

Modular Multilevel Converters

For Medium Voltage Megawatt Power Applications

*Left side: Modular Multilevel Converter
(MMC) with up to 96 full-bridge cells*

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Right side: MMC with 42 full-bridge cells

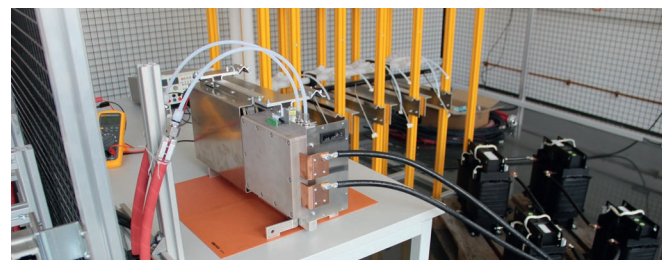
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Various MMCs with vastly different input and output parameters available

- 200 V Low Voltage Research MMC (30 half-bridge cells)
- 15 kV_{DC} Flexible Medium Voltage MMC (12-96 full-bridge cells)
- 5 kV_{DC} Compact Medium Voltage MMC (42 full-bridge cells)
- All MMC power electronic software and hardware designed in house
- Available for your individual testing demands
- For your test setup or as configurable power source/sink

MMC Know-how

- 30 years of industrial application design experience
- Single cell burn-in tests and failure analysis
- Experience in full power electronics toolchain from software to hardware design



*MMC submodule burn-in test bench with flexible control, cooling
and power solutions © Fraunhofer IISB*

SEEDS MMC: Up to 96 Full-Bridge Cells with 1200 V, 600 A Si-Modules

- C_{SM} = 5.5 mF
- $U_{c,max}$ = 900 V
- $U_{DC,max}$ = 15 kV
- $U_{AC,LL,eff}$ ≤ 15 kV
- $S_{AC,max}$ = 10 MVA
- $f_{AC, rated}$ = 50 Hz
- f_{AC} = 10-2000 Hz (with derating)



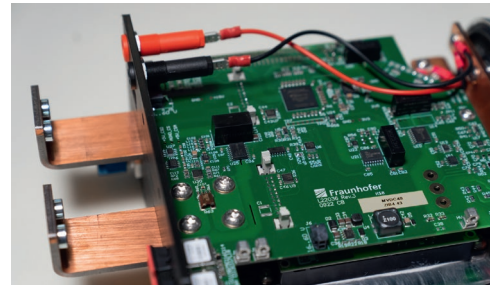
Full-bridge cell with 5.5 mF capacitors, 1200 V IGBT modules, custom cooling plate and FPGA control © Fraunhofer IISB



MMC in 200 m² medium voltage lab © Daniel Karmann / Fraunhofer IISB

MVDC4S MMC: 42 Full-Bridge Cells with 1700 V, 300 A Si-Modules

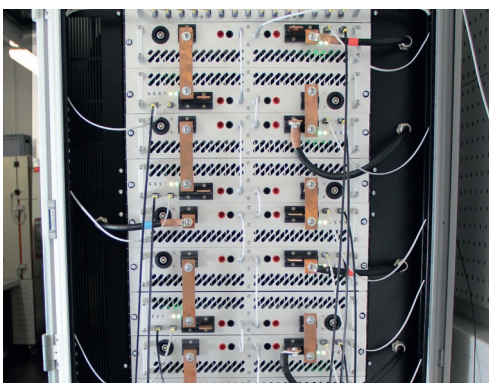
- C_{SM} = 1.2 mF
- $U_{c,max}$ = 1200 V
- $U_{DC,max}$ = 6 kV
- $U_{AC,LL,eff}$ ≤ 4.16 kV
- $S_{AC,max}$ = 1.2 MVA
- $f_{AC, rated}$ = 60 Hz
- f_{AC} = 40-200 Hz (with derating)



Inside view of full-bridge cell with minimized volume including 1.7 kV IGBT modules and 1.2 mF capacitance © Elisabeth Iglhaut / Fraunhofer IISB



MMC with
42 full-bridge cells
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Research setup for easy control customization with rapid prototyping hardware © Fraunhofer IISB

Low Voltage MMC: 30 Half-Bridge Cells with 300 V, 210 A Si-MOSFETs

- C_{SM} = 33.6 mF
- $U_{c,max}$ = 200 V
- $U_{DC,max}$ = 1000 V
- $U_{AC,LL,eff}$ ≤ 500 V
- $S_{AC,max}$ = 150 kVA
- $f_{AC, rated}$ = 50 Hz

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