



Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

Manufacturer	Astrol Electronic AG
Address	Ahornweg 14, Othmarsingen, 5504, Switzerland
Type	Circuit Breakers (Env Tested)
Description	DC-Breaker 1500 V DC 350 - 3000 A
Trade Name	DC-Breaker
Application	Marine, Offshore and industrial applications for the use in environmental categories ENV1, ENV2, ENV3 (general power distribution zones) as defined in Lloyd's Register Type Approval System, Test Specification Number 1, 2021
Specified Standard	Manual nr. AD-10811-020, rev. 2.7, date 23.8.2024
Ratings	see appendix

This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid Certificate.

The Design Appraisal Document HPC 1962126-24/JK and its supplementary Type Approval Terms and Conditions form part of this Certificate.

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APPENDIX

DESCRIPTION DC-Breaker

Type	Rated voltage (V)	Rated current (A)
DC-Breaker	1500V DC	350 to 3000

TYPES	Ident number	Description	Nominal current	Size	No. Modules
	AA-10411-101	DC-Breaker 0.5kA-1.5kV	500A	Small	1
	AA-10411-111	DC-Breaker 0.35kA-1.5kV	350A	Small	1
	AA-10411-112	DC-Breaker 1.1kA-1.5kV	1100A	Medium	1
	AA-10411-122	DC-Breaker 1.5kA-1.5kV	1500A	Medium	1
	AA-10411-113	DC-Breaker 2.25kA-1.5kV	2250A	Large	2
	AA-10411-103	DC-Breaker 3.0kA-1.5kV	3000A	Large	2

RATINGS

General Specification

Parameter	Min	Max	Unit	Notes
DC Link voltage	0.01	1500	V _{DC}	
DC Link nominal current	0.35	3.0	kA	
System loop inductance		100	μH	1
Breaking time		10	μs	3
Breaking current		20	kA	3
Clearance time		625	μs	2, 3
24V Power	16	100	W	
Link Length		30	m	6
Ambient temperature	5	60	°C	
Water Inlet Temperature		49	°C	4
Humidity		95 %	RH	5
IP grade electronic		IP54		
IP grade switch		IP 54		

Notes:

1. System inductance is not limiting factor but does have influence on overvoltage protection
2. Depends on customer system (inductance, voltage, current)
3. Refer to Astrol «Manual Marine DC-Breaker» doc. No. AD-10811-020 rev. 2.7.
4. Tap water or deionized water is applicable
5. Non-condensing
6. Any optical link

Software Package	FPGA Firmware	CPU Application	MU4HV FW	GDU FW	CU4FAN FW
DC-Breaker	1.46	2.10	1.07	1.00	1.04

OTHER CONDITIONS

The DC Breaker is a (bi-)directional fault current suppressor based on current interruption by switching of insulated gate bipolar transistors (IGBT). This type approval is applicable for a directional and bi-directional peer-to-peer configuration.

The device is used for fault current suppression and does not replace circuit breakers or switches for isolation. The system design needs to be approved on a case-by-case basis, and must include, as part of the overall system arrangement:

means for manual, local, operation independent of higher-level automation system, enabling necessary means for local operation, local/remote change over, and interface for setting of parameters.

means for monitoring and indication of operating status and alarms, as well as means for isolation/switching, allowing operation, enabling access for repair and electrical maintenance, in accordance with relevant rule requirements.

back-up protection (e.g. fuses) in accordance with relevant rule requirements (as applicable).

documentation of required system discrimination.