MEDIUM VOLTAGE <u>Crowbar</u>



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About Us

FOUNDED IN 1975, SECOM IS A LEADING COMPANY FOR THE DISTRIBUTION AND PRODUCTION OF COMPONENTS AND DEVICES FOR POWER ELECTRONICS

SECOM continuously carries out new research and technical proposal in conjunction with important clients, providing technical support to meet their specific needs.

Production excellence and efficient organization allow SECOM to commit itself to providing to the market with timely and professional service in numerous sectors of static energy conversion.

Flexibility and short delivery time have become pillars to SECOM's company policy.

WHO WE ARE >>

Over the years the company has become an important designer and manufacturer of power electronic devices for industrial automation manufacturing technologies

WHAT WE DO >>

SECOM studies and manufactures customized solutions on behalf of its customers.

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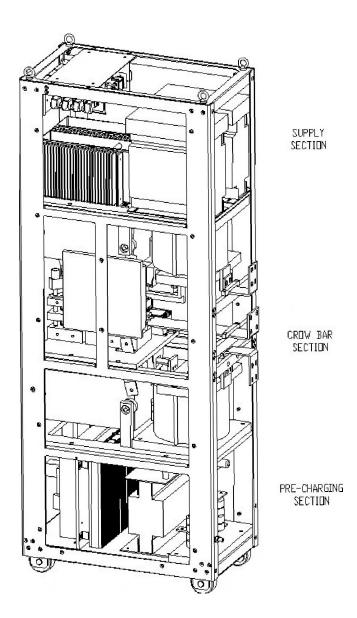
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CROWBAR OVERVIEW

The **Medium Voltage Crowbar module**, named CWB.SD.MT.V33, is an auxiliary removable stack which gather a series of tasks necessary for the operating of the Medium Voltage SD Drives.

The module is divided in the listed sections:

- Crow-bar section/chopper section (depending on the version);
- Power Supply section;
- Capacitor Pre-charge section.



CROWBAR OVERVIEW

There are different topologies of Crow-bar depending on:

- Precharge type;
- Number of supply units;
- Discharge resistor mounting.

The name coding is described as CWB-SD-MT-V33GCT-AXRY-FP where: - X is the number of supply units (1-2-3); - Y is the discharge resistor mounting (1 -> external, 2 -> internal) - F if present, defines the precharge layout with fuses - P if present, defines the precharhe layout for enhanced DC-bus capacitance.

e.g. CWB-SD-MT-V33GCT-A231-F defines Crow-bar with two supply units, external discharge resistor and fuses in the precharge circuit.

For water cooled version (there is no Crow-bar section but chopper section) the name coding is described as CWB-SD-MT-V33GCT-AXR1-H20-FP where: - X is the number of supply units (1-2-3);

-F if present, defines the precharge layout with fuses;

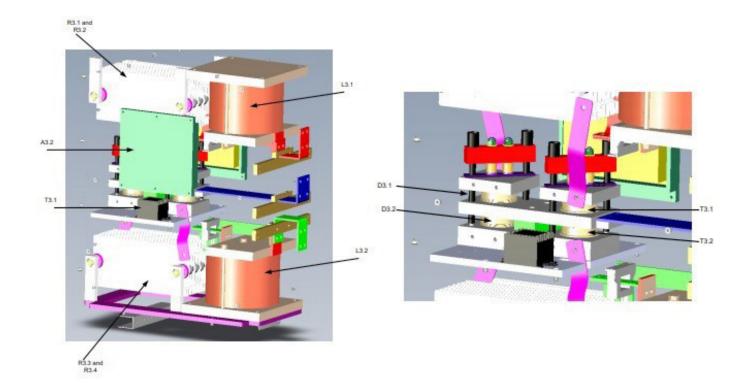
- P if present, defines the precharge layout for enhanced DC-bus capacitance.



CROWBAR SECTION

The Crowbar section main components are listed below:

- Control card for thyristor firing (UNDEX_MT) A3.1 and A3.2;
- Semiconductor stack, composed by two thyristors (T3.1 and T3.2) and two diodes (D3.1 and D3.2);
- Discharge resistors (R3.1 and R3.3) if present (only for version AXR2);
- Di/dt limiting reactors L3.1 and L3.1;
- Current transducers U3.1 and U3.2;
- Supply transformer T3.1.





POWER SUPPLY SECTION

The auxilary supplies for the phase modules IGCT and IGBT are generated in this section; this section has been developed in two different version which differs depending on the drive supplied:

Drive IGCT; since this drive provides both inverter and AFE units, two or three power supply circuits are installed (CWB.SD.MT.V33.GCT). The number of power supply is defined according the ordering code.
Drive IGBT; this drive provide the power supply only for the inverter module, for this reason just one supply circuit is installed (CWB.SD.MT.V33.GBT).

The main components which compose the circuit are listed below:

- Automatic circuit breaker Q1.1. This breaker disconnect all the circuitry from the 400V supply voltage (the

precharge unit and the Crow-bar unit are also feeded from this circuit breaker);

- Automatic circuit breakers Q1.2 and Q1.3. These circuit breakers protect the transformer(s) for ALI-MT supplier.

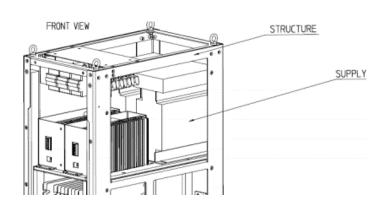
- Transformers T1.1 and T1.2. These three-phase transformers with 400V primary and 200V secondary winding supply the ALI-MT. In case of A3 configuration, there is only T1.1 transformer with three secondary separated windings;

- ALI-MT supplier A1.1, A1.2 and A1.3 (depending on supply configuration A1, A2 or A3). The output voltage is 200 V_{AC} at 25 kHz for IGCT/IGBT gate drivers. Each ALI-MT can supply at most 3 IGCT phase modules.

The ALI-MT has a fiber optic power good that can be used for diagnostic purpose.

Power supply section (A2 configuration)

Power supply section (A3 configuration)

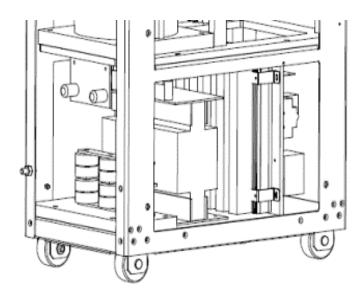




DC-BUS PRECHARGE SECTION

The last section integrated in the CWB.SD.MT.V33 module provide the necessary **supply** to charge the capacitor bank installed on the DC bus.

The circuit is supplied with a 400 V_{AC} three-phase, through the automatic circuit breaker Q2.1; from this line is derived the supply for the single phase transformer T2.2, 400/115-115V 50VA, protected by the automatic circuit breaker Q2.2.





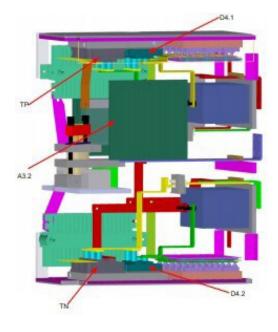
CHOPPER SECTION

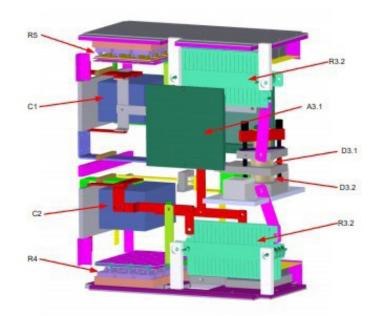
The **chopper section** main components are listed below:

- Control cards for current activation feedback (UNDEX_MT_CHT) A3.1 and A3.2;
- Driver cards for IGBTs control;

- Chopper power circuitry parts composed by IGBT (TP and TN), diodes (D4.1 and D4.2), resistors (R4 and R5) and capacitors (C1 and C2);

- Anti-swing back power circuitry composed by diodes (D3.1 and D3.2) and resistors (R3.2 and R3.4);
- Current trasducers U3.1 and U3.2;
- Supply transformer T3.1 and T3.2.







CROWBAR CABINET LAYOUT





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CROWBAR CABINET LAYOUT





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TECHNICAL DATA

Ambient conditions					
Altidude	1000 m. a.s.l.				
Operating temperature min./max.	0 40°C				
Storage temperature	0 40°C				
Umidity	10 90%				
Dimension and weight					
Height	1740 mm				
Width	400 mm				
Depth	760 mm				
Weight	210 kg				
Electrical data					
DC-bus nominal voltage	4800 V _{DC} (2400+2400)				
Crow-bar activation treshold	6000 V _{DC} (3000+3000)				
Discharge peak current	1000 A				
Water cooling system (only for H2O version)					
Flow	> 20 L/min				
Pressure drop	2 Bar				
Maximum operating temperature	40°C				
Minimum operating temperature	20°C				
Operating pressure	2.5 Bar				
Water type	Distilled				
Water maximum conductivity	7 μS/cm				
Water pH	7÷8				
Water hardness	3 ÷ 10° dH				
Chloride (Cl)	< 300 mg/l				
Copper (Cu)	< 0.1 mg/l				
Undissolved particles	< 5 mg/l				



The CWB can be used for several applications, depending the number of IGCT phase modules or the DCbus capacitance.

Ordering code	Precharge with MV disconnector	Supply units	Internal Disch. Resist.	Fuses	Max DC-bus capacitance (mF) ²	Drawing n.	
110706R1002	CWB-SD-MT-V33GBT-A1R2	1	Yes	No	< 26 mF	220374	
110706R1004	CWB-SD-MT-V33GBT-A1R1	1	No	No	< 26 mF	220374	
110706R1001	CWB-SD-MT-V33GCT-A2R2	2	Yes	No	< 26 mF	220357	
110706R1003	CWB-SD-MT-V33GCT-A2R1	2	No	No	< 26 mF	220357	
110706R1005	CWB-SD-MT-V33GCT-A3R2	3	Yes	No	< 26 mF	220400	
110706R1006	CWB-SD-MT-V33GCT-A3R1	3	No	No	< 26 mF	220400	
110705R1001	CWB-SD-MT-V33GCT (LAES)	2	-	-	< 26 mF	220372	
Code	Precharge with fuses						
110706R1013	CWB-SD-MT-V33GCT-A1R2.F	1	Yes	Yes	< 26 mF	220503	
110706R1014	CWB-SD-MT-V33GCT-A1R1.F	1	No	Yes	< 26 mF	220503	
110706R1008	CWB-SD-MT-V33GCT-A2R2.F	2	Yes	Yes	< 26 mF	220481	
110706R1009	CWB-SD-MT-V33GCT-A2R1.F	2	No	Yes	< 26 mF	220481	
110706R1011	CWB-SD-MT-V33GCT-A3R2.F	3	Yes	Yes	< 26 mF	220504	
110706R1012	CWB-SD-MT-V33GCT-A3R1.F	3	No	Yes	< 26 mF	220504	
Code	Precharge with fuses for enhanced capacitor bank						
110706R1019	CWB-SD-MT-V33GCT-A2R1.FP	2	No	Yes	< 48 mF	220507	
110706R1022	CWB-SD-MT-V33GCT-A3R1.FP	3	No	Yes	< 48 mF	220508	
	Chopper version (water cooled)						
110706R1025	CWB-SD-MT-V33GCT-H20-A2R1.FP	2	No	Yes	< 48 mF	220520	
110706R1027	CWB-SD-MT-V33GCT-H20-A3R1.FP	3	No	Yes	< 48 mF	220521	
110706R1030	CWB-SD-MT-V33GCT-H20-A2R1.F	2	No	Yes	< 26 mF	220525	
110706R1032	CWB-SD-MT-V33GCT-H20-A3R1.F	3	No	Yes	< 26 mF	220526	

In this case it's possible to refer to the table below.



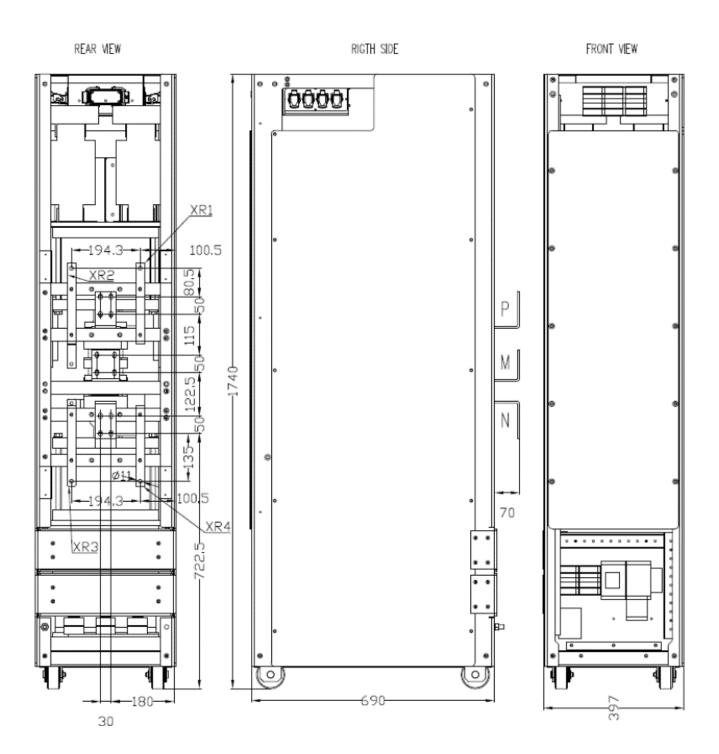
The CWB can be used for several applications, depending the number of IGCT phase modules or the DCbus capacitance.

Ordering code	Precharge with MV disconnector	Supply	Internal	Fuses	Max DC- bus capacitance (mF) ²	Drawing n.	
110706R1102	CWB-SD-MT-V33GBT-A1R2.UL	1	Yes	No	< 26 mF	220374	
110706R1104	CWB-SD-MT-V33GBT-A1R1.UL	1	No	No	< 26 mF	220374	
110706R1101	CWB-SD-MT-V33GCT-A2R2.UL	2	Yes	No	< 26 mF	220357	
110706R1103	CWB-SD-MT-V33GCT-A2R1.UL	2	No	No	< 26 mF	220357	
110706R1105	CWB-SD-MT-V33GCT-A3R2.UL	3	Yes	No	< 26 mF	220400	
110706R1106	CWB-SD-MT-V33GCT-A3R1.UL	3	No	No	< 26 mF	220400	
Code	Precharge with fuses						
110706R1113	CWB-SD-MT-V33GCT-A1R2.F.UL	1	Yes	Yes	< 26 mF	220503	
110706R1114	CWB-SD-MT-V33GCT-A1R1.F.UL	1	No	Yes	< 26 mF	220503	
110706R1108	CWB-SD-MT-V33GCT-A2R2.F.UL	2	Yes	Yes	< 26 mF	220481	
110706R1109	CWB-SD-MT-V33GCT-A2R1.F.UL	2	No	Yes	< 26 mF	220481	
110706R1111	CWB-SD-MT-V33GCT-A3R2.F.UL	3	Yes	Yes	< 26 mF	220504	
110706R1112	CWB-SD-MT-V33GCT-A3R1.F.UL	3	No	Yes	< 26 mF	220504	
Code	Precharge with fuses for enhanced capacitor bank						
110706R1119	CWB-SD-MT-V33GCT-A2R1.FP.UL	2	No	Yes	< 48 mF	220507	
110706R1122	CWB-SD-MT-V33GCT-A3R1.FP.UL	3	No	Yes	< 48 mF	220508	
	Chopper version (water cooled)						
110706R1125	CWB-SD-MT-V33GCT-H20-A2R1. FP.UL	2	No	Yes	< 48 mF	220520	
110706R1127	CWB-SD-MT-V33GCT-H20-A3R1. FP.UL	3	No	Yes	< 48 mF	220521	
110706R1130	CWB-SD-MT-V33GCT-H20- A2R1.F.UL	2	No	Yes	< 26 mF	220525	
110706R1132	CWB-SD-MT-V33GCT-H20- A3R1.F.UL	3	No	Yes	< 26 mF	220526	

In this case it's possible to refer to the table below.



CROWBAR DIMENSIONS





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