ripple on DC (battery)	10 % RMS	10 % RMS	10 % RMS	10 % RMS
Input current (nominal load)	22.5 A	37.5 A	11 A	19 A
No-load power consumption:				
• 'on' mode (230 V)	0.58 A – 7 W	0.58 A – 7 W	0.29 A – 7 W	0.29 A – 7 W
• stand-by (scan mode)	0.33 A – 4 W	0.33 A – 4 W	0.16 A – 4 W	0.16 A – 4 W
Minimal DC fuse (slow blow)*	40 A	80 A	20 A	40 A
DC cable	included	included	included	included
Harmonic distortion typical	< 6%	< 6%	< 6%	< 6%
Cos Phi	all power factors allowed	all power factors allowed	all power factors allowed	all power factors allowed
Temperature range (ambient temp.)	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	50 °C (auto recover after cooling down)	50 °C (auto recover after cooling down)	50 °C (auto recover after cooling down)	50 °C (auto recover after cooling down)
Cooling	natural/forced	natural/forced	natural/forced	natural/forced
Protection degree	IP23	IP23	IP23	IP23
Protections	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage
MasterBus compatible	no	no	no	no

* DC fuse depends on the cable size.



In addition to the Mastervolt sine wave inverters, we also supply the Marinco Inverter series.

See also our global product catalogue where we offer the most extended product portfolio worldwide under the Marinco brand.

www.marinco.com

MARINCO

Specifications Mass Sine inverters 120 V



	Mass Sine 12/2000	Mass Sine 24/2500
Product code 120 V	25012000	25022500
GENERAL SPECIFICATIONS		
Nominal battery voltage	12 V	24 V
Recommended battery capacity	> 200 Ah	> 200 Ah
Output voltage (± 5 %)	120 V – 60 Hz (± 0 .01 Hz)	120 V – 60 Hz (± 0 .01 Hz)
P30 power at 104 °F, cos phi 1	2000 W	2500 W
Continuous power at 104 °F, cos phi 1	1800 W	2000 W
Peak load	4000 W	5000 W
Output waveform	true sine	true sine
AC connection	internal	internal
Efficiency	92 %	92 %
Display/read-out	LED display	LED display
Parallel configuration	no	no
3-Phase configuration	no	no
Dimensions, hxxwxd	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
Weight	32.2 lb / 14.6 kg	32.2 lb / 14.6 kg
Approvals	CE, E-mark, ABYC A-31	CE, E-mark, ABYC A-31
TECHNICAL SPECIFICATIONS		
Technology	HF switch mode	HF switch mode
Low battery voltage, switches off at	10 V, ± 0.5 V	19 V, ± 0.5 V
Low battery voltage, switches on at	11 V, ± 0.5 V	22 V, ± 0.5 V
High battery voltage, switches off at	15.5 V, ± 0.5 V	33 V, ± 0.5 V
High battery voltage, switches on at	14.5 V, ± 0.5 V	31 V, ± 0.5 V
Max. ripple on DC (battery)	5 % RMS	5 % RMS
Input current (nominal load)	183 A	115 A
No-load power consumption (ON mode)	480 mA – 6 W	250 mA – 6 W
No-load power consumption (energy saving mode)	50 mA – 0.6 W	25 mA – 0.6 W
Minimal DC fuse (slow blow)*	250 A	160 A
Minimal cable size	70 mm ²	50 mm ²
Harmonic distortion typical	< 5 %	< 5 %
Cos Phi	all power factors allowed	all power factors allowed
Transfer system	Masterswitch/Systemswitch can be connected to all sine wave inverters	Masterswitch/Systemswitch can be connected to all sine wave inverters
Temperature range (ambient temp.)	-13 °F to 176 °F -25 °C to 80 °C; derating > 104 °F / 40 °C	-13 °F to 176 °F -25 °C to 80 °C; derating > 104 °F / 40 °C
Cooling	natural/forced	natural/forced
Protection degree	IP23	IP23
Protections	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage
MasterBus compatible	yes, using a MasterBus Inverter Interface or AC Power Analyser	yes, using a MasterBus Inverter Interface or AC Power Analyser

* DC fuse depends on the cable size.



OPTIONS		C4-RI 70404110	option	option
			Remote control on/off for the Mass Sine sine wave inverter.	
		MasterView Easy 77010305	option	option
			Touchscreen panel for reading charge status, current fold-back and/or Power Sharing setting.	
		Masterlink/MICC 70403105	option	option
			Battery consumption meter for 2 batteries, 12/24 V DC with LCD read-out, remote control for Mass Sine inverter and Mass battery charger or Mass Combi.	
		MasterBus USB Interface 77030100	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).	
		MasterBus Inverter Interface 77030700	option	option
			Integrates the Mass Sine inverter in a MasterBus network.	
		AC Power Analyser 77031200	option	option
			Integrates the Mass Sine inverter in a MasterBus network and visualizes the AC voltage, current and power.	

Mastervolt Combis: 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, Mass Combi Ultra and Mass Combi Pro can be used as an automatic stand-alone device for a non-stop power supply or as part of a larger power system.

Powerful Power Assist function

The Mass Combi and Mass Combi Ultra provide extra power from the battery when consumption is higher than can be supplied by the generator or grid connection. **Power Assist** prevents current variations and blown grid fuses, even in case of weak electricity connections or small generators.

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

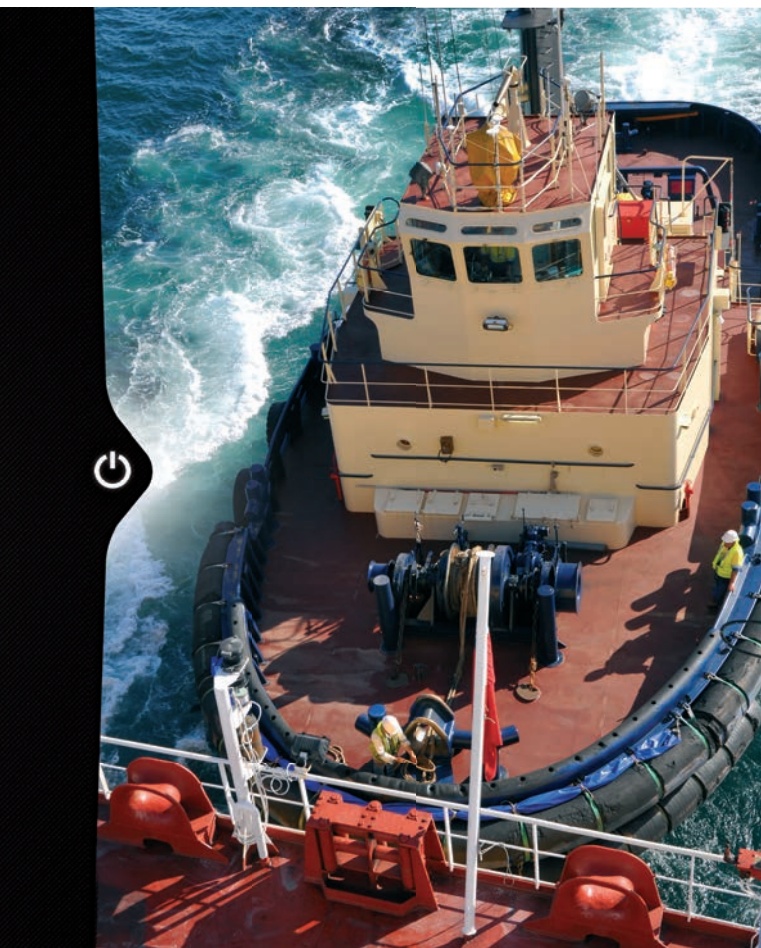


Mass Combi versus Mass Combi Ultra

Mastervolt has developed four Mass Combi models ranging from 1600 W to 2600 W. The Mass Combi is recognised as the best product on the market and offers proven reliability. There are also five Mass Combi Ultra models available for systems from 3000 W to 40 kW.

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.

The revolutionary technology of the Combi Ultra ensures a high yield, and the fan remains switched off until 50 % of the charge current or 50 % of the inverter capacity is reached. This is perfect for night-time operation when little power is consumed. At higher capacities, the *Optima Cooling* concept provides a constant ventilator speed without an annoying noise.





Power Assist for extra power



If you require more power than the grid or generator can provide, the Mass Combi 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.

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.

Not just any battery charger



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.

Two AC inputs



The Mass Combi Ultra has two separate AC inputs for generator or mains supply, both adjusted to the specific characteristics of each power source. Thanks to the ultra-fast controls, transfer to and from the inverter is seamless, preventing any flickering in the lights, or the unintentional powering down of sensitive devices.

Highest yield from solar power

The design of the integrated MPPT solar charge regulator in the Mass Combi Ultra is based on Mastervolt's extensive experience in the field of grid connected solar energy. Compared to most charge regulators, you will achieve up to 30 % more yield from solar energy for charging your batteries.

Dynamic window

The dynamic battery voltage window allows you to enjoy AC power for a longer time, without mistreating your batteries.

Renewed Mass Combi offers best price/quality ratio

Based on the exceptionally reliable Mass Combi series, the four new models now offer even more power at a highly competitive price. In addition, they 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 new 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 197.

The benefits of the improved Mass Combi:

- 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:** extra power assistance from the batteries in case of limited grid or generator power (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 30 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

NEW
MODEL

**Mass Combi
12/1600-60**

NEW
MODEL

**Mass Combi
12/2200-100**

NEW
MODEL

**Mass Combi
24/1800-35**

NEW
MODEL

**Mass Combi
24/2600-60**

Product code	36011600	36012200	36021800	36022600
Incl. MasterBus Combi Interface (see page 30 for details)	36011602	36012202	36021802	36022602
Incl. remote control (see page 30 for details)	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	230 V (± 5 %), adjustable 180-250 V 50/60 Hz (± 0.05 %)	230 V (± 5 %), adjustable 180-250 V 50/60 Hz (± 0.05 %)	230 V (± 5 %), adjustable 180-250 V 50/60 Hz (± 0.05 %)	230 V (± 5 %), adjustable 180-250 V 50/60 Hz (± 0.05 %)
Output waveform	true sine, Thd < 2.5 % under standard conditions	true sine, Thd < 2.5 % under standard conditions	true sine, Thd < 2.5 % under standard conditions	true sine, Thd < 2.5 % under standard conditions
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				
Input voltage range	180-265 V	180-265 V	180-265 V	180-265 V
Max. charge current (adjustable)	60 A at 14.25 V	100 A at 14.25 V	35 A at 14.25 V	60 A at 14.25 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
GENERAL SPECIFICATIONS				
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hxxwxd	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	CE, ABYC, E4	CE, ABYC, E4	CE, ABYC, E4
TECHNICAL SPECIFICATIONS				
Charge characteristic	IUoUo, automatic / 3-step+ for gel/AGM/MLI/ wet/spiral/traction	IUoUo, automatic / 3-step+ for gel/AGM/MLI/ wet/spiral/traction	IUoUo, automatic / 3-step+ for gel/AGM/MLI/ wet/spiral/traction	IUoUo, automatic / 3-step+ for gel/AGM/MLI/ wet/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
Transfer time	10 ms	10 ms	10 ms	10 ms
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)
Safety protections	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, 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		Masterlink/MICC 70403105	option	option	option	option
		MasterView Easy 77010305	option	option	option	option
		MasterBus USB Interface 77030100	option	option	option	option
Battery consumption metre for 2 batteries, 12/24 V DC with LCD read-out, remote control for Mass Sine inverter and Mass battery charger or Mass Combi. In combination with a MasterBus Combi Interface. Touchscreen panel for reading charge status, current fold-back and/or Power Sharing setting. 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 MasterView Easy 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 and an APC remote 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 – 60 Hz, ± 0,05 %	120 V – 60 Hz, ± 0,05 %	120 V – 60 Hz, ± 0,05 %	120 V – 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, hxxwxd	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/ wet/spiral/traction	IUoUo, automatic / 3-step+ for gel/AGM/MLI/ wet/spiral/traction	IUoUo, automatic / 3-step+ for gel/AGM/MLI/ wet/spiral/traction	IUoUo, automatic / 3-step+ for gel/AGM/MLI/ wet/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 time	10 ms	10 ms	10 ms	10 ms
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)
Safety protections	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, short circuit, high/low battery voltage	over temperature, over load, 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
		Remote APC 70405010	option	option	option	option
		Masterlink/MICC 70403105	option	option	option	option
		MasterView Easy 77010305	option	option	option	option
		MasterBus Combi Interface 77030475	delivered as standard	option	delivered as standard	option

Mass Combi Ultra: Powerful, complete and versatile

The Mass Combi Ultra series comprises five models, varying from 3000 W to 5000 W. For higher capacities up to 40 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





Power Assist for extra power

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

Exceptional performance

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.

Optimal battery use

The powerful battery charger simultaneously charges two battery banks and provides a full charge current in ambient temperatures up to 40 °C. Meticulous load properties and a low ripple current guarantee a long battery life. The 24 V model can combine 12 V and 24 V battery banks.

Home comforts

A robust and intelligent system switches between grid power, generator power and inverter power. Dual AC inputs and outputs enable users to feed heavy loads via the grid and/or generator. Thanks to the ultra-fast controls, the transfer to and from the inverter is seamless. This ensures users continuous power without flickering or the risk of sensitive devices such as computers being switched off.



Quiet operation

The Combi Ultra 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 three-phase configurations for larger applications up to 35 kW.

Specifications

Mass Combi Ultra 230 V

	NEW MODEL	NEW MODEL		NEW MODEL
				
	Mass Combi Ultra 12/3000-150	Mass Combi Pro 12/3000-150	Mass Combi Ultra 24/3500-100	Mass Combi Pro 24/3500-100
Product code	38013000	38513000	38023500	38523500
SPECIFICATIONS SINE WAVE INVERTER				
Nominal DC voltage	12 V (9.5 – 16 V)	12 V (9.5 – 16 V)	24 V (19 – 32 V)	24 V (19 – 32 V)
Output voltage	230 V (± 2 %), adjustable 180-260 V	230 V (± 2 %), adjustable 180-260 V	230 V (± 2 %), adjustable 180-260 V	230 V (± 2 %), adjustable 180-260 V
Output waveform	true sine, Thd < 1 % under standard conditions	true sine, Thd < 1 % under standard conditions	true sine, Thd < 1 % under standard conditions	true sine, Thd < 1 % under standard conditions
Continuous power at 40 °C, cos phi 1	3000 W	3000 W	3500 W	3500 W
Surge capability	6000 W	6000 W	7000 W	7000 W
Parallel configuration	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 %	≥ 90 %	≥ 92 %	≥ 92 %
Max. ripple on DC (battery at full load)	< 5 %	< 5 %	< 5 %	< 5 %
No-load power consumption	< 16 W	< 16 W	< 16 W	< 16 W
Energy saving mode consumption	7 W	7 W	7 W	7 W
SPECIFICATIONS BATTERY CHARGER				
Input voltage range	184 – 275 V	184 – 275 V	184 – 275 V	184 – 275 V
Max. charge current at 40 °C	150 A at 14.25 V	150 A at 14.25 V	100 A at 28.5 V	100 A at 28.5 V
Secondary charger output voltage	12 V	n.a.	12/24 V selectable	n.a.
Secondary charger output current	10 A	n.a.	10 A	n.a.
Battery temperature sensor	yes, included	yes, included	yes, included	yes, included
SPECIFICATIONS TRANSFER SYSTEM				
AC input 1	50 A (generator only, switched)	50 A (generator only, switched)	50 A (generator only, switched)	50 A (generator only, switched)
AC input 2	30 A (mains only, switched)	30 A (mains only, switched)	30 A (mains only, switched)	30 A (mains only, 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)
Transfer voltage range (adjustable)	184 – 275 V	184 – 275 V	184 – 275 V	184 – 275 V
Transfer frequency range (adjustable)	35 – 68 Hz	35 – 68 Hz	35 – 68 Hz	35 – 68 Hz
SOLAR INPUT DC SPECIFICATIONS				
Input voltage range	25-50 V	n.a.	25-100 V	n.a.
Max. PV peak power	500 Wp	n.a.	500 Wp	n.a.
Max. input current	19 A	n.a.	19 A	n.a.
Max. charge current	30 A at 14.25 V	n.a.	15 A at 28.5 V	n.a.
MPP Tracker	full power at 25-50 V	n.a.	full power at 35-80 V	n.a.
GENERAL SPECIFICATIONS				
Display/read-out	LED display	LED display	LED display	LED display
Dimensions, hwxwd	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	CE, ABYC	CE, ABYC	CE, ABYC
TECHNICAL SPECIFICATIONS				
Charge characteristic	IUoU, automatic 3-step+ for AGM/gel/MLI/wet/ traction/spiral	IUoU, automatic 3-step+ for AGM/gel/MLI/wet/ traction/spiral	IUoU, automatic 3-step+ for AGM/gel/MLI/wet/ traction/spiral	IUoU, automatic 3-step+ for AGM/gel/MLI/wet/ 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	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, AC over load, AC short circuit, DC short circuit, high/low battery voltage	over temperature, AC over load, AC short circuit, DC short circuit, high/low battery voltage	over temperature, AC over load, AC short circuit, DC short circuit, high/low battery voltage	over temperature, AC over load, AC short circuit, DC short circuit, high/low battery voltage
MasterBus compatible	yes	yes	yes	yes

UPCOMING
MODEL**Mass Combi Ultra
24/5000-125**

38025000

NEW
MODEL**Mass Combi Ultra
48/3500-50**

38343500

UPCOMING
MODEL**Mass Combi Ultra
48/5000-60**

38045000

24 V (19 – 32 V)

230 V (± 2 %),
adjustable 180-260 Vtrue sine, Thd < 1 % under
standard conditions

5000 W

10.000 W

yes, up to 10 standard

yes, up to 3x3

≥ 92 %

< 5 %

22 W

10 W

48 V (38 – 62 V)

230 V (± 2 %),
adjustable 180-260 Vtrue sine, Thd < 1 % under
standard conditions

3500 W

7000 W

yes, up to 10 standard

yes, up to 3x3

≥ 93 %

< 5 %

< 16 W

7 W

48 V (38 – 62 V)

230 V (± 2 %),
adjustable 180-260 Vtrue sine, Thd < 1 % under
standard conditions

5000 W

10.000 W

yes, up to 10 standard

yes, up to 3x3

≥ 93 %

< 5 %

22 W

10 W

184 – 275 V

125 A at 28.5 V

12/24 V selectable

10 A

yes, included

184 – 275 V

50 A at 57 V

12/24 V selectable

10 A

yes, included

184 – 275 V

60 A at 57 V

12/24 V selectable

10 A

yes, included

100 A (generator only,
switched)

50 A (mains only, switched)

125 A

100 A (switched)

seamless (< 1 ms)

184 – 275 V

35 – 68 Hz

50 A (generator only,
switched)

30 A (mains only, switched)

67 A

50 A (switched)

seamless (< 1 ms)

184 – 275 V

35 – 68 Hz

100 A (generator only,
switched)

50 A (mains only, switched)

125 A

100 A (switched)

seamless (< 1 ms)

184 – 275 V

35 – 68 Hz

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

n.a.

LED display

522 x 318 x 178 mm

20.6 x 12.5 x 7 inch

21 kg / 46.3 lb

CE, ABYC

LED display

472 x 318 x 178 mm

18.6 x 12.5 x 7 inch

15.3 kg / 33.1 lb

CE, ABYC

LED display

522 x 318 x 178 mm

20.6 x 12.5 x 7 inch

21 kg / 46.3 lb

CE, ABYC

IUoU, automatic 3-step+
for AGM/gel/MLI/wet/
traction/spiral

yes, configurable

-25 °C to 60 °C,
derating > 40 °Cmaintenance-free vario
fans

IP23 (vertical mounting)

over temperature, AC
over load, AC short circuit,
DC short circuit, high/low
battery voltage

yes

IUoU, automatic 3-step+
for AGM/gel/MLI/wet/
traction/spiral

yes, configurable

-25 °C to 60 °C,
derating > 40 °Cmaintenance-free vario
fans

IP23 (vertical mounting)

over temperature, AC
over load, AC short circuit,
DC short circuit, high/low
battery voltage

yes

IUoU, automatic 3-step+
for AGM/gel/MLI/wet/
traction/spiral

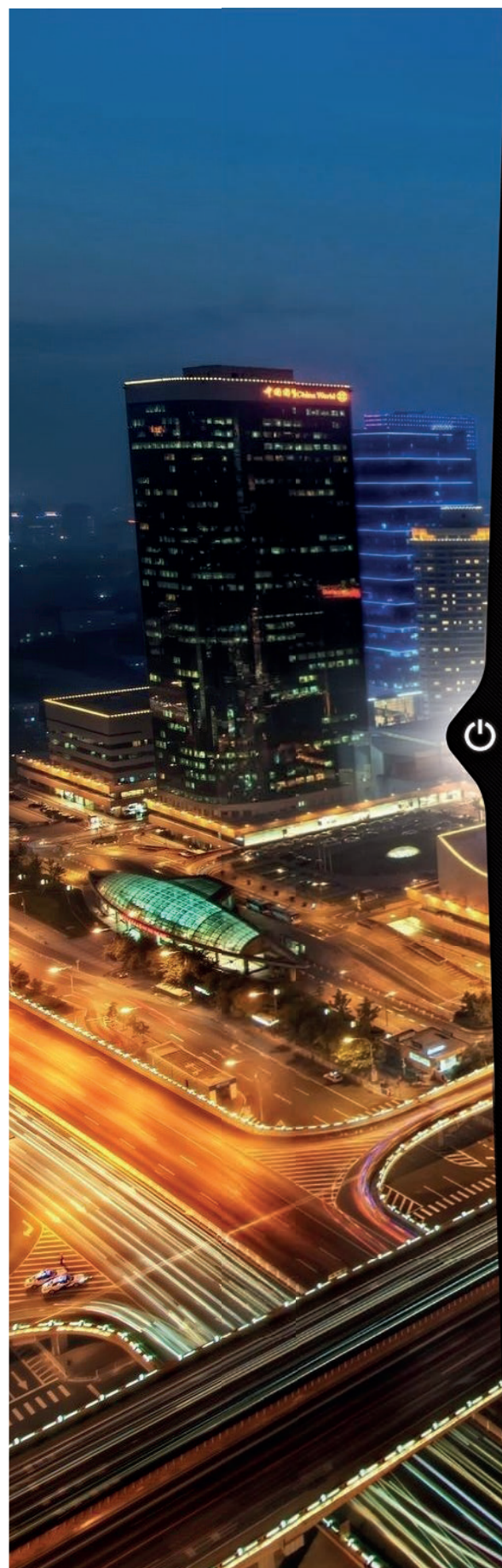
yes, configurable

-25 °C to 60 °C,
derating > 40 °Cmaintenance-free vario
fans

IP23 (vertical mounting)

over temperature, AC
over load, AC short circuit,
DC short circuit, high/low
battery voltage

yes



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.
- Battery charger and dimmer function.
- Parallel connection.
- Adjustable output voltage.
- Voltage stabilisation for a longer lifespan of halogen lights, etc.

DC Master series

- Recreational and semi-professional use.
- Easy to install using included mounting bracket.
- Excellent price/performance ratio.

The 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.

Masterstrokes

- No unnecessary heat development due to the use of smart electronics.
- Continuous output voltage.
- Easy to install.

Please note

- Choose the right input/output voltage.
- Consider whether you require galvanic isolation?
- Decide on desired output power.

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'll 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**





Programmable via desktop or laptop or PC

Remote control the Mac or 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.

Complete package DC Master

All DC Master converters are delivered with mounting bracket, screws and fasteners.



Energy-saving dimmer function



Many standard light dimmers convert part of the energy to heat and also lose unnecessary energy. The Mastervolt Magic converters regulate the power supply efficiently and without excessive heat build-up, up to 580 watts for optimal safety (multiple Magic converters can be used for multiple lamps).

3-Step+ battery charger



Connected to the 24 V main battery, the converter can also be used as an advanced 3-step+ battery charger for 12/24 V gel, AGM, wet or Lithium Ion batteries (Mac & Magic models only).

Parallel operation



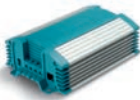
If you have many/heavy power-consuming devices onboard, the parallel use of several units allows capacities of 40, 60 or more amps. Advanced high-frequency technology with modern microprocessors ensures minimum power loss when switching from 24 to 12 V and vice versa.

Solid connections



Chrome-plated brass connection block with screw terminal or chrome-plated fast-on for DC in/out.

Specifications Mac & Magic converters

				
	Mac 24/12-20	Magic 24/12-20	Magic 24/24-20	Magic 12/12-20
Product code	81200100	81300100	81300200	81300400
INPUT SPECIFICATIONS				
Nominal input voltage	24 V	24 V	24 V	12 V
Input range	20-32 V DC	19-32 V DC	19-32 V DC	11-16 V DC
Input range, 3-step charge mode	24-32 V DC	24-32 V DC	24-32 V DC	12-16 V DC
Lower input set point*	20 V DC	20 V DC	20 V DC	10 V DC
Delay lower input set point*	30 sec.	30 sec.	30 sec.	30 sec.
OUTPUT SPECIFICATIONS				
Nominal output voltage*	13.6 V DC	13.6 V DC	27.2 V DC	13.6 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	4-13 V DC	8-26 V DC	4-13 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 / 270 W	300 / 300 W	580 / 580 W	300 / 300 W
Max. current	20 A	20 A	20 A	20 A
Charge current - 3-step mode	16 A	16 A	16 A	16 A
Parallel configuration	yes, up to 10	yes, up to 10	yes, up to 10	yes, up to 10
GENERAL SPECIFICATIONS				
Galvanic isolation	no	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 over load	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	no	yes (fast-on connector)	yes (fast-on connector)	yes (fast-on connector)
Dimensions, hxxwx d	190 x 130 x 61 mm 7.5 x 5.1 x 2.4 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 kg / 2.2 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	< 30 mA	< 115 mA	< 115 mA	< 115 mA
Connections input/output	screw terminals, maximum wire size 16 mm ² / AWG5	screw terminals, maximum wire size 16 mm ² / AWG5	screw terminals, maximum wire size 16 mm ² / AWG5	screw terminals, maximum wire size 16 mm ² / AWG5
Temperature range (ambient temp.)	-25 °C to 80 °C; > 40 °C derating power power	-25 °C to 80 °C; > 40 °C derating power power	-25 °C to 80 °C; > 40 °C derating power power	-25 °C to 80 °C; > 40 °C derating power power
Cooling	natural cooling	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.			
		MasterView Easy 77010305	option	option	option	option
			In combination with a MasterBus Serial Interface.Touchscreen panel for reading status and dimmer function settings.			
		MasterBus Serial Interface 77030450	option	option	option	option
			Integrates the Mac & Magic converters in a MasterBus network.			


Magic
12/24-10

81300300

12 V

11-16 V DC

12-16 V DC

10 V DC

30 sec.

27.2 V DC

20-28.5 V DC

8-26 V DC

2 % at extremes of
temperatures, load and
input

max. 1 % peak peak

300 / 300 W

10 A

8 A

yes, up to 10

yes

yes

>90 % (at nom. input
voltage, full load); 92 %
peak

yes

yes

yes, by external
momentary switch via
fast-on connection, to be
activated by DIP-switch
setting

yes (fast-on connector)

227 x 154 x 81 mm

8.9 x 6.1 x 3.2 inch

1.8 kg / 4 lb

CE

yes (DIP switch settings)

< 115 mA

screw terminals, maximum
wire size 16 mm² / AWG5-25 °C to 80 °C; > 40 °C
derating power powermaintenance-free vario
fans

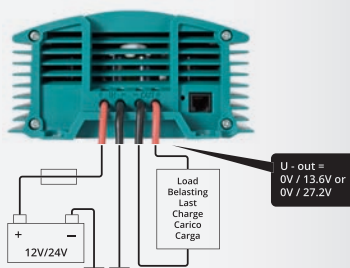
IP21

yes, in combination with a
MasterBus Serial Interface

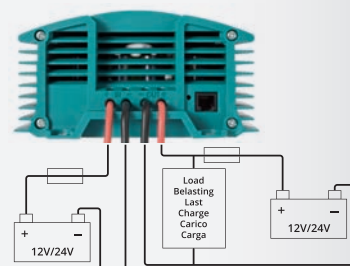
option

option

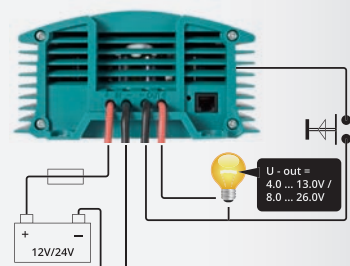
option


Magic as power supply

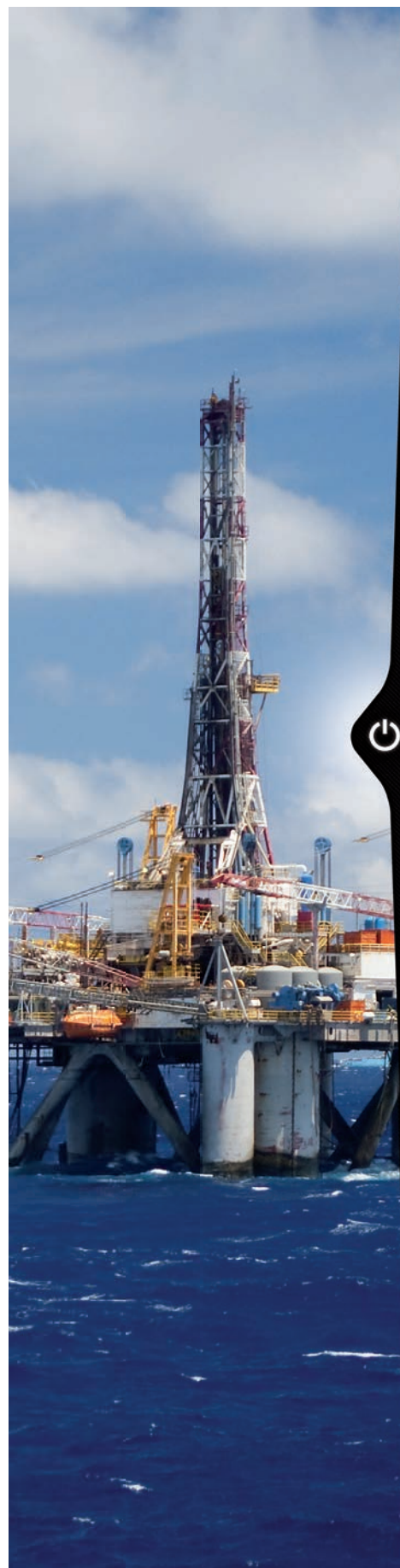
The Magic models can be fully used as a stabilised power supply: From 12 to 24 V, from 24 to 12 V or from 24 to 24 V. Inputs and outputs are galvanically isolated.


Mac & Magic as battery charger

A 12 V starter or emergency power battery can be charged as well as maintained by Mac or Magic units. The charging method is identical to the Mass 3-step with voltage levels adjustable by means of MasterBus PC-Link/MasterAdjust software.


Mac as dimmer

Light can be dimmed by means of a push button or plus switch, with a maximum load of 250 watt for the Mac. A second Mac can be installed if there are multiple lamps.



Specifications

DC Master converters

Non Isolated

				
	DC Master 24/12-3A	DC Master 24/12-6A	DC Master 24/12-12A	DC Master 24/12-24A
Product code	81400100	81400200	81400300	81400330
INPUT SPECIFICATIONS				
Nominal input voltage	24 V	24 V	24 V	24 V
Input range	20-32 V DC	20-32 V DC	20-32 V DC	20-32 V DC
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	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	< 10 mA	< 10 mA	< 10 mA	< 10 mA
GENERAL SPECIFICATIONS				
Dimensions, hxxwxd	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	225 g / 0.5 lb	270 g / 0.6 lb	405 g / 0.9 lb	635 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 12/12-3A	DC Master 12/12-6A	DC Master 24/12-3A	DC Master 24/12-6A
Product code	81500600	81500700	81500100	81500200
INPUT SPECIFICATIONS				
Nominal input voltage	12 V	12 V	24 V	24 V
Input range	10-15.5 V	10-15.5 V	20-32 V DC	20-32 V DC
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	81 W	41 W	82 W
Current max. 2 minutes* / continuous	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	< 100 mA	< 100 mA	< 10 mA	< 10 mA
GENERAL SPECIFICATIONS				
Dimensions, hxxwxd	89 x 87 x 50 mm 3. 3.4 x 2 inch	217 x 87 x 50 mm 8.5 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	290 g / 0.6 lb	820 g / 1.8 lb	290 g / 0.6 lb	410 g / 0.9 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

NEW
MODEL**DC Master
24/12-50A**

81400352

**DC Master
12/24-3A**

81400400

**DC Master
12/24-7A**

81400500

**DC Master
48/12-6A**

81400600

**DC Master
48/12-9A**

81400700

**DC Master
48/12-20A**

81400800

24 V	12 V	12 V	48 V	48 V	48 V
20-32 V DC	10-15.5 V DC	10-15.5 V DC	40-62 V DC	40-62 V DC	40-62 V DC
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
< 20 mA	< 110 mA	< 120 mA	< 15 mA	< 15 mA	< 15 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	290 g / 0.6 lb	610 g / 1.3 lb	415 g / 0.9 lb	415 g / 0.9 lb	765 g / 0.9 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
24/12-12A**

81500300

**DC Master
24/12-24A**

81500350

**DC Master
24/24-3A**

81500400

**DC Master
24/24-7A**

81500500

24 V	24 V	24 V	24 V
20-32 V DC	20-32 V DC	20-32 V DC	20-32 V DC
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	24 A / 30 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
< 10 mA	< 10 mA	< 25 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	850 g / 1.9 lb	590 g / 1.3 lb	820 g / 1.8 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

* Two minutes of extra power for short power boosts.

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

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 Lithium Ion 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 new 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 new SCM25 MPPT and SCM60 MPPT-MB regulators.





Features of the Solar ChargeMaster range

- High efficiency: your batteries are charged quickly.
- Capacity for solar panel configurations of up to 3600 Wp.
- Suitable for AGM, gel, wet and Mastervolt Lithium Ion 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 overtemperature, overload, high/low battery voltage, high/low PV voltage, short circuit and reverse polarity.

Additional features of the 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

	NEW MODEL	NEW MODEL		
				
	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, hxxwxd	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	-25 °C to 50 °C
Cable size	max. 10 mm ² Litz wire	max. 35 mm ² Litz wire	max. 16 mm ² Litz wire	max. 16 mm ² Litz wire
Protections	over temperature, over load, high/low battery voltage, high/low PV voltage, short circuit, reverse polarity & HV transients	over temperature, over load, high/low battery voltage, high/low PV voltage, short circuit, reverse polarity & HV transients	over temperature, over load, high/low battery voltage, high/low PV voltage, short circuit, reverse polarity & HV transients	over temperature, over load, 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, wet, Lithium Ion	AGM, gel, wet, Lithium Ion	AGM, gel, wet, Lithium Ion	AGM, gel, wet, Lithium Ion
Battery temperature sensor	yes	yes	yes	yes
Lithium Ion protection	via Multipurpose Contact Output, product code 77030500	yes, via MasterBus connection	via DC relay & Multipurpose Contact Output, product code 77030500	via DC relay & Multipurpose Contact Output, product code 77030500
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.
OPTIONS				
	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.

SOLAR CHARGE REGULATORS

SCM25 MPPT

SCM60 MPPT

SCM20

SCM40



Make the most of every ray with a Mastervolt solar inverter

We all want to make the most of our solar panels and that requires an inverter that will convert even the day's last rays of sun into electricity. Mastervolt has the answer! Based on 20-plus years of experience, our inverters leverage on the very latest technologies to ensure the best possible yield. Take, for example, our Soladin *WEB*, including internet monitoring via WiFi. Produced in the Netherlands, and suitable for every type of solar panel.

The robust Soladin *WEB* inverter brings solar energy within everyone's reach, and guarantees a professional performance for small PV systems. Due to the integrated WiFi and Mastervolt IntelliWeb the functioning of your PV system can be easily monitored from home, your workplace or while on holiday.

Fast installation, wide applications

Due to their silent operation, Soladin *WEB* inverters are ideally suited for installation in-house. The Soladin 2200 and 3000 *WEB* models can also be installed outdoors due to their solid IP65 casing. Soladin *WEB* inverters can be applied with every type of solar panel, both in new and in existing systems. In addition, the Soladin *WEB* is suitable for most European countries.

Mastervolt IntelliWeb: Internet monitoring via WiFi

Soladin *WEB* can utilise any existing WiFi connection. After logging into your personal IntelliWeb page, you will see a clear overview of the technical data, energy yield, and financial effects on your laptop, smartphone or tablet. You will be able to see whether the system is functioning properly at a single glance, while real-time data updates always provide you with the latest information. IntelliWeb automatic monitoring provides you with maximum operational security!

QUOTE

"The Mastervolt Soladin WEB inverters are very reliable. As a technical wholesaler, we are pleased with the Mastervolt products, the organization and the Mastervolt service. Our sales people are proud to supply such a quality Dutch product."

**PETER HUISMAN, LEADER NEW BUSINESS DEVELOPMENT
REXEL, THE NETHERLANDS**





WiFi monitoring via IntelliWeb



Direct overview of your PV system,
at any time of day.

Safe data storage in the Netherlands

In accordance with local privacy
regulations.

Soladin 2200 WEB & Soladin 3000 WEB



The professional solution for residential
applications, suitable for 7 to 15 solar
panels. Thanks to their robust IP65
casing, these transformerless inverters
are ideal for indoor and outdoor
installation, and offer superior dust-
protection. The intelligent and
functional design ensures that
installation is only a matter of minutes.
The inverters are supplied with a
waterproof AC plug.

Soladin 1000 WEB & Soladin 1500 WEB



Suitable for residential use with 4 to 8
solar panels, these compact inverters
are ideal for smaller households where
the energy consumption is immediately
compensated by the power generated.
Due to the intelligent and functional
design, installation takes as little as
three minutes. The HF transformer
technology makes this Soladin WEB
suitable for every type of solar panel.

Ease of installation



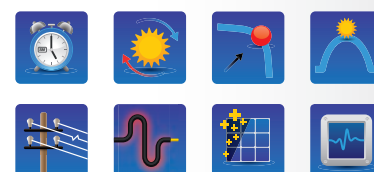
Both models are delivered with a
mounting bracket for trouble-free
installation.

Reliable quality

The Soladin WEB is a Dutch quality
product from Mastervolt. The range
is designed in the Netherlands
and produced in accordance with
stringent quality and environmental
requirements, such as ISO9001 and
ISO14001. Our 'Zero Defects' policy
limits errors to a minimum. The Soladin
WEB inverters are supplied with 10
years manufacturer warranty.

Mastervolt IntelliConcept

Eight integrated IntelliConcept
innovations ensure maximum yield in
all conditions.



Specifications

Soladin WEB

solar inverters



	Soladin 1000 WEB	Soladin 1500 WEB	Soladin 2200 WEB	Soladin 3000 WEB
Product code	130001000	130001500	131512200	131513000
GENERAL SPECIFICATIONS				
Operating temperature	-20 °C to 60 °C; derating power > 45 °C	-20 °C to 60 °C; derating power > 45 °C	-20 °C to 60 °C; derating power > 45 °C	-20 °C to 60 °C; derating power > 45 °C
Enclosure	aluminium, plastic front	aluminium, plastic front	coated aluminium	coated aluminium
Safety class	class I	class I	class I	class I
Inverter technology	HF trafo	HF trafo	transformerless	transformerless
Sound level (typ.)	< 36 dB(A) SPL	< 36 dB(A) SPL	< 30 dB(A)	< 30 dB(A)
Dimensions, hxxwxd	478 x 241 x 128 mm 18.8 x 9.5 x 5 inch	478 x 241 x 128 mm 18.8 x 9.5 x 5 inch	440 x 460 x 160 mm 17.3 x 18.1 x 6.3 inch	440 x 460 x 160 mm 17.3 x 18.1 x 6.3 inch
Weight	7 kg / 15,4 lb	8 kg / 17,6 lb	13,5 kg / 29,8 lb	13,5 kg / 29,8 lb
Protection degree	IP21 for indoor use	IP21 for indoor use	IP65 for outdoor application	IP65 for outdoor application
Product warranty	10 years	10 years	10 years	10 years
TECHNICAL SPECIFICATIONS				
Relative humidity	< 90 % non condensing	< 90 % non condensing	4-100 % non condensing	4-100 % non condensing
GRID OUTPUT (AC) SPECIFICATIONS				
Grid voltage	230 V +15 % / -20 %	230 V +15 % / -20 %	230 V +15 % / -20 %	230 V +15 % / -20 %
Nom. output power	1050 VA	1575 VA	2200 VA	3000 VA
Max. output power	1050 VA	1575 VA	2310 VA	3150 VA (Italy 3000 VA)
Max. output current	5.1 A	7.6 A	10.5 A	14.3 A
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Power factor	> 0.99	> 0.99	> 0.99	> 0.99
Standby power	< 0.5 W	< 0.5 W	< 1 W	< 1 W
EU efficiency	94.4 %	95 %	96.2 %	96.2 %
Max. efficiency	95.3 %	95.6 %	97.1 %	97.1 %
AC connection	0,75-4 mm ² push-in connector	0,75-4 mm ² push-in connector	Amphenol IP67 connector, suitable for 2.5-6 mm ² cables	Amphenol IP67 connector, suitable for 2.5-6 mm ² cables
REGULATIONS & DIRECTIVES				
CE conformity	yes	yes	yes	yes
Approved for use in	DE, SP, NL, UK, DK, FR, BE, GR, AT, IE, BG, CZ, PT, PL, CL	DE, SP, NL, UK, DK, FR, BE, GR, AT, IE, BG, CZ, PT, PL, CL	DE, SP, NL, UK, DK, FR, BE, GR, AT, IE, BG, CZ, CY, PL	DE, SP, NL, UK, DK, FR, BE, GR, AT, IE, BG, CZ, CY, PL
Nat. grid requirements	VDE0126-1-1; VDE-AR-N4105; RD1699; G83/2; C10/11	VDE0126-1-1; VDE-AR-N4105; RD1699; G83/2; C10/11	VDE0126-1-1; VDE-AR-N4105; RD1699; G83/2; C10/11	VDE0126-1-1; VDE-AR-N4105; RD1699; G83/2; C10/11
COMMUNICATION & MONITORING				
Display	three LED indicators	three LED indicators	three LED indicators	three LED indicators
Diagnostics	IntelliWeb	IntelliWeb	IntelliWeb	IntelliWeb
Communication	WiFi	WiFi	WiFi / IntelliWeb	WiFi / IntelliWeb
SOLAR INPUT (DC) SPECIFICATIONS				
PV power range	850-1350 Wp	1300-2000 Wp	1900-2850 Wp	1900-3900 Wp
Start-up power	< 5 W	< 5 W	8.5 W	8.5 W
Operating voltage range	70-290 V	80-375 V	125-400 V	125-550 V
MPP voltage range at nom. power	130-230 V	150-300 V	420 V	400 V
Nom. voltage	205 V	220 V	350 V	350 V
Max. voltage	290 V	375 V	500 V	630 V
Number of inputs	1 MPP tracker and 1 set Amphenol DC connections	1 MPP tracker and 1 set Amphenol DC connections	1 MPP tracker + 1 set MC4 connectors	1 MPP tracker + 1 set MC4 connectors
Efficiency MPP trackers (static/dynamic)	99.9 % / 99.7 %	99.9 % / 99.7 %	99.9 % / 99.8 %	99.9 % / 99.7 %
Nom. input current	8.6 A	11 A	1 x 10 A	1 x 10 A
DC protection	surge arresters, class III according to IEC 61643-1	surge arresters, class III according to IEC 61643-1	surge arresters, class III according to IEC 61643-1	surge arresters, class III according to IEC 61643-1
Number of panels	4-5	6-8	8-11	10-15

OPTIONS  	DC switch Soladin 1000/1500 WEB 130500640	option	option	n.a.	n.a.
	DC switch Soladin 2200/3000 WEB 130500650	n.a.	n.a.	option	option

Completely pre-assembled DC switch ensures fast installation and optimum safety.

Completely pre-assembled DC switch ensures fast installation and optimum safety.



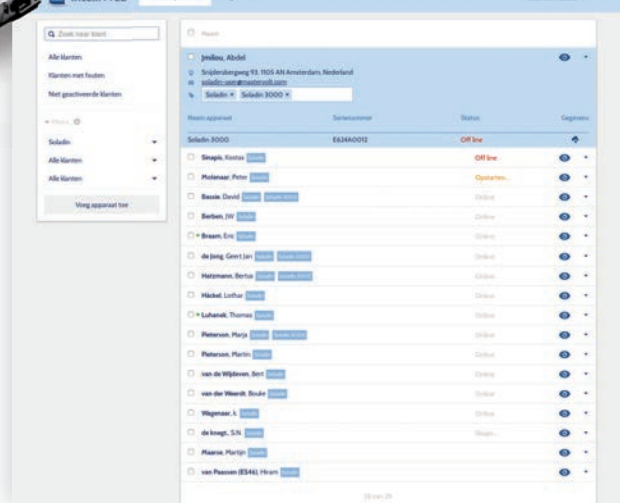
Mastervolt IntelliWeb: Internet monitoring via WiFi

All of Mastervolt's Soladin *WEB* solar inverters are equipped with IntelliWeb. The inverters have an integrated data logger that stores yield information, and a WiFi connection for communication.

After logging into your personal IntelliWeb page, you will see a clear overview of the technical data, energy yield, and financial effects on your laptop, smartphone or tablet. You will be able to see whether the system is functioning properly at a single glance. Should an error occur, you will receive an automatic notification via e-mail.

All system data is sent to the Mastervolt server in the Netherlands and stored safely and locally. This allows you to monitor the current situation from anywhere and at any time, even when the inverter is switched off, while real-time data updates provide you with the latest information. You will also have permanent access to a detailed history of your PV system.

IntelliWeb automatic monitoring provides you with maximum operational security!



Mastervolt IntelliGuard: easy management of multiple systems

For the management of multiple systems, Mastervolt provides a set of management functions under the name IntelliGuard.

IntelliGuard provides installers, housing corporations and other service organisations with an overview of their clients on one computer screen. The clear information on the so-called dashboard gives insight into what systems demand attention. Error notifications with background information are provided via e-mail, while a powerful search function and the option of co-monitoring with the client simplify client support. The Mastervolt hotline guarantees direct contact with an expert.

IntelliGuard provides installers with the capacity to offer better client service (free account on request).

MASTER TIP



Monitoring allows users to make the most of their PV system by allowing them to respond to issues and errors when needed, optimising both the financial and energy yields.

Soladin 600: The sun as power station

The Soladin 600 is the entry level model of the Soladin series, and a smart solution for small PV systems comprising up to three solar panels. The user-friendly Soladin 600 involves the entire family in sustainable energy and electricity conservation in a fun and easy way. In addition, the inverter is suitable for every type of solar panel and can be connected directly to the grid. We advise you to consult your dealer for the local regulations.

Easy plug & play installation

The Soladin 600 inverter is very compact and equipped with an easily accessible DC connection. MultiContact connectors realise the positive and negative connection of the panel, while the integrated AC plug can be connected to any socket, making the system immediately ready for use. Clear LED indicators provide information about the energy yield and system status as well as the Soladin inverter itself.



Mastervolt IntelliConcept: Smart innovation for 5 to 10 % extra yield

Soladin *WEB* solar inverters will get the most out of your solar panels in all conditions. This means not only a great performance in blazing sunshine, but also the best possible yield on cloudy days. Eight built-in IntelliConcept innovations guarantee maximum yield under all conditions.

IntelliStart



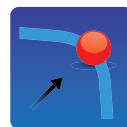
Delivers additional yield in the early morning and the late evening.

IntelliCool



Stable high efficiency and constant high power.

IntelliTrack



Additional yield by tracking fast weather changes.

IntelliPeak



Maximizes efficiency where it's needed most.

IntelliGrid



Stable operation during small grid disturbances.

IntelliString



Up to 80 % reduction of cable loss.

IntelliShade



Maximizes production, even under shaded conditions.

IntelliWeb



Integrated monitoring for early warning on system fault.

Specifications Soladin 600 solar inverter



Soladin 600

Product code	130000600
GENERAL SPECIFICATIONS	
Operating temperature	0 °C to 40 °C
Relative humidity	max. 85 %; non condensing
Protection degree	IP20
Safety class	class II
Dimensions, hwxwx	365 x 143 x 76 mm 14,4 x 5,6 x 3 inch
Weight	2 kg
Enclosure	plastic (ABS)
Product warranty	5 years
SOLAR INPUT (DC) SPECIFICATIONS	
Nom. input power	535 W
Max. input power	600 W
PV power range	160-700 Wp
MPP voltage range at nom. power	40-125 V DC
Number of MPP trackers	1 dynamic MPP tracker
Max. voltage	155 V DC
Start-up power	1 W
DC connection	1x MultiContact 4 mm ²
GRID OUTPUT (AC) SPECIFICATIONS	
Grid voltage	230 V (184-265 V, programmable)
Max. output current	2.25 A
Fuse	3.15 A slow
Frequency	50 Hz (49.8-50.2 Hz)
Power factor	0.99
Standby power	< 0.05 W AC
EU efficiency	91 %
Max. efficiency	93 %
AC connection	Euro socket
REGULATIONS & DIRECTIVES	
CE conformity	yes
Nat. grid requirements	EMC 89/336/EEG; EN 50081-1; EN 61000-3-2; EN 50082-2; LV 73/23/EEC; EN 60950; EN62109-1
SAFETY REGULATIONS	
Island protection	monitoring of voltage and frequency frame, disconnects within 100 ms
Protection of peak capacity	automatic control, dependent on the temperature of the converter, by raising the Vmpp; it is impossible to damage the converter with too much power
Temperature protection	reducing the power in case of a higher temperature of the converter; will disconnect > 80 °C
DC polarity protection	DC connection is protected (MC connectors can be damaged)
COMMUNICATION & MONITORING	
Display	two LED's: yellow and red
Correct operation	flashing yellow (speed of flashing is in relation to the power generated)
Malfunction	red (6 different flashing codes)

Dynamic MPP tracker

All solar panels reach a point at which they supply maximum energy. This so-called 'maximum power point' (MPP) varies per brand and panel type, and is determined by a combination of voltage, current, exposure and temperature.

The Soladin 600 is equipped with a dynamic MPP tracker which ensures an exceptionally high MPP yield in nearly all conditions. It has no limitations related to the type of solar panel (silicon, amorphous, etc.), and guarantees an optimal performance of your solar system.

Input range

The Soladin 600 has a wide working area that allows it to be connected to nearly all systems up to 700 Wp. With a maximum voltage of 155 V DC, configurations of 36, 54, 60 or 72 cell solar panels can be connected. The current ranges from 0 to 8 amp, making the Soladin 600 suitable for high-power panels as well.

MASTER TIP



Our robust and reliable solar charge regulators also offer an efficient solution for autonomous applications. See page 44 for all models and specifications.

Mastervolt batteries: The right choice for power storage

Mastervolt makes selecting the right battery easy. Whether you choose a low priced battery such as the AGM or an innovative and technologically advanced Lithium Ion battery, Mastervolt has the best solution for every power need you have.

Mastervolt has divided its entire battery range of 35 types into seven series and five different battery technologies. Each series has its specific benefits.

All Mastervolt batteries offer you these advantages:

- Maintenance-free.
- Safe - no degassing.
- 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.

Reinforced batteries

All Mastervolt gel and AGM batteries are equipped with shock-proof positive and negative battery plates with rubber separation, while the electrolyte is absorbed in gel or glass fibre (AGM). A high-grade lead/calcium compound guarantees a constant capacity and minimum self-discharging.

Mastervolt has the right battery for every application.



Which battery is best for your application?

		1	2	3	4	5
	Traditional open batteries	MLI Ultra Lithium Ion	MLS Lithium Ion	MVG gel semi-traction	MVSV 2V gel traction	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	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 Ultra range is top of the line. It offers large capacity batteries designed for extreme duty cycling with all possible features such as Battery Management System (BMS) and MasterBus 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.

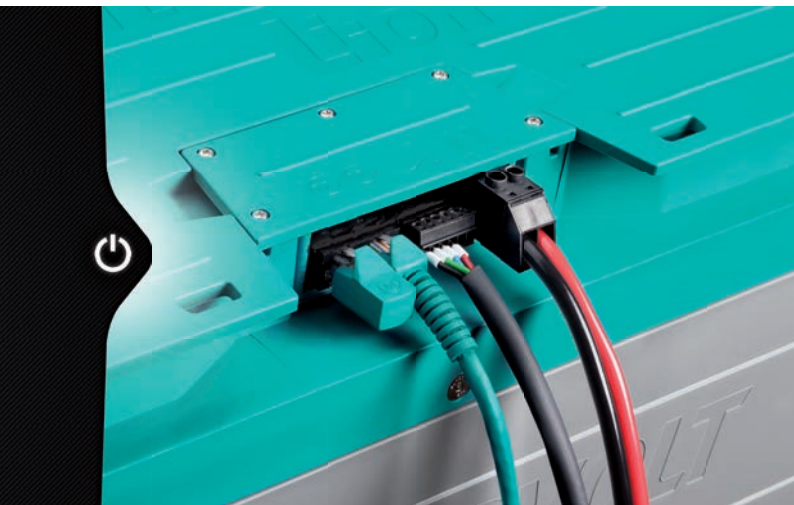
5 AGM batteries



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 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 (2000 cycles).
- Extremely fast charging and discharging.
- High efficiency: not wasting energy.
- Safe operation.

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).

Mastervolt brings Lithium Ion technology in two product ranges

■ MLI Ultra series.

Large capacity series, fully equipped for extreme cycling, like running airconditioning, pumps or electric motors for long periods of time with short intermittent charging.

■ MLS series.

Small capacity series, entry model for smaller applications, such as portable/mobile equipment or backup power.

■ MLI Ultra series



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

■ MLS series



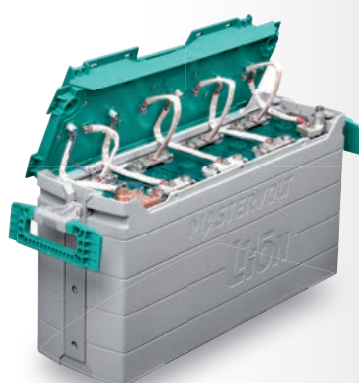
The MLS series is the MLI Ultra's smaller brother, for use in a small system where reducing weight/volume and/or increasing cycle life is key. It is specifically designed to be as easy as possible to install. The MLS series comes with an integrated safety disconnect. This saves installation and commissioning time, but reduces the maximum allowable charge/discharge rate. While the MLS series is a little less heavy duty than the MLI Ultra series, it gives an ideal entry to Lithium Ion technology. Perhaps consider replacing your existing lead-acid battery?



Suitable for large battery banks

The Lithium Ion Ultra batteries are 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 batteries.

Safe operation



The Mastervolt Lithium Ion Ultra battery is equipped with an integrated Battery Management System (BMS) with active cell balancing and communication through MasterBus. Even in the harshest cycling conditions this guarantees efficient and safe operation of the battery. The MLS batteries come with an integrated automatic safety disconnect. Safety always comes first.

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'.

Weight reduction

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

Easy installation



The elegant design of the MLI Ultra in the characteristic Mastervolt colours 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 there are hardly any changes to the system needed.

MLI Ultra Lithium Ion series

- 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 (2000 cycles).
- High cycle efficiency.
- Fast charging up to half an hour.
- High discharge rate up to 3C.
- MasterBus communication with every Mastervolt battery charger.
- Integrated Battery Management System (BMS) with active balancing.
- Integrated battery monitoring (Ah consumed, state of charge).
- Series balancing technology optimizes string connection.
- Waterproof electronics cabinet.
- Safest Lithium Ion chemistry available (LiFePO4).
- Tested and certified according to UN38.3.
- Two year warranty.

MLS Lithium Ion series

- Easy entry into Lithium Ion technology.
- Drop-in replacement for lead-acid batteries.
- Saves up to 70 % in space and weight.
- Three times the lifespan of traditional batteries (2000 cycles).
- High cycle efficiency.
- Fast charging up to one hour.
- High discharge rate up to 1C.
- Integrated Battery Management System (BMS) with passive balancing.
- Integrated automatic safety disconnect.
- Safest Lithium Ion chemistry available (LiFePO4).
- Tested and certified according to UN38.3.
- Two year warranty.

Specifications MLI Ultra Lithium Ion series



**MLI Ultra
12/2500**

Product code	66012500
GENERAL SPECIFICATIONS	
Nominal battery voltage	13.2 V
Nominal battery capacity	180 Ah
Nominal battery energy capacity	2500 Wh
Max. charge current	500 A (2.8 C)
Max. continuous discharge current	500 A (2.8 C)
Peak discharge current	1800 A (10 C) for 10s
Cycle life	~2000 at 80 % DoD
Battery monitoring	integrated
MasterBus communication	yes
Battery terminals	M8
Mounting position	upright or either long side
Max. outer dimensions, l x w x h (incl. terminals/grip handles)	341 x 197 x 355 mm 13.3 x 7.8 x 14 inch
Weight	31 kg / 68.3 lb
TECHNICAL SPECIFICATIONS	
Battery chemistry	Lithium Iron Phosphate
Protection degree	IP65 (electronics cabinet)
Parallel connection	yes, unlimited
Series connection	yes, up to 10 batteries (series balancing up to 2 batteries)
Safety protections	over voltage, under voltage, over temperature
Safety relay	to be added mandatorily, product code 79007700
Safety relay controls	integrated

Specifications MLS Lithium Ion series

NEW
MODEL



MLS 12/80

Product code	65010006
GENERAL SPECIFICATIONS	
Nominal battery voltage	12 V
No-load voltage, fully charged	12.8 V
Nominal battery capacity	6 Ah
Nominal battery energy capacity	77 Wh
Max. charge current	6 A (1 C)
Max. continuous discharge current	6 A (1 C)
Max. short discharge current	for 30 seconds 12 A (2 C)
Peak discharge current	for 2 seconds 24 A (4 C)
Cycle life	2000 cycles at 80 % DoD
Battery terminals	M5
Mounting position	upright or either long side
Max. outer dimensions, l x w x h (incl. terminals/grip handles)	90 x 70 x 109 mm 3.5 x 2.8 x 4.3 inch
Weight	0.8 kg / 1.8 lb
TECHNICAL SPECIFICATIONS	
Battery chemistry	Lithium Iron Phosphate
Protection degree	IP65 (electronics cabinet)
Parallel connection	yes, max. 3 batteries
Series connection	no
Safety protections	over voltage, under voltage, over temperature
Safety disconnect	yes, electronic

**MLI Ultra
12/5000**

66015000

**MLI Ultra
24/5000**

66025000

13.2 V	26.4 V
360 Ah	180 Ah
5000 Wh	5000 Wh
500 A (1.4 C)	500 A (2.8 C)
500 A (2.8 C)	500 A (2.8 C)
1800 A (5 C) for 10s	1800 A (10 C) for 10s
~2000 at 80 % DoD	~2000 at 80 % DoD
integrated	integrated
yes	yes
M8	M8
upright or either long side	upright or either long side
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
58 kg / 127.9 lb	58 kg / 127.9 lb

Lithium Iron Phosphate	Lithium Iron Phosphate
IP65 (electronics cabinet)	IP65 (electronics cabinet)
yes, unlimited	yes, unlimited
yes, up to 10 batteries (series balancing up to 2 batteries)	yes, up to 10 batteries (series balancing up to 2 batteries)
over voltage, under voltage, over temperature	over voltage, under voltage, over temperature
to be added mandatorily, product code 79007700	to be added mandatorily, product code 79007700
integrated	integrated

NEW
MODEL**MLS 12/130**

65010010

NEW
MODEL**MLS 12/260**

65010020

NEW
MODEL**MLS 12/390**

65010030

12 V	12 V	12 V
12.8 V	12.8 V	12.8 V
10 Ah	20 Ah	30 Ah
128 Wh	256 Wh	384 Wh
10 A (1 C)	20 A (1 C)	20 A (0.67 C)
10 A (1 C)	20 A (1 C)	30 A (1 C)
for 30 seconds 25 A (2.5 C)	for 30 seconds 40 A (2 C)	for 30 seconds 60 A (2 C)
for 2 seconds 48 A (4.8 C)	for 2 seconds 85 A (4 C)	for 2 seconds 100 A (3.3 C)
2000 cycles at 80 % DoD	2000 cycles at 80 % DoD	2000 cycles at 80 % DoD
M5	M5	M5
upright or either long side	upright or either long side	upright or either long side
151 x 65 x 103 mm 5.9 x 2.6 x 4.1 inch	180 x 77 x 161 mm 7.1 x 3 x 6.3 inch	182 x 127 x 140 mm 7.1 x 5 x 5.5 inch
1.5 kg / 3.3 lb	3.1 kg / 6.8 lb	4.9 kg / 10.8 lb

Lithium Iron Phosphate	Lithium Iron Phosphate	Lithium Iron Phosphate
IP65 (electronics cabinet)	IP65 (electronics cabinet)	IP65 (electronics cabinet)
yes, max. 3 batteries	yes, max. 3 batteries	yes, max. 3 batteries
no	no	no
over voltage, under voltage, over temperature	over voltage, under voltage, over temperature	over voltage, under voltage, over temperature
yes, electronic	yes, electronic	yes, electronic

MASTER TIP

The beating heart of the electrical system onboard all boats participating in the Volvo Ocean Race was formed by two Mastervolt MLI Ultra 24/5000 Lithium Ion batteries, which performed seamlessly throughout the race. Choose indestructible Mastervolt Lithium Ion batteries, like the Volvo Ocean Race boats.



Courtesy of Matt Knighton / Abu Dhabi Ocean Racing / Volvo Ocean Race.



MVG gel series

- Perfect service battery for medium 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, l x w x h (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

- 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 Ah
Battery terminal	F-M8
Max. outer dimensions, l x w x h (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 Ah
Battery terminal	F-M8
Max. outer dimensions, l x w x h (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.





MVG 12/55

64000550

12 V

55 Ah

27.5 A

230 A

380 A

A-type

261 x 136 x 230 mm
10.3 x 5.4 x 9.1 inch

19 kg / 41.9 lb



MVG 12/85

64000850

12 V

85 Ah

42.5 A

270 A

450 A

A-type

330 x 171 x 236 mm
13 x 6.7 x 9.3 inch

32.6 kg / 71.9 lb



MVG 12/120

64001200

12 V

120 Ah

60 A

450 A

760 A

A-type

513 x 189 x 223 mm
20.2 x 7.4 x 8.8 inch

41 kg / 90.4 lb



MVG 12/140

64001400

12 V

140 Ah

70 A

540 A

920 A

A-type

513 x 223 x 223 mm
20.2 x 8.8 x 8.8 inch

49 kg / 108 lb



MVG 12/200

64002000

12 V

200 Ah

100 A

630 A

1100 A

A-type

518 x 274 x 238 mm
20.4 x 10.8 x 9.4 inch

70 kg / 154.3 lb



MVSV 420

68000420

2 V

420 Ah

210 Ah

F-M8

126 x 208 x 515 mm
5 x 8.2 x 20.3 inch

30 kg / 66.1 lb



MVSV 500

68000500

2 V

500 Ah

250 Ah

F-M8

147 x 208 x 515 mm
5.8 x 8.2 x 20.3 inch

35 kg / 77.2 lb



MVSV 580

68000580

2 V

580 Ah

290 Ah

F-M8

168 x 208 x 515 mm
6.6 x 8.2 x 20.3 inch

39 kg / 86 lb



MVSV 750

68000750

2 V

750 Ah

375 Ah

F-M8

147 x 208 x 690 mm
5.8 x 8.2 x 27.2 inch

49 kg / 108 lb



MVSV 1000

68001000

2 V

1000 Ah

500 Ah

F-M8

212 x 193 x 690 mm
8.3 x 7.6 x 27.2 inch

66 kg / 145.5 lb



MVSV 1250

68001250

2 V

1250 Ah

625 Ah

F-M8

212 x 235 x 690 mm
8.3 x 9.3 x 27.2 inch

80 kg / 176.4 lb



MVSV 1650

68001651

2 V

1650 Ah

825 Ah

F-M8

212 x 277 x 759 mm
8.3 x 10.9 x 29.9 inch

115 kg / 253.5 lb



MVSV 2200

68002200

2 V

2200 Ah

1100 Ah

F-M8

216 x 400 x 816 mm
8.5 x 15.7 x 32.1 inch

160 kg / 352.7 lb



MVSV 2700

68002700

2 V

2700 Ah

1350 Ah

F-M8

214 x 489 x 816 mm
8.4 x 19.3 x 32.1 inch

198 kg / 436.5 lb



AGM series

- Excellent starter function.
- Perfect upgrade for wet lead acid batteries.
- Same initial power surge in an AGM 12/90 Ah as 180 Ah wet 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 Ah
CCA to DIN	250 A
CCA to SAE	400 A
Battery terminal	M6
Max. outer dimensions, lxxh (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

- 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.
- Can be combined with every standard battery terminal.
- 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 Ah
CCA to DIN	490 A
CCA to SAE	790 A
Battery terminal	M6
Max. outer dimensions, lxxh (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

- 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 Ah
CCA to DIN	440 Ah
CCA to SAE	740 Ah
Battery terminal	A-type + stud M10
Max. outer dimensions, lxxh (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)**

62000700

12 V
 70 Ah
 19.5 Ah
 290 A
 460 A
 M8
 348 x 167 x 178 mm
 13.7 x 6.6 x 7 inch
 21 kg / 46.3 lb



**AGM 12/90
(group 31)**

62000900

12 V
 90 Ah
 25.5 Ah
 360 A
 570 A
 M8
 330 x 173 x 220 mm
 13 x 6.8 x 8.7 inch
 28 kg / 61.7 lb



AGM 12/130

62001300

12 V
 130 Ah
 36 Ah
 590 A
 940 A
 M8
 408 x 176 x 228 mm
 16.1 x 6.9 x 8.9 inch
 37.6 kg / 82.9 lb



**AGM 12/160
(group 4D)**

62001600

12 V
 160 Ah
 45 Ah
 550 A
 870 A
 M8
 485 x 170 x 242 mm
 19.1 x 6.7 x 9.5 inch
 42.3 kg / 93.3 lb



**AGM 12/225
(group 8D)**

62002250

12 V
 225 Ah
 63 Ah
 680 A
 1080 A
 M8
 522 x 240 x 224
 20.6 x 9.5 x 8.8 inch
 63.5 kg / 140 lb



**AGM 12/270
(group Super 8D)**

62002700

12 V
 270 Ah
 76.5 Ah
 750 A
 1200 A
 M8
 522 x 268 x 226 mm
 20.6 x 10.6 x 8.9 inch
 73 kg / 161 lb



AGM-SL 12/185

63001850

12 V
 185 Ah
 53 Ah
 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

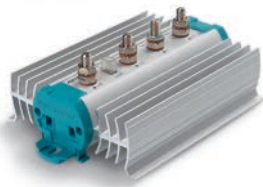
61004000

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



Convenience, safety and comfort around your battery installation

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.



Main engine with alternator as power source

To charge two or more batteries via your alternator, use an automatic battery isolator. Choose the BI type with conventional diode or the Battery Mate with electronic distribution and low voltage drop. See page 95 for details and specifications.



Prevent unnecessary voltage drop

A battery can be depleted even by the smallest clock or a device on standby. The most practical solution is the Mastervolt Battery Watch, which switches off all consumers via the central key switch. See page 97 for details and specifications.



Prevent unnecessary discharge

Use the battery switch to turn off the power of the onboard network or starter circuit, preventing unnecessary discharge.



Secure fuses

The MasterShunt is standard equipped with a T-fuse suitable for the high short circuit currents of the batteries. The DC Distribution comes with four ANL fuses: 80, 80, 125 and 160 A; and a spare fuse of 125 A.



Strong connections

Your battery set is not complete without a proper connection with the electrical system. Mastervolt supplies battery terminals, that combined with the correct covers, connect your batteries safely. Mastervolt recommends connections with corrosion-proof links and heavy-duty screw bolts.

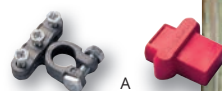


Maximum safety

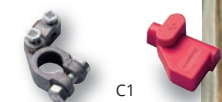
A proper cover and isolation of the battery poles prevents sparks or short circuiting, even in the toughest conditions. Mastervolt isolation covers protect the battery terminals completely, for your convenience and safety.

Specifications

Description	Type	Product code
BATTERY TERMINALS		
Battery terminal double plus flat	A	68060500
Battery terminal double min flat	A	68060600
Battery terminal plus flat	C1	68060300
Battery terminal min flat	C2	68060400
Battery terminal with M10 thread plus	D	68061100
Battery terminal with M10 thread min	D	68061200
Battery terminal with M12 thread plus	D	68061300
Battery terminal with M12 thread min	D	68061400
ISOLATION COVERS		
Cover 451N9V02 red, for product code 68060500	A	68451902
Cover 451N9V14 black, for product code 68060600	A	68451914
Cover 454R9V02 red, for product code 68060300	C1	68454002
Cover 453L9V14 black, for product code 68060400	C2	68453014
Cover 457N3V02 red, for product code 68061100 & 68061300	D	68457302
Cover 457N3V14 black, for product code 68061200 & 68061400	D	68457314
MASTERSHUNT FUSE		
T-fuse 500 A / 160 V DC, current limiting capability 20 kA		77049000
DC DISTRIBUTION 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		124001000



A



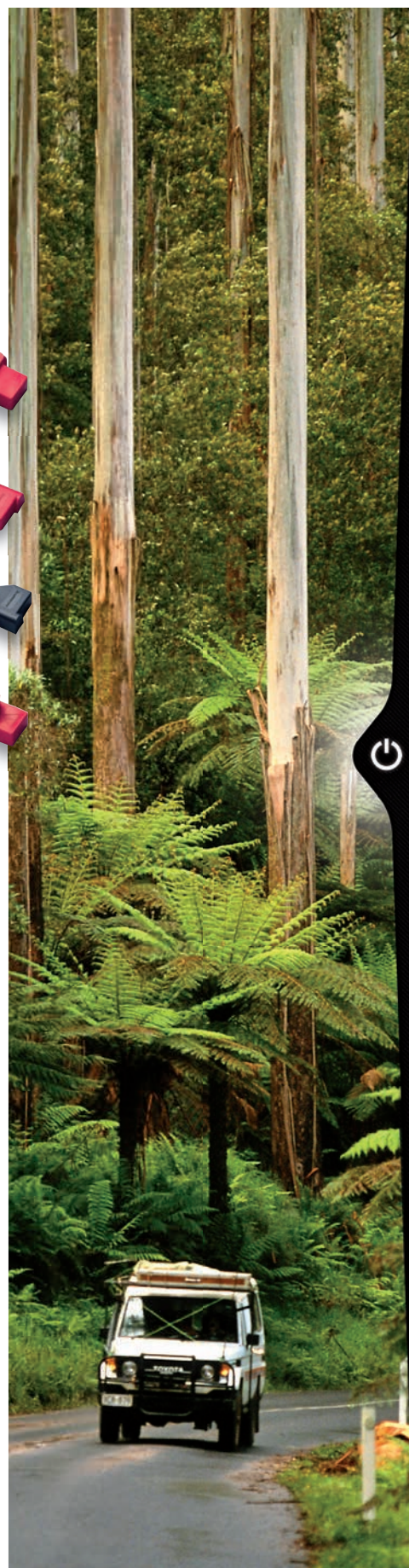
C1



C2



D



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.

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. Thanks to galvanic isolation, nearly all devices can supply power to the MasterBus, ensuring 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. Moreover, 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.

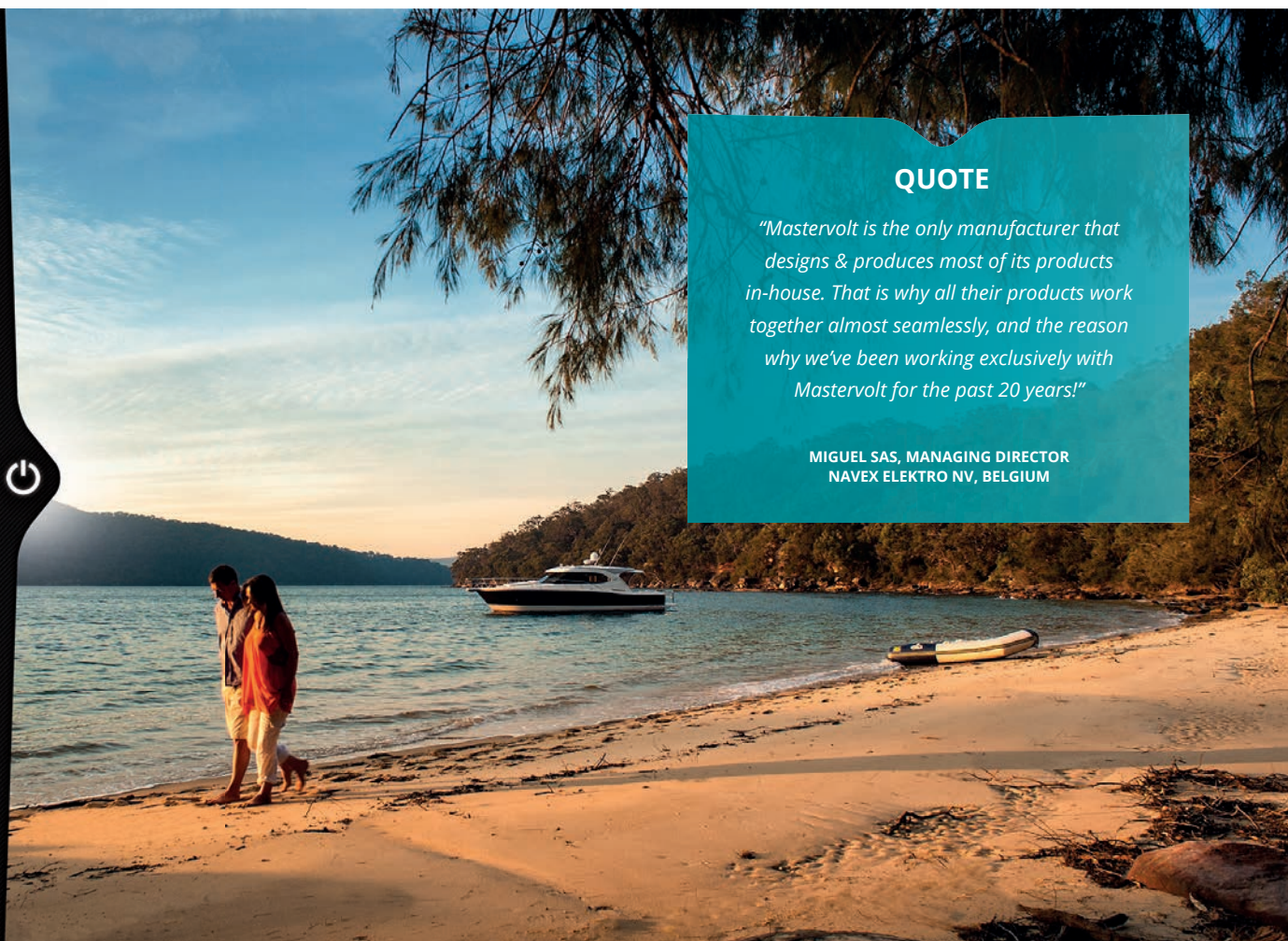
Easy maintenance

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

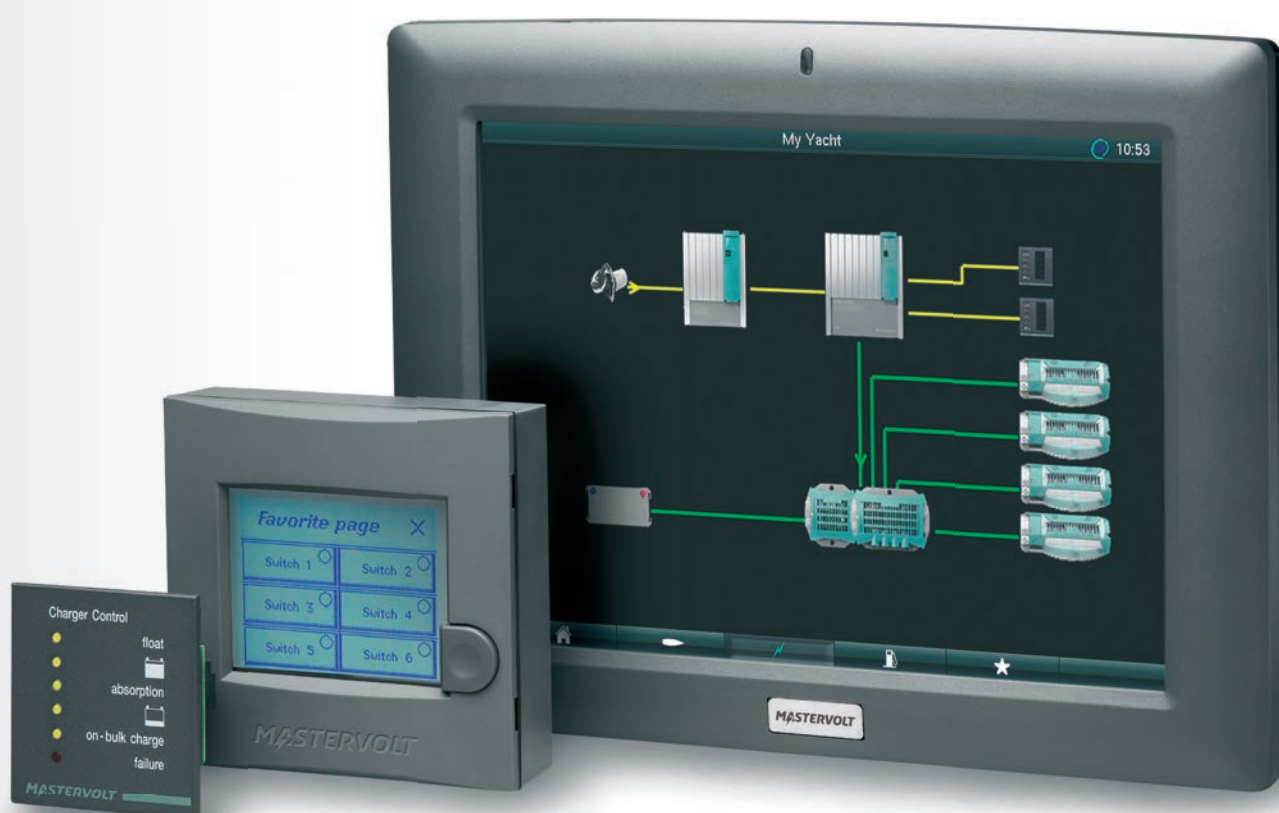
"Mastervolt is the only manufacturer that designs & produces most of its products in-house. That is why all their products work together almost seamlessly, and the reason why we've been working exclusively with Mastervolt for the past 20 years!"

MIGUEL SAS, MANAGING DIRECTOR
NAVEX ELEKTRO NV, BELGIUM



MasterView control panels: Monitor & control your MasterBus network

Fast and clear information about your onboard 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 with its intelligent MasterView panels.



The smartest solution: MasterView System

Mastervolt's intelligent MasterView System brings an end to cluttered, unclear and excessive information. The system is based on our in-house developed software combined with a user-friendly 10.4-inch colour touchscreen. The simple yet brilliant set-up of the MasterView System intelligently connects all the power sources and loads via the MasterBus. It provides all information you need on your electrical system in one clear overview on an organised, intuitively operated panel.

Multifunctional touchscreen remote panel: MasterView Easy

This multifunctional display can monitor every MasterBus product. Connected to the MasterShunt it functions as a battery monitor; connected to the generator as a generator panel. These and other functions can also take place simultaneously and you can create a favourites page showing all your main information.

MasterView Read-out

Control panel for all MasterBus products

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



MasterView Read-out	
Product code	77010050
Display	7 LEDs
Dimensions, h x w	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



MasterView Read-out OEM	
Product code	77010030

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

MasterView Easy

Touchscreen control panel for all MasterBus products

This touchscreen control panel is easy to read and operate. The grey button turns the display on or off or locks it, while all other functions can be controlled using the touchscreen.

The first of three control levels provides a short system overview with all the information you may need on a daily basis. The product overview screen shows detailed information. The favourites screen can be custom designed to meet your specific needs for information and control. The MasterBus cable is used for data transfer and as a power supply for the display.

Benefits:

- Clearly lit display.
- On/off button and lock to prevent unwanted activities.
- Touchscreen control of all functions.
- White background light – red for alarm functions or night lighting.
- Buzzer and alarm function.
- Requires only one MasterBus cable for data transfer and power supply.
- Low energy consumption.
- Easy to install (flush and surface mounted).

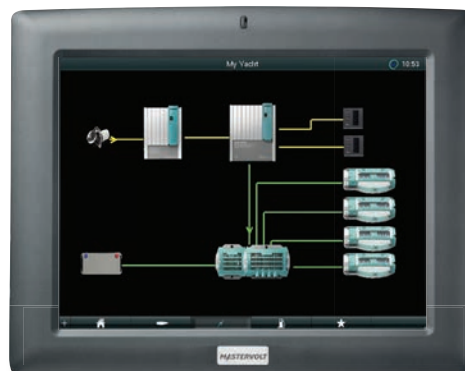


MasterView Easy	
Product code	77010305
Display	3.5 inch touchscreen
Dimensions, h x w x d	110 x 110 x 20 mm 4.3 x 4.3 x 0.8 inch
Weight	230 gr / 0.51 lb
MasterBus connection	yes
Powered by	MasterBus
Power consumption	160 mW
Protection degree	IP21
Languages	ENG, NL, DE, SP, IT, FRA, FIN, SWE, DEN, NOR

MasterView System

Interactive touchscreen

This full colour graphical display helps installers to configure the electrical onboard system, and is extremely easy to reproduce. Configuration, monitoring and operation becomes easier, cheaper, lighter and faster. The software makes complicated electrical systems understandable for each user. Electricity has become fun to operate!



Favourites screen

The favourites screen can be custom designed to meet your specific needs for information and control. Any information that is available on the MasterBus network can be shown in the most logical way. Multiple pages can display information, for example, one overview page, one or two breaker pages, an engine information page and a NMEA 2000 information page.

System overview

This screen gives a dynamic graphical overview of your electric system, answering any questions you have in an instant. Incorrect line voltages are shown in red, inactive circuits in grey: It couldn't be easier.



Digital switching screen

This screen shows the complete layout, lights, selected pumps and other consumers. You manage the loads by clicking the icons. The background image can be uploaded for full customisation. Alarm notifications are shown via eye-catching pop-ups.



Tank level screen

Stop guessing and know immediately the contents of up to 20 tanks. You can also install your own warning signals for full or (nearly) empty tanks. All you need to do is connect the MasterBus Tank Level Interface to the MasterBus system.



Home screen

The home screen provides a status overview of power sources like grid power, inverters, generators and batteries. A basic form of control is possible, for example turning your inverter on and off.

MasterView System	
Product code	77010400
Display	10.4 inch colour touchscreen
Dimensions, hxxwxd	222 x 276 x 38 mm 8.7 x 10.9 x 1.5 inch
Weight	1.4 kg / 3.1 lb
MasterBus connection	by means of System Panel Controller (delivered as standard)
Power	by means of System Panel Controller (delivered as standard)
Power consumption	28 W
Protection degree	IP64 (front)
Languages	ENG, NL, DE, SP, IT, FRA, FIN, SWE, DEN, NOR

System Panel Controller

Connect the MasterView System or your PC with the MasterBus network. Provides the power and software license key for the MasterView System panel.

Delivered as standard with MasterView System.
Also available separately.



System Panel Controller	
Product code	77031900
MasterBus powering	yes (when the PC is switched on)
Dimensions, hxxwxd	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

The basic components of a MasterBus network

MasterShunt 500

MasterBus integrated battery monitor, with detailed information on the status of your batteries for an optimised charging process, including voltage, current, remaining time and consumption capacity in percentage. With an intelligent connection system, the MasterShunt is easily connected to the DC Distribution. The integrated system clock combined with command-based events custom automates the system to your needs. Example of system automation: The generator should start automatically when the batteries are almost depleted. The MasterShunt also provides a robust built-in main fuse that can safely interrupt short-circuit currents of 20 kA.



	MasterShunt 500
Product code	77020100
Dimensions, hwxwx	150 x 150 x 65 mm 5.9 x 5.9 x 2.5 inch
Weight	1 kg / 2.2 lb
Battery types	gel, AGM, wet, Lithium Ion, spiral
Battery voltage	12, 24 or 48 V DC
Current	300 A continuous / 500 A for 5 minutes
MasterBus powering	yes
Main fuse	500 A T-fuse (300 A continuous at 40 °C)
System functionality	alarm, timers, auto start/stop for the generator
Programmable alarms	warning low voltage, warning low state of charge, high voltage
Protection degree	IP21
Delivered with	MasterShunt, temperature sensor, MasterBus terminator, MasterBus cable, isolation cover for DC connections

DC Distribution 500

The DC Distribution 500 is the 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. The MasterView 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).



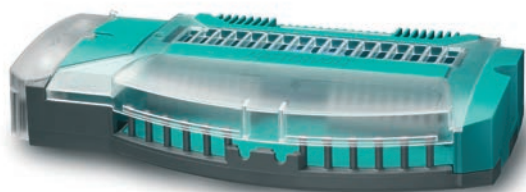
	DC Distribution 500
Product code	77020200
Dimensions, hwxwx	150 x 216 x 65 mm 5.9 x 7.9 x 2.5 inch
Weight	1.2 kg / 2.6 lb
Battery voltage	12, 24 or 48 V DC
Current	300 A continuous / 500 A for 5 minutes
MasterBus powering	no
Standard fuses	80, 80, 125, 160 A - ANL type (deviating values can be ordered separately)
Spare fuse	125 A ANL type
Alarm	fuse monitoring
Protection degree	IP21
Delivered with	five fuses, 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, h x w x d	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 mm ²
Maximum software fuse current	10 A per channel
Hardware fuse current	15 A per channel
DC INPUT	
Connections	max. 95 mm ² 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 or Modbus network, and vice versa.

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



NEW
MODEL

MasterBus Firecan Interface

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



	MasterBus Firecan Interface
Product code	77032400
MasterBus powering	no
Dimensions, hwxwx	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	Firecan connection cable, MasterBus terminator, user's manual

NEW
MODEL

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. The MasterBus Power Interrupter pauses the MasterBus power supply while communication remains possible.



	MasterBus Power Interrupter
Product code	77031550
MasterBus powering	no
Dimensions, hwxwx	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 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, hwxwx	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

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, hwxwx	66 x 78 x 32 mm 2.6 x 3.1 x 1.3 inch
Weight	± 100 g / 0.22 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, hwxwx	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 MasterView panel or PC.



	MasterBus Combi Interface
Product code	77030475
MasterBus powering	yes
Dimensions, hwxwx	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 MasterView or PC.



	MasterBus Inverter Interface
Product code	77030700
MasterBus powering	no
Dimensions, hwxwx	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

The MasterBus Serial Interface connects conventional Mastervolt products to MasterBus. Data becomes permanently available to allow configuration, operation and monitoring via MasterView panels. Suitable for Masterlink BTM-III, Mac and Magic DC-DC converters.



	MasterBus Serial Interface
Product code	77030450
MasterBus powering	no
Dimensions, hwxwx	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

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: Communicate with your system via mobile phone.



GPRS Module	
Product code	77031000
MasterBus powering	no
Dimensions, hwxwd	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

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, hwxwd	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

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 devices from either MasterBus displays, CZone displays or integrated products.

Features/functions:

- Control of Mastervolt inverters and chargers from CZone displays, switches or integrated products.
- Control of CZone output devices (turn lights, pumps, etc. on/off) via MasterBus displays and switches.
- Display CZone acquired systems information such as tank and power levels on MasterBus displays.
- 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, hwxwd	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

Multipurpose Contact Output

Mastervolt's potential-free contact can be customised and programmed to give your MasterBus network unprecedented possibilities. Use it, for example, to control a ventilator or operate a generator from a different brand.



Multipurpose Contact Output	
Product code	77030500
Potential free contact	NO-C-NC - 1 A / 30 V DC
MasterBus powering	no
Dimensions, hwxwd	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 Repeater

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



	MasterBus Repeater
Product code	77031100
MasterBus powering	yes
Dimensions, hwxwd	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

Digital Input

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



	Digital Input
Product code	77030900
MasterBus powering	no
Dimensions, hwxwd	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 a relay.



	Digital AC 1x6A
Product code	77031500
MasterBus powering	no
Max. relay current	6 A (230 V AC single pole)
Dimensions, hwxwd	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, hwxwd	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. <i>Switches and mounting frame not included</i>

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, hwxwd	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. <i>Switches and mounting frame not included</i>

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 the power of the system. On top of that it features the 'inverter control' and a free programmable 'potential free contact'.



	AC Power Analyser
Product code	77031200
MasterBus powering	yes
Dimensions, hwxwd	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.

Practical: MasterBus accessories

MasterShunt fuse

The robust fuse (500 A/160 V DC, 20 kA short circuit current) is suitable for high short circuit currents from the batteries. Spare fuse available separately.



Product code	77049000
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DC Distribution fuses

The DC Distribution standard comes with four ANL fuses: 80, 80, 125 and 160 A, and a spare fuse of 125 A.



Replacement fuses and other amperages:

Product code	
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, prevent reflection of data signals and ensure high communication speeds.



Product code	77040000
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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
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Separately available:

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



QUOTE

"As an established manufacturer and interior designer of high-end travel and expedition vehicles, we depend on the reliability of the Mastervolt system because unique special solutions for optimum power supply are often necessary. We can select the right custom-designed components and know that we will meet our customers' expectations."

KLAUS HÜNERKOPF, FOUNDER & MANAGING DIRECTOR
HÜNERKOPF SPEZIALFAHRZEUGE, GERMANY

Digital switching: the future is now

By decentralising your installation, it is possible to create a smarter system with less cables and installation work. Central switchboards are replaced by decentralised power outputs, which are controlled via a bus system. These outputs power equipment such as lights, pumps and navigation equipment.

Different input modules can be connected to this bus as well. These input modules – from switches to touchscreen panels – control the output modules.

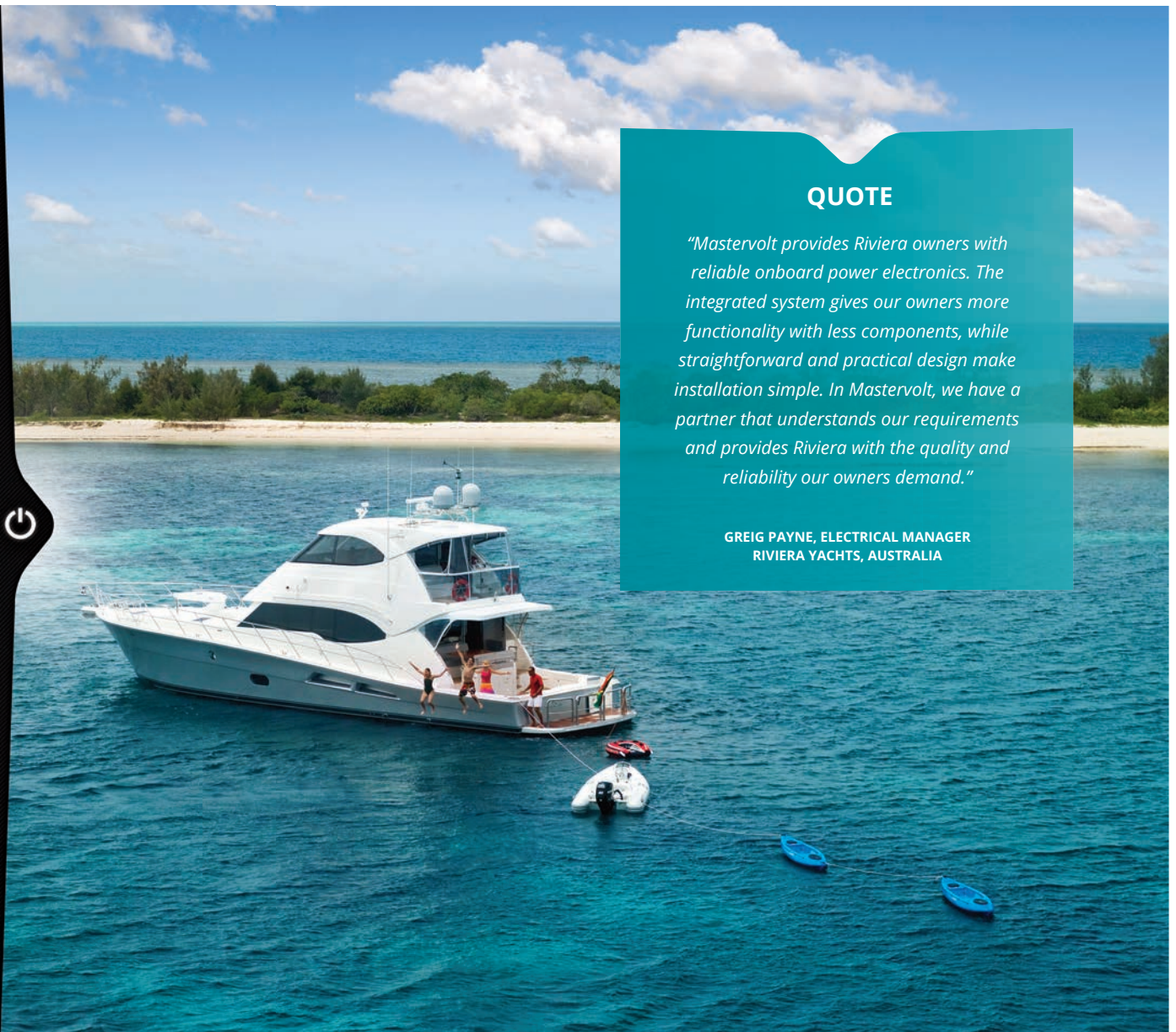
This allows you to control your system from anywhere, even from your mobile phone via text messages.

Digital switching systems give you greater flexibility and facilitate enhanced integration. It is possible to design a smart system without additional components like relays, timer modules and extensive cable trees. Digital switching systems result in systems that are easy to operate and offer greater functionality and convenience.

QUOTE

"Mastervolt 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**



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 & 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 redundancies that is 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.

LCD displays

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.



Monitoring

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



Settings

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



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.



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.

* Screen showing CZone 2.0 software (available soon as a free update).

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.

Power control

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

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/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.

Monitoring

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.

NEW
MODEL

Touch 10

The gateway to your CZone digital switching and Mastervolt power electronics system has just been transformed by the new 'state of the art' CZone Touch 10. The sleek, attractive screen design offers the very latest generation capacitive touchscreen technology. The high bright display outperforms in sunlight and the improved screen resolution provides a detailed and crisp graphical user interface. All of this has been packaged into an innovative, splash-proof 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/m ²
Power supply	8-32 V
Power consumption	1 A at 12 V, 500 mA at 24 V
Interfaces	NMEA2000, USB2.0, Ethernet
Dimensions, hwxwx	196 x 275 x 41 mm 7.7 x 10.8 x 1.6 inch
Weight	1.8 kg



Product code	3.5" Display Interface
80-911-0001-00	With power cable, black bezel
80-911-0002-00	With power cable, grey bezel
80-911-0003-00	Display Interface only, black
80-911-0004-00	Display Interface only, grey
Screen	3.5" transfective QVGA
Protection degree	IPX7 water ingress
Power consumption	at 12 V: 180 mA (standby 130 mA)
Including	rotary knob for easy menu navigation
Dimensions, hwxwx	105 x 165 x 62 mm 4.1 x 6.5 x 2.4 inch
Weight	0.374 kg / 0.8 lb

Wireless Interface



Monitor and control your onboard systems from your iPad



iPad® is a trademark of Apple Inc.

Mastervolt has produced a Wireless Interface that allows your iPad 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 the two popular Digital Switching protocols of MasterBus and CZone.

Features:

- User-friendly homepage to monitor and control onboard circuits.
- Integrated control and monitoring of power products including battery chargers and inverters.
- Monitor AC/DC power and batteries.
- Monitor tank levels.
- Receive visible alarms.
- Connect a maximum of three devices simultaneously.
- Ability to personalise homepage to display favourite circuits, modes & monitoring.
- Customise your layout.

Hardware:

- 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.
- Tested to FCC, CE, EMC.
- 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, hxxwxd	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 extension cable, user's manual



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.



DC Interfaces

Switch Control Interface (SCI)

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 (dimnable)
- Outputs systems on and function/fault codes to systems on LED of switches (dimnable)
- Dimensions, hwxwd: 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

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

Signal Interface (SI)

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, hwxwd: 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

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

Meter Interface (MI)

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 feature high and low alarms that can be set by the user.



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, hwxwd: 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

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

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

Output Interface (OI)

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.

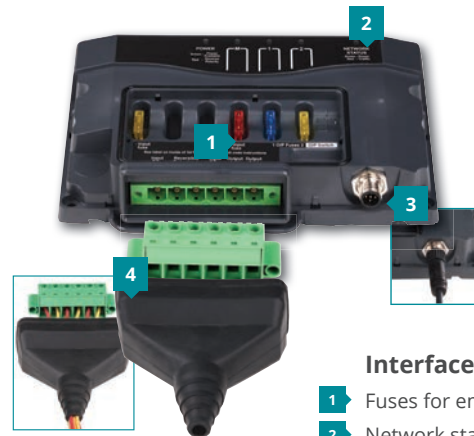


Output Interface (OI)

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, hwxwd: 128 x 200 x 45 mm / 5.0 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

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

Product code
80-911-0010-00
Output Interface only



Interface parts

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

Motor Output Interface (MOI)

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 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, hwxwd: 128 x 200 x 45 mm / 5.0 x 7.9 x 1.8 inch

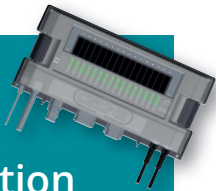
Product code
80-911-0007-00
Motor Output Interface with connector and protective boot

Product code
80-911-0008-00
Motor Output Interface only

PRODUCT NEWS

New Combination Output Interface (COI) coming soon

This new Interface combines multiple input and output devices to minimize the distribution zones in large applications. Modules can be grouped together for easier access and servicing. Check mastervolt.com/new for updates on new products.



AC Interfaces

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 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.

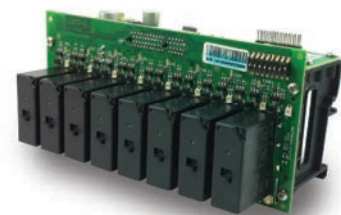
Sample AC control screen



Product code 80-911-0069-00

ACOI standard

- 8x 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, hwxwd:
430 x 276 x 186 mm / 17 x 10.9 x 7.3 inch
- Contact Mastervolt for custom requirements.



Product code 80-911-0082-00

ACOI DIN rail mount

- 8x 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, hwxwd:
77 x 160 x 60 mm / 3 x 6.3 x 2.4 inch
- Contact Mastervolt for custom requirements.

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). It was 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 bypass 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.

Features

- Six source inputs up to 100 A (e.g. 2x grid power, 2x 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.



Product code 80-911-0068-00

ACMI standard

Three inputs: 1x 16 A grid power, 1x 32 A grid power, 1x 50 A generator parallel.

Two load groups: 40 A.

230 V AC 50 Hz.

Current, voltage, frequency and power monitoring incorporated.

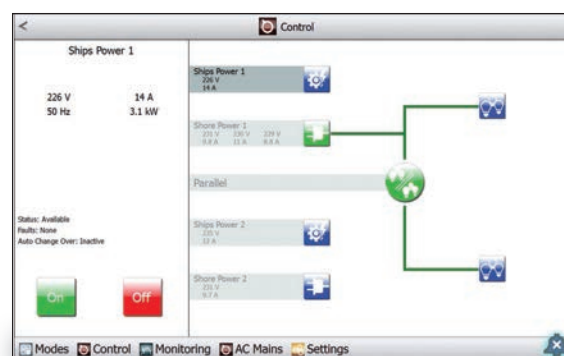
Manual override panel on enclosure.

Dimensions, hxxwxd:

430 x 540 x 186 mm / 17 x 21.3 x 7.3 inch

Contact Mastervolt for custom requirements.

Sample AC mains screen



Accessories

Single T-connector

Connects a single device into the NMEA backbone.



Product code
80-911-0029-00

2 Way T-connector

Connects multiple devices into the NMEA backbone.



Product code
80-911-0047-00

4 Way T-connector

Connects multiple devices into the NMEA backbone.



Product code
80-911-0048-00

Male banking cap

Protects unused T-connector from dust and water.



Product code
80-911-0050-00

Female banking cap

Protects unused T-connector from dust and water.



Product code
80-911-0051-00

Terminating resistors

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



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

Extension cable

Carries power and data along backbone to NMEA 2000 devices.



	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

Power cable for Display Interface

Supplies power for the 3.5" Display Interface.



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

Power cable

Provides power to the NMEA 2000 network and devices.



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

90° elbow connector

Connects cable together in tight spaces. NMEA 2000 network.



Product code
80-911-0046-00

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



Product code
AC-VSEN-4

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

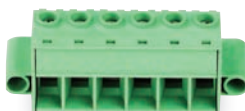
Product code
80-911-0036-00

Cable gland for MI, silicone

Product code
80-911-0033-00

Terminal block, SI/MI, 8-way

Product code
80-911-0043-00

Terminal block, OI/MOI, 6-way

Product code
80-911-0041-00

Terminal block, 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

3.2 mm, for MI and
SI cable glands
5 mm,
for SCI cable glands

Product code

80-911-0016-00

80-911-0017-00

DC current shunt

- 450A / 50mV shunt supplied with DC Systems Monitor (DCSM), product code 80-600-0027-00.
- Dimensions:
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 serviceable
connector**

For terminating bare NMEA cable.

- NMEA 2000 network.



Product code
80-911-0053-00

Male field serviceable connector

For terminating bare NMEA cable.

- NMEA 2000 network.



Product code
80-911-0054-00

Accessories

USB CAN adapter

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



Product code
80-911-0044-00

Cable assembly

SCI, to suit push buttons.



	Product code
0.5 metres	80-911-0085-00
1 metres	80-911-0086-00
2 metres	80-911-0087-00
5 metres	80-911-0088-00
8 metres	80-911-0089-00

Cable assembly

SCI, 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.

- 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.



	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/mom ON, red LED	80-911-0040-00
Mom ON/OFF, blue LED	80-911-0066-00
Mom ON/OFF/mom 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 the two popular Digital Switching protocols of MasterBus and CZone.



Wireless Interface
WI MasterBus connector (required for MasterBus connection)

Product code
80-911-0090-00
80-911-0095-00

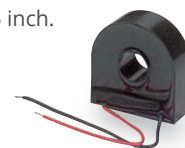
More information on page 80.

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 this is fitted, a further 40 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.

12 V DC
24 V DC

Product code
80-707-0004-00
80-707-0005-00



Proven in the world's toughest testing ground, CZone™ was chosen as standard fit equipment for the Volvo Ocean Race fleet.



Courtesy of Ian Roman / Volvo Ocean Race.

Integration partners



Mastervolt's CZone technology has partnered with leading electronics manufacturers including Navico's Simrad, B&G and Lowrance brands and Garmin's glass helm touchscreens*, making it simple to monitor and control the onboard power system and circuits.

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 boating 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.

** Please check the Mastervolt site for the latest developments on integration partners.*



CZone MasterBus Bridge Interface

Full control on all networks

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 control and monitoring of devices from either MasterBus displays, CZone displays or integrated products.

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



Features/functions:

- Control of Mastervolt inverters and chargers from CZone displays, switches or integrated products.
- Control of CZone output devices (turn lights, pumps, etc. on/off) via MasterBus displays and switches.
- Display CZone acquired systems information such as tank and power levels on MasterBus displays.
- 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, hxxwx d	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

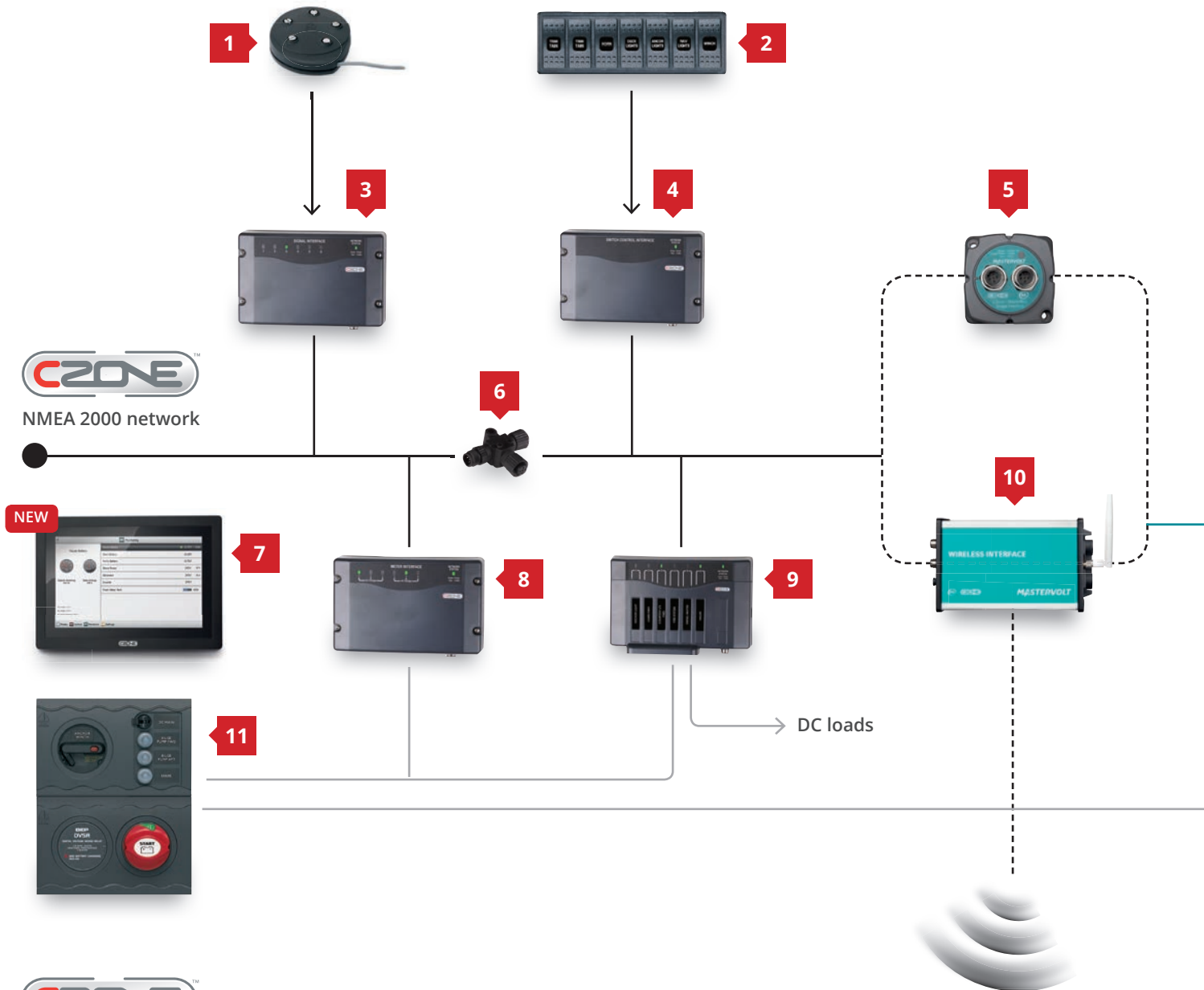


QUOTE

"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."

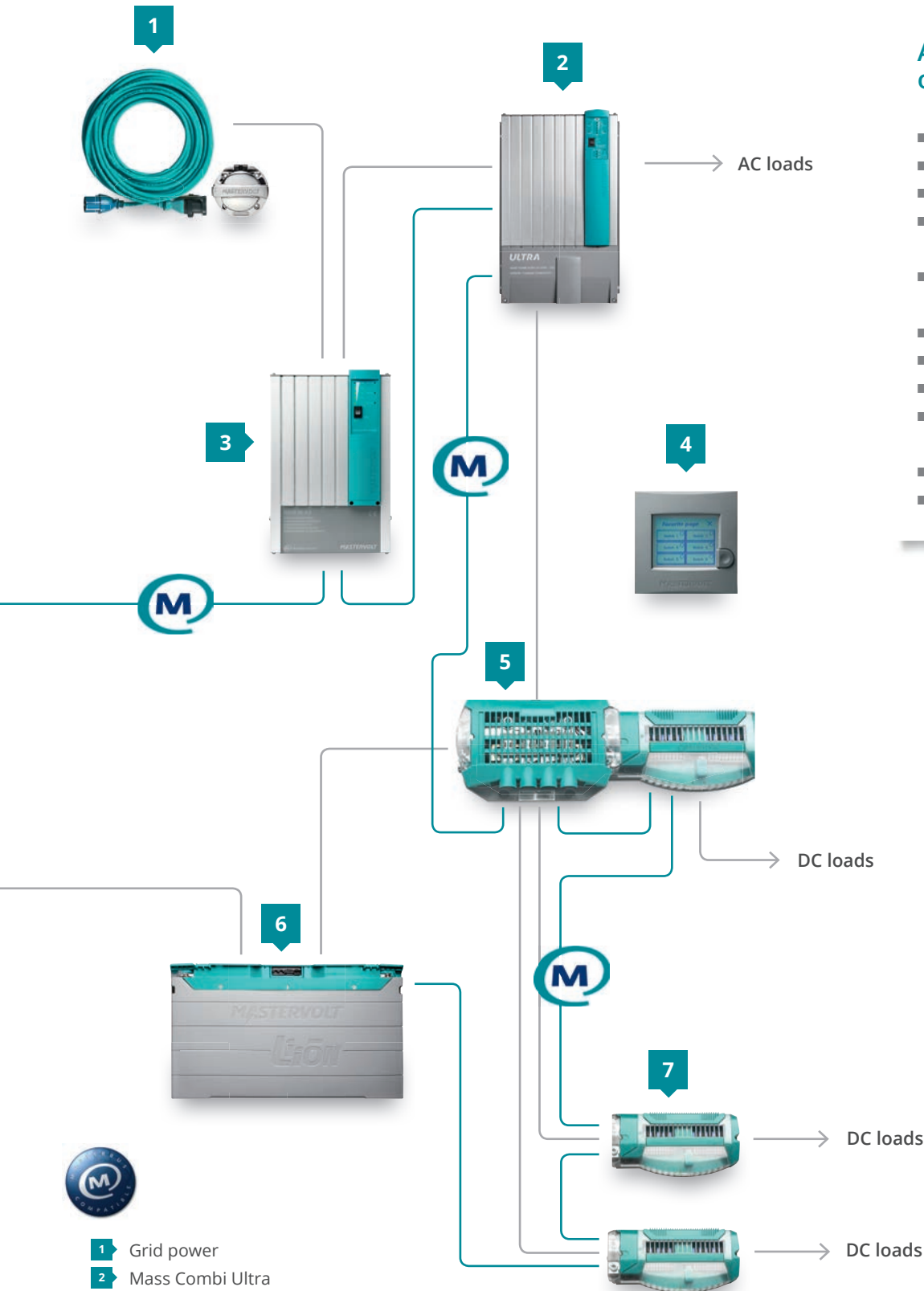
DAN BARTEL, VICE PRESIDENT WORLDWIDE SALES
GARMIN, USA

Fully integrated CZone MasterBus system



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





Advantages of one system:

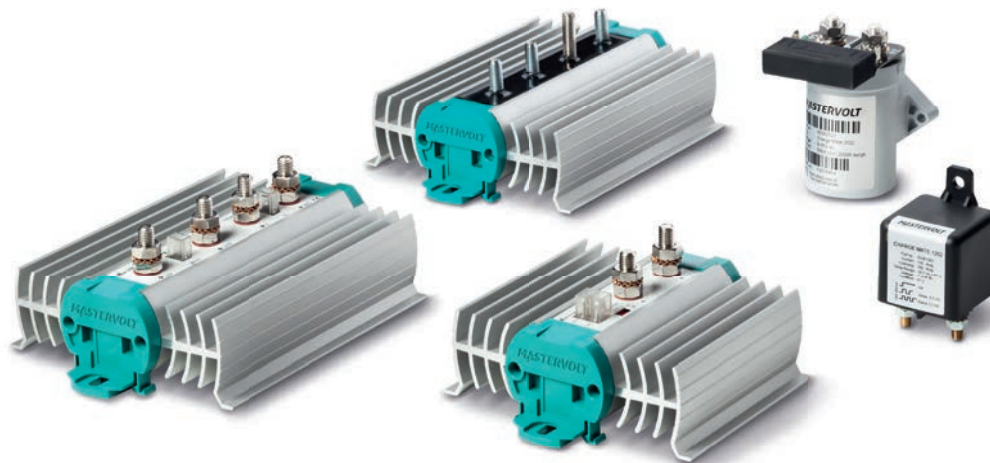
- Fewer cables.
- Less weight.
- Installation time savings.
- Increased flexibility in terms of design changes.
- 'Superyacht' power and load management capabilities.
- Remotely accessible.
- Easy to maintain.
- Integrated solution.
- Single button 'mode' selection.
- Redundant and safe.
- Global service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

- 1** Grid power
- 2** Mass Combi Ultra
- 3** Mass GI isolation transformer
- 4** MasterView Easy
- 5** DC Distribution, Digital DC 10x10 (*)
- 6** Mastervolt Lithium Ion Ultra 12 V (service battery)
- 7** Digital DC 10x10 (*)

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

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 and other peripheral equipment.



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.
- Robust manual switches for centrally turning off the power of the onboard network or starter circuit.
- Battery Watch for monitoring the condition of your batteries (also usable as main switch).

Complete range for every system

- **BI 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.
- **Battery switches** for switching on and off the consumers attached to the battery.

Charging two or three batteries at high capacity

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

Robust and durable

Mastervolt's completely corrosion-proof materials feature heat sinks made of aluminium alloy as well as electronic components (and, in the case of BI models, diode splitters) cast in synthetic materials.

Clear monitoring

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

Fast installation

The composite end plates feature connection lugs and solid bolt connections with nuts and locking rings to 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 battery chargers and Alpha Pro MB charge regulators come as standard with automatic voltage drop compensation.

Specifications BI battery isolators

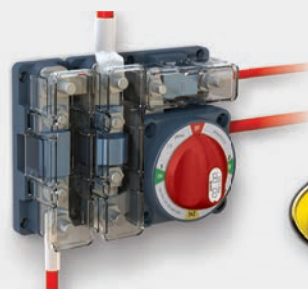
				
	BI 702-S	BI 703	BI 1202-S	BI 1203-S
Product code	83007021	83007030	83012021	83012031
Max. output charger	50 A	50 A	80 A	80 A
Max. output alternator	70 A	70 A	120 A	120 A
Compensation diode	yes	no	yes	yes
Dimensions, hxxwxd	157 x 140 x 80 mm 6.2 x 5.5 x 3.1 inch	207 x 140 x 80 mm 8.1 x 5.5 x 3.1 inch	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
Number of battery banks	2	3	2	3

Battery Mate

While 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
Max. output charger	120 A	120 A	200 A
Max. output alternator	160 A	160 A	250 A
Dimensions, hxxwxd	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
Number of battery banks	2	3	3



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 where we offer the most extended product portfolio worldwide, including the award winning EZ-Mount switches.



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

BEP

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. Mastervolt has the solution: The Charge Mate connects both batteries with a relay while charging, and keeps them isolated when discharging. The Charge Mate is especially practical for small systems.

Specifications Charge Mate

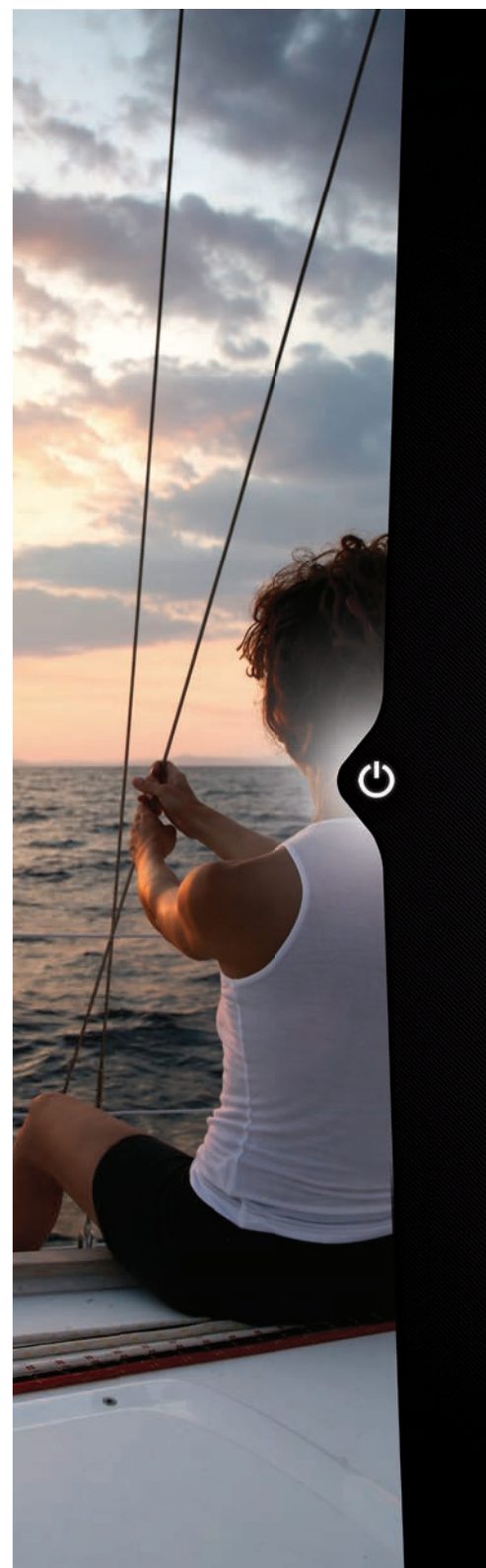
		
	Charge Mate 1202	Charge Mate 2502
Product code	83301202	83302502
GENERAL SPECIFICATIONS		
Battery voltage	12/24 V	12/24 V
Continuous power	120 A	500 A
Number of modes	n.a.	on, off, auto, start assist
Dimensions, hxxwxd	76 x 46 x 46 mm 3 x 1.8 x 1.8 inch	90 x 80 x 85 mm 3.5 x 3.1 x 3.3 inch
Weight	0.125 kg / 0.3 lb	0.65 kg / 1.4 lb
TECHNICAL SPECIFICATIONS		
Power consumption	switch open: < 1 mA at 12/24 V DC	switch open: < 1 mA at 12/24 V DC
Inrush current (250ms)	2000 A	2000 A
Switch on voltage	13 - 15 V (12 V) 26 - 30 V (24 V)	13 - 15 V (12 V) 26 - 30 V (24 V)
Switch on delay	5 sec.	30 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)
Switch off delay	no	3 minutes
Ambient temperature	-40 to 65 °C	-40 to 60 °C
Protection degree	IP21	IP21

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 DC
Max. load	150 A
Switch off under voltage 12 V	9-12 V DC
Switch off under voltage 24 V	18-24 V DC
Dimensions, hxxwxd	157 x 140 x 80 mm 6.2 x 5.5 x 3.2 inch
Weight	0.6 kg / 1.3 lb



Mastervolt monitoring: A window into the life of your batteries

Unexpected flat batteries put a dampener on your pleasure. A Mastervolt battery monitoring system brings an end to nasty surprises. A clear display shows performance, consumption and available battery capacity. More elaborate systems management 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 complicated feat, 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 five 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. Moreover 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.

- **Masterlink MICC;** This compact battery monitor provides information on the system like the BTM-III as well as enabling the user to control and monitor the Mass inverter, Mass battery charger or Mass Combi.
- **MasterShunt + MasterView Easy;** MasterBus integrated battery monitor collecting detailed information on the status of your batteries. The MasterBus remote panel with touchscreen controls 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.

Specifications battery monitoring

	 NEW MODEL	 NEW MODEL			
	BattMan Lite	BattMan Pro	Masterlink BTM-III	Masterlink MICC	MasterShunt + MasterView Easy
Product code	70405060	70405070	70403163	70403105	77020100 + 77010305
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.	Battery monitor, 12/24 V DC with LCD read-out. Remote control for Mass Sine inverter, Mass charger or Mass Combi.	The MasterShunt in combination with a MasterView Easy 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	2; service (fully), starter (voltage)	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	voltage, current, amp-hours, time remaining, battery capacity in %, inverter & charger operation, Power Sharing, special battery status events
Dimensions, hwxwd	Ø 64 mm / 79 mm Ø 2.5 inch / 3.1 inch	Ø 64 mm / 79 mm Ø 2.5 inch / 3.1 inch	65 x 120 x 40 mm / 2.6 x 4.7 x 1.6 inch	65 x 120 x 40 mm / 2.6 x 4.7 x 1.6 inch	113 x 113 x 37 mm / 4.5 x 4.5 x 1.5 inch
Dimensions shunt, hwxwd	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	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	Ø 52 / 79 mm Ø 2.1 / 3.1 inch	Ø 52 / 79 mm Ø 2.1 / 3.1 inch	55 / 40 mm 2.2 / 1.6 inch (incl./excl. cover and cable)	55 / 40 mm 2.2 / 1.6 inch (incl./excl. cover and cable)	surface mount
Weight	0.15 kg / 0.3 lb	0.15 kg / 0.3 lb	0.25 kg / 0.6 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	9999 Ah
Supply voltage	9-35 V	9-35 V	8-50 V	9-35 V	8-60 V
Voltage range	0-35 V	0-35 V	7-35 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	28 mA / 12 V 16 mA / 24 V	32 mA / 12 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	100 mA / 12 V 50 mA / 24 V
Voltage resolution	0.1 V	0.01 V	0.1 V	0.01 V	0.1 V
Voltage accuracy	± 0.3 %	± 0.3 %	± 0.6 %	± 0.6 %	± 0.6 %
Shunt specification	500 A / 50 mV (service set)	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 (optional 900 A)	0-500 A (optional 9000 A)	0-500 A (option incl. 1000 A)	0-500 A	0-500 A
Current accuracy	± 0.4 %	± 0.4 %	± 0.8 %	± 0.8 %	± 0.8 %
Battery alarm contact	yes, potential free	yes, potential free	yes, open collector	yes, potential free	yes, via MasterBus alarm interface
Remaining time indication	no	yes	yes	yes	yes
Historical data	no	yes	yes	yes	yes
MasterBus compatible	no	no	no	no	yes
Connection cable (6-wire) necessary	yes	yes	no	no	no
Modular cable necessary	no	no	no	no	MasterBus cable included
Languages display	universal	universal	English, Dutch, French, Spanish, German, Danish, Finnish, Norwegian, Italian, Swedish	English	English, Dutch, French, Spanish, German, Danish, Finnish, Norwegian, Italian, Swedish

Mastervolt transfer systems: Manages 230 V power sources

The Mastervolt transfer system helps you regulate your grid, generator or inverter power and automatically selects the right power sources at the right time. With Mastervolt you can cook and do laundry at the same time or watch TV with the airco on full blast. In addition, Mastervolt transfer systems are suitable for every installation.

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: The simple solution

- Two AC inputs, for example grid power and generator.
- One outlet to AC power group.
- Automatic switching.
- Power transfer up to 25 kW, input/output from 20 to 125 A.
- Can be combined with circuit breakers (Masterswitch Fuses).

Mass Systemswitch: The complete system solution

- 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.
- Optional automatic fuses; for larger systems this usually requires an extra casing.
- MasterBus compatible.

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 load 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 MasterView Easy indicates AC current, amperage and frequency including the 'load on inverter' mode. The 12/24 V read-out shows current, power (charge/discharge) and battery monitoring, and can provide generator start/stop control.

Suitable for MasterBus



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

Specifications AC transfer systems



	Masterswitch 5 kW	Masterswitch 10 kW	Masterswitch 25 kW	Masterswitch Fuses 5 kW
Product code 230 V	55006010	55006015	55003500	55006060
Product code 120 V (check mastervolt.com/transfer-systems-for-specifications)	55106000 (3 kW)	55106100 (7 kW)		
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	2	2	2	2
Number of outputs	1	1	1	2
Dimensions, hxxwxd	200 x 110 x 115 mm 7.9 x 4.3 x 4.5 inch	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
Weight	1.2 kg / 2.6 lb	1.3 kg / 2.9 lb	3.8 kg / 8.4 lb	2.1 kg / 4.6 lb
TECHNICAL SPECIFICATIONS				
Connection for remote control	no	no	no	no
MasterBus compatible	no	no	no	no
LED indication on cabinet	no	no	no	no
Nominal input current generator	20 A	40 A	125 A	16 A
Nominal input current grid	20 A	40 A	125 A	16 A
Nominal input current inverter	n.a.	n.a.	n.a.	20 A
Earth leakage switch	n.a.	n.a.	n.a.	yes (1x)
Generator input switch	no	no	no	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	n.a.	n.a.	n.a.	6 A + 6 A + 6 A
Nominal current power output	20 A	40 A	125 A	6 A + 10 A
Nominal current generator output	n.a.	n.a.	n.a.	n.a.
Automatic circuit breakers	no, system dependent	no, system dependent	no, system dependent	yes
Power consumption (AC all inputs)	7 VA	7 VA	26 VA	7 VA
Power consumption (only inverter power)	no no-load consumption	no no-load consumption	no no-load consumption	no no-load consumption
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 tolerances)	-25 °C to 70 °C (may not meet the specified tolerances)	-25 °C to 70 °C (may not meet the specified tolerances)	-25 °C to 70 °C (may not meet the specified tolerances)
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	no	no	no	no
Cable size	0.5-10 mm ² / AWG 20-7	0.5-10 mm ² / AWG 20-7	4-50 mm ² / AWG 10-1/0	0.5-10 mm ² / AWG 20-7
Protection degree	IP55	IP55	IP55	IP55



**Mass Systemswitch
6 kW**

55008005



**Mass Systemswitch
10 kW**

55008105



**Mass Systemswitch
16 kW**

55008205

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
3	3	3
3	4	4
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
4.4 kg / 9.7 lb	4.9 kg / 10.8 lb	5 kg / 11 lb
yes	yes	yes
yes	yes	yes
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
25 A	40 A	63 A
25 A	25 A	40 A
25 A	25 A	25 A
no	no	no
continuous monitoring of voltage and frequency	continuous monitoring of voltage and frequency	continuous monitoring of voltage and frequency
0-10 sec (adjustable)	0-10 sec (adjustable)	0-10 sec (adjustable)
25 A	25 A	25 A
25 A	25 A	40 A
n.a.	40 A	63 A
no, system dependent	no, system dependent	no, system dependent
27 VA	33 VA	33 VA
<1 VA	<1 VA	<1 VA
-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 tolerances)	-25 °C to 70 °C (may not meet the specified tolerances)	-25 °C to 70 °C (may not meet the specified tolerances)
-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
yes	yes	yes
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
IP23	IP23	IP23



A safe connection between grid power and your onboard network

You need to be careful when introducing grid power onboard, for example when a yacht is made of aluminium or steel. An incorrectly configured system can result in electrolysis, which will slowly but surely corrode the metal components. A Mastervolt isolation transformer will help preserve your valuable investment while providing you with the safety of a correctly earthed 230 V system.

Select the right transformer for your system:

Lightweight Mass GI transformer

- Ultramodern 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).
- 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
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	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	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
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, hwxwd	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		MasterView Easy 77010305	option	option	n.a.	n.a.	n.a.
		Soft Start 13 kW 55003300	included	included	option	option	option
		Soft Start 22 kW 55003400	included	included	n.a.	n.a.	n.a.

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, hwxwd	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**

85000800

**IVET 10***

85001000

**IVET 13**

85001300

**IVET 18**

85001800

**IVET 22**

85002200

110/220/240 V

45-65 Hz

35 A

<10 W

no

110/220/240 V

45-65 Hz

44 A

<10 W

no

110/220/240 V

45-65 Hz

57 A

<10 W

no

110/220/240 V

45-65 Hz

78 A

<10 W

no

110/220/240 V

45-65 Hz

96 A

<10 W

no

120/220/240 V, $\pm 5\%$

45-65 Hz

option

n.a.

> 93 %

120/220/240 V, $\pm 5\%$

45-65 Hz

option

n.a.

> 93 %

120/220/240 V, $\pm 5\%$

45-65 Hz

option

n.a.

> 93 %

120/220/240 V, $\pm 5\%$

45-65 Hz

option

n.a.

> 93 %

120/220/240 V, $\pm 5\%$

45-65 Hz

option

n.a.

> 93 %

8000 W

E-core
430 x 280 x 210 mm
16.9 x 11 x 8.3 inch

59 kg / 130 lb

CE, ABYC

0 °C to 40 °C,
derating power > 40 °C

n.a.

natural cooling

max. 95 %

IP00

no

10 kW

E-core
430 x 280 x 240 mm
16.9 x 11 x 9.5 inch

75 kg / 165.4 lb

CE, ABYC

0-40 °C,
derating power > 40 °C

n.a.

natural cooling

max. 95 %

IP00

no

13 kW

E-core
490 x 320 x 230 mm
19.3 x 12.6 x 9 inch

90 kg / 198.4 lb

CE, ABYC

0 °C to 40 °C,
derating power > 40 °C

n.a.

natural cooling

max. 95 %

IP00

no

18 kW

E-core
490 x 320 x 260 mm
19.3 x 12.6 x 10.2 inch

110 kg / 242.5 lb

CE, ABYC

0 °C to 40 °C,
derating power > 40 °C

n.a.

natural cooling

max. 95 %

IP00

no

22 kW

E-core
490 x 320 x 290 mm
19.3 x 12.6 x 11.4 inch

130 kg / 286.6 lb

CE, ABYC

0 °C to 40 °C,
derating power > 40 °C

n.a.

natural cooling

max. 95 %

IP00

no

n.a.

option

n.a.

n.a.

option

n.a.

n.a.

option

option

n.a.

n.a.

option

n.a.

n.a.

option

* Also available in cabinet, product code 86001000.



Charge regulators and alternators: 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 MB charge regulator. This charge regulator maximises the output of alternators by regulating the alternator in a way that ensures that 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 MB 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.

Alpha Pro MB charge regulators

- Suitable for 12 and 24 V.
- Including plug & play connection cable, also for Bosch alternators.
- Automatic voltage and temperature compensation.
- MasterBus compatible.

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

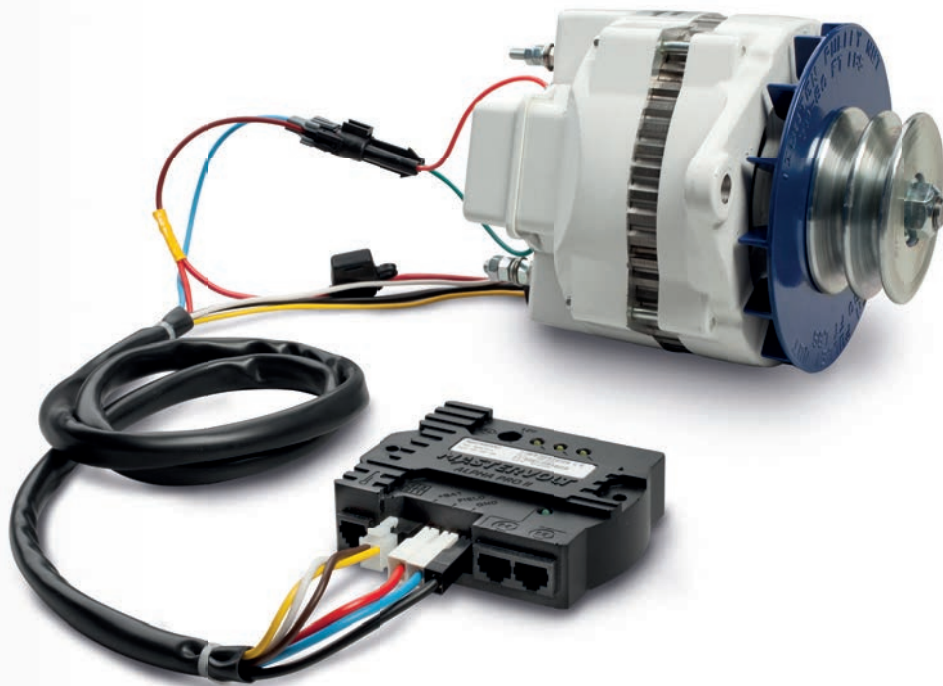
- Fast & complete charging of all batteries.
- Power supply for all consumers.
- 12 V and 24 V versions.
- 75 A to 150 A charge current.
- Standard delivered with Alpha Pro MB charge regulator for an optimal performance and longer-lasting batteries.

Using a Battery Mate or 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

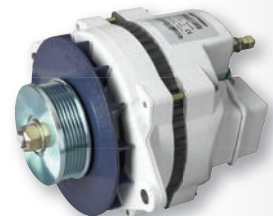


Standard alternators only supply the specified capacity at a high rpm. The Mastervolt Alpha alternator is specifically designed for powerful charging, even with a low engine rpm.

Alpha Pro MB: Easy to operate

Easy operation LEDs on the body of the charge regulator indicate the charge phase. The Alpha Pro MB 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, with a cable supplied as standard.

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.

MasterBus connectivity



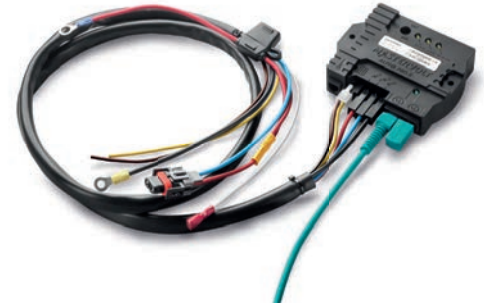
The Alpha Pro MB is compatible with MasterBus, allowing easy monitoring via a MasterView touchscreen. In a MasterBus system the voltage drop over the battery cable and the battery temperature is compensated automatically.

Specifications Alpha Pro MB



Alpha Pro MB

Product code	45512000
GENERAL SPECIFICATIONS	
Link to MasterShunt	yes
Connection to Mastervolt alternator	yes
Connection to Bosch alternator	yes
Cooling	fanless
Nominal output voltage	12 V / 24 V
Cable length regulator/alternator	1.5 mtr oil resistant connection cable
Cable length temperature sensor	6 mtr
Connection plug regulator/alternator	Alpha/Mastervolt
Display/read-out	LED display
MasterBus powering	yes
Dimensions, hxxwxd	90 x 109 x 30 mm 3.5 x 4.3 x 1.2 inch
Weight	0.4 kg / 0.9 lb
Approvals	CE
TECHNICAL SPECIFICATIONS	
Charge characteristic	IUoUo, automatic / 3-step+ for gel/AGM/ wet/Lithium Ion
Charge voltage Bulk	14.25 V / 28.5 V
Charge voltage Absorption	14.25 V / 28.5 V
Absorption time	4 hours, adjustable from 2 minutes to 12 hours
Charge voltage Float	13.25 V / 26.5 V
Temperature compensation	-30 mV / °C
Voltage compensation	voltage drop compensation in DC cables up to 3 V
Alternator type	various
MasterBus compatible	yes



The Alpha Pro MB is standardly delivered with a connection cable, plus a connection cable for any other brand of alternator that has a standard Bosch connector.



Benefits of a Mastervolt charge regulator

- The Alpha Pro MB 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 Alpha Pro MB 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.

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
GENERAL SPECIFICATIONS					
Charge regulation	an Alpha Pro MB regulator comes standard with all models	an Alpha Pro MB regulator comes standard with all models	an Alpha Pro MB regulator comes standard with all models	an Alpha Pro MB regulator comes standard with all models	an Alpha Pro MB 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

* Available with multi-belt pulley.
Product code 12/130 model = 48512131
Product code 24/75 model = 48524076

During the latest edition of the Volvo Ocean Race, the batteries had a single primary source of charging via two 24/150 A Mastervolt alternators, regulated by two Alpha Pro MB charge regulators, which could fully charge the Li-ion batteries in one hour.



Electrical cables & 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.
- High or low frequent isolation transformer: 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

- Wear-proof
- UV-proof
- Moulded plugs
- Integrated LED power indicator
- 2.5 mm²



Extension cable

Product code 15 m 121160151
Product code 25 m 121160251

- Wear-proof
- UV-proof
- Moulded plugs
- Integrated LED power indicator
- 2.5 mm²



RVS inlet

Product code 121160000

- 16 A
- 230 V



Adapter CEE 7/7 - CE

Product code 121160900

- From CEE-7/7 to CE plug
- Wear-proof
- UV-proof
- Integrated LED power indicator



Adapter CE - CEE 7/7

Product code 121160910

- From CE to CEE-7/7 plug
- Wear-proof
- UV-proof



Splitter for CE plug

Product code 121160920

- Wear-proof
- UV-proof
- Integrated LED power indicator

■ 32 A models



Power cable

Product code 25 m 121320250

- Wear-proof
- UV-proof
- Moulded plugs
- Integrated LED power indicator
- 25 metres
- 4 mm²



RVS inlet

Product code 121320000

- 32 A
- 230 V



In addition to the Mastervolt power connections, we also supply the complete Marincó product range, including the new EEL ShorePower series.

See also our global product catalogue where we offer the most extended product portfolio worldwide under the Marincó brand.

MARINCO

The power of electric and hybrid propulsion

Quiet, clean, sustainable and very comfortable: there are many reasons why electric sailing is becoming increasingly popular. But there is more to electric propulsion than these assets alone, and the benefits of electric sailing apply to other types of electric propulsion. At least they can do in modern and intelligent systems featuring components which comply with the very latest technologies. With electric motors working closely together with the engine controls, battery chargers and batteries within a single system, you can make the most of the advantages of electric and/or hybrid propulsion.

Mastervolt is a specialist in the conversion, storage and management of electric power. Our battery chargers, inverters, digital switching systems, advanced Combis (charger/inverter), and Lithium Ion batteries are global market leaders. Combined with your electric propulsion, these components are the perfect building blocks for a safe and fully reliable electric system.

Hybrid applications too

The use of well thought-through 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

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



maintenance. Instead, you have a smart system that efficiently supplements the limited generator capacity (peak shaving) or even makes it entirely redundant. With the efficient and high energy intake of Lithium Ion batteries, it is even possible to charge the batteries intermediately using brake power and solar panels.

Full integration

Digital switching technology and the various communication options provided by MasterBus ensure optimal integration of your system. By linking all power electronics to other systems, you can easily monitor the relevant information and operate all components.

Tailor-made advice

Mastervolt works closely with its partner IDT/Bellmarine on the electric motors and controllers, a Dutch company with a great reputation for battery-powered propulsion technology. Together with Mastervolt, the specialists at IDT/Bellmarine 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!

Bellmarine®
www.bellmarine.nl

Geesinknorba supplies environmentally-friendly solutions for collecting waste, including Hybrid Plug-in systems. The rear loader of the waste collection vehicle pictured below is powered by Lithium Ion batteries from Mastervolt. The benefits of this system include fuel savings, silent operation for employees and the environment, and a greater load capacity. For more information, go to www.geesinknorba.com / hybrid systems.





Courtesy of Flying Focus, the Netherlands.



In 2015 Mastervolt supported the KNRM, the Royal Netherlands Sea Rescue Institution. This is one of many worldwide organisations responsible for the safety and rescue of people and animals on the water. In the Netherlands, the KNRM is an organisation consisting entirely of volunteers, financed by donations. Mastervolt's partnership with the KNRM recently became permanent: Mastervolt will support the 45 rescue stations of the KNRM with products and services, free of charge.

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Your guide to a Mastervolt system

Whatever your application, Mastervolt offers a system-wide solution. We don't just send you a box of components and expect you to sort it all out, even though you will find the Mastervolt systems remarkably intuitive. Instead, you will have our full technical support throughout your project, from purchase to installation.

Better still, the system will be technologically bullet proof – every component is perfectly geared to link seamlessly into the network, with advanced software in place for accurate monitoring and control. This uniform approach drastically reduces the amount of wiring and power consumption required, and creates a custom-made system with unprecedented flexibility for your needs.

Mastervolt's broad product range enables us to design a suitable system for each 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 or 24 V consumers:**
What kind of equipment will be used and for how long?
- **Required capacity:**
What is the total power 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?

Choosing whether to get a generator?

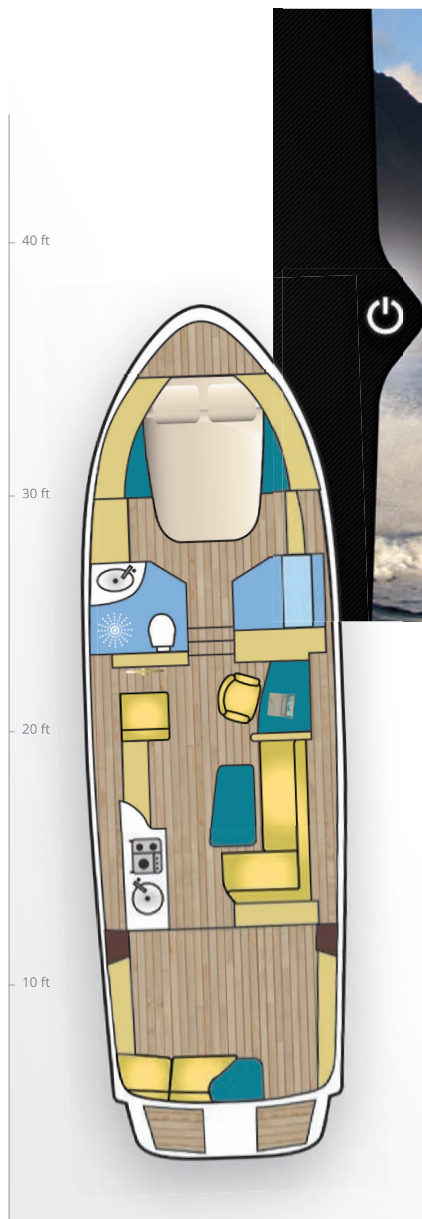
A generator usually seems the easiest solution to be sure of an independent power supply wherever you may go. There may, however, be a more efficient answer to reach this goal and the comfort you deserve. How about a combination of batteries connected to an inverter that converts 24 volt power to 230 volt? Or a solar power system for charging the battery? These solutions are quieter than a generator and considerably less harmful to the environment as there is no need for a diesel engine to be constantly running. However, if a generator must be used, Mastervolt systems are compatible with all mainstream generators.

A complete system saves time and money

The purchase of a complete system also provides an economic advantage. Builders, installers and end users will agree. Component selection, purchase, installation and documentation take considerably less time. And because everything is perfectly aligned, you are choosing for optimum reliability.



Complete comfort on the water



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	TOTAL X CAPACITY 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.

Application

35-40 ft motoryacht

Use

Longer weekend trips

Details

Comfortable onboard facilities

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: 2 x MVG 12/140 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: MasterView Easy

This touchscreen control panel is easy to read and operate. The grey button turns the display on or off or locks it, while all other functions can be controlled using the touchscreen.

Digital distribution

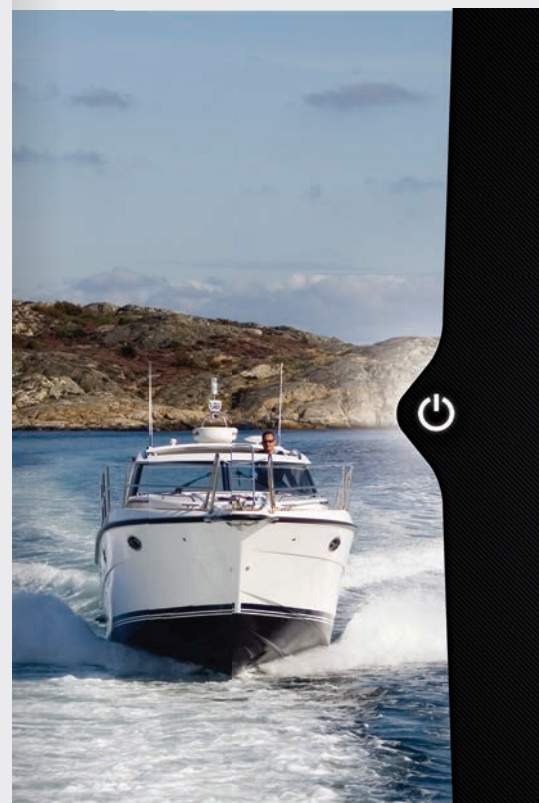
The products in this system communicate with each other via MasterBus. This brilliantly simple platform for communication and connections ensures that all components 'speak' the same language. The result is a single communication protocol with high-speed CANbus technology.

■ 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 with 4 fuses

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

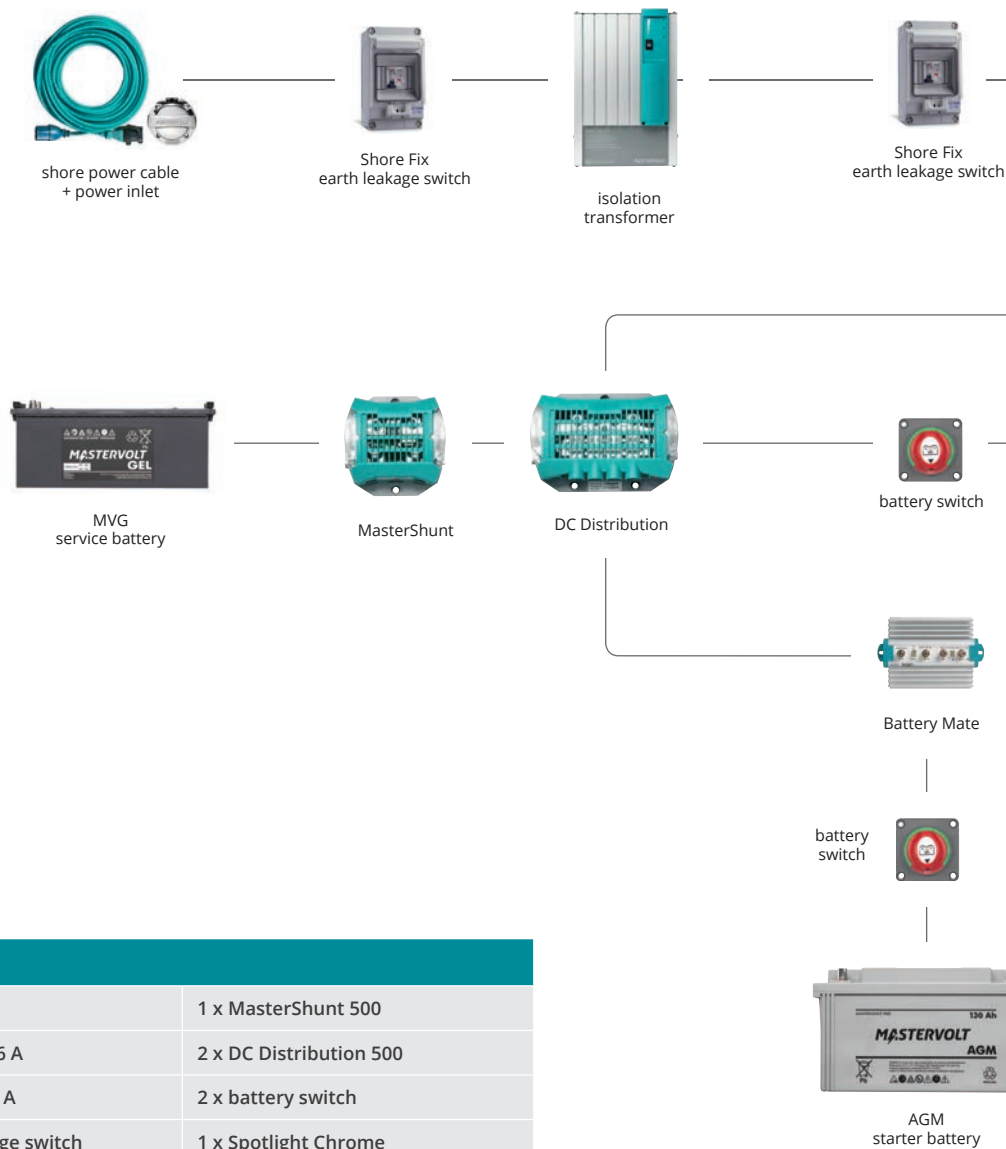


Other system components

- 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 Battery Mate 1602 IG; the ultimate solution for charging several batteries simultaneously, compatible with any type of alternator/charger.
- 3 x Shore Fix, 16A/30mA earth leakage switches.
- 1 x shore power cable 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 MasterView Easy	1 x MasterShunt 500
1 x shore power cable, 16 A	2 x DC Distribution 500
1 x shore power inlet, 16 A	2 x battery switch
3 x Shore Fix earth leakage switch	1 x Spotlight Chrome
1 x Mass GI 3.5 isolation transformer	1 x Battery Mate 1602 IG
1 x Mass Combi 12/1600-60	1 x AGM 12/130 starter battery
2 x MVG 12/140 service battery	



Complete comfort on the water



MasterView Easy



Mass Combi



Shore Fix
earth leakage switch



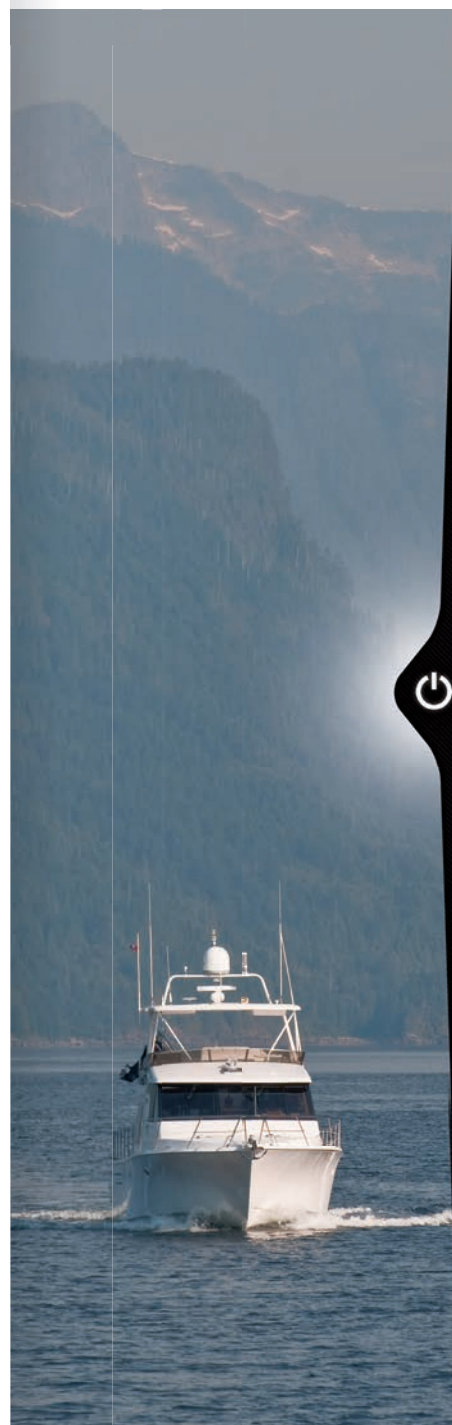
Spotlight



DC Distribution



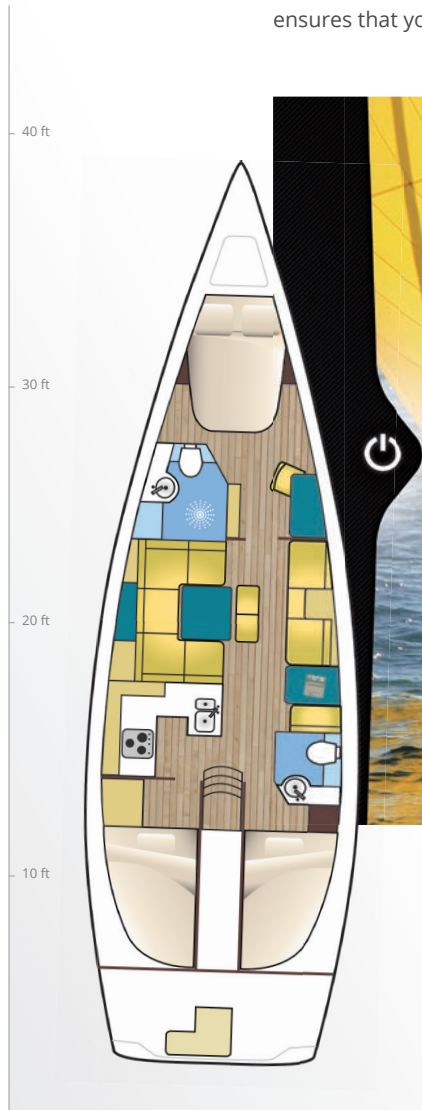
alternator



A weekend with wind in your sails

Sailing profile

You like to leave harbour on a Friday afternoon for a fantastic weekend of sailing. There is a good wind so the sails are quickly filled and the weather stays great for the entire weekend. Onboard, your Mastervolt system ensures that you do not have to worry about a thing.



Energy consumption

DESCRIPTION	POWER	TOTAL X CAPACITY X TIME	DAILY CONSUMPTION
Daily AC consumers (on inverter)			
Phone/tablet charger	20 W	1 x 20 watt x 1 hour	= 0.020 kWh
Laptop	30 W	1 x 30 watt x 15 minutes	= 0.007 kWh
LED television	80 W	1 x 80 watt x 1 hour	= 0.080 kWh
Daily DC consumers			
Autopilot	30 W	1 x 30 watt x 3 hours	= 0.090 kWh
Hifi installation	50 W	1 x 50 watt x 1 hour	= 0.050 kWh
Water pump	30 W	1 x 3 watt* x 24 hours	= 0.072 kWh
Interior lighting	20 W	3 x 20 watt x 1 hour	= 0.060 kWh
Navigation electronics	20 W	4 x 20 watt x 8 hours	= 0.640 kWh
Navigation deck lights	20 W	1 x 20 watt x 8 hours	= 0.160 kWh
Total AC and DC consumers			= 1.179 kWh

* The water pump runs for 1/10 of the time, resulting in an average of 3 watt.

Application

30-40 ft sailing yacht

Use

Weekends sailing; shore power not always available

Details

Average onboard facilities

The basics

- Your navigation station includes GPS, plotter, wind meter, speedometer and depth gauge.
- You prefer optimum ease of operation; centrally located.
- Due to short cable lengths and relative low power requirements, 12 volt has been selected.



System choice

A system with separate charger and inverter provides the highest flexibility and reliability. The charger will always provide the optimum charge even when the available shore power is limited, fluctuating or unreliable. The inverter will provide a perfect true sine wave output to your sensitive onboard electronics. Power is available when you need it.

■ Service battery: MVG 12/200

The total of AC and DC consumers requires around 1.2 kWh. Totally discharging the batteries is not advisable so opt for a maximum of 50 % discharge = 2.4 kWh. Taking into account ease of installation and the amount of standard equipment (such as lighting) we selected a 12 V system. The required battery capacity is therefore $2.4 \text{ kWh} / 12 \text{ V} = 200 \text{ Ah}$.

■ Battery charger: ChargeMaster 12/50-3

In normal conditions we assume 25 % of the battery capacity when selecting a battery charger: 25 % of 200 Ah requires a 50 A battery charger. In this case the ChargeMaster 12/50-3 is an excellent choice. It is even able to charge up to three battery banks. In this case you only use two outputs: One for the service battery and one for the starter battery of the engine. This gives you flexibility should you want to add another battery later. Furthermore, you can use this third output as a second starter battery if you have two engines, or for a bowthruster battery.

■ Inverter: AC Master 12/300

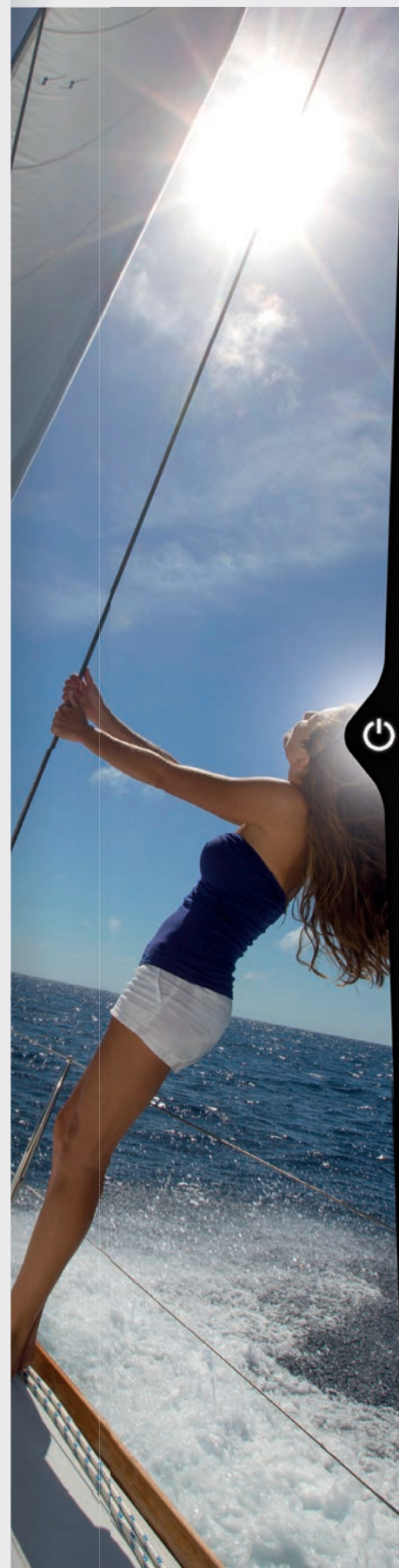
The AC Master 12/300 is sized to power all the loads at the same time.

■ Monitoring: BattMan Pro

The BattMan Pro battery monitor provides critical information about the status of your battery bank under all circumstances. It will warn you when your battery bank is empty, and displays the remaining time until your battery needs to be charged and stores historical data.

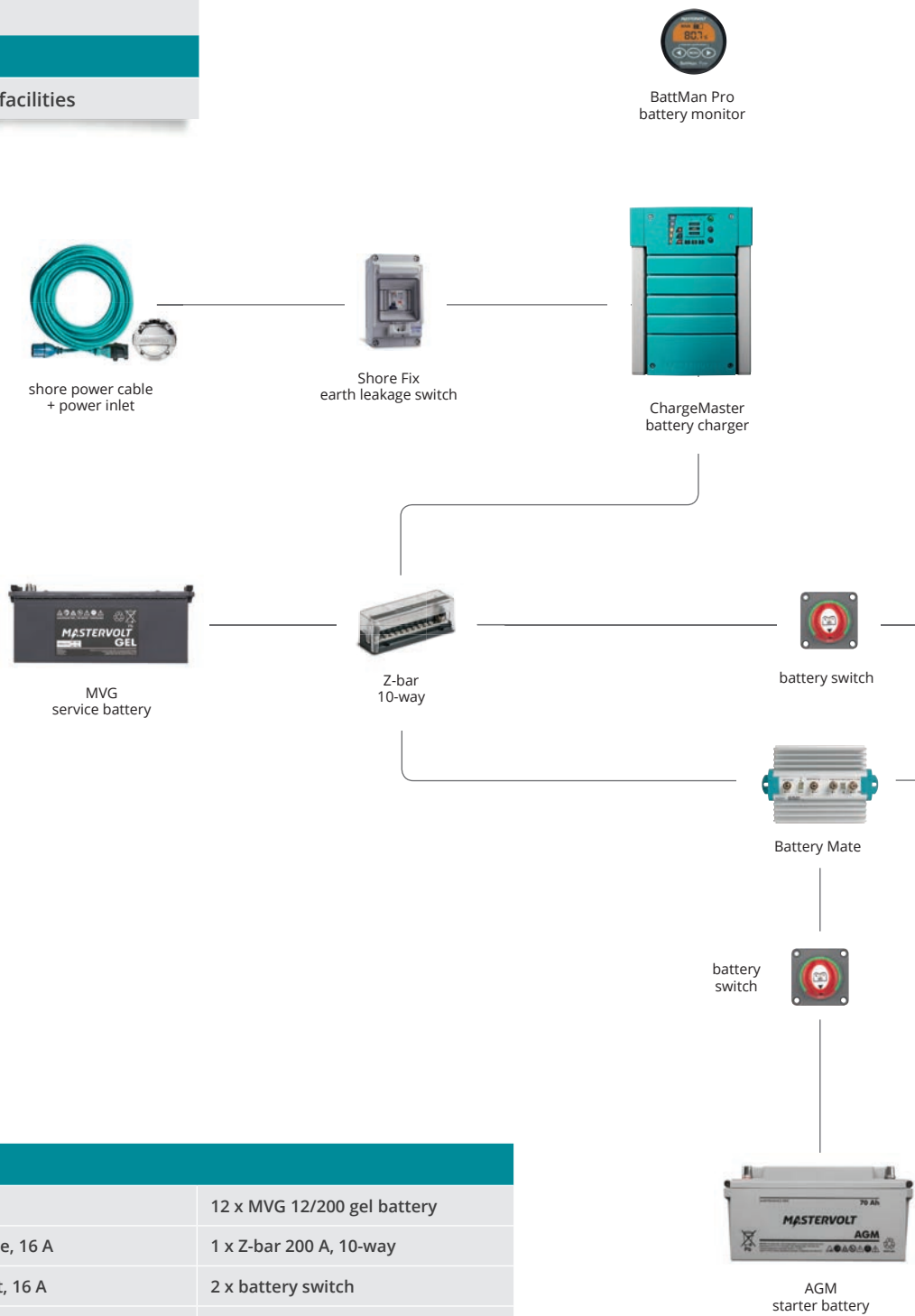
Other system components

- 1 x AGM 12/70 starter battery.
- 1 x Battery Mate 1602 IG; the ultimate solution for charging several batteries simultaneously, compatible with any type of alternator/charger.
- 1 x Shore Fix, 16A/30mA earth leakage switch.
- 1 x shore power cable 16 A, 25 m.
- 1 x shore power inlet 2+PE, 16A/230V.
- 1 x Z-bar 200 A 18-way.
- 1 x Z-bar 200 A 10-way.
- 2 x battery switches for switching on and off the consumers attached to the battery.



System drawing

Application
30-40 ft sailing yacht
Use
Weekends sailing; shore power not always available
Details
Average onboard facilities



Products used	
1 x BattMan Pro	12 x MVG 12/200 gel battery
1 x shore power cable, 16 A	1 x Z-bar 200 A, 10-way
1 x shore power inlet, 16 A	2 x battery switch
1 x Shore Fix earth leakage switch	1 x Z-bar 200 A, 18-way
1 x ChargeMaster 12/50-3 battery charger	1 x Battery Mate 1602 IG
1 x AC Master 12/300 inverter	1 x AGM 12/70 starter battery



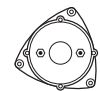
A weekend with wind in your sails



AC Master
inverter



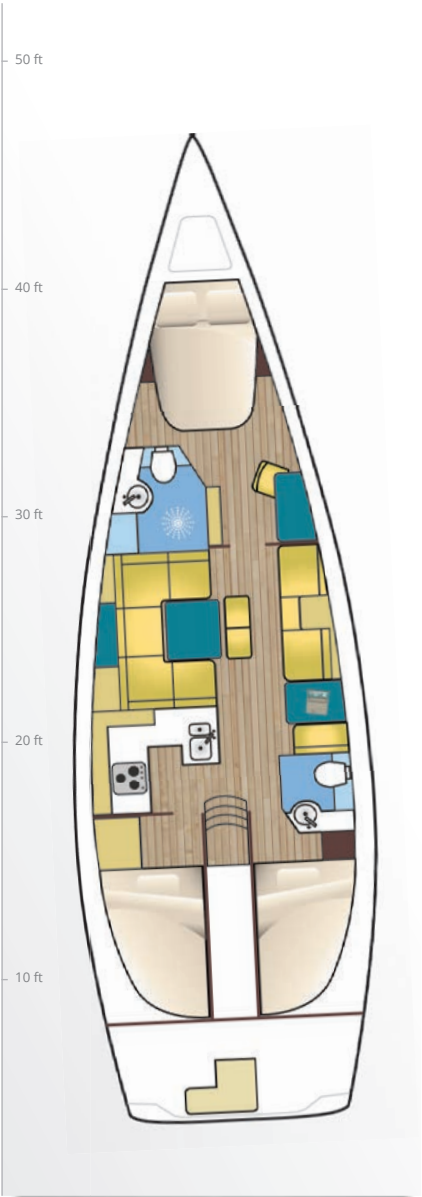
Z-bar
18-way



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	TOTAL X CAPACITY 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 Ultra 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 MasterView Easy 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 Ultra 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 Ultra. The Mass 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.

■ Monitoring: MasterView Easy

This touchscreen control panel is easy to read and operate. The grey button turns the display on or off or locks it, while all other functions can be controlled using the touchscreen.

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

- 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 MB 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 shore power cable 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.

System drawing

Application

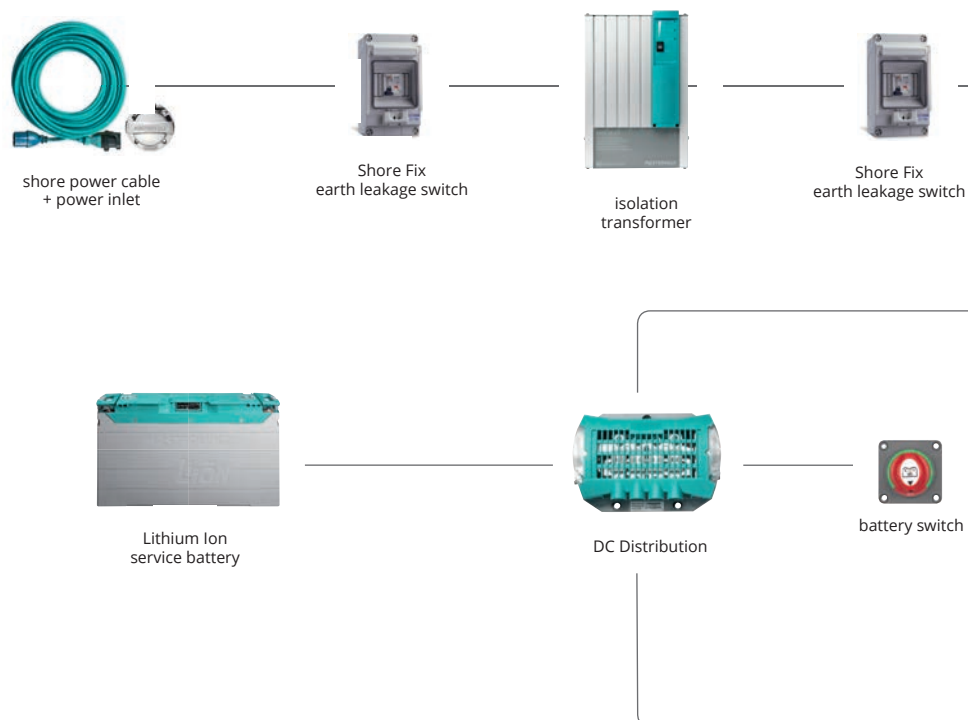
40-50 ft sailing yacht

Use

Extensive trips

Details

Normal onboard facilities



Products used

1 x shore power cable, 16 A	2 x DC Distribution 500
1 x shore power inlet, 16 A	2 x battery switch
3 x Shore Fix earth leakage switch	1 x DC-DC converter, 24V/12V
1 x Mass GI 3.5 isolation transformer	1 x Alpha 24/75 alternator
1 x Mass Combi Ultra 24/3500-100	1 x Alpha Pro MB charge regulator
1 x MasterView Easy	2 x AGM 12/90 starter battery
3 x MLI Ultra 24/5000 Lithium Ion battery	



The wind in your sails for the day



MasterView Easy



Mass Combi Ultra



Shore Fix
earth leakage switch



DC Master
DC-DC converter



DC Distribution



Alpha alternator



Alpha Pro MB
charge regulator

battery
switch



standard
alternator



AGM
starter battery



The full boating experience at the touch of a finger

Imagine that you have full control of your onboard circuits with one touch, the ability to customise your experience, and improve safety by making all of the right decisions at the right time. One touch to go boating, one touch to shut down, one touch for evening cruising, and anything else your heart desires. With CZone technology by Mastervolt, all of this is possible. Whether you use a key fob or your tablet, the ability to monitor and control is at your fingertips.



The basics

- Onboard circuits controlled with CZone™ digital switching technology.
- Ability to customise modes, bundling circuits together for easy of operation and control.
- Ability to monitor and control the system via tablet or key fob or integrated with major electronics brands including Simrad, B&G, Garmin* at the helm.
- Mastervolt integrated power system with battery charger and AGM batteries.
- Monitoring of the power system.
- 12 V DC, 120 V AC system.

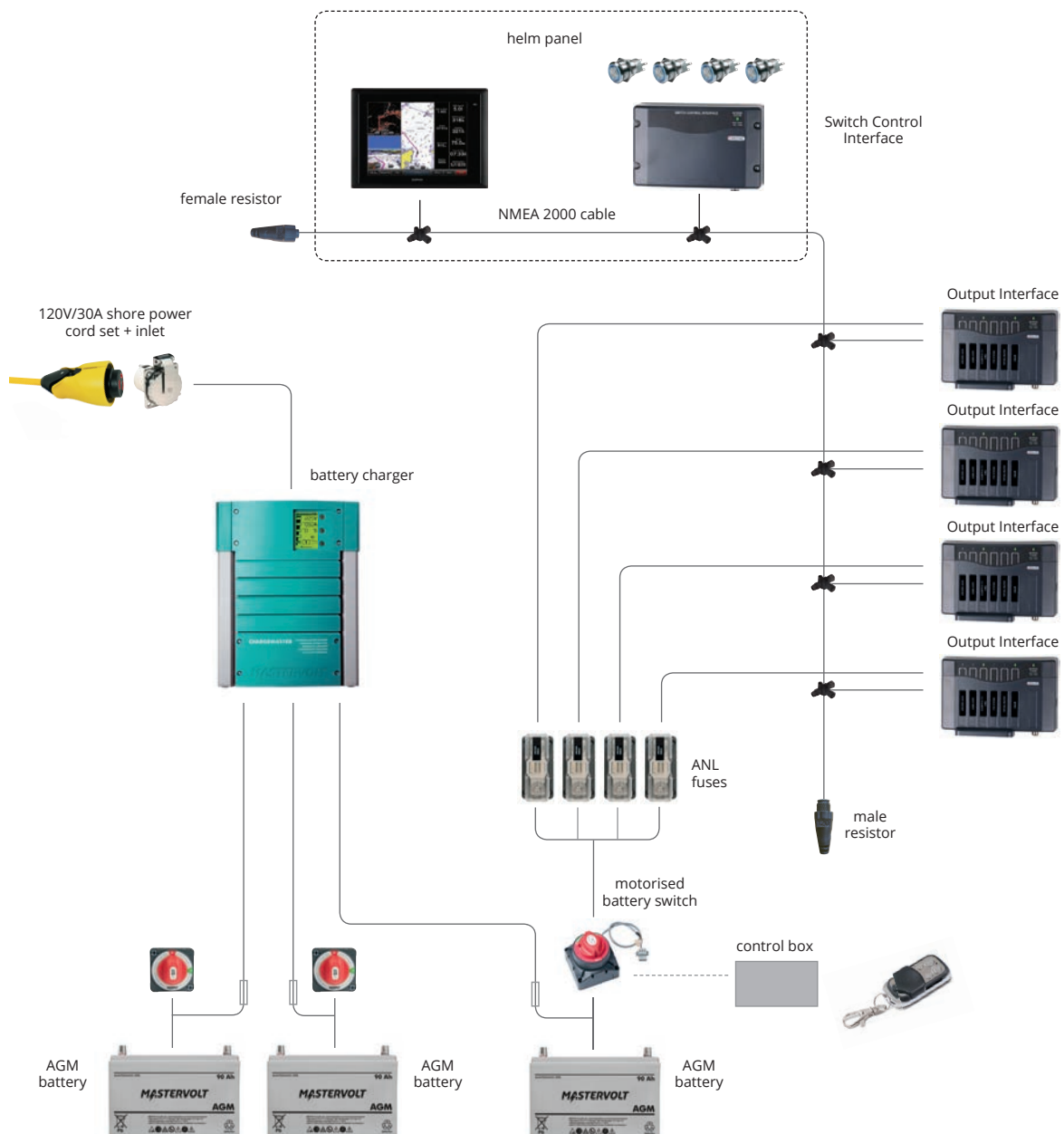
** Please check the Mastervolt site for the latest developments on integration partners.*



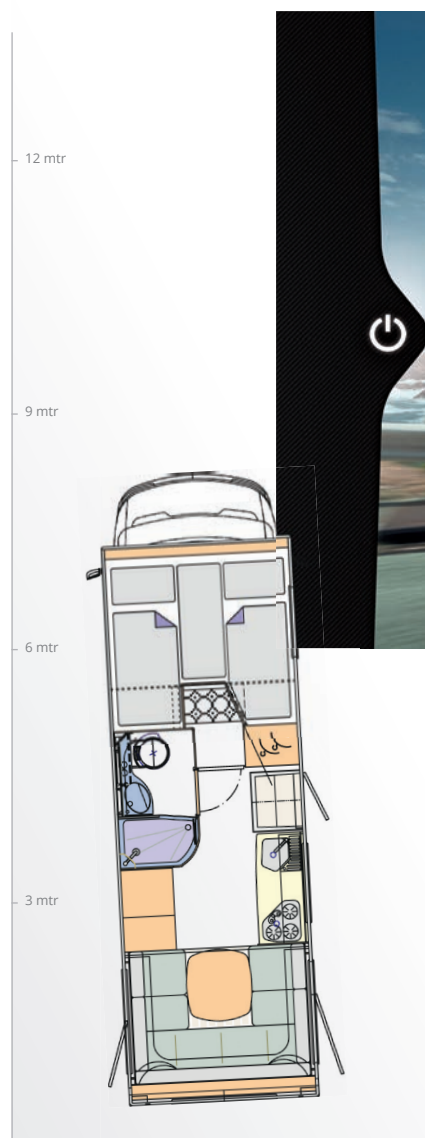
System choice

- System integration with the Garmin 8000 SMAP series.
- NMEA 2000 cable, T-connectors and resistors.
- 6 x push button, illuminated switches.
- 1 x CZone Switch Control Interface.
- 1 x 120V/30A EEL shore power cord set.
- 1 x 120V/30A inlet.
- 1 x ChargeMaster 12/70-3 battery charger.
- 4 x CZone Output Interface.
- 4 x Pro Installer ANL fuses & fuse holders.
- 2 x Pro Installer EZ-Mount battery switch.
- 1 x motorised battery switch.
- 1 x key fob & control box.
- 3 x AGM 12/90 battery.

System drawing



A Mastervolt system for carefree camping



System description

This system is designed for mobile homes, recreational vehicles and commercial vehicles with limited electrical demands or equipment. The system satisfies basic power needs for 12 V lighting, radio/TV/DVD, a satellite dish and a few 230 V devices, such as a laptop, electrical toothbrush and your mobile telephone charger. The heart of the system consists of a sturdy and maintenance-free gel battery. Used normally, the battery will deliver enough power for a full day, independently of the engine alternator or grid voltage. This is especially practical considering the number of locations with no mains hook-up.

Energy consumption

DESCRIPTION	POWER	TOTAL X CAPACITY X TIME	DAILY CONSUMPTION
Daily AC consumers (on inverter)			
LED television	80 W	1 x 80 watt x 1 hour	= 0.080 kWh
Phone/tablet charger	20 W	1 x 20 watt x 3 hours	= 0.060 kWh
Laptop	30 W	1 x 30 watt x 3 hours	= 0.030 kWh
Daily DC consumers			
Interior lighting	20 W	3 x 20 watt x 3 hours	= 0.180 kWh
Total AC and DC consumers			= 0.350 kWh

Application

6-8 metre motor home

Use

Generally day trips or weekend trips, at night connected to the grid

Details

Basic appliances

The basics

- Battery monitoring for full information on state of charge and time remaining of your batteries.
- The maximum AC capacity is 80 watt for the laptop and telephone/tablet charger.
- Simple operation via touchscreen control panel.
- Complete convenience: With an onboard inverter you and your guests will be able to use the standard phone and laptop adapters.



System choice

A system with separate charger and inverter provides the highest flexibility and reliability. The charger will always provide the optimum charge even when the available grid power is limited, fluctuating or unreliable. The inverter will provide a perfect true sine wave output to your sensitive onboard electronics. Power is available when you need it.

■ Service battery: MVG 12/85

The total of AC and DC consumers requires around 0.35 kWh. Totally discharging the batteries is not advisable so opt for a maximum of 50 % discharge = 0.7 kWh. Taking into account ease of installation and the amount of standard equipment (such as lighting) we selected a 12 V system. The required battery capacity is $0.7 \text{ kWh} / 12 \text{ V} = 60 \text{ Ah}$. This makes the MVG 12/85 gel battery the best choice.

■ Battery charger: ChargeMaster 12/15-2

In normal conditions we assume 20-25 % of the battery capacity when selecting a battery charger: 20-25 % of 85 Ah requires a 15 A battery charger. In this case the ChargeMaster 12/15-2 is an excellent choice.

You can use two outputs: One for the service battery and one for the starter battery of the engine.

■ Inverter: AC Master 12/300

The AC Master 12/300 is sized to power all the loads at the same time.

■ Monitoring: Masterlink BTM-III

This battery monitor provides an accurate indication of the current, amperage, time remaining and estimated capacity of the battery. The built-in microprocessor calculates the remaining capacity and stores historic data.

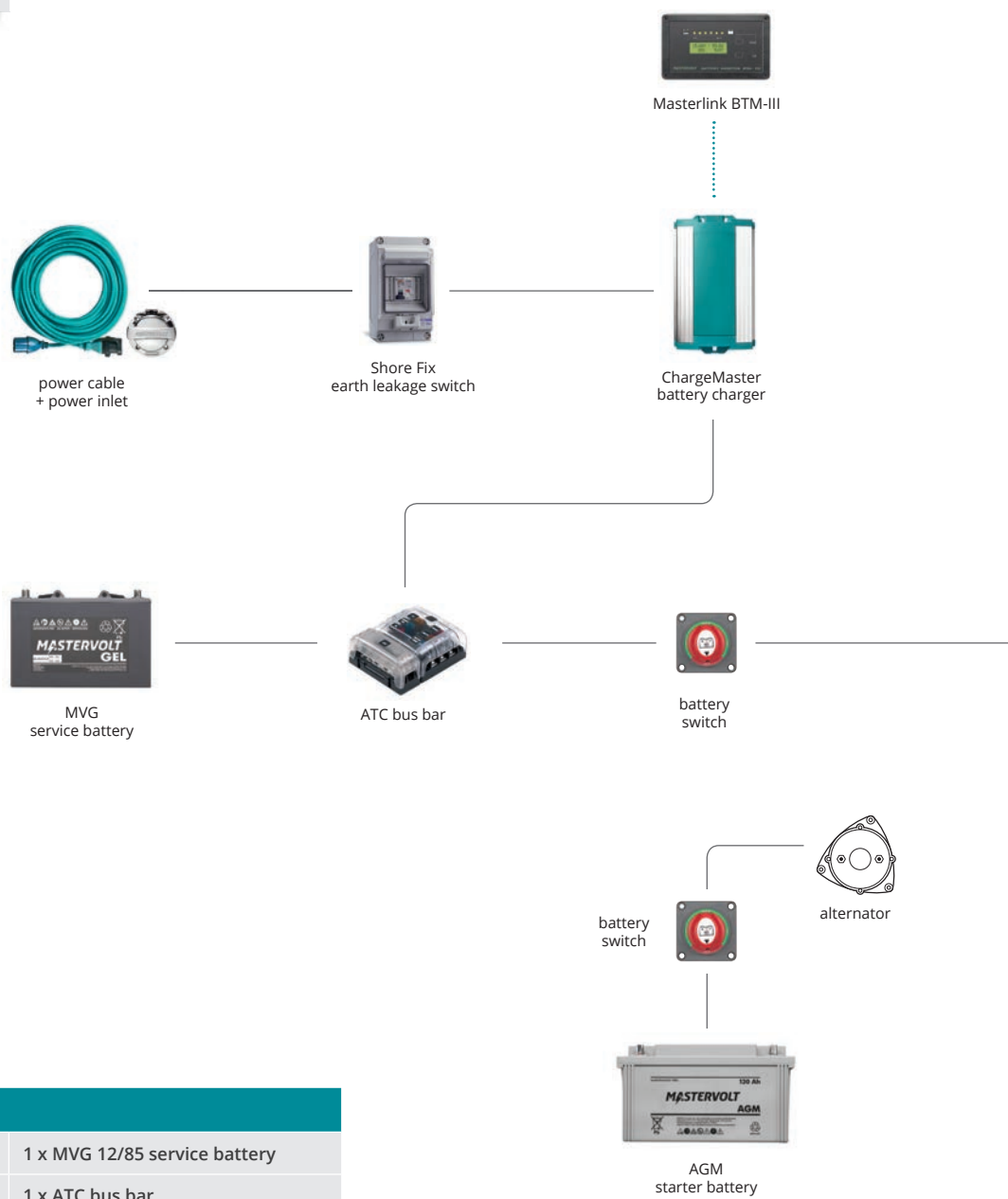
Other system components

- 1 x AGM 12/70 starter battery.
- 1 x Shore Fix, 16A/30mA earth leakage switch.
- 1 x power cable 16 A, 25 m.
- 1 x power inlet 2+PE, 16A/230V.
- 1 x ATC bus bar.
- 1 x Z-bar 200 A 10-way.
- 2 x battery switches for switching on and off the consumers attached to the battery.



System drawing

Application
6-8 metre motor home
Use
Generally day trips or weekend trips, at night connected to the grid
Details
Basic appliances



Products used	
1 x Masterlink BTM-III	1 x MVG 12/85 service battery
1 x power cable, 16 A	1 x ATC bus bar
1 x power inlet, 16 A	2 x battery switch
1 x Shore Fix earth leakage switch	1 x Z-bar 200 A, 10-way
1 x ChargeMaster 12/15-2 battery charger	1 x AGM 12/70 starter battery
1 x AC Master 12/300 inverter	



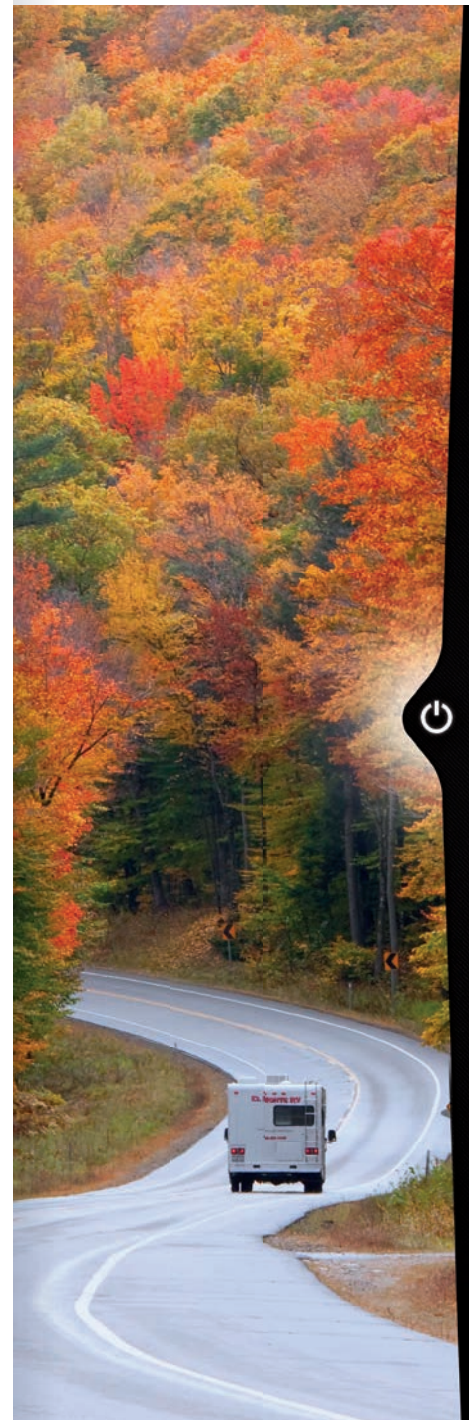
A Mastervolt system for carefree camping



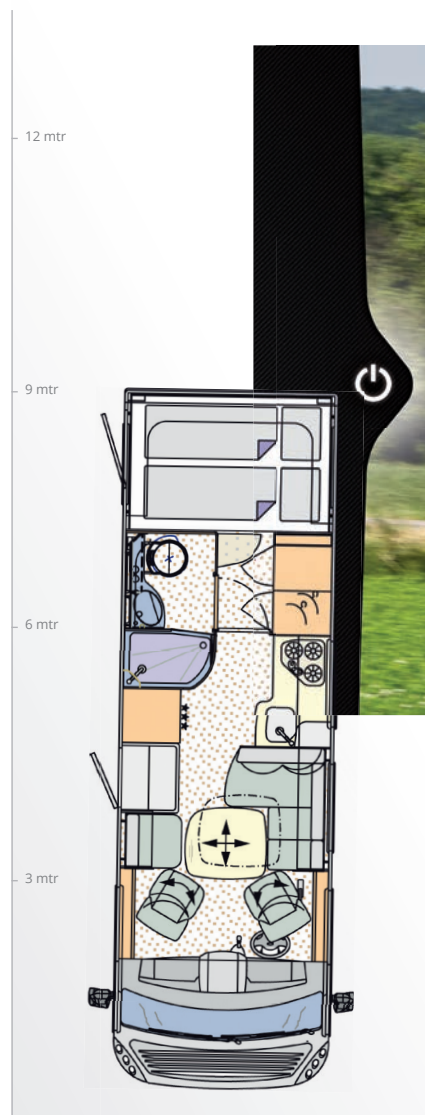
AC Master
inverter



Z-bar
10-way



Complete comfort on the road



System description

This energy system comprises a powerful Mass Combi inverter/charger combined with a gel battery for more substantial power needs, ensuring longer appliance life and reliability. Each system is tailor-made, providing you with everything you need for faultless supply of both 230 V and 12/24 V equipment. Power sources other than the engine include batteries, the grid, and sometimes solar panels. And if your power needs are even higher, you can charge the battery swiftly and safely while underway. With this system onboard you will enjoy unlimited independence.

Energy consumption

Application
7-9 metre motor home
Use
Longer weekend trips, two days independent from the grid
Details
Comfortable onboard facilities

DESCRIPTION	POWER	TOTAL X CAPACITY X TIME	DAILY CONSUMPTION
Daily AC consumers (on inverter)			
Hair dryer	1500 W	1 x 1500 watt x 15 minutes	= 0.375 kWh
Coffee machine	1000 W	1 x 1000 watt x 15 minutes	= 0.250 kWh
Microwave	1500 W	1 x 1500 watt x 15 minutes	= 0.375 kWh
LED television	80 W	1 x 80 watt x 3 hours	= 0.240 kWh
Laptop	30 W	1 x 30 watt x 3 hours	= 0.090 kWh
Phone/tablet charger	20 W	1 x 20 watt x 3 hours	= 0.060 kWh
Daily DC consumers			
Interior lighting	20 W	5 x 20 watt x 3 hours	= 0.300 kWh
Water pump	30 W	1 x 3 watt* x 24 hours	= 0.072 kWh
Total AC and DC consumers			= 1.762 kWh

* The water pump runs for 1/10 of the time, resulting in an average of 3 watt.

The basics

- As compact and lightweight is important, a combined inverter/charger has been selected.
- Recharge the batteries using the energy from the sun.



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 grid 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 exceptionally high efficiency with minimal conversion loss and 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 12/200 Ah

The total of AC and DC consumers requires around 3.6 kWh (1.8 kWh for one day). Totally discharging the batteries is not advisable so opt for a maximum of 50 % discharge = 7.2 kWh. Taking into account the various appliances and required peak loads we suggest a 12 V system. The required battery capacity is 7.2 kWh/12 V = ± 600 Ah.

■ Charger/inverter: Mass Combi 12/2200-100

600 Ah needs approx. 25 % of the battery capacity for charging power, so in this case we chose for a 100 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: MasterView Easy

This touchscreen control panel is easy to read and operate. The grey button turns the display on or off or locks it, while all other functions can be controlled using the touchscreen.

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.

■ 1 x MasterBus USB Interface

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

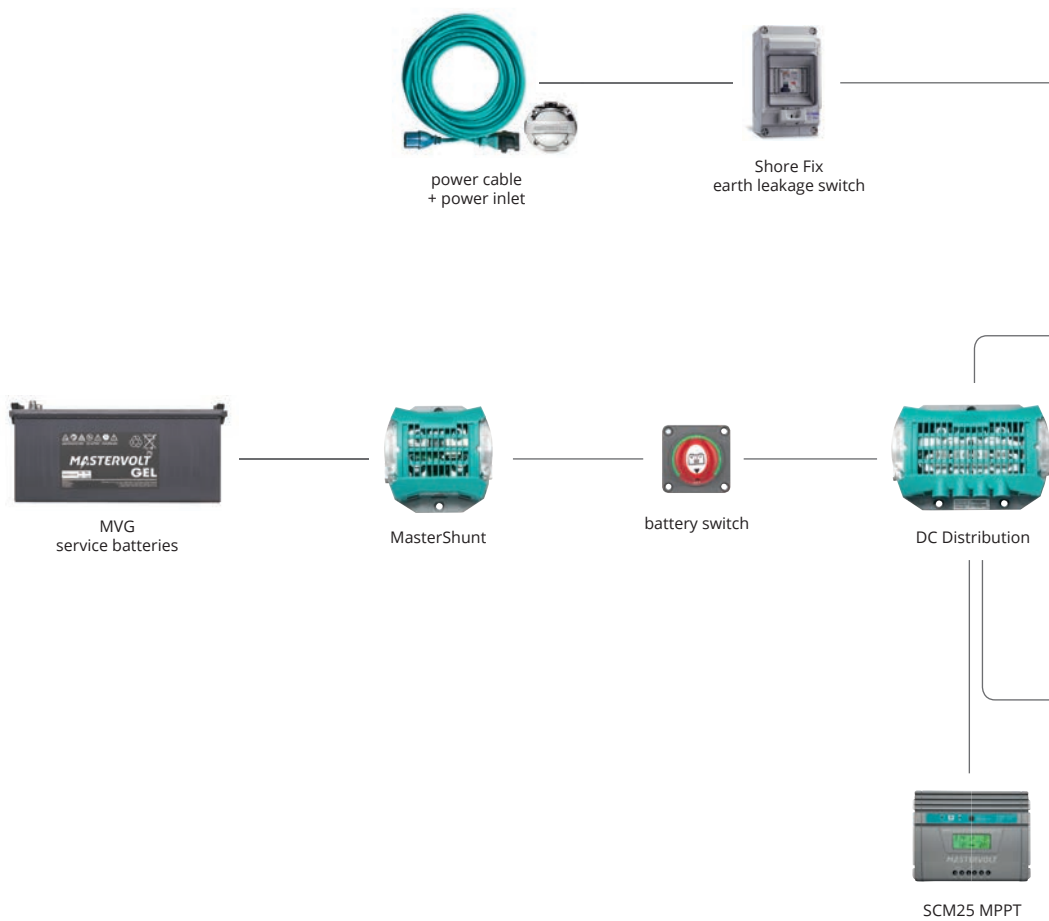


Other system components

- 1 x AGM 12/90 starter battery.
- 1 x ChargeMate 2502; charges two batteries while driving.
- 1 x SCM25 MPPT solar charge regulator; provides a pure charge current in all conditions while the 3-step charging method ensures a safe charging process and a longer lifespan for your batteries.
- 2 x Shore Fix, 16A/30mA earth leakage switches.
- 1 x power cable 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
7-9 metre motor home
Use
Longer weekend trips, two days independent from the grid
Details
Comfortable onboard facilities



Products used	
1 x MasterView Easy	1 x MasterShunt 500
1 x MasterBus USB Interface	2 x battery switch
1 x power cable, 16 A	2 x DC Distribution 500
1 x power inlet, 16 A	1 x ChargeMate 2502
2 x Shore Fix earth leakage switch	1 x SCM25 MPPT solar charge regulator
1 x Mass Combi 12/2200-100	1 x AGM 12/90 starter battery
3 x MVG 12/200 Ah service battery	



Complete comfort on the road



MasterView Easy



MasterBus
USB Interface



Mass Combi



Shore Fix
earth leakage switch



battery switch



DC Distribution



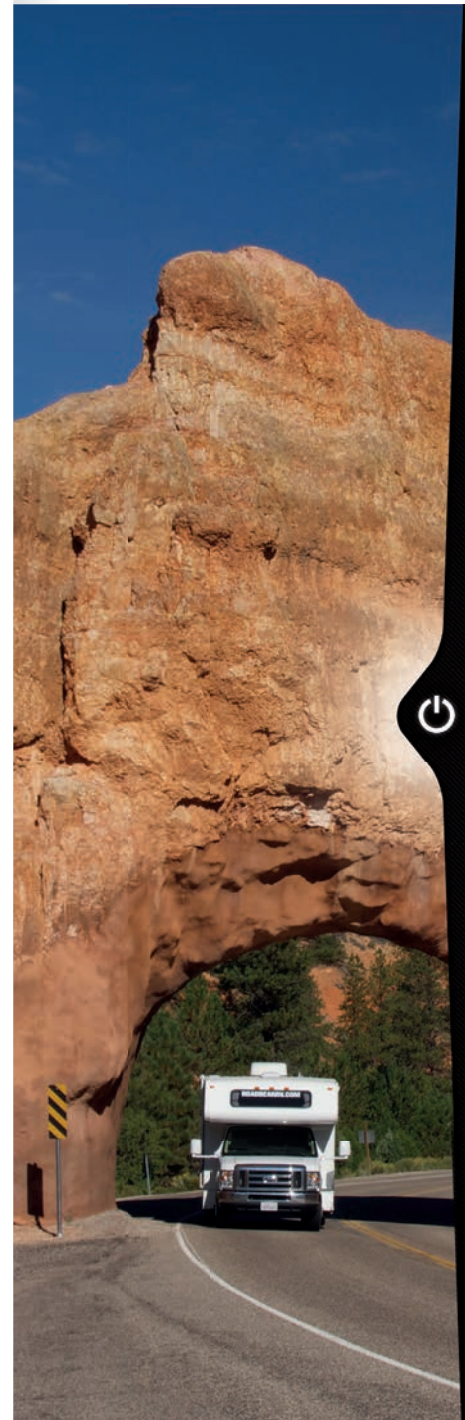
ChargeMate



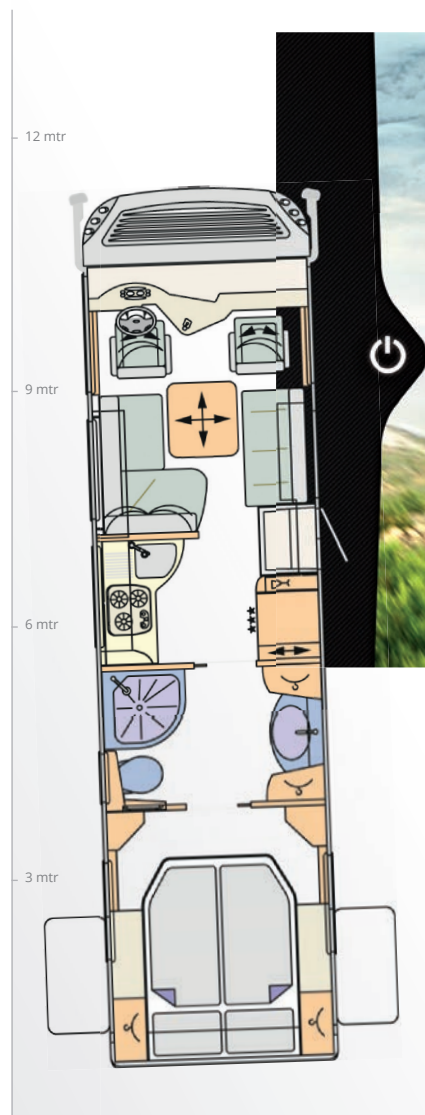
alternator



AGM
starter battery



Five-star luxury on the road



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	TOTAL X CAPACITY 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.

Application

Large motor home with all comforts

Use

Longer trips and extended periods without grid power

Details

Luxurious onboard facilities

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 $24 \times 75 = 1.8 \text{ kWh}$ 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 90 % discharge for Lithium Ion batteries, i.e. they should provide at least 13.3 kWh. Li-ion batteries can be 100 % discharged.

- A battery voltage of 24 V is selected to allow for smaller cable sizes.
- The required battery capacity is around 600 Ah.
- Three Lithium Ion batteries provide 625 Ah onboard.
- 3 x latching relay 500 A; mandatory safety relay.
- 3 x T-fuse holder plus 3 x T-fuse 225 A.

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

In this case, 625 Ah needs 15 % 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.

■ Monitoring: MasterView Easy

This touchscreen control panel is easy to read and operate. The grey button turns the display on or off or locks it, while all other functions can be controlled using the touchscreen.

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.

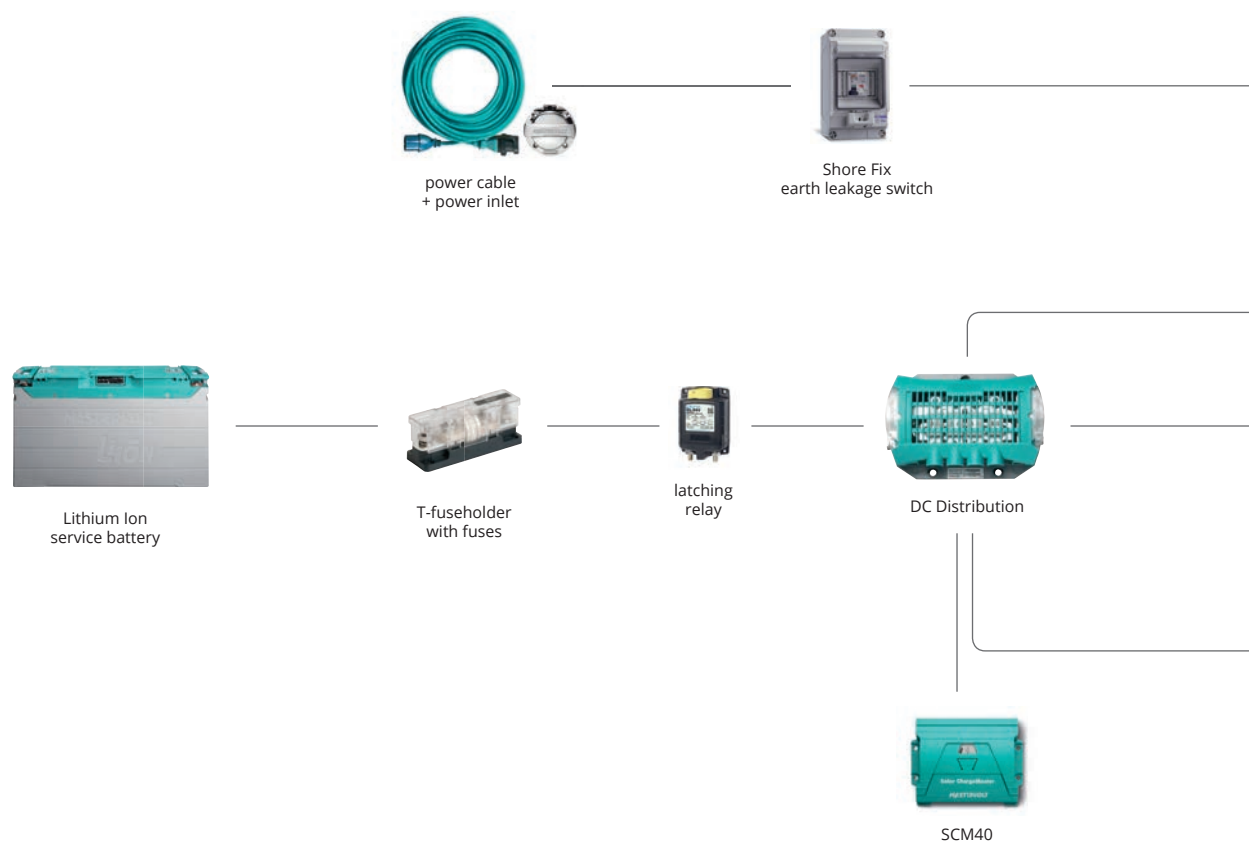
Other system components

- 1 x AGM 12/130 starter battery.
- 1 x SCM40 solar charge regulator; provides a pure charge current in all conditions while the 3-step charging method ensures a safe charging process and a longer lifespan for your batteries.
- 2 x Shore Fix, 16A/30mA earth leakage switches.
- 1 x power cable 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



Products used	
1 x MasterView Easy	3 x T-fuse holder + 3 x T-fuse 225 A
1 x MasterBus USB Interface	3 x latching relay 500 A
1 x power cable, 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 SCM40 solar charge regulator
3 x MLI Ultra 24/5000 Lithium Ion battery	1 x AGM 12/130 starter battery



Five-star luxury on the road



MasterView Easy



MasterBus
USB Interface



Mass Combi Ultra



Shore Fix
earth leakage switch



battery
switch



DC Distribution



Alpha alternator



battery
switch



alternator



AGM
starter battery



Providing global options and rich features for the trucking industry

A North American trucking company specialised in operating vehicles worldwide chooses Mastervolt for global power solutions. The integrated electrical system with tank monitoring provides added power and functionality, and a reduction in wiring.



The basics

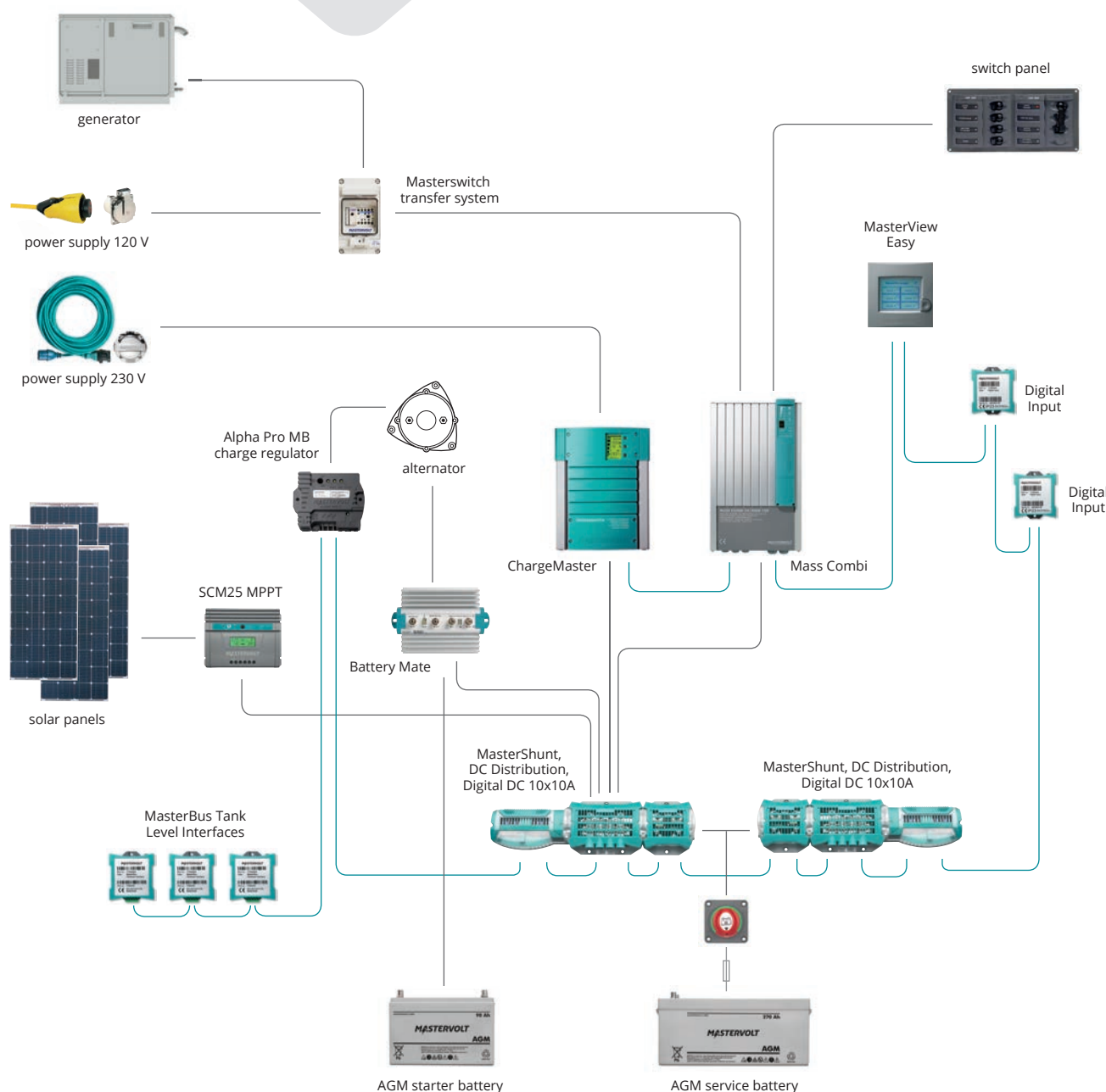
- Global power options.
- The alternator powers the inverter and runs the air conditioning during driving.
- Limitation of generator use.
- The Mass Combi inverter/charger provides 60 Hz at all times.
- The second battery charger manages 50 Hz power.
- The Digital DC 10x10A reduces wiring and adds functionality.
- Dimmers are eliminated.
- 12 V, 120 V AC system.



System choice

- 1 x 120V/30A EEL power cordset.
- 1 x 230V/16A power cordset.
- 1 x 120V/30A inlet.
- 1 x 230V/16A inlet.
- 1 x MasterSwitch 7 kW.
- 1 x MasterView Easy.
- 1 x Alpha Pro MB charge regulator.
- 1 x ChargeMaster 12/100-3.
- 1 x Mass Combi 12/2200-100.
- 2 x Digital Input.
- 1 x SCM25 MPPT solar charge regulator.
- 1 x Battery Mate, 250 A voltage drop free battery isolator.
- 3 x Tank Level Interface.
- 2 x MasterShunt 500, digital battery monitor.
- 2 x DC Distribution 500.
- 2 x Digital DC 10x10A.
- 3 x AGM 12/90 starter battery.
- 4 x AGM 12/270 service battery.

System drawing



The Volvo Ocean Race power system



Courtesy of Ainhoa Sanchez / Volvo Ocean Race.

At Mastervolt, we couldn't be more excited about supporting the 2014-2015 edition of the world-famous Volvo Ocean Race with our power products and systems.



The tailor-made power system that Mastervolt developed for the seven participating boats in the 2014-2015 Volvo Ocean Race is advanced to say the least. It is designed to run the normal range of electrical equipment onboard, as well as the very latest and most sophisticated communication and media equipment on the market.

This helped organisers track and analyse the fleet's position and sailing conditions throughout the offshore legs from the race control headquarters in Alicante. Thanks to the latest video, satellite and multimedia content production technology employed by each team's On Board Reporter, the public could follow the boats over nearly 40,000 nautical miles of relentless ocean racing. And it was all powered. Powered by Mastervolt.

One design

The latest edition of the Volvo Ocean Race was totally different from earlier years as it now featured new one-design, 65-foot long, high-performance yachts, all equipped with the latest communication, safety and power technology – power technology by Mastervolt, to be precise. With our broad experience in the harsh marine environment, both leisure and commercial, we feel very much at home in this ultra-challenging environment.



Energy consumption

DESCRIPTION	POWER	TOTAL X CAPACITY 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
	20 % lifespan correction (80 % DOD)		= 1.418 kWh
			= 8.508 kWh

The total of DC consumers requires around 7.1 kWh. Totally discharging the batteries is not advisable so opt for a maximum of 80 % discharge, i.e. at least 8.5 kWh. In this case we chose for two MLI Ultra 24/5000 batteries in parallel, resulting in 10 kWh battery power.

QUOTE

"The Power management side of things aboard a Volvo Ocean 65 was always going to be hard to manage due to the technicality of a Volvo Ocean 65 as well as being one of the harshest environments in the world for this sort of application. Without a doubt, the complete Mastervolt set up including the CZone system were both extremely reliable and dealt with anything a Volvo Ocean 65 could throw at it. Not only did the products perform beyond anyone's expectations, the support as part of The Boatyard and throughout the race (24hr support) from the Mastervolt team was the most professional I have seen in 5 editions of this race."

NICK BICE, HEAD OF THE BOATYARD,
VOLVO OCEAN RACE, SPAIN

System choice

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

1 MasterBus section, including:

- 2 x Lithium Ion Ultra battery.
- 2 x 24/150 A alternator.
- 2 x Alpha Pro MB charge regulator.
- 2 x Magic DC-DC converter 24/12-20.
- 1 x MasterBus USB Interface.
- 2 x 500 A latching relay.
- 1 x DC Distribution 500.
- 1 x MasterShunt 500.

2 CZone section, including:

- 1 x CZone MasterBus Bridge Interface.
- 1 x 3.5" Display Interface.
- 6 x Output Interface.
- 2 x Signal Interface.
- 1 x Meter Interface.

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 3.5" Display 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.



Courtesy of Ian Roman/Volvo Ocean Race.



Specifications

- The seven participating boats are each powered by two Mastervolt Ultra 24/5000 Lithium Ion batteries, giving a total battery power of 10 kWh.
- The batteries have a single primary source of charging via two 24/150 A Mastervolt alternators, regulated by two Alpha Pro MB charge regulators, which can fully charge the Li-ion batteries in one hour.
- Each boat has 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 Display Interface, and the B&G Zeus 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.

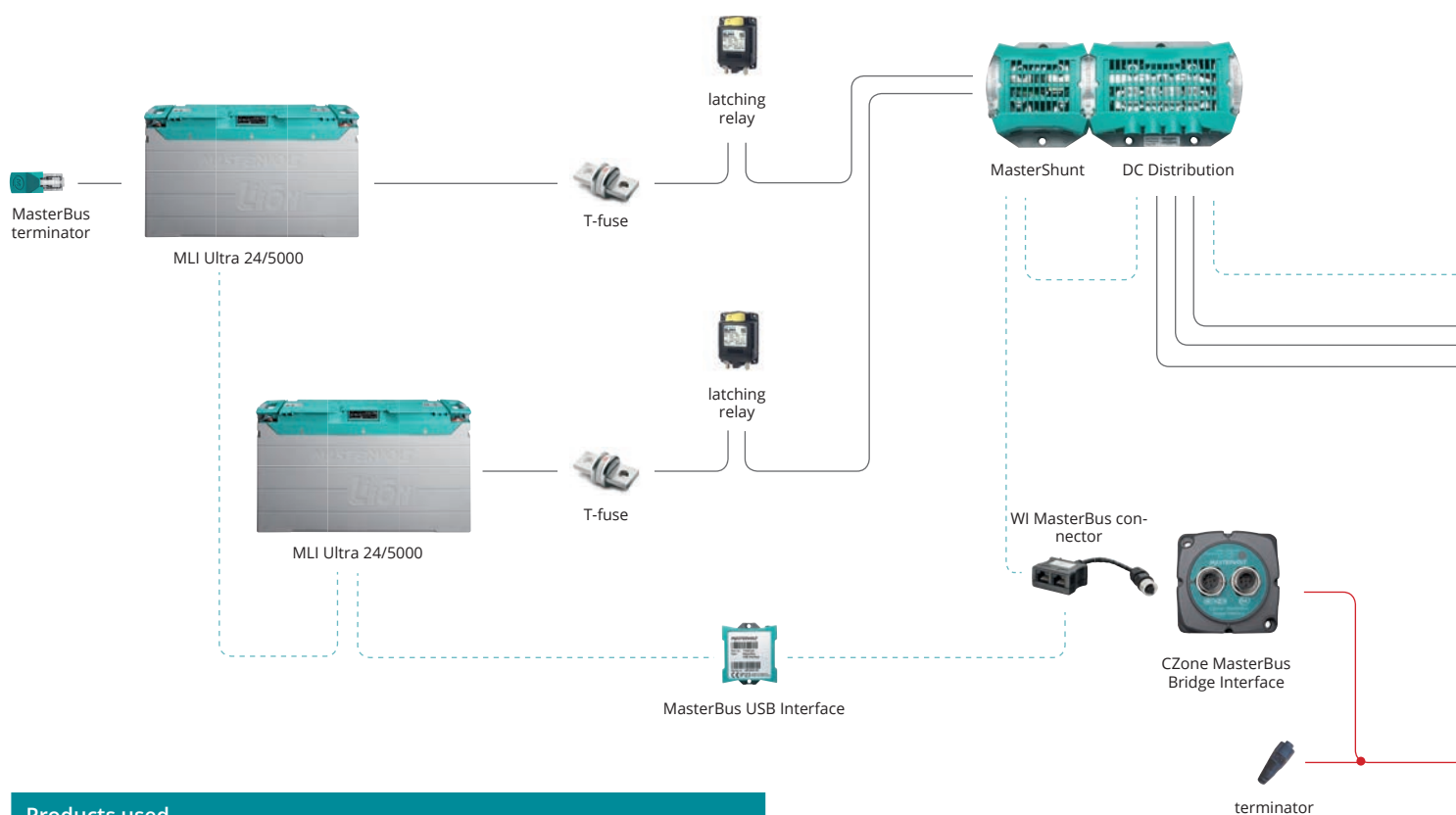


Courtesy of Alinhao Sanchez / Volvo Ocean Race.

This edition's Volvo Ocean Race is won by the Abu Dhabi Ocean Racing team. But as all boats are equipped with a Mastervolt electrical system we truly feel a winner as well.

Especially since none of the boats have had severe electrical problems, not even in the wildest weather conditions or going through whatever temperature changes. This confirms and supports our company objective for the market: developing and producing the most innovative and reliable products in the world.

System drawing

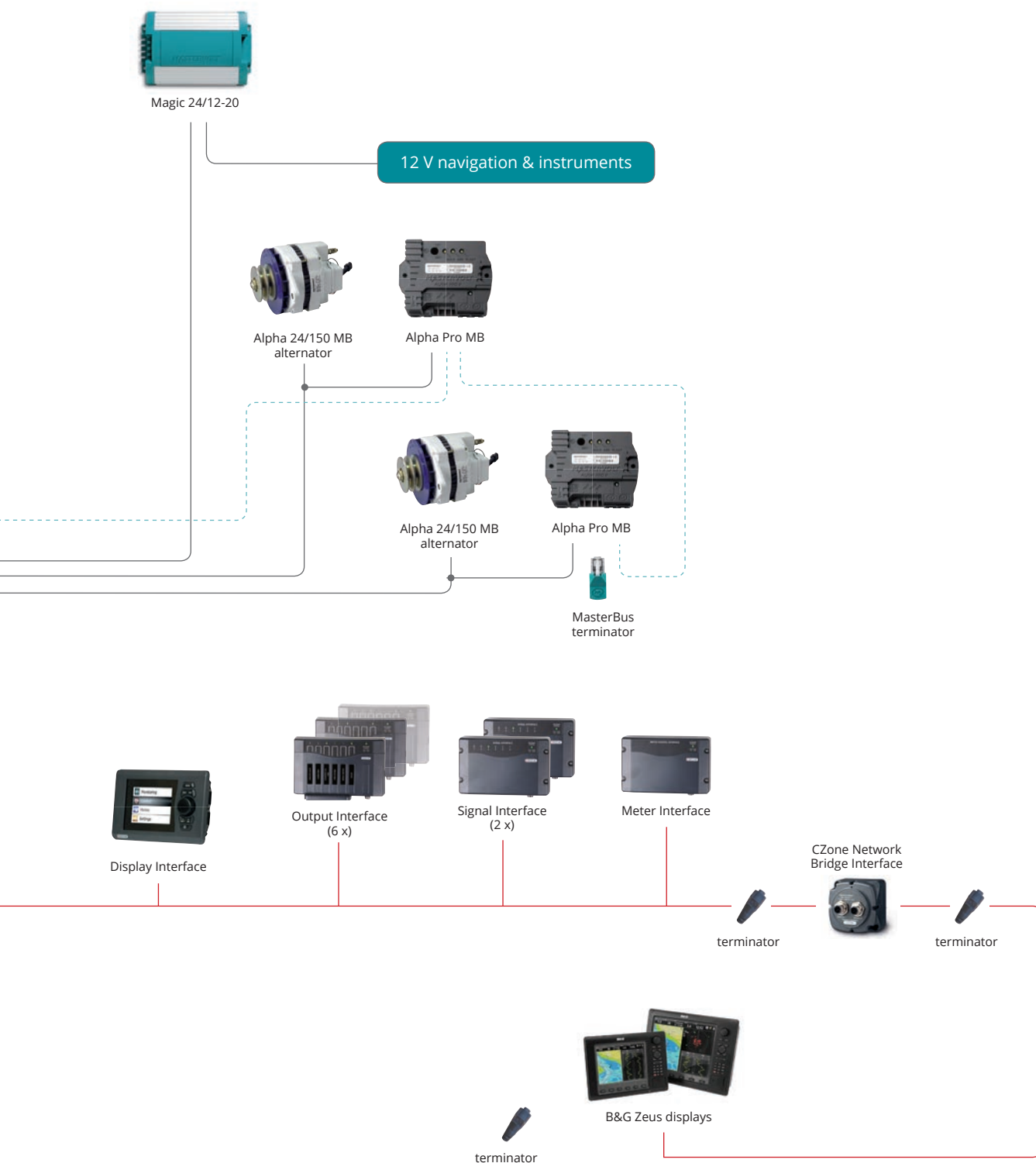


Products used

2 x Li-Ion Ultra battery (in parallel)	1 x Magic 24/12-20 DC-DC converter
2 x T-fuse	2 x 24/150 A alternator
2 x latching relay 500 A	2 x Alpha Pro MB charge regulator
1 x MasterShunt 500	1 x 3.5" Display Interface
1 x DC Distribution 500	6 x Output Interface
1 x MasterBus USB Interface	2 x Signal Interface
1 x WI MasterBus connector	1 x Meter Interface
1 x CZone MasterBus Bridge Interface	1 x CZone Network Bridge Interface



Volvo Ocean Race power system



The Wissinger system

Independence and comfort around the world

Keen to travel the world using his own means of transportation, in 2013 Michael Wissinger asked premium custom builder Bischoff+Scheck to build him a vehicle which would use Mastervolt's autonomous power products for the onboard energy consumption.

The resulting truck combines the ruggedness required to drive in all road conditions with the home-from-home comforts needed to enjoy travelling for up to a year. Long periods of electrical autonomy are critical to such a high degree of comfort, especially when travelling to places where grid connections are rarely available.

Providing peace of mind for Michael during even the biggest adventures, the Mastervolt system:

- Powers all onboard (DC and AC) appliances fully autonomously on batteries.
- Is able to charge the batteries from the truck's engine while driving as well as via solar power.
- Offers autonomy of up to one week of sunny days, without driving (and thus charging the batteries) in between.



QUOTE

"Having Mastervolt's Lithium Ion batteries and system onboard gives me a comfortable feeling on the road. I know that wherever in the world 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



Energy consumption

DESCRIPTION	NUMBER	AVG. POWER	HOURS/DAY	DAILY CONSUMPTION
AC consumers				
Washing machine	1	300 W	0.5 hr	0.150 kWh
Refrigerator & freezer	1	30 W	24 hr	0.720 kWh
Electric cooking	1	1200 W	1 hr	1.200 kWh
Electric oven	1	900 W		
Water heater/heating system	1	400 W	0.5 hr	0.200 kWh
Television	1	150 W	1 hr	0.150 kWh
Lights	15	10 W	4 hr	0.600 kWh
Hair dryer	1	2000 W	0.25 hr	0.500 kWh
Air conditioning	1	1000 W	1.5 hr	1.500 kWh
Total AC consumers				= 5.020 kWh
Sources				
Main truck engine (through alternator)	1	3000 W	1 hr	3.000 kWh
Solar panels	4	100 W	8 hr	3.200 kWh
Grid connection	1	3500 W		
Total sources				= 6.200 kWh

System choice

The requirement for this vehicle is to have autonomy for one week of sunny days. With an average daily onboard energy consumption of 5 kWh and about 3 kWh of solar energy generation on a sunny day, this means that 7 times $5 - 3 = 2$ kWh, or 14 kWh is required. This can be achieved by using three MLI Ultra 24/5000 batteries bringing a total capacity of 15 kWh. With Lithium Ion batteries the actual capacity can be almost fully (80 %) used on every discharge cycle without compromising cycle life, which is why there is no need to install surplus capacity. On completely cloudy days, the same set will deliver autonomous power for almost three days without having to run the engine.

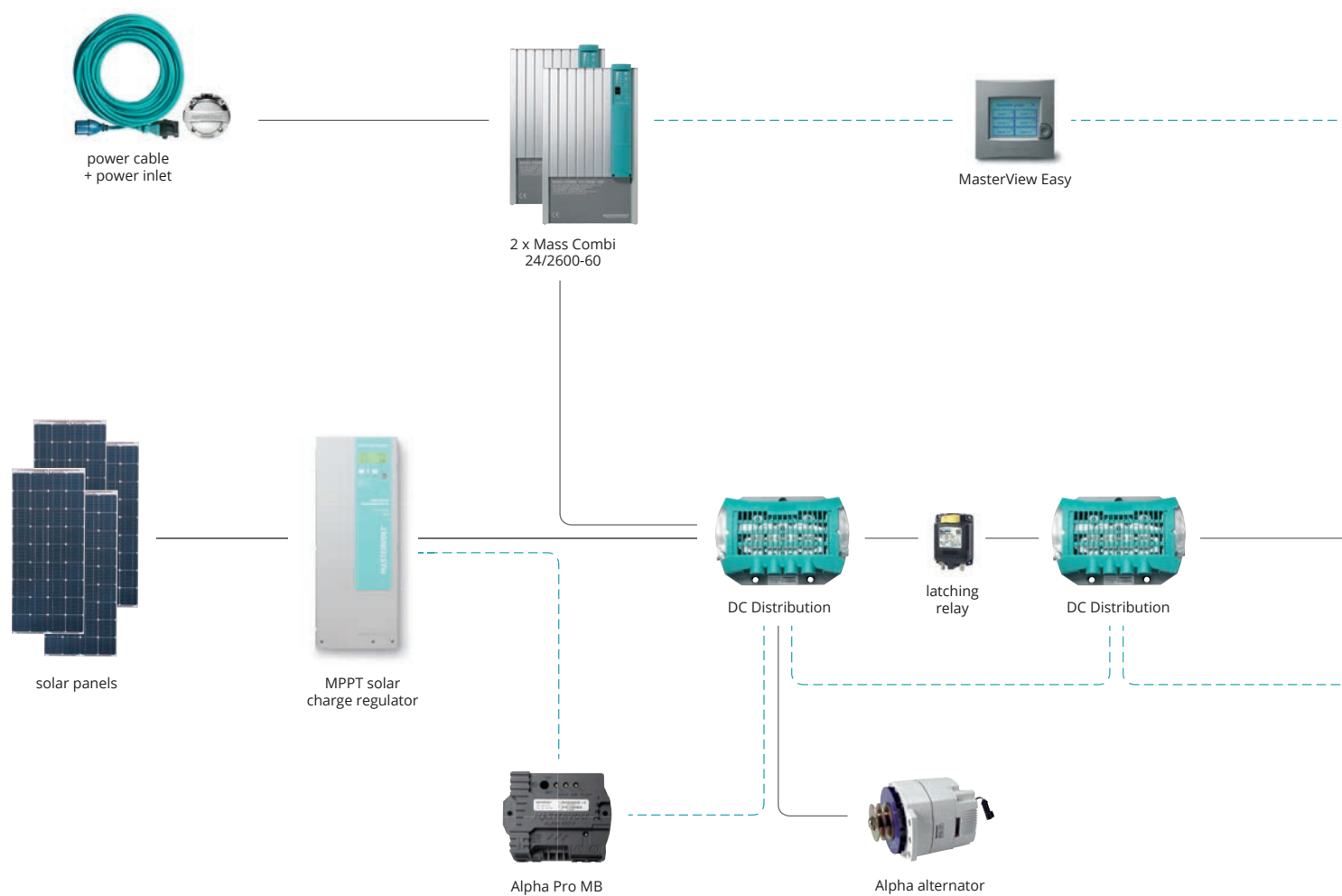
Almost all major appliances onboard are AC appliances, requiring the use of an inverter. To supply a combination of loads simultaneously the choice was made to install two Mass Combi 24/2600-60s with a combined inverter output of 5000 W.

Using a combined inverter/charger product automatically added the functionality of charging on a plug. The two main energy sources are an alternator on the truck's engine and four solar panels on the roof. To properly charge the Lithium Ion battery, an Alpha Pro MB charge regulator is used for the alternator. Mastervolt did not have the MPPT solar charge regulators it currently has in its portfolio at the time this vehicle was built – these would now be the choice for connecting the solar panels as well.

System components

- 3 x MLI Ultra 24/5000 Lithium Ion battery.
- 2 x Mass Combi 24/2600-60.
- 2 x DC Distribution 500.
- 1 x latching relay 500 A.
- 1 x Alpha Pro MB charge regulator.
- 1 x Alpha 24/150 alternator.
- 1 x MasterView Easy remote control.
- 1 x power cable 16 A.
- 1 x power inlet 16A/230V.

System drawing



Products used

1 x power cable, 16 A	1 x latching relay 500 A
1 x power inlet, 16 A	3 x MLI Ultra 24/5000 Li-ion battery
2 x Mass Combi 24/2600-60	1 x Alpha Pro MB charge regulator
1 x MasterView Easy	1 x Alpha 24/150 alternator
2 x DC Distribution 500	

—— 24 V DC
 - - - - MasterBus network



Wissinger system



3 x MLI Ultra 24/5000



The FLiDAR system

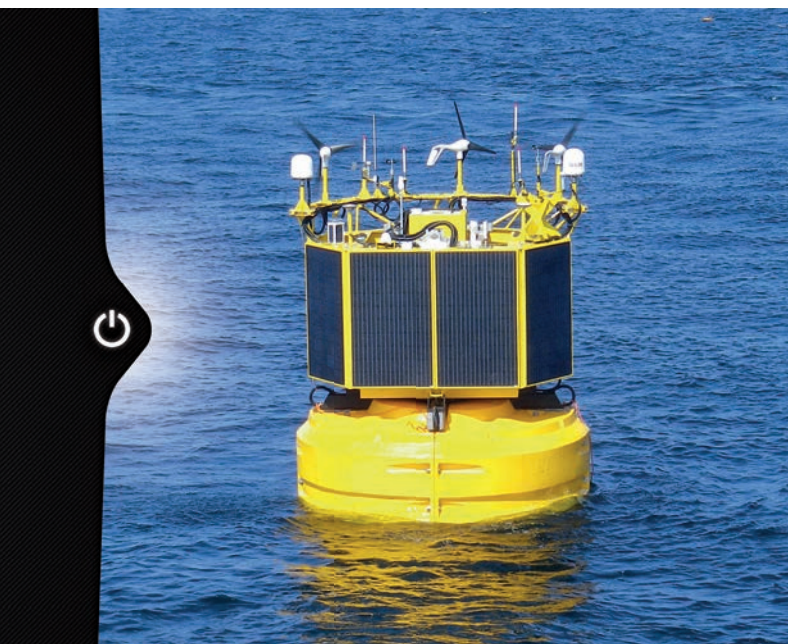
Measuring the power of the sea with Navex Elektro Belgium

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 latching relays controlled by Multipurpose Contact Output interfaces. This can all be done remotely by the integration of a GPRS module in the MasterBus system.

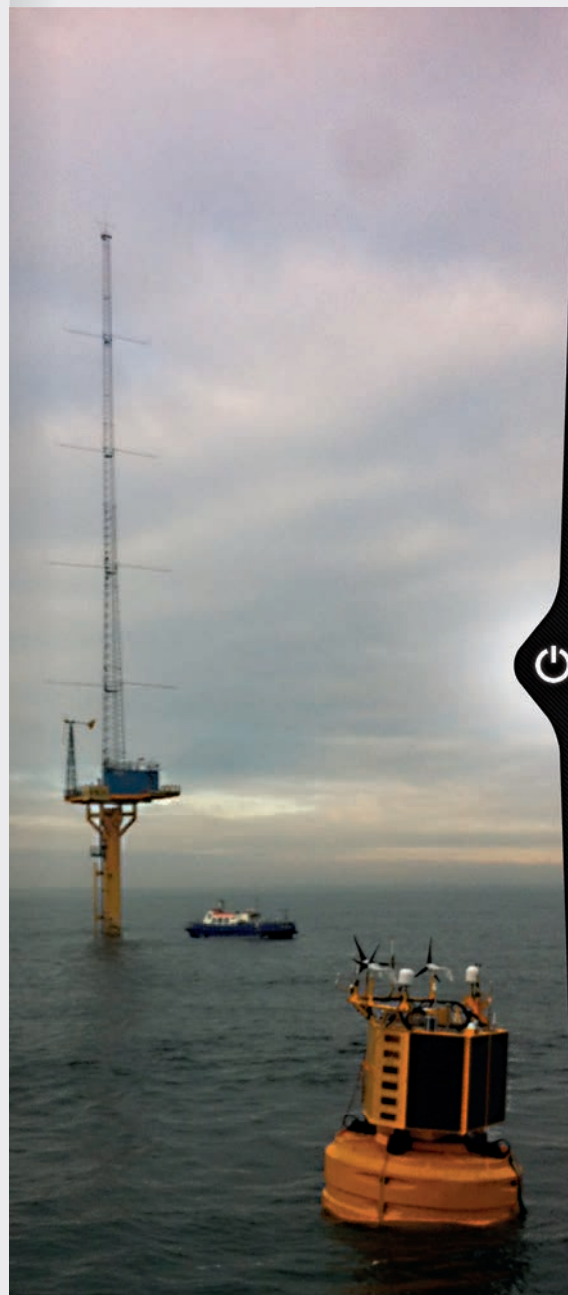
- 2 x MasterShunt 500
- 2 x DC Distribution 500
- 8 x Digital DC 10x10A
- 20 x MasterBus Tank Level Interface
- 1 x Digital Input
- 1 x GPRS Module
- 4 x Multipurpose Contact Output

■ 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

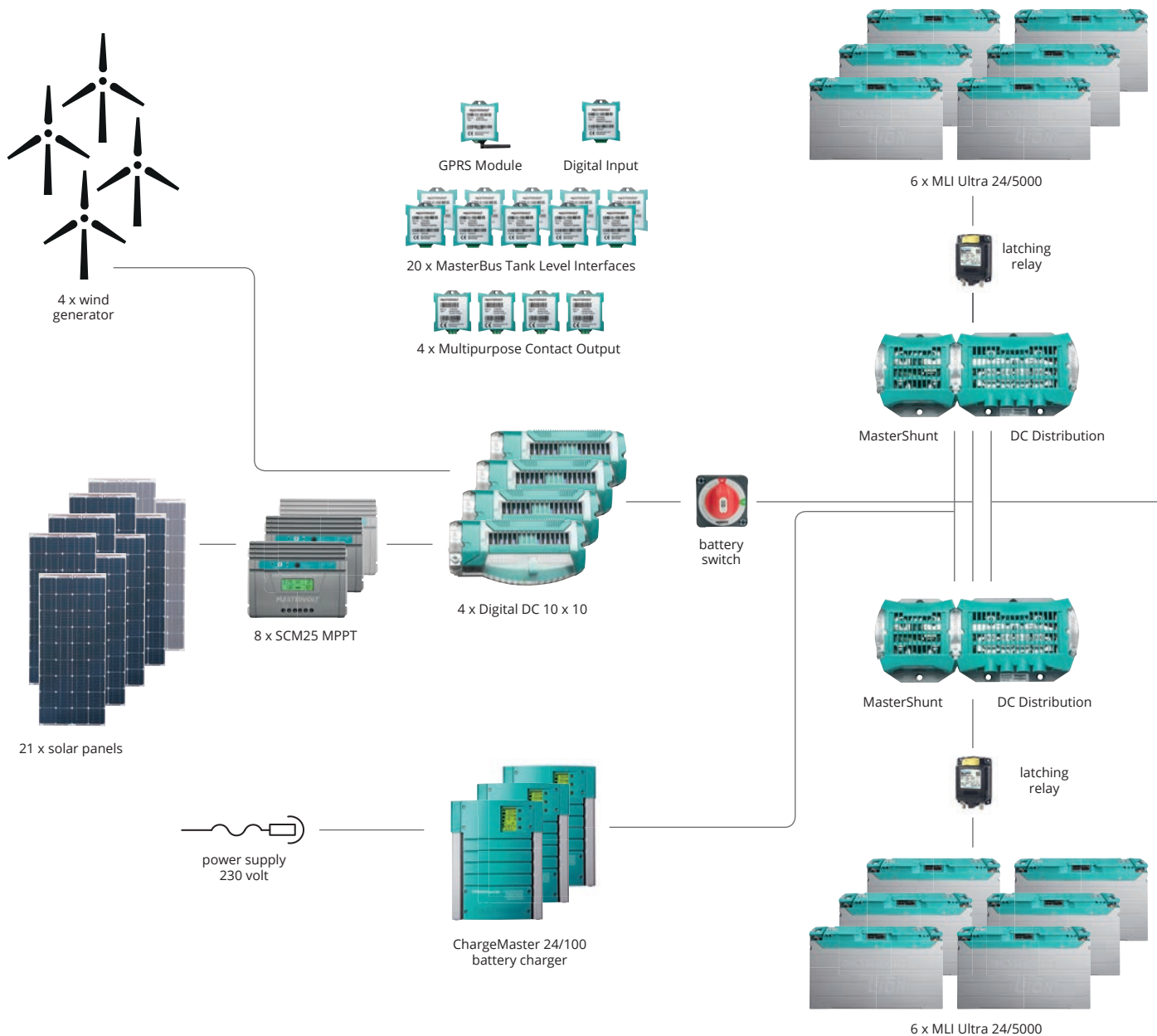
The buoy can be plugged into the grid when not at sea, charging the MLI Ultra batteries through a set of ChargeMaster battery chargers.



Other system components

- 8 x SCM25 MPPT solar charge regulator; to efficiently charge the Lithium Ion batteries via the solar panels.
- 14 x latching relay 500 A
- 2 x Pro Installer 400A EZ-Mount on/off battery switch

System drawing

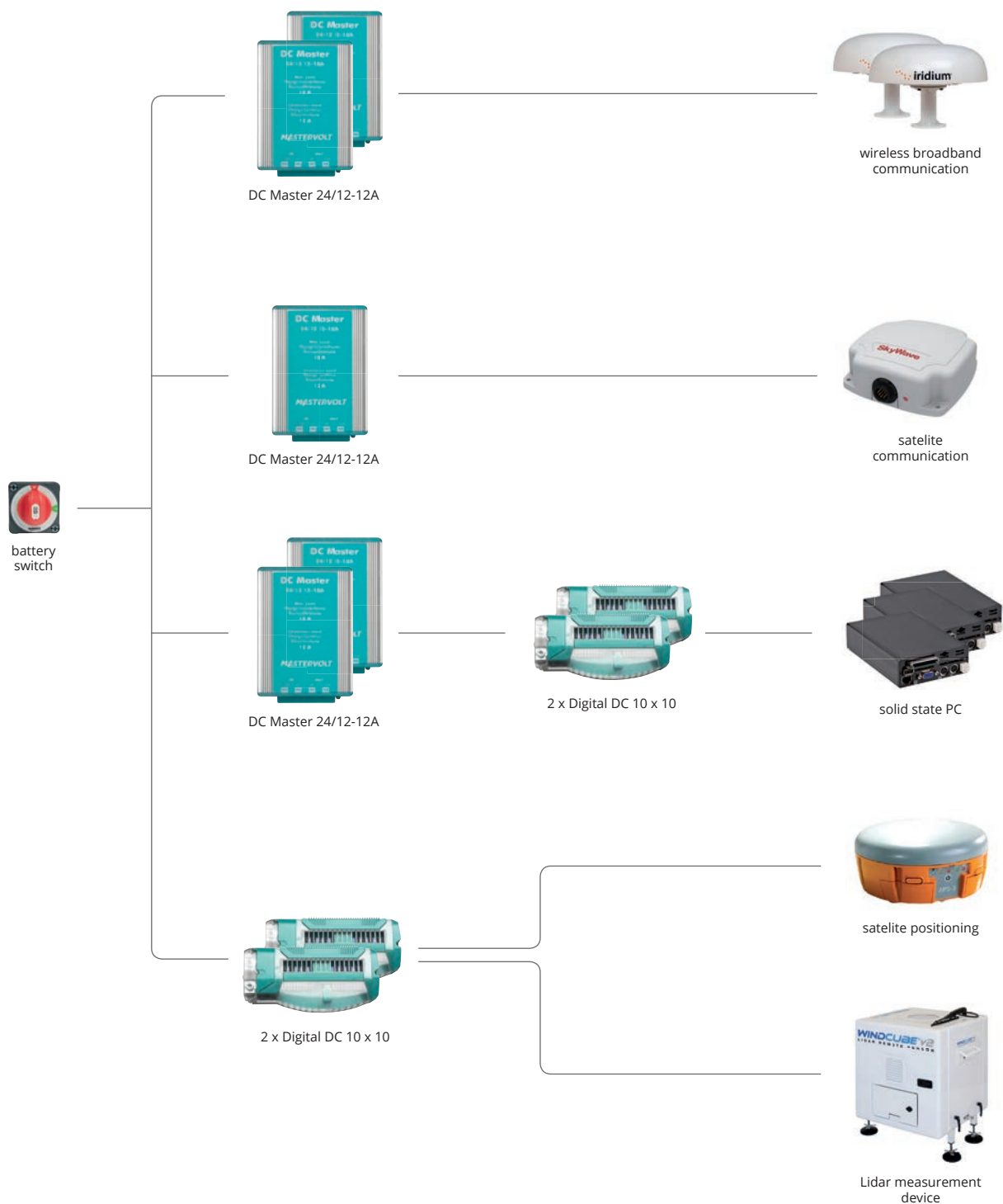


Products used

1 x GPRS Module	14 x latching 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



The Korvet system

Superyacht functionality within reach

CANbus networks are increasingly used in the maritime market, offering easier operation and greater comfort for end users. The Korvet 14 CLR from Deep Water Yachts was specifically equipped with the intelligent Mastervolt CANbus technology (both MasterBus and CZone), allowing important data such as the contents of the water tanks and charge status of the service batteries to be monitored at a glance and the associated alarms to be set for every level. The system is also equipped with a GPRS Module for communication via mobile phone (such as text messaging when a battery is running low). Thanks to the integration with leading navigation partners, it is also possible to monitor and control from the navigation displays.

By combining the various activities in one mode, the system can be adjusted to the desired setting in one easy action; for example 'mode off' if you do not plan to use your yacht for a longer time period. This command switches off all loads, including the inverter element of the Mass Combi Ultra, and automatically brings the electric battery switches to the right position. It is also possible to configure the deck lighting so it is dimmed when you leave your yacht.

It is now much easier to set the yacht to 'night sailing' or 'relax' mode. Moreover, Mastervolt digital switching also gives full control over your yacht with only a few switches.





The basics

- Navigating, monitoring system data and the control of power electronics via a single display.
- Digital switching and monitoring of relevant system data via iPad.
- A battery charger, inverter and AC transfer system are combined in one casing to save space.
- The maximum shore power per port may vary between 4 A to 16 A. A simple and automatic control via the power electronics required to ensure the shore fuses do not blow when more power is consumed.
- Availability of relevant system data via mobile phone.
- 24 V battery capacity for larger loads.



Energy consumption

DESCRIPTION	POWER	TOTAL X CAPACITY X HOUR	
Daily AC consumers (only shore or generator)			
Air-conditioning (> 6 kBTU) incl. pumps and fan coils	3000 W	n.a. (only shore or generator)	
Washing machine	1500 W		
Boiler	1000 W		
Mass Combi charger part	3600 W		
Generator load	9100 W		
Total generator load x 60 % simultaneity factor	5460 W		
Total inverter load x 60 % simultaneity factor	1746 W		
Required generator power (= generator load + inverter load)	7206 W		
DESCRIPTION	POWER	TOTAL X CAPACITY X HOUR	DAILY CONSUMPTION
Daily AC consumers (on inverter)			
Coffee machine	1200 W	1 x 1200 watt x 30 minutes	0.600 kWh
LED television	100 W	1 x 100 watt x 3 hours	0.300 kWh
Laptop	30 W	1 x 30 watt x 2 hours	0.060 kWh
Phone/tablet charger	20 W	1 x 20 watt x 3 hours	0.060 kWh
Microwave	1500 W	1 x 1500 watt x 15 minutes	0.375 kWh
Router	10 W	1 x 10 watt x 24 hours	0.240 kWh
Refrigerator	50 W	1 x 50 watt x 12 hours	0.600 kWh
Daily DC consumers			
Spotlight	100 W	1 x 100 watt x 15 minutes	0.025 kWh
Navigation lights	100 W	1 x 100 watt x 4 hours	0.400 kWh
Navigation electronics	60 W	1 x 60 watt x 24 hours	1.440 kWh
Navigation displays	50 W	1 x 50 watt x 24 hours	1.200 kWh
Interior lighting	150 W	1 x 150 watt x 4 hours	0.600 kWh
Total AC and DC consumers			= 5.900 kWh
		20 % temperature correction	1.18 kWh
		20 % lifespan correction	1.18 kWh
			= 8.260 kWh



QUOTE

"It is great to be able to control and monitor the system, pumps and lighting from a single iPad and the navigation displays. The seamless integration of Mastervolt power electronics with the CZone digital switching system is truly unique. It adds the kind of new dimension to boating that I thought would only be possible on superyachts..."

**PETER J. BOST, MANAGING DIRECTOR
DEEP WATER YACHTS, THE NETHERLANDS**



System choice

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

The Mass Combi Ultra is a 100 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, batteries and solar panels. It automatically controls and distributes power, seamlessly passing on the available sources. As a result, batteries are always sufficiently charged and there is a stable AC voltage for the use of electrical equipment onboard. This all-in-one solution provides optimal ease of installation and comfort.

■ **Batteries : 4 x MVG 12/200 (24V/400Ah)**

This system comprises four series/parallel switched 12 V 200 Ah batteries that create a 24 V battery voltage. The AC and DC loads require a total of 5.9 kWh. Multiplied by a temperature correction of 20 % and a lifespan correction of 20 %, this results in a total consumption of 8.26 kWh, divided by 24 V = 344 Ah. This means that a battery capacity of 400 Ah is required. The service battery in this system functions cyclically (regular 50 % charge/discharge) and therefore uses gel technology. Gel batteries are completely maintenance-free and ideal for cyclic applications such as service batteries.

■ **Monitoring: MasterView Easy**

This touchscreen control panel is easy to read and operate. The grey button turns the display on or off or locks it, while all other functions can be controlled using the touchscreen.

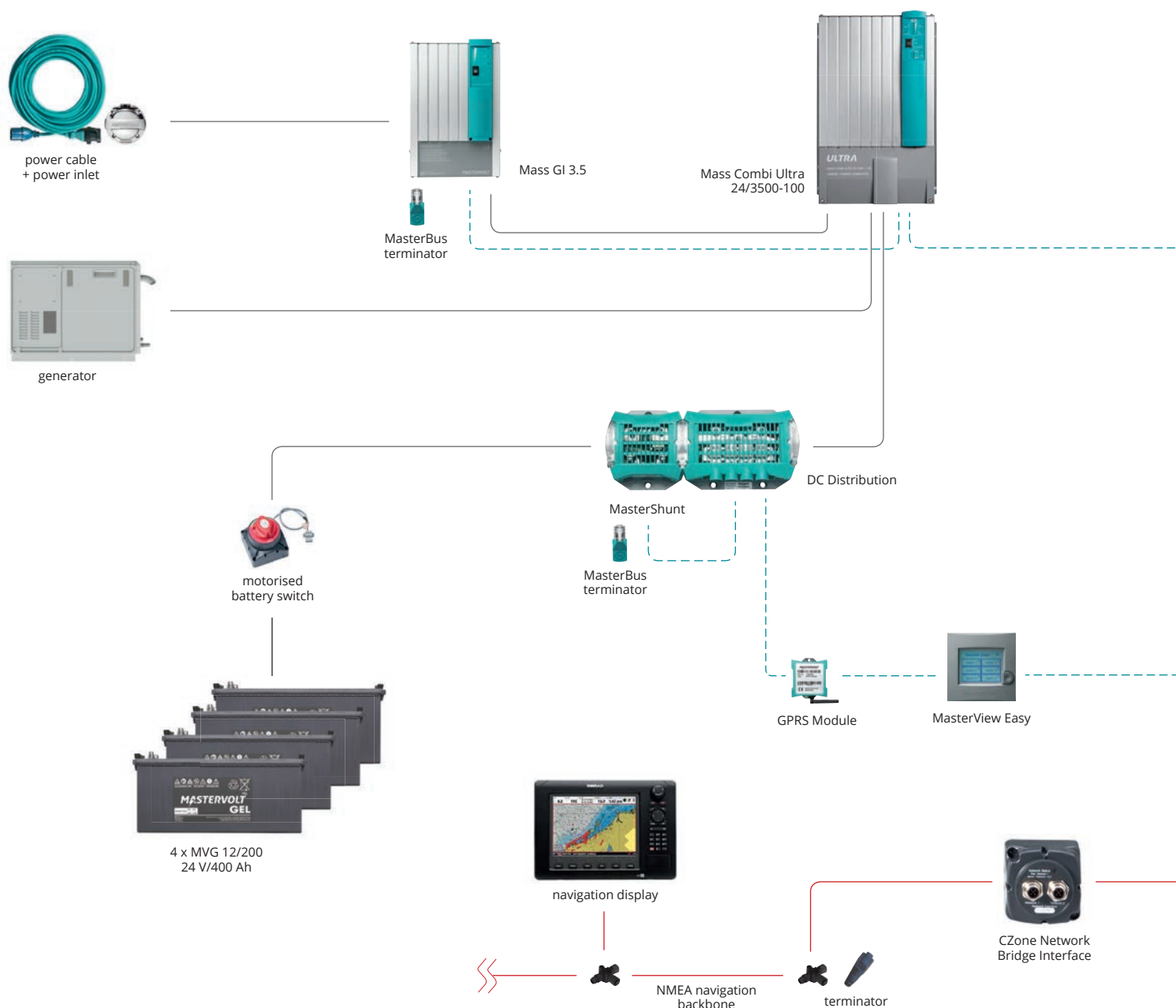
■ **Wireless Interface + WI MasterBus connector**

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

- 7 kW generator.
- 1 x 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 motorised battery switch.
- 1 x MasterShunt 500; MasterBus integrated battery monitor, with detailed information on the status of your batteries.
- 1 x DC Distribution 500; connects up to four DC devices to the DC groups.
- 1 x Signal Interface.
- 9 x Output Interfaces.
- 4 x Switch Control Interfaces.
- 1 x GPRS Module.
- 1 x CZone Network Bridge Interface; for isolating sections of a NMEA 2000 network to decrease standby current draw.
- 1 x NMEA 2000 power cable.
- 1 x power cable 16 A, 25 mtr.
- 1 x power inlet 2+PE, 16A/230V.

System drawing

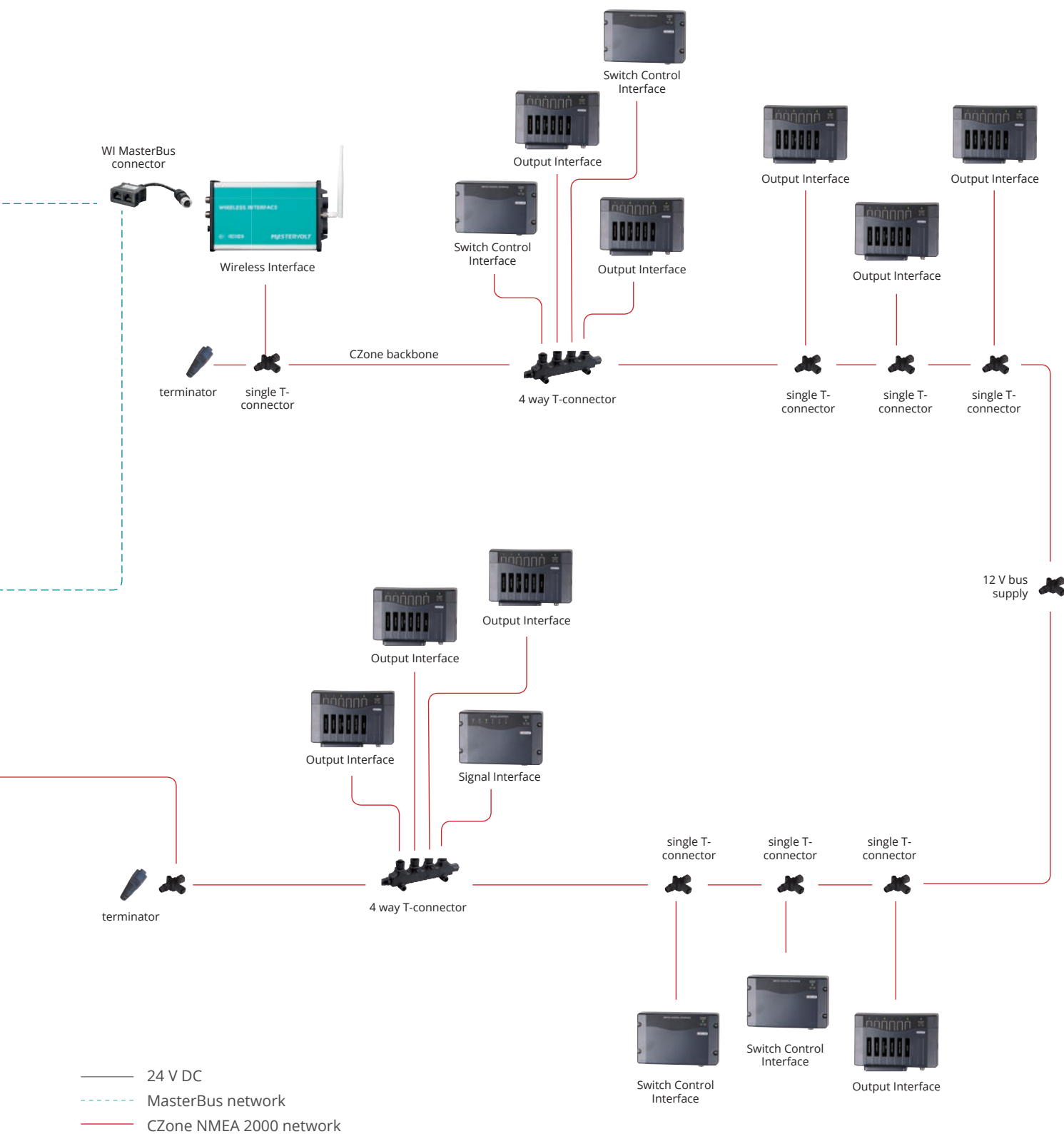


Products used

1 x power cable, 16 A	4 x Switch Control Interface	1 x MasterShunt 500
1 x power inlet, 16 A	9 x Output Interface	1 x 7 kW generator
1 x Mass GI 3.5	1 x Signal Interface	1 x motorised battery switch
1 x Mass Combi Ultra 24/3500-100	1 x MasterView Easy	4 x MVG 200 (24V/400Ah)
1 x WI MasterBus connector	1 x GPRS Module	1 x CZone Network Bridge Interface
1 x Wireless Interface	1 x DC Distribution 500	1 x NMEA 2000 power cable



Korvet system



Independence from the grid thanks to The Sun Factory (NL)

Having the ability to store energy in your house allows you to be more independent from the electrical grid, both financially and in terms of security and/or comfort.

In national park de Oude Venen, various remote cottages are provided with an off grid system. The generated solar energy is stored in two Lithium Ion batteries via a MPPT solar charge regulator. The 5 kW Mastervolt inverter delivers a pure 230 V sine wave, enabling you to use all appliances as usual. The entire off grid system can be monitored remotely by means of a WiFi module.



Energy consumption

DESCRIPTION	NUMBER	AVG. POWER	HOURS/DAY	DAILY CONSUMPTION
AC consumers				
Kitchen consumers	2	1200 W	1	= 2.400 kWh
LED television	1	80 W	4	= 0.320 kWh
Laptop	1	20 W	6	= 0.120 kWh
Refrigerator	1	80 W	12	= 0.960 kWh
Washing machine	1	1800 W	1	= 1.800 kWh
Interior lighting	8	7 W	6	= 0.360 kWh
Total AC consumers				= 5.96 kWh
Sources				
Solar panels	12	2200 Wp	6	= 7.900 kWh
Wind energy	1	750 Wp	1.5	= 1.100 kWh
Total sources				= 9 kWh

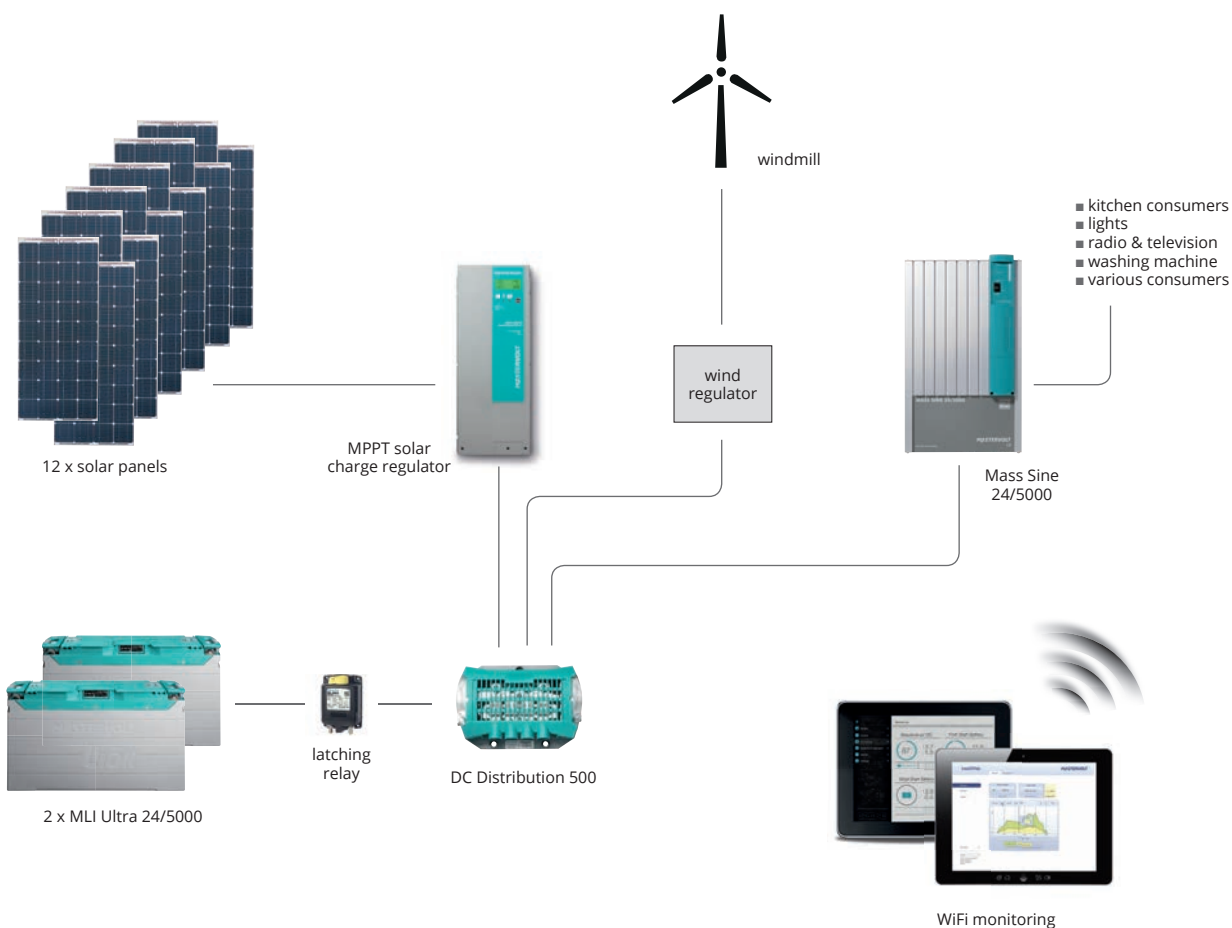


System choice

- 1 x MPPT solar charge regulator.
- 1 x Mass Sine 24/5000 inverter.
- 2 x MLI Ultra 24/5000 Lithium Ion batteries.
- 1 x DC Distribution 500.
- 1 x WiFi monitoring.



System drawing



Industrial 3-phase solution



In these environmentally aware times, greener solutions for industrial applications are becoming a necessity. A hybrid generator solution is the kind of application that will offer the best of both worlds. The generator works perfectly together with Mastervolt's Mass Combi Ultra charger/inverter and the MLI Ultra Lithium Ion battery. This solution will offer fuel savings, more flexibility and higher reliability.

More specifically, the advantages range from the possibility to run silently when an operator chooses to and having the comfort of a backup power system to save fuel by limiting generator running hours. The system is managed through Mastervolt's intelligent MasterBus system. When the battery pack reaches a minimum state of charge, the generator starts to run. It then both powers the system and charges the MLI Ultra batteries up to 100 %, to be ready for its next cycle. The MLI Ultra in combination with the Mass Combi Ultra is an ideal solution for managing power with a minimal amount of components. System solutions range from 3 kWh single phase up to 30 kWh 3-phase.

Energy consumption

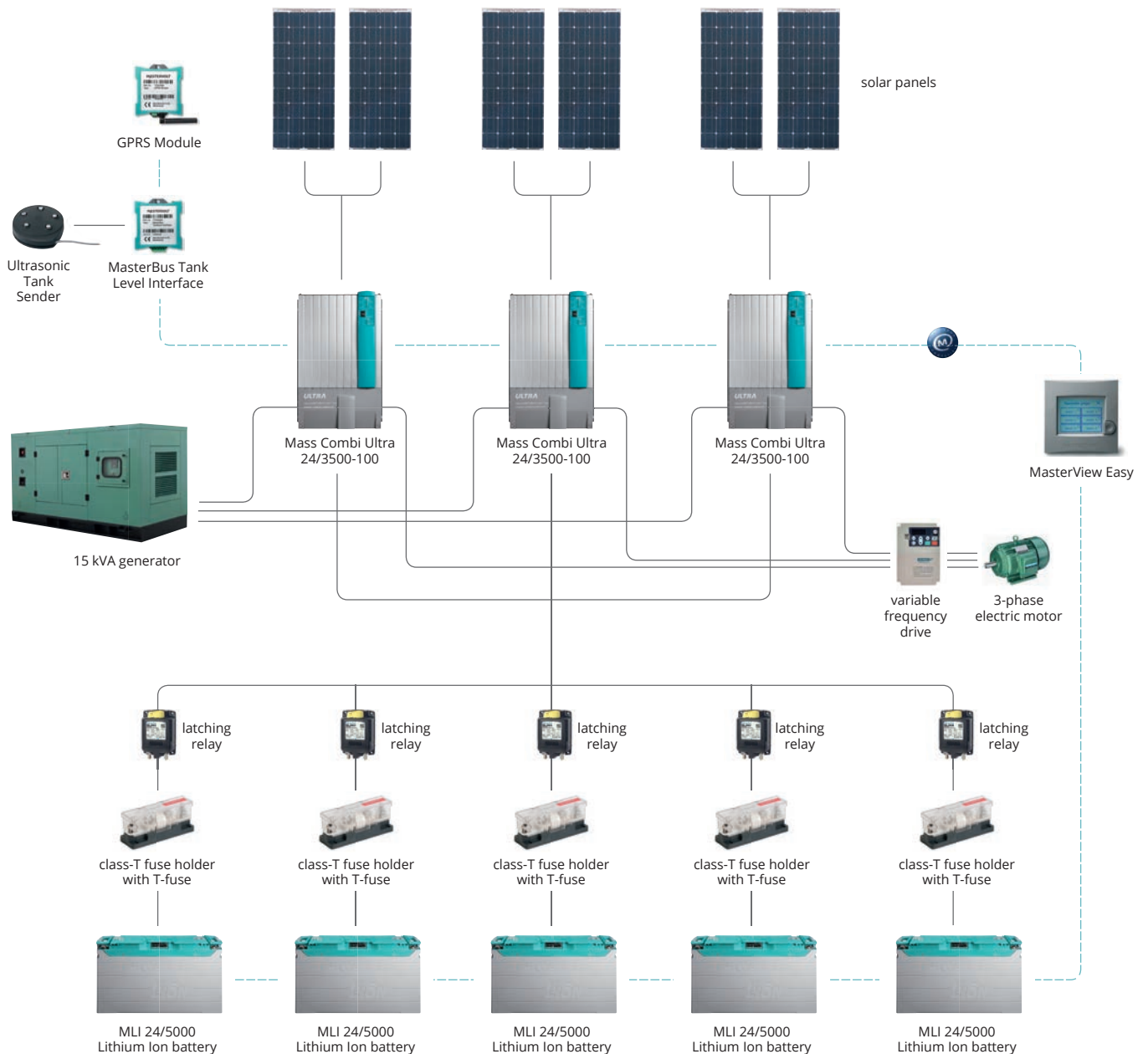
DESCRIPTION	NUMBER	AVG. POWER	HOURS/DAY	DAILY CONSUMPTION
AC consumers				
3-phase motor	1	3000 W	24	= 72 kWh
				= 72 kWh
Sources				
Generator	1	14000 W	3 x 2	= 84 kWh
Solar panels	6	250 W	± 5	= 7.5 kWh
Total sources				= 91.5 kWh



System choice

- 3 x Mass Combi Ultra 24/3500-100.
- 5 x MLI Ultra 24/5000.
- 5 x Pro Installer fuse holder.
- 5 x T-fuses.
- 1 x MasterView Easy.
- 1 x MasterBus USB Interface.
- 1 x MasterBus Tank Level Interface.
- 1 x Ultrasonic Tank Sender.
- 1 x GPRS module.

System drawing





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 ORACLE
TEAM USA

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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. $V = I \times R$
 Voltage [V] = current [I] x resistance [R]

Because we often use the term power, the formula below is frequently used to determine power: $P = V \times I$
 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 $P = V \times I$.

Example: If a battery or battery charger provides an expected current of 75 amps, you require a cable of at least 25 mm².

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.

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).

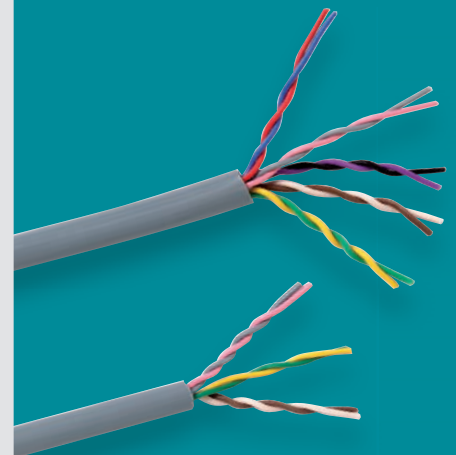
Conversion

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

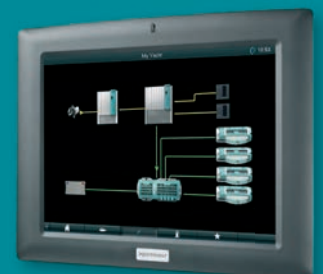
MasterBus makes an electrical installation far less complex by reducing the number of cables. Each system component has two MasterBus communication ports. As soon as two or more devices are connected to each other via these communication ports they form a local data network - what we call a MasterBus 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](http://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 MasterView System 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.

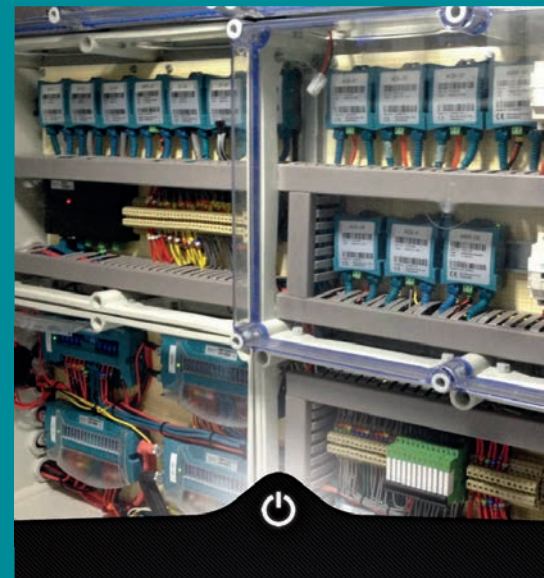
Digital switching with MasterBus

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.

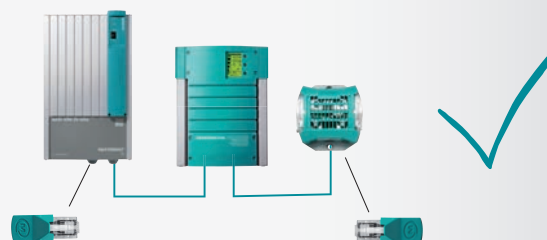
How to create a MasterBus network

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.



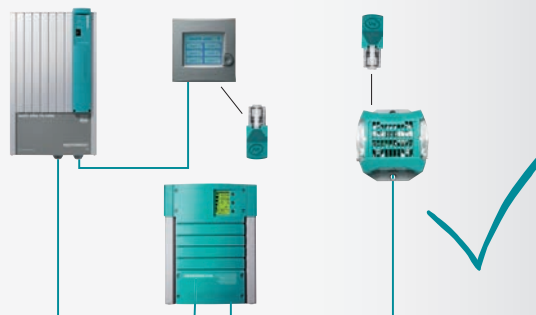
As with all high speed data networks, MasterBus needs a terminator at both ends of the network.



You need two terminators to close both ends of the network - communication cables in-between connect a chain of components.



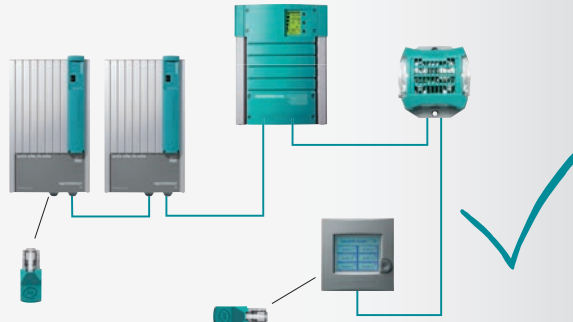
The network should not be circular.



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

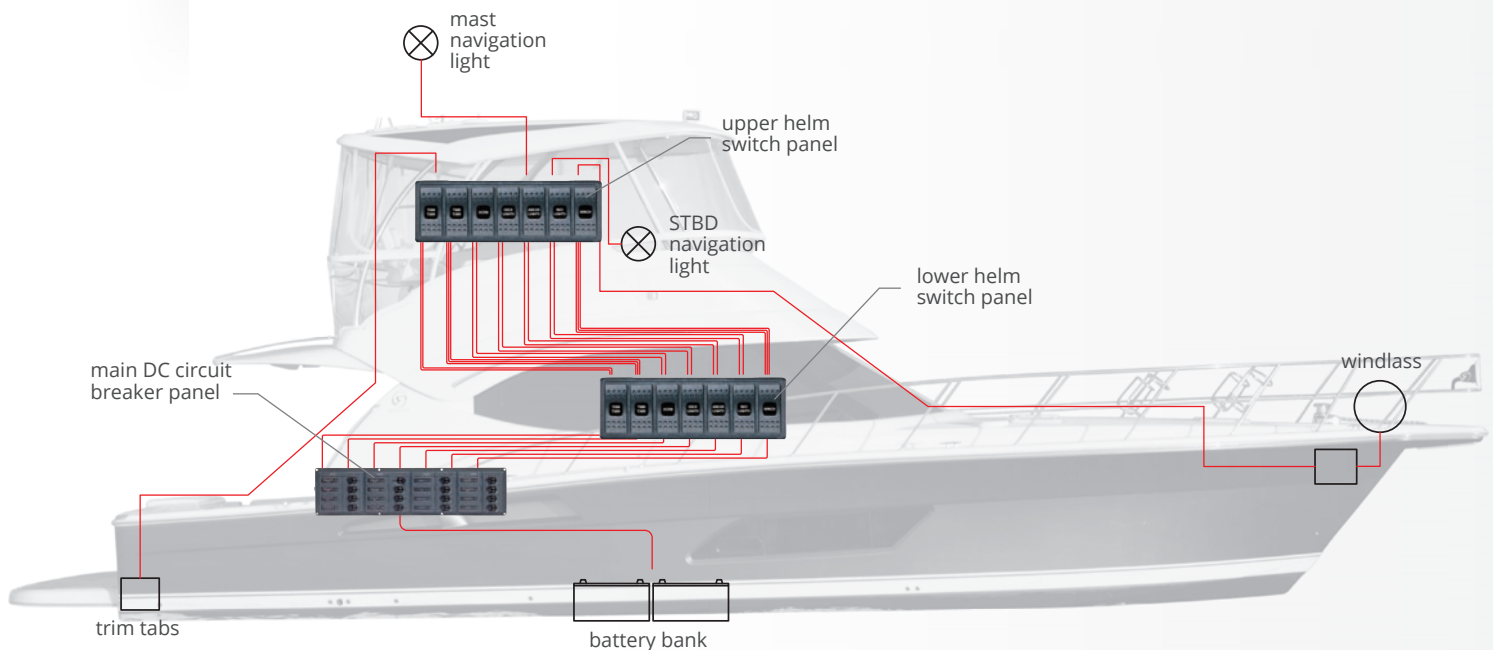
The CZone digital control & monitoring network simplifies installation of electrical systems through the replacement of complicated, cumbersome wiring to switch and fuse panels, with state-of-the-art, robust interfaces and light NMEA 2000 network cable. It also provides a sophisticated solution via the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

Builders 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.



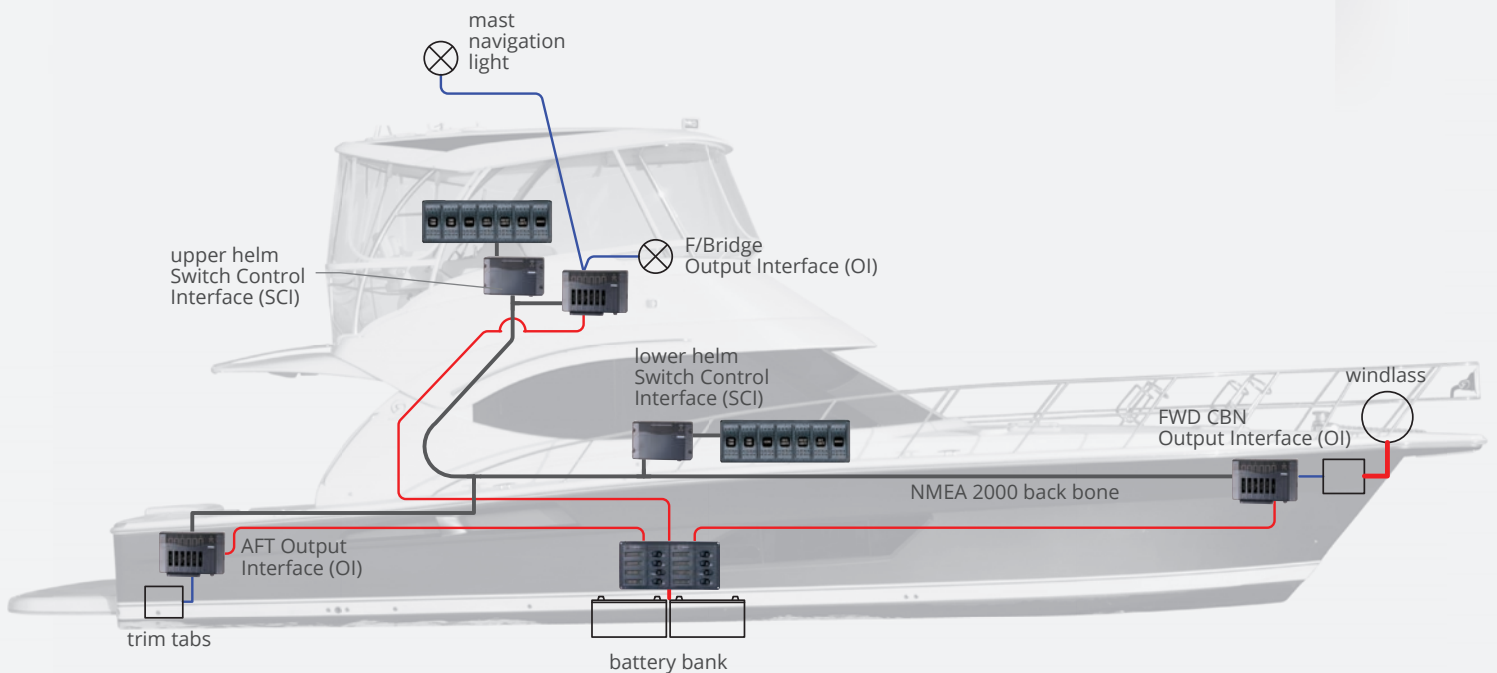


CZONE DC wiring

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 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. It can also be configured from the 3.5" Display Interface (not recommended for a large CZone system).

12

Can CZone be connected to MasterBus?

Yes, that is possible with a CZone MasterBus Bridge Interface or Wireless Interface.

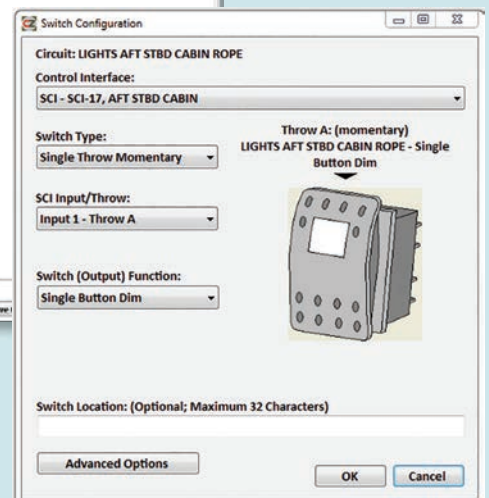
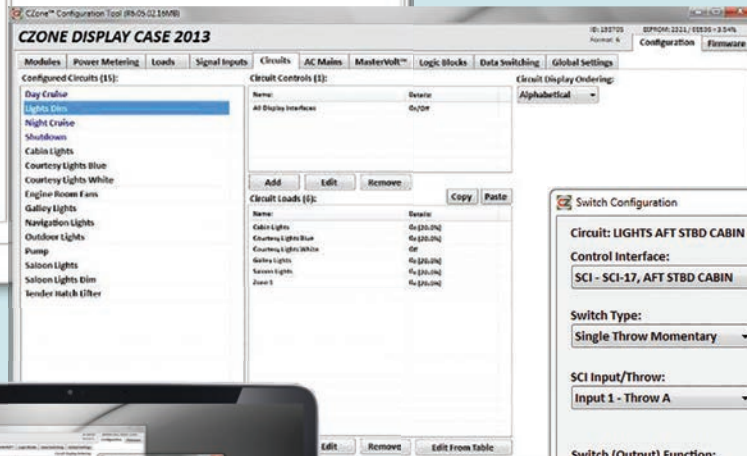
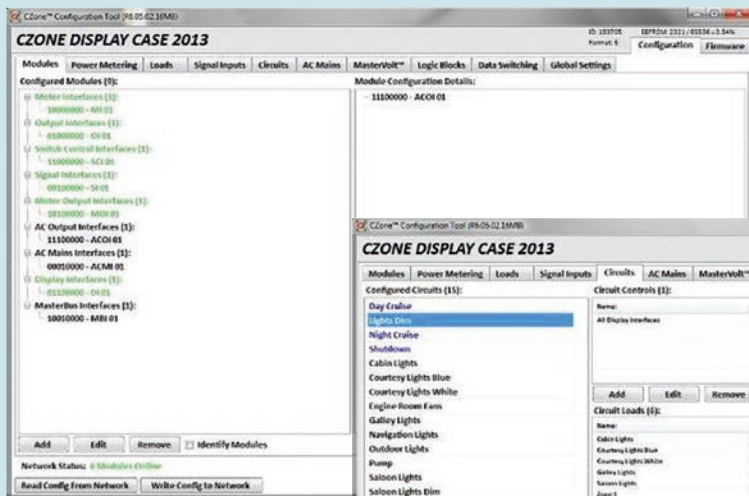




Configuration made easy

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 (page 12-18).

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 on page 12-18, 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	2.0 amperes
EasyCharge 10A	2.5 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?

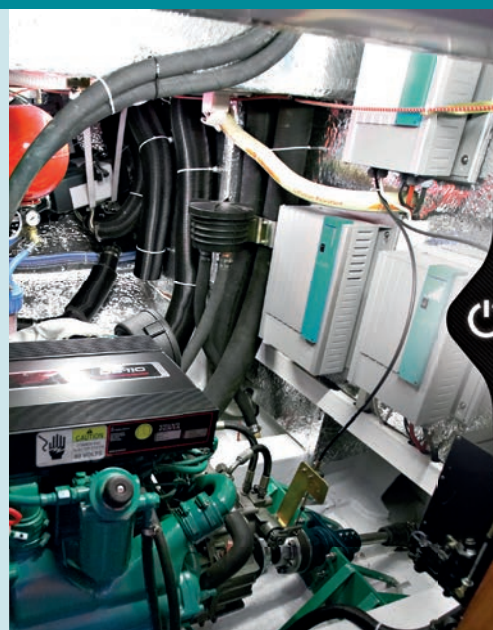
The charging time of a battery is directly related to the ratio of battery to charger capacity. Other important factors that decide how long it takes for an empty battery to completely recharge are the battery type and the power consumption of the potential consumers.

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 wet 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.

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.

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.

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.

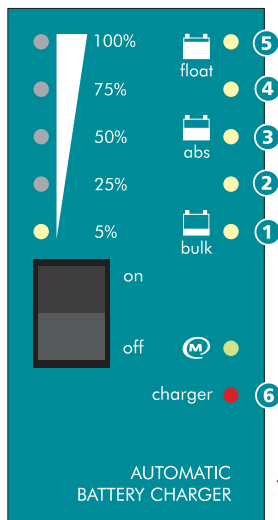
The possibility remains that one of the chargers will switch to the absorption phase sooner than the others. This is a perfectly normal phenomenon caused by tolerances in the adjustment, with no effect on charge time and charger operation. When parallel connecting multiple battery chargers, we recommend 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:

In addition to these visual alarms, all Mass battery chargers have a potential-free relay contact.

- 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



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.

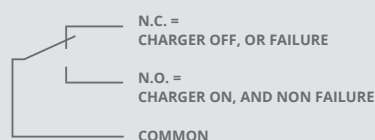
Alarm options/settings:

Internal alarm contact

A

Non continuous mode

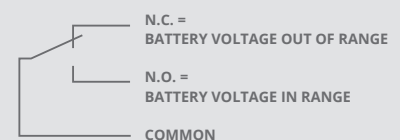
C.S.I. / DC alarm



B

Continuous mode

DC high / low alarm





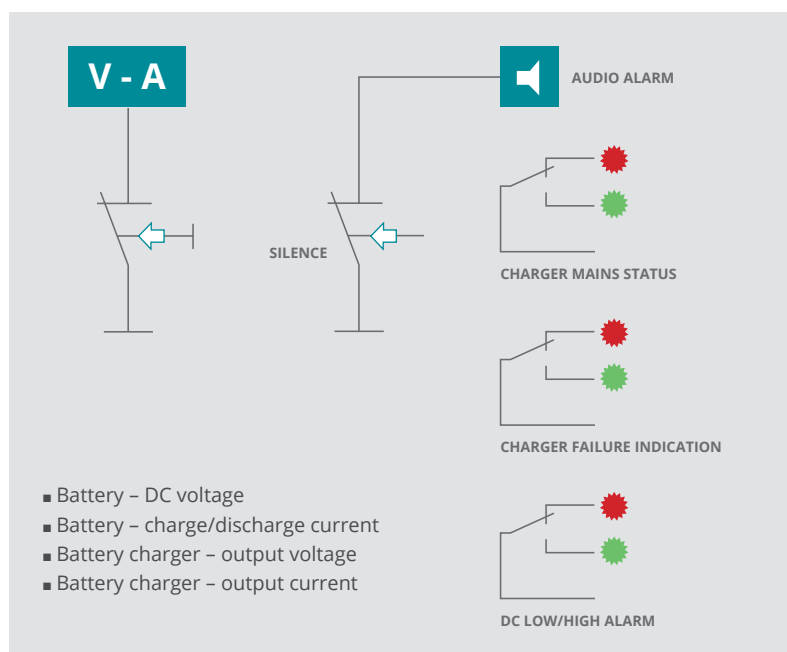
Mass Charger Interface

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.



Operating principle:



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.

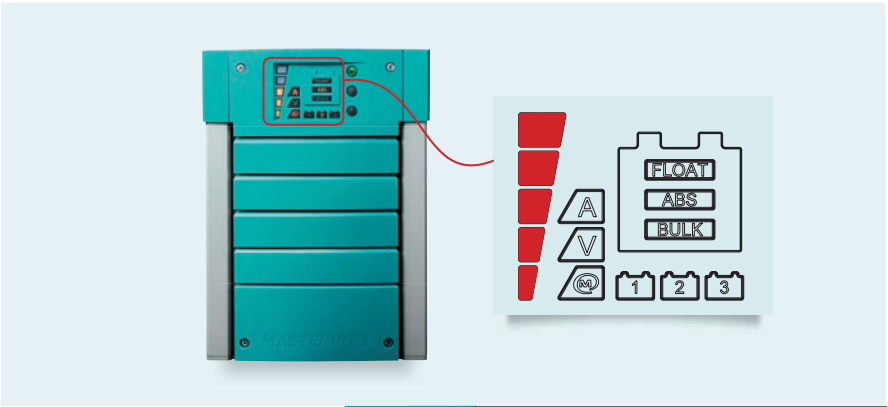
For professional use: GMDSS

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.



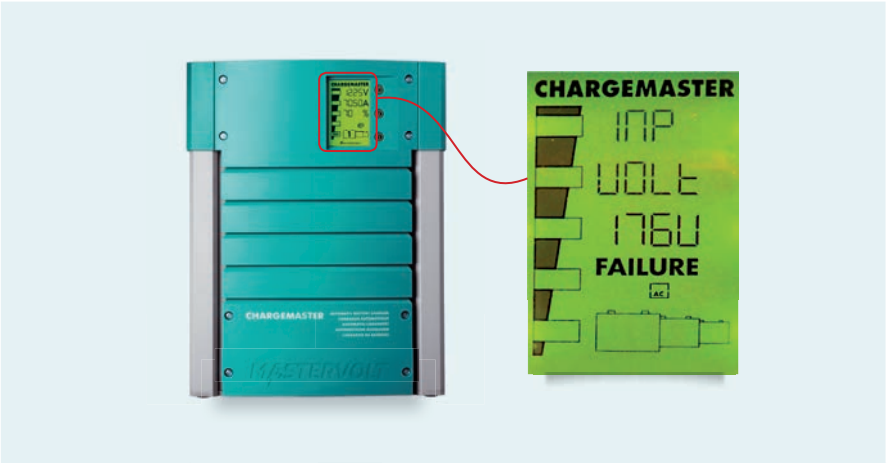
* The **POWER** button is blinking.

** 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.



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.

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

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.

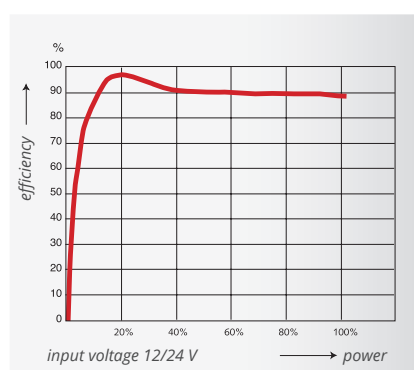
What is no-load?

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?

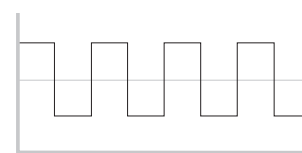
An inverter uses a small amount of energy during the conversion process. The difference between the input power and the output power is expressed in percentages. The efficiency of modern inverters is more than 92 %. This means that a maximum of 8% of the power consumption is used to convert battery voltage 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:

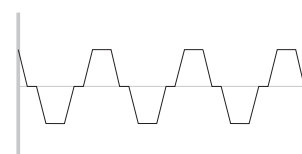


What are trapezoidal or square wave inverters?

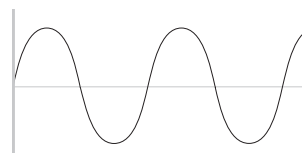
Square wave and trapezium inverters are often available in DIY shops and supermarkets at low prices. These cheap inverters are not suitable for all loads, however, and therefore not safe to use. Modern inverters generate a sine wave-shaped output current similar to or even better than that of the public 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 W Marinco 700 W Mass Sine 800 W	Marinco 1500 W Mass Sine 1200/1500 W	Marinco 2000 W Mass Sine 2000/2500 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	□	■	■	■	■
Angle grinder	□	□	■	■	■
Water pump	□	▣	■	■	■
Electric tools	□	□	■	■	■
Microwave/oven	□	□	■	■	■
Washing machine 3 kg	□	□	□	■	■
Air conditioning/electric hob	□	□	□	■	■
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 $120 \times 1 \text{ min} = 2 \text{ Ah}$. 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.

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.

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?

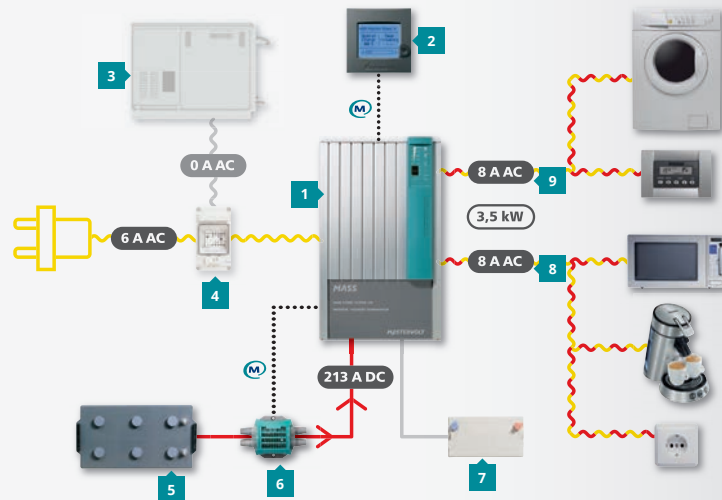
The Mass Combi can easily power a washing machine. One whole washing cycle will, on average, take 80-100 Ah (with a 12-volt system), and 40-50 Ah (with a 24-volt system). Most of the energy is used to heat up the water, so consumption is properly correlated to the water temperature. Washing your laundry 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.

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.

Example 1 - Mass Combi

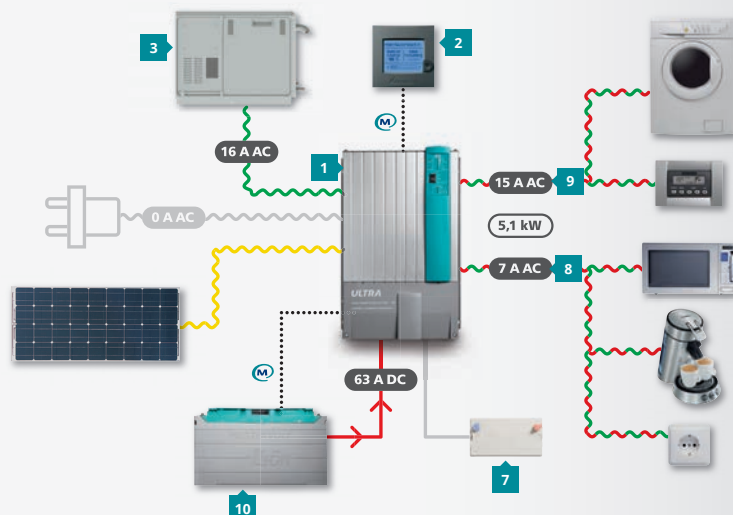
Higher consumption than available from the grid.



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 MasterView Easy 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.

- 1 Mass Combi (Ultra) inverter/charger combination.
- 2 MasterView Easy, 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.

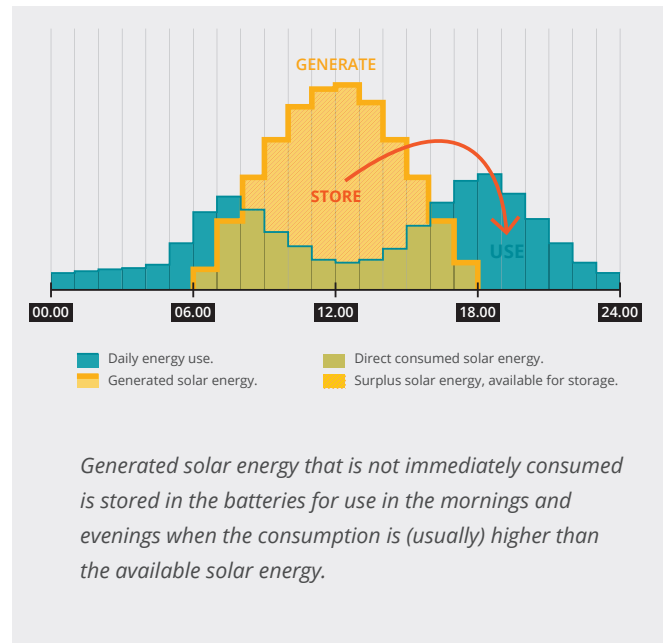
Mass Combi in a grid-connected solar power system with energy storage

The use of local energy storage combined with a grid connected system with solar panels in a home or company is increasingly popular.

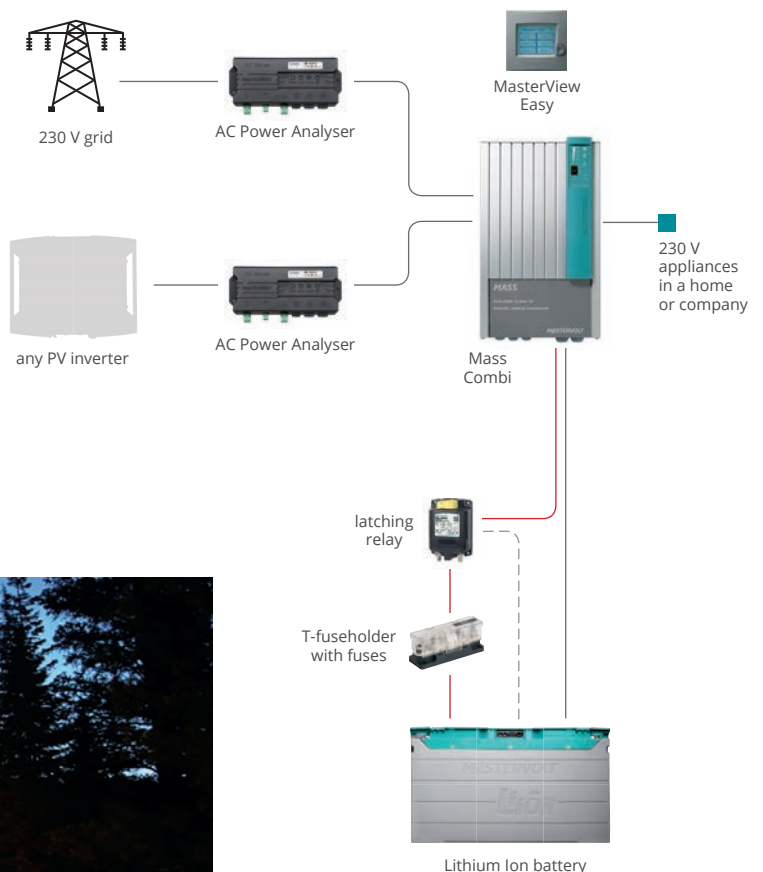
Using energy storage significantly increases the self-consumption (i.e., the amount of generated solar energy that is actually used). Benefits include cost savings through reduced power consumption from the electricity grid, the certainty of using self-generated green energy, and increased autonomy. 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.



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 °C, 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

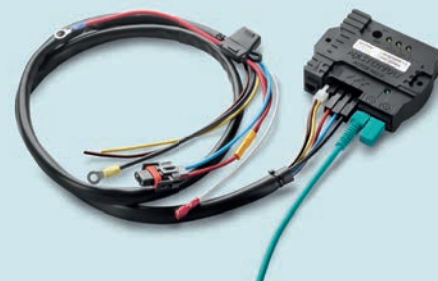
Benefits of the Alpha Pro MB charge regulator

■ The Alpha Pro MB 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, with a cable supplied as standard in the box. Easy operation LEDs on the body of the regulator indicate the charge phase.

■ The Alpha Pro MB is also fully connectable to the MasterBus CANBus system, allowing easy monitoring via a MasterView 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 MB 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 MB 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

Lithium Ion batteries also offer major benefits compared to nickel-cadmium batteries, 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 that automatically compensates for the imbalance between the cells and increases the lifespan. The MLI Ultra series features an active balancing, matching the high charge and discharge currents that these batteries can supply. The MLS series is equipped with a passive balancing.



The 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 wet traction batteries are often used in forklifts and small electrical equipment such as industrial-grade cleaning machines.

But wet 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?

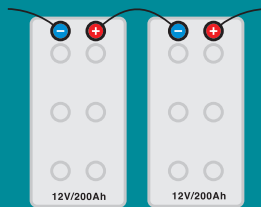
The lifespan of a battery is related to how often and to what extent it is discharged. Proper charging with the right charger is also crucial. At a normal use for holidays and weekends, a lifespan of between five and seven years is quite common for gel and AGM batteries. When batteries are frequently 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'.

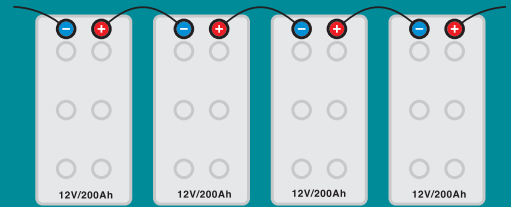
What is series connection and parallel connection?

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.



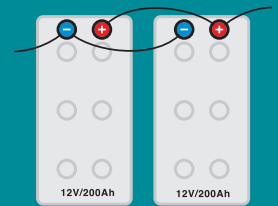
Series connection 24 V/200 Ah.



Series connection 48 V/200 Ah.

Parallel connection

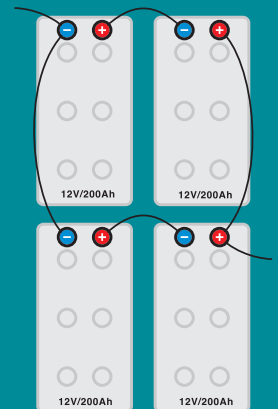
Parallel connection is used when you need to increase your capacity. The positive leads are connected together, as are the negative leads. The cabling from the battery to the system should be: Positive from battery 1 and negative from battery 2 (or the last in the parallel connection).



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).



Series/parallel connection
24 V/400 Ah.

■ Mastervolt also supplies 2 V, 6 V and 24 V batteries; the principle of series and parallel connecting remains the same.

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 batteries, especially gel and AGM

- 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.

Can I leave the batteries onboard during winter?

This is fine for all batteries as the lower temperature will actually prolong their lifespan. Remember to charge the batteries completely and to ensure that no consumers are left on. Voltmeters, timers and car radio memory are some of the stealthy consumers to look out for in this respect. Wet batteries have to be regularly topped up and charged to avoid freezing. It is advisable to connect the power once every two to three weeks so the batteries can be fully recharged. If you do not have access to power during the winter we advise you to fully charge the batteries before the winter and then disconnect the battery poles so small users cannot discharge your battery. We also advise charging your battery every two months.

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 wet 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 bowthruuster 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. Mastervolt's Lithium Ion batteries are the safest batteries of their kind.

A unique feature is their built-in Battery Management System (BMS). The system controls cell voltage and temperature, and guarantees optimal safety. Lithium Ion batteries are MasterBus compatible and up to 15 % more efficient than lead-acid batteries.

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.



- Lithium Ion batteries are also ideal for electric and hybrid propulsion. Mastervolt Lithium Ion batteries can be paralleled up to ten units.
- 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 is not out of the ordinary.

■ 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.

The benefits of Lithium Ion require the batteries to be used strictly within the allowed operating conditions. Although the products are set up to deal with that for you automatically in a safe way, 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 Ultra & MLS series	preferable settings
Bulk/Absorption voltage	28.5 V
Float voltage	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 2500 and 5000 models have an external safety relay (or 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 to the batteries.

The MLS products have an integrated safety relay and no integrated battery monitoring. 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 °C, 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. This can be attributed to a wide range of features including cell management, the negligible self-discharge, the absence of 'memory effect' and a discharge to 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 can be transported as non-dangerous goods as 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.



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.

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 $\pm 80\%$ (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 wet 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.

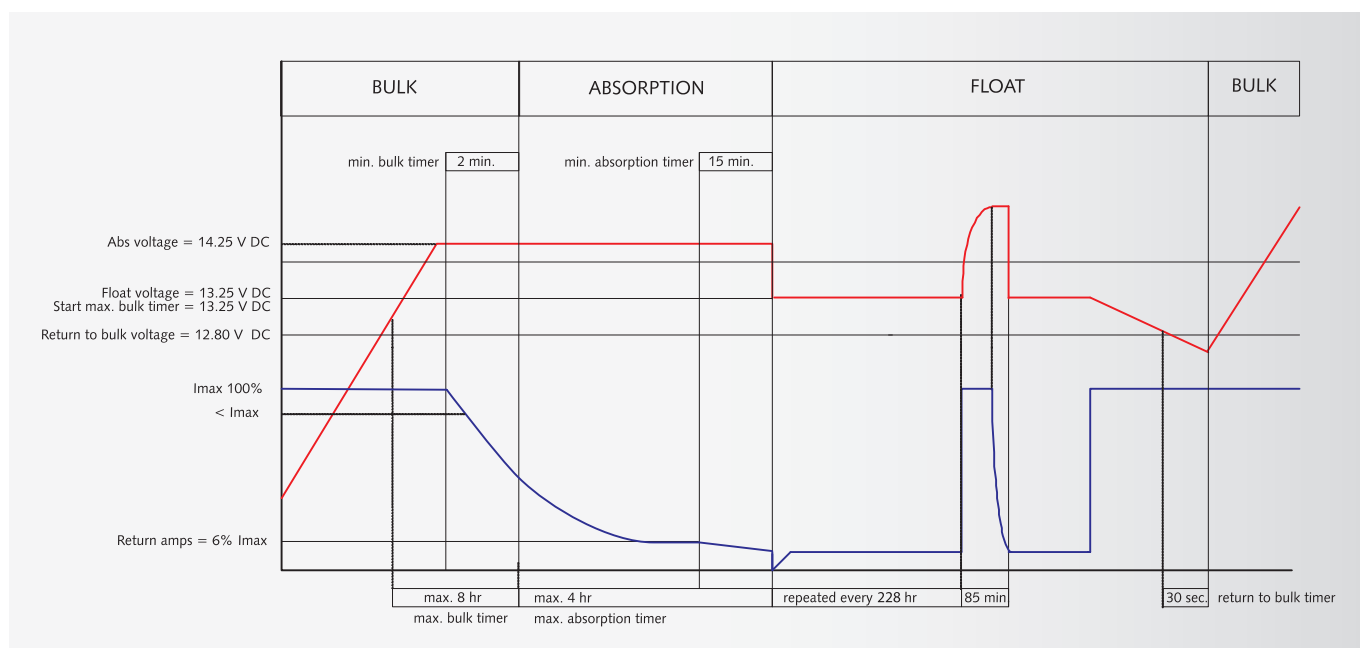
Once the battery is 100 % charged, the Mastervolt charger automatically switches to the **FLOAT PHASE**. In this step, the batteries are kept in optimal condition and the connected users are supplied with power. If power consumption is higher than can be supplied by the battery charger, the remaining power is supplied by the battery. The battery is then (partly) discharged and the charger automatically switches back to the bulk phase.

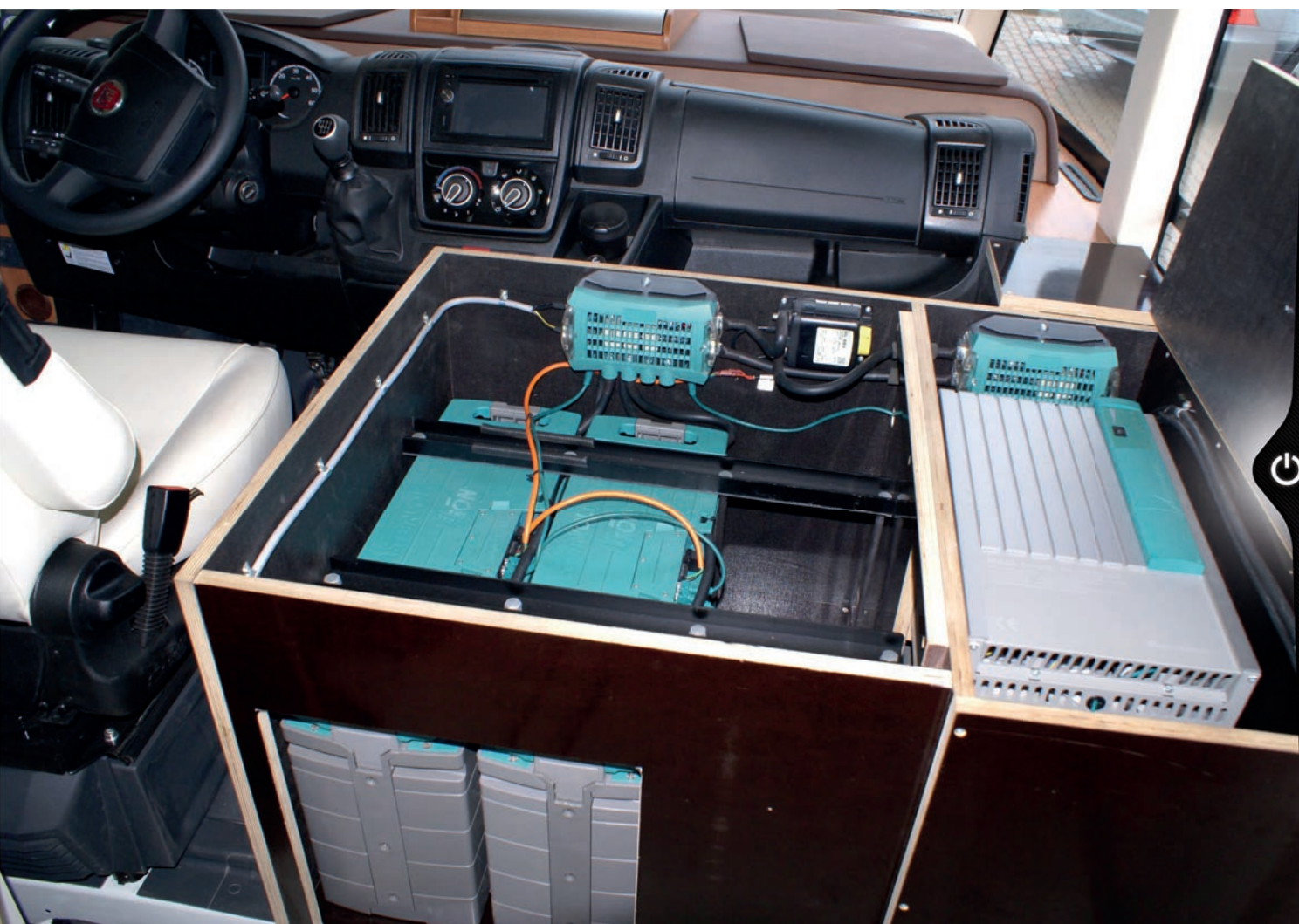
If consumption is reduced, the charger will start charging the battery again via 3-step+ charging. A battery charger with 3-step+ charging can remain connected to the battery, even in winter, and ensures a long lifespan for your batteries as well as being safe for the connected equipment.

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 wet 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 wet 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

Gel (12 and 2-volt) and AGM (6 and 12-volt) batteries need to be charged with a voltage of 2.4 volt per cell at a temperature of 20 °C. For a 12-volt battery set, this corresponds to 14.4 volt, and for a 24-volt battery set to 28.8 V. The maximum time that a battery can be charged at this voltage is four hours, after which the voltage has to be reduced to 2.2 volt per cell, or 13.25 and 26.5 volt, respectively. Lithium Ion batteries need to be charged with a voltage of 29.2 volt for a 24-volt system and 14.6 volt for a 12-volt system. The float voltage is 26.5 V and 13.25 V respectively.

With emergency power systems, where gel batteries can be in float condition for long periods of times (years), the float voltage needs to be slightly increased to 13.8 and 27.6 respectively at a temperature of 25 °C. Mastervolt supplies DC-DC converters that regulate the onboard voltage to a lower level (13.8 or 27.6 volt) thus ensuring that (halogen and other) lamps do not fail during charging.

The charge current

A rule of thumb for gel and AGM batteries states that the minimum charge current should be 15 to 25 % of the battery capacity. Connected equipment usually also needs to be powered during charging, so include the power used for that purpose in the abovementioned figure. This means that, with a battery set of 400 Ah and a connected load of 10 amps, battery charger capacity has to be between 70 and 90 amps in order to charge the battery in reasonable time.

The maximum charge current is 50 % for a gel battery and 30 % for an AGM battery. For a Lithium Ion battery the charge current can be the same as the capacity. A 180 Ah Lithium Ion battery, for example, can be recharged with 180 amps.

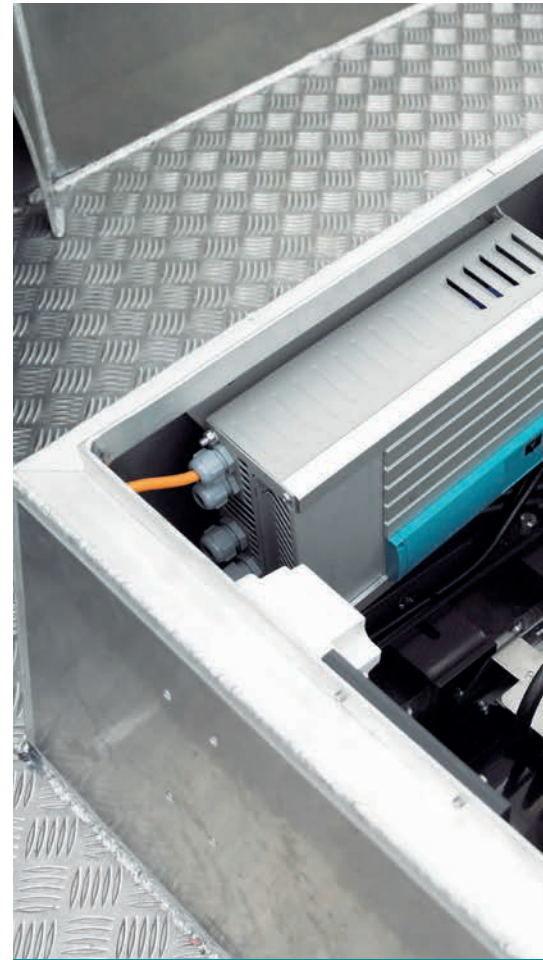
The charge system

Ensuring the longest possible lifespan for gel, AGM and Lithium Ion batteries requires a modern battery charger with 3-step+ charging and a sensor for measuring battery temperature. These battery chargers will constantly regulate charge voltage and charge current and adapt the charge voltage to the battery temperature.

As there is always equipment onboard such as refrigerators that draw power from a battery even when it is being charged, a maximum charge voltage has been set to protect the connected appliances. This maximum is 14.55 volt for a 12-volt system and 29.1 volt for a 24-volt system, which is also the charge voltage applicable at an ambient temperature of 12 °C.

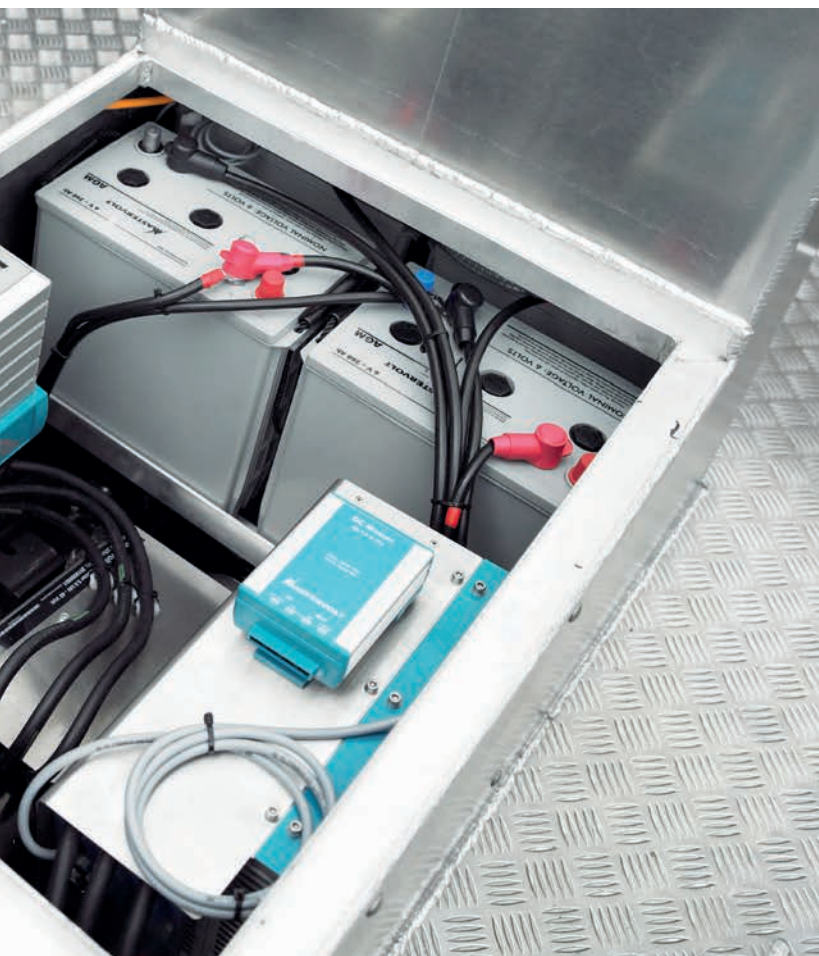
Mastervolt's modern battery chargers come with a temperature sensor for attaching to the battery, which allows the charger to automatically regulate the charge voltage in accordance with battery temperature. Adjusting voltage to high or low temperatures is not necessary with Lithium Ion batteries.

In order to prevent premature failure of the battery, the ripple voltage of the battery charger has to stay below 5 %. If the battery also powers navigation or communication equipment such as GPS or VHF, the ripple voltage must be less than 100 mV (0.1 volt) or problems may occur with the equipment. Another advantage of a low ripple voltage is that onboard power systems will not be damaged if a battery pole is corroded or incorrectly attached. A low ripple voltage even allows the charger to power the system without being connected to a battery.



Mastervolt chargers are, of course, all equipped with an excellent voltage regulation that keeps ripple voltage below 100 mV. For Global Maritime Distress Safety Systems (GMDSS) onboard larger ocean-going vessels, the battery charger also can be equipped with an amps and voltmeter plus an alarm contact. The alarm contact is connected to the ship's alarm system so that any interruptions to the operation of the charger – due to a cut in the 230-volt supply, for instance – are detected on time. The optional Mass Charger Interface makes Mass chargers very suitable as GMDSS chargers.





The following formula can be used to calculate the charging time of a gel or AGM battery:

$$L_t = \frac{C_o \times \text{eff}}{A_i - A_b} + 4h$$

- L_t** = charging time
C_o = capacity drawn from the battery
eff = efficiency; 1.1 for a gel battery, 1.15 for a AGM battery and 1.2 for a wet battery
A_i = battery charger current
A_b = consumption of the connected equipment during the charging process

Taking a battery that is discharged to 50 % and applying the example of a 400 Ah gel battery and an 80 amps charger, charging up to 100 % will take:

$$L_t = \frac{200 \times 1,1}{80 - 10} + 4h \approx 7h$$

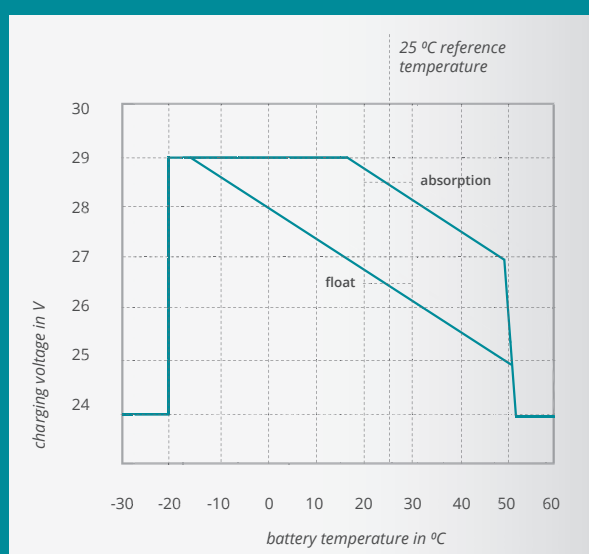
Calculating charging time

Various factors have to be taken into account when calculating the charging time for a battery.

The first consideration is battery efficiency. With a standard wet battery, efficiency is about 80 %. This means that 120 Ah has to be charged into the battery in order to be able to draw 100 Ah later. With gel, AGM and Lithium Ion batteries the efficiency is higher – 85 to 90 % – so there is less losses and charging time is shorter compared to wet batteries.

Another issue that has to be considered when calculating charging time is the fact that the last 20 % of the charging process (80-100 %) takes ± four hours (this does not apply to Lithium Ion batteries). In the second stage, also known as the absorption phase, the battery determines how much current it needs to absorb independently of the output of the battery charger.

The amount of power depends on the type of battery (wet, AGM, gel or Lithium Ion) and other factors such as the extent to which it was charged to begin with, temperature, lifespan and the ambient temperature.



Temperature compensation curve

Checking the remaining capacity of a sealed AGM or gel battery

The simplest and most accurate way to check the remaining capacity or condition of a battery is with an Ah meter, such as Mastervolt's MasterShunt or BTM-III battery monitor.

In addition to charge and discharge current, the monitor also tracks battery voltage, the number of amp-hours consumed and how much longer the battery has before it needs recharging. The device also provides data on how often the battery has been discharged and to what extent, with both the average and highest discharge level shown. The MasterShunt is easy to connect to the MasterBus network and, with its integrated system clock combined with command-based events, you can program the system to your preference.

A different but very imprecise method of checking your battery is to measure the voltage, which can only be done when the battery has not been used (discharged) or charged for at least 24 hours. While measuring voltage provides a rough estimation of how discharged a battery is, small variations in voltage make an accurate digital voltmeter essential.

remaining battery capacity	battery voltage
25 %	between 11.7 and 12.3 volt
50 %	between 12.0 and 12.6 volt
75 %	between 12.1 and 13.0 volt
100 %	between 12.6 and 13.35 volt

This method is only 15-20 % accurate and gives a rough indication of the power remaining in the battery.

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). 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:

$$C_p = I^n t$$

C_p = battery capacity available with the given discharge current

I = the discharge current level

$$n = \text{the Peukert exponent} = \frac{\log T_2 - \log T_1}{\log I_1 - \log I_2}$$

T = discharge time in hours

I_1 , I_2 and T_1 , T_2 can be found by carrying out two discharge tests. This involves draining the battery twice at two different current levels.

One high (I_1) – 50 % of battery capacity, say – and one low (I_2) – around 5 %. In each of the tests, the time T_1 and T_2 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.

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:

$$Q = 0.05 \times 80 \times 0.5 \times 0.5 \times 6 = 6 \text{ m}^3/\text{h}$$

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 $28 \times 6 = 168 \text{ cm}^2$ (around 10 x 17 cm) for each opening.

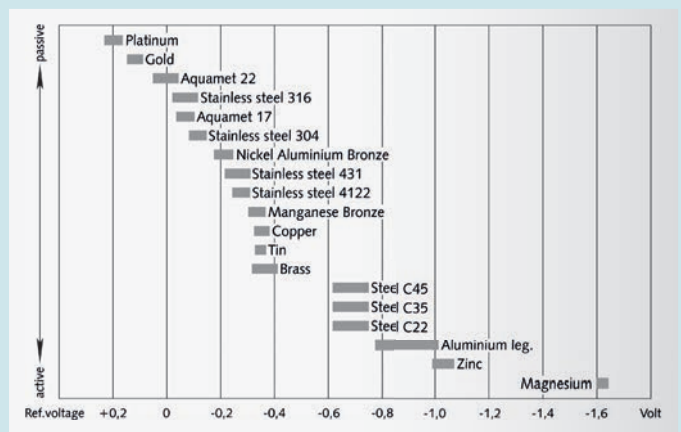
Lithium Ion batteries do not produce any hydrogen gas and are therefore safe to use. When batteries are charged quickly there is some degree of heat production, in which case the above formula can be used to remove the heat.

Contact your installer for larger systems with multiple battery chargers.



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

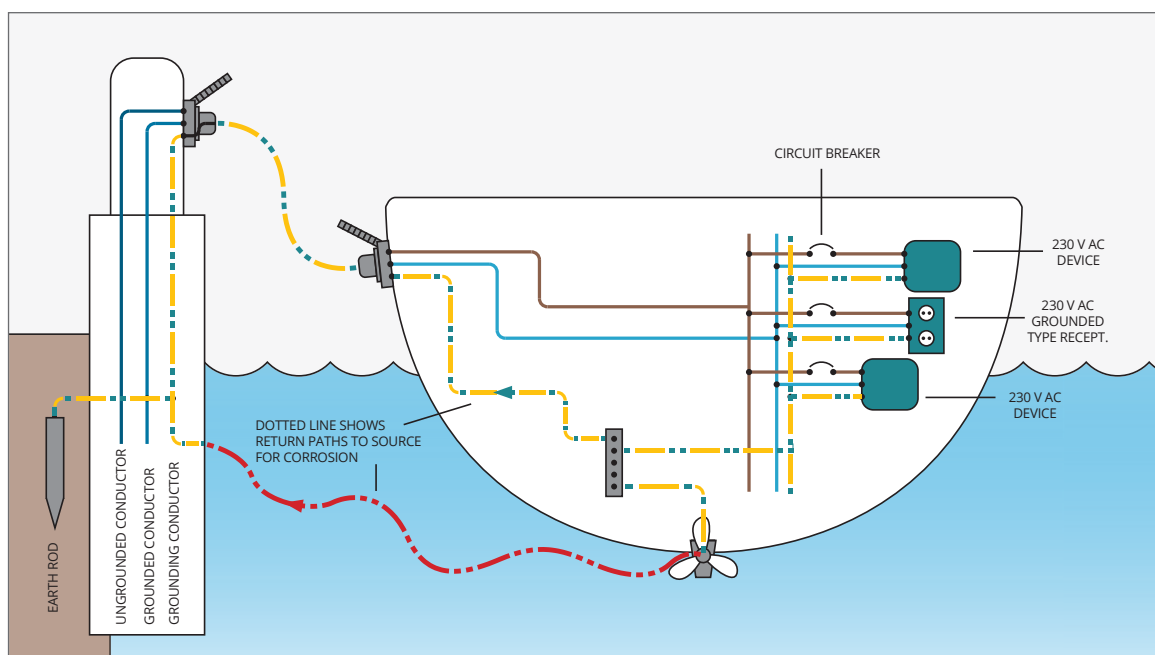
The third relevant situation involves the shore power earth connection. In power installations, the neutral and protective earth are connected to each other at the power station and connected to groundwater via a thick steel rod. This means that all protective earth connections in a harbour are linked 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.

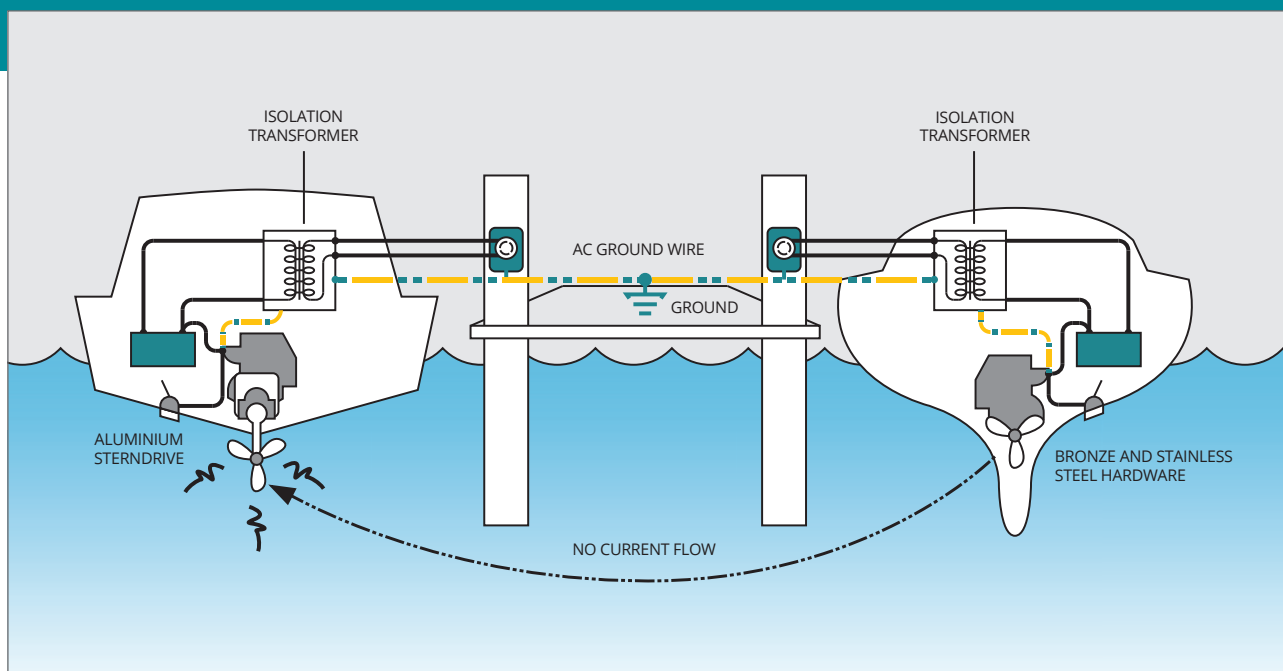
With an isolation transformer, the earth wire remains within the power cable for safety reasons but is not connected to the boat. The phase and the neutral of the power connection will instead be connected to the primary (shore) side of the transformer, which will 'convert' the voltage to the same or, 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.

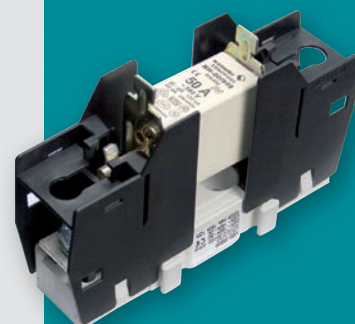
wire size	max. current	fuse required	preferred type
0.75 mm ²	12 A	10 A	ATO/ATC (car type)
1 mm ²	18 A	15 A	ATO/ATC (car type)
1.5 mm ²	21 A	20 A	ATO/ATC (car type)
2.5 mm ²	30 A	30 A	ATO/ATC (car type)
4 mm ²	40 A	40 A	ANL Blade type
6 mm ²	50 A	50 A	ANL Blade type
10 mm ²	80 A	70 A	ANL Blade type
16 mm ²	100 A	100 A	NH (knife type) or T-fuse
25 mm ²	140 A	125 A	NH (knife type) or T-fuse
35 mm ²	185 A	160 A	NH (knife type) or T-fuse
50 mm ²	230 A	224 A	NH (knife type) or T-fuse
70 mm ²	285 A	250 A	NH (knife type) or T-fuse
95 mm ²	330 A	315 A	NH (knife type) or T-fuse
120 mm ²	400 A	400 A	NH (knife type) or T-fuse
150 mm ²	430 A	425 A	NH (knife type) or T-fuse
240 mm ²	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).

■ **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 $20 \times 5 = 100$ 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 wet 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 five 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. This information is also available via the Masterlink MICC, which also offers control and monitoring options for the Mass inverter, Mass battery charger or Mass Combi. The modern MasterShunt combined with the MasterView Easy 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 98 to 99 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.



■ 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 theoretical 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.

■ 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.

■ 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.

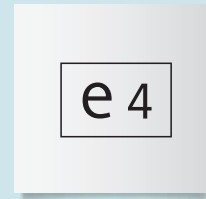
■ Electrolyte

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.



■ 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 Systems switch. 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 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.

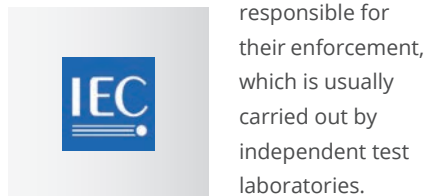
■ **Hydrogen gas**

Highly explosive gas mixture of hydrogen and oxygen formed during the charging of wet 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, which automatically compensates for any imbalance between the cells to guarantee a longer battery lifespan.

■ Lloyd's approval

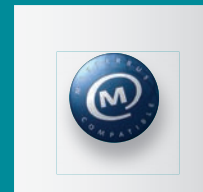
Lloyd's Register of Shipping is a British classification society for yachts, professional shipping, drilling platforms, etcetera. Numerous insurance companies require large vessels to be approved by Lloyd's. This means that the vessel



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.

■ 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.

O ■ 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.

■ Ohm's law

Gives the relationship between voltage (U), current (I) and resistance (R). In formula terms this is expressed as $U = I \times R$.



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 $55 + 55 = 110 \text{ Ah}$.

■ **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.



■ **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.

■ **RS 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.



■ **Self-discharging**

The decrease in the capacity of a battery that occurs when no load is connected. A wet 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 standby. 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. Wet 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.

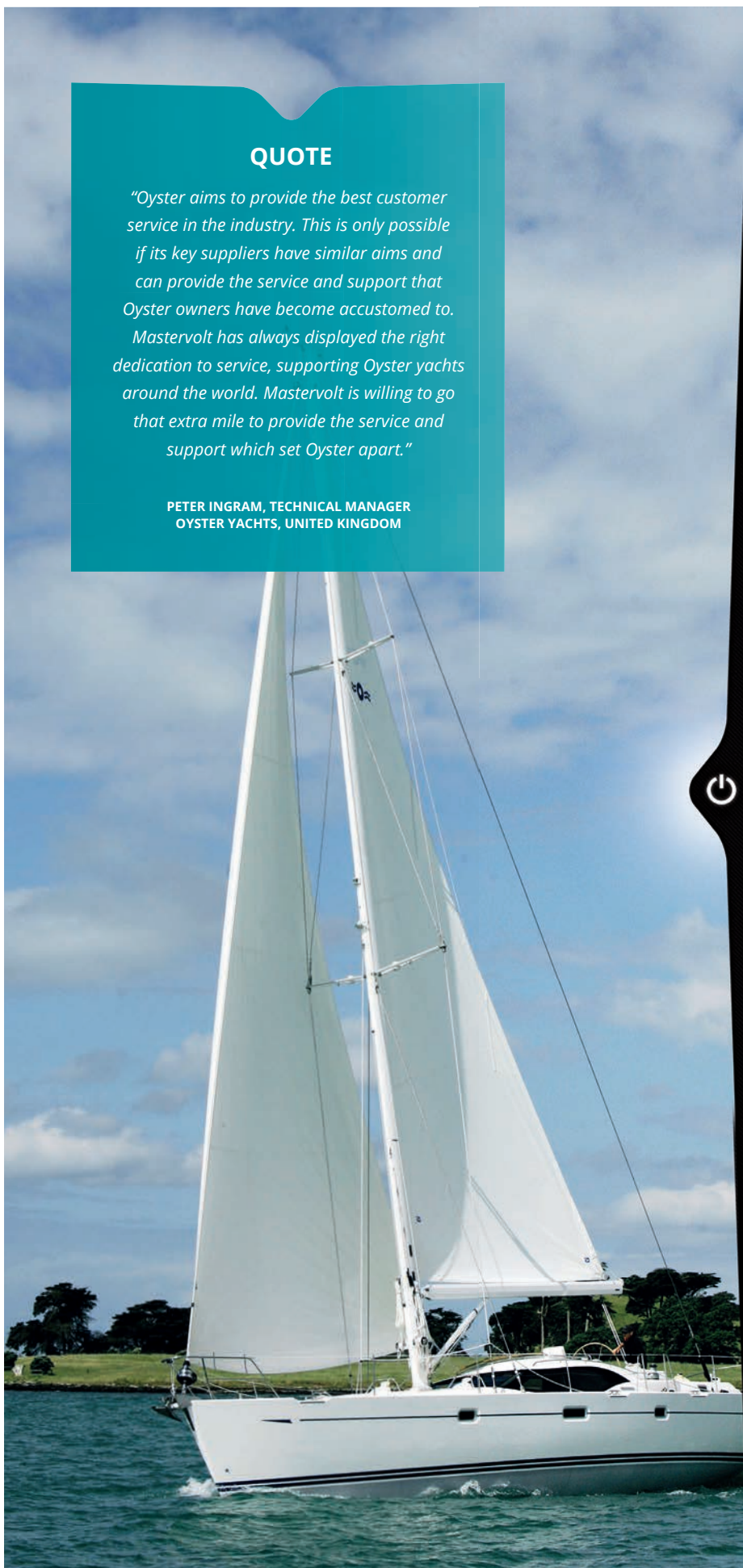
■ Watt-hour (Wh)

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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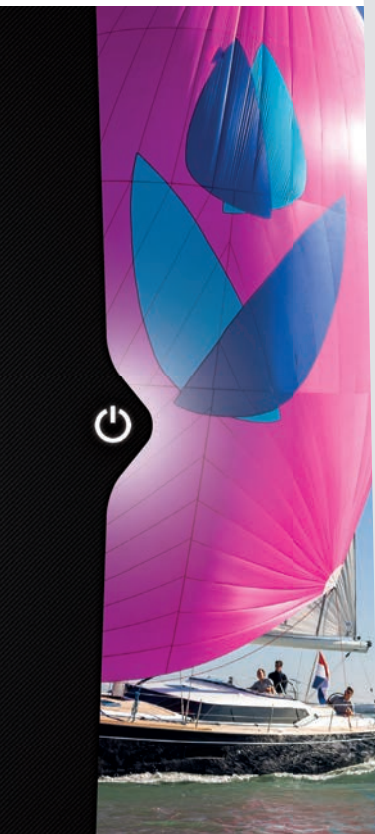
ROUND THE WORLD
RACE SUPPLIER

Courtesy of Amory Ross / Team Alvimedica / Volvo Ocean Race.



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Colophon

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