

# Datasheet

## Marine DC-Breaker 3.0kA



### Features

- > Stand-alone solution for integration in any type of DC-grid
- > High di/dt-capability with autonomous switch-off
- > Ultra-fast break time in microsecond range
- > Bi-directional functionality
- > Liquid cooling (tap or de-ionized water)
- > Topology optimized for low power loss and maximum lifetime
- > Autonomous current monitoring and switch control
- > Internal self-diagnostic capability
- > Optical trigger and feedback
- > DNV-GL certified

### Configuration

- > IP20 without heat exchanger and fan
- > Short interface suitable for busbar connection
- > Balancing switch 1300W
- > Liquid cooling with threaded coupling
- > Liquid detection
- > Built in fan

## 1 Introduction

**Product Number:** AA-21002-003

**Product Code:** CBM-3.0-1.5-O3-IB-BS13-SC-LD-FL-01

The Marine DC-Breaker is a solid-state circuit breaker especially designed and certified for on-board electrical systems in the maritime industry. In order to protect healthy sections of the system, the breaker has to interrupt a fault current within microseconds. With this response time requirement, local fault protection must be performed autonomously by the breaker control system, without the need for external control or fault detection. In addition to the fast over-current protection, the breaker can be programmed to open according to a time-current profile. It allows the overall system to reconfigure the behavior of the DC-Breaker within certain boundaries which are pre-defined by the factory. The fast opening time of solid-state breaker limits the fault current and reduces the negative impact on the load to a minimum. The current does not reach damaging energy levels and can be interrupted without forming an arc.

## 2 Technical Specifications

### 2.1 Power Supply

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Notes
Input Voltage	$V_{IN}$	-	20	24	31	V	
Power Consumption	$P_{IN}$	@ $V_{IN}=24V$	25	30	40	W	
Insulation Voltage	$V_{Insulation}$	-	-	6	-	kV	

**Table 1** Power supply

### 2.2 Electrical Characteristics

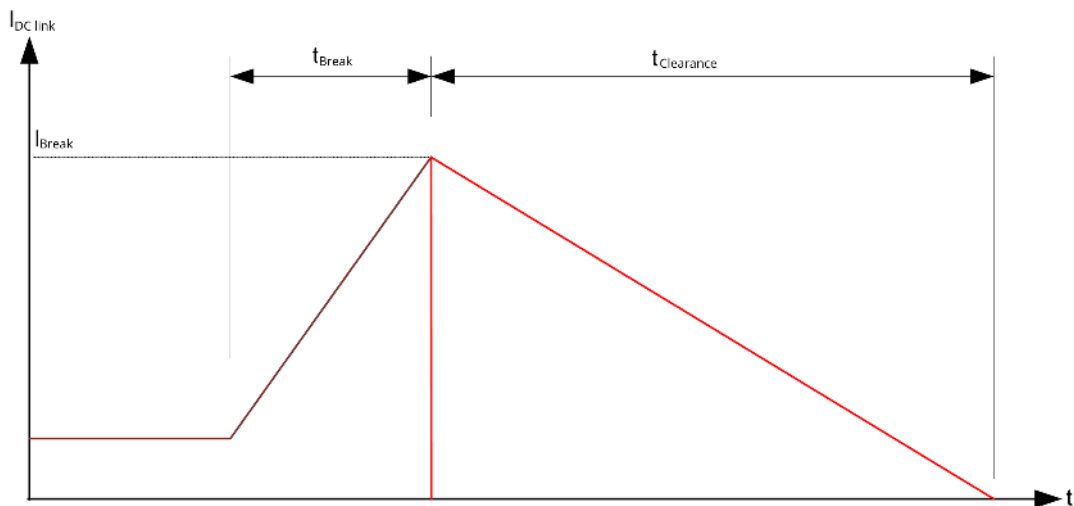
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Notes
DC Link Voltage	$V_{DC\ link}$	-	0.01	1.0	1.5	kV	
DC Link Current	$I_{DC\ link}$	-	-	-	3.0	kA	<sup>1</sup>
Current Interruption	$I_{Break}$	-	-	-	20	kA	<sup>2</sup>
System Loop Inductance	$L_{DC\ link}$	-	-	-	100	$\mu H$	
Breaking Time	$t_{Break}$	-	-	8	10	$\mu s$	
Clearance Time	$t_{Clearance}$	typ. @ $L=4\mu H$	-	45	525	$\mu s$	<sup>2</sup>
Voltage Drop	$V_{Drop}$	-	-	6.1	6.5	V	
Link Length	$l_{Link}$	-	-	-	30	m	<sup>3</sup>

<sup>1</sup> Additional 20% short term overload

<sup>2</sup> Depends on customer system (inductance, voltage, current)

<sup>3</sup> Length of the optical link between two DC-Breakers

**Table 2** Electrical characteristics



**Figure 1** Short Circuit

## 2.3 Environmental Conditions

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Notes
Ambient Temperature	T <sub>amb</sub>	non condensing	+5	-	+60	°C	
Storage Temperature	T <sub>store</sub>	non condensing	-40	-	+85	°C	
Humidity		non condensing	-	-	95	% RH	
IP Grade		-	-	IP20	-		
Operating Altitude	Alt	-	-	-	1000	MSL	

**Table 3** Environmental conditions

### 3 Operation

#### 3.1 Overload and Tripping

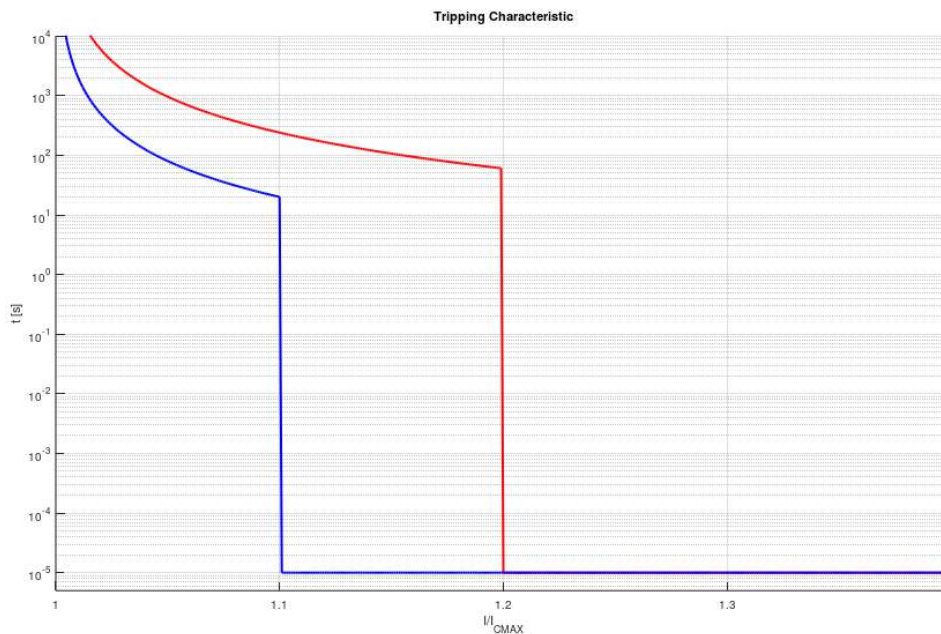
The overload and overcurrent tripping characteristics are configurable using a parameter set with adjustments relative to the maximum continuous current  $I_{CMAX}$ .

Parameter	Symbol	Description	Min	Max	Unit	Note
Maximum Continuous Current	$I_{cmax}$	This current can be conducted continuously without causing an overload error.	50	$I_{dc link}$	A	
Overload Factor	$K_{OL}^1$	If a current $I_{cmax} \cdot K_{OL}$ is applied continuously it will cause an error after the time $T_{OL}$ is reached.	1	1.2	-	
Overload Time	$T_{OL}$	The overload current can be applied continuously for this time without causing an overload error.	1	100	s	
Peak Current	$I_P$	Exceeding this current level causes an immediate trip.	$I_{cmax}$	$1.2 \cdot I_{cmax}$	A	

<sup>1</sup> This parameter is configured in % where a  $K_{OL}$  of 1.0 equals 100%

**Table 4** Tripping characteristic parameter set

With these parameters the tripping characteristic is divided into an overload range with a thermal tripping characteristic and the overcurrent range with immediate tripping. Figure 2 illustrates this characteristic on two different examples.



**Figure 2** Tripping characteristics

**Blue:**  $K_{OL}=1.2, T_{OL}=5s, I_P=1.1 \cdot I_N$

**Red:**  $K_{OL}=1.2, T_{OL}=60s, I_P=1.2 \cdot I_N$

## 4 Mechanical Interface Description

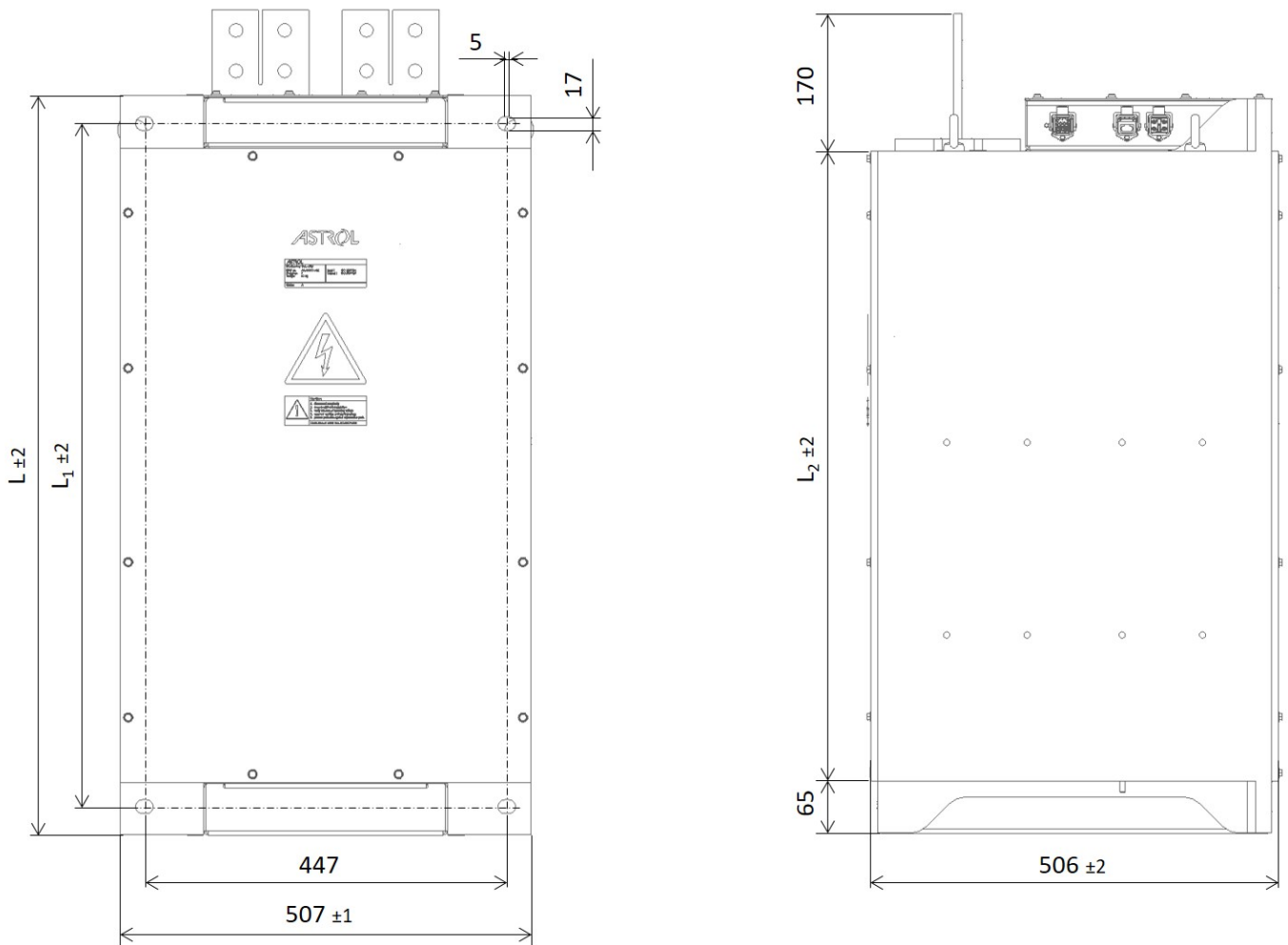


Figure 3 Mechanical dimensions DC-Breaker

Model	No	L [mm]	L1 [mm]	L2 [mm]	Weight [kg]	Notes
3.0kA	AA-21002-003	912	842	782	154	<sup>1</sup>

<sup>1</sup> For more details about mechanical dimensions, refer to the dimensional drawing AD-10811-028

Table 5 Mechanical size

Rev.	Changes	Author	Date
1.0	Initial Release	AST	06.08.2020
1.1	changed Astrol numbers to new 3kA version	AST	09.04.2021



Figure 4 Checked



Figure 5 Approved

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