TECHNICAL SPECIFICATION

Type designation: AMG 0450CC04
Application: Diesel/Gas Engine Industrial Application Series
Site criteria: Land use

NOTES

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*Type definition:

AMG0450CC04 DBAI

IC/IP combination
Bearing type
Excitation type
Industrial generators

Bearing type: A-Double bearing, B-Single bearing
Excitation type: A-Auxiliary winding, P-PMG

ABB Generators Ltd.

AABB

Prep. RA.JI 14.5.2012
Appr. TU.TU 24.5.2012
Resp. dept. R&D

8AMG 5860299

Technical Specification

No. of sh. 12

Lang. en
Rev. ind. C
Sheet 1
# PERFORMANCE DATA (Calculated values)

## TYPE

**Type designation:** AMG 0450CC04

## PERFORMANCE DATA

<table>
<thead>
<tr>
<th>Main standard</th>
<th>IEC 60034</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power factor</td>
<td>0.8</td>
</tr>
<tr>
<td>Insulation class</td>
<td>H</td>
</tr>
<tr>
<td>Temperature rise</td>
<td>H</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>40 °C</td>
</tr>
<tr>
<td>Altitude over sea level</td>
<td>≤ 1000 m</td>
</tr>
<tr>
<td>Cooling/Protection</td>
<td>IC01A/IP23</td>
</tr>
<tr>
<td>Mounting arrangement</td>
<td>IM 2105</td>
</tr>
<tr>
<td>Weight without/with PMG</td>
<td>4345/4365 kg</td>
</tr>
<tr>
<td>Inertia (no difference with PMG)</td>
<td>47.6 kgm²</td>
</tr>
</tbody>
</table>

### Single bearing

- CW (Facing drive end)
- Maximum overspeed: 2250 rpm
- Winding pitch: Two thirds (2/3)
- Stator winding resistance: 0.0008 Ω per phase at 20°C series star connection
- Rotor winding resistance: 1.108 Ω at 20°C
- Ex. stator winding resistance: 22.873 Ω at 20°C
- Ex. rotor winding resistance: 0.03148 Ω at 20°C

### Double bearing

- Maximum overspeed: 1800 rpm
- Winding pitch: Two thirds (2/3)
- Stator winding resistance: 0.0008 Ω per phase at 20°C series star connection
- Rotor winding resistance: 1.108 Ω at 20°C
- Ex. stator winding resistance: 22.873 Ω at 20°C
- Ex. rotor winding resistance: 0.03148 Ω at 20°C

### Voltage regulation

± 1%

### Telephone Interference

- THF<2%
- TIF<50

### Frequency

- 50 Hz
- 60 Hz

### Speed

- 1500 rpm
- 1800 rpm

### Cooling Air

- 1.65 m³/sec
- 1.98 m³/sec

### Voltage series star 3 ph.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>380/220</th>
<th>400/231</th>
<th>415/240</th>
<th>440/254</th>
<th>415/240</th>
<th>440/254</th>
<th>460/266</th>
<th>480/277</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xd(s)</td>
<td>3.025</td>
<td>2.713</td>
<td>2.364</td>
<td>1.650</td>
<td>3.566</td>
<td>3.245</td>
<td>2.984</td>
<td>2.713</td>
</tr>
<tr>
<td>Xq(u)</td>
<td>1.899</td>
<td>1.808</td>
<td>1.680</td>
<td>1.352</td>
<td>2.093</td>
<td>1.973</td>
<td>1.887</td>
<td>1.808</td>
</tr>
<tr>
<td>Xq(s)</td>
<td>1.215</td>
<td>1.204</td>
<td>1.190</td>
<td>1.109</td>
<td>1.237</td>
<td>1.223</td>
<td>1.213</td>
<td>1.204</td>
</tr>
</tbody>
</table>

### Voltage series delta 3 ph.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>220</th>
<th>230</th>
<th>240</th>
<th>254</th>
<th>240</th>
<th>254</th>
<th>266</th>
<th>277</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xd(s)</td>
<td>3.025</td>
<td>2.713</td>
<td>2.364</td>
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<td>1.680</td>
<td>1.352</td>
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<td>1.973</td>
<td>1.887</td>
<td>1.808</td>
</tr>
<tr>
<td>Xq(s)</td>
<td>1.215</td>
<td>1.204</td>
<td>1.190</td>
<td>1.109</td>
<td>1.237</td>
<td>1.223</td>
<td>1.213</td>
<td>1.204</td>
</tr>
</tbody>
</table>

### Rated continuous output

<table>
<thead>
<tr>
<th>Voltage</th>
<th>1990 kVA</th>
<th>2100 kVA</th>
<th>2100 kVA</th>
<th>1900 kVA</th>
<th>2180 kVA</th>
<th>2310 kVA</th>
<th>2415 kVA</th>
<th>2520 kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xd(s)</td>
<td>3.025</td>
<td>2.713</td>
<td>2.364</td>
<td>1.650</td>
<td>3.566</td>
<td>3.245</td>
<td>2.984</td>
<td>2.713</td>
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<td>1.808</td>
<td>1.680</td>
<td>1.352</td>
<td>2.093</td>
<td>1.973</td>
<td>1.887</td>
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</tr>
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<td>1.215</td>
<td>1.204</td>
<td>1.190</td>
<td>1.109</td>
<td>1.237</td>
<td>1.223</td>
<td>1.213</td>
<td>1.204</td>
</tr>
</tbody>
</table>

### SCR (short circuit ratio), Ir0/Xd (u)

<table>
<thead>
<tr>
<th>SCR</th>
<th>0.33</th>
<th>0.37</th>
<th>0.42</th>
<th>0.61</th>
<th>0.28</th>
<th>0.31</th>
<th>0.34</th>
<th>0.37</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>s=saturated value, u=unsaturated value, values are p.u. at rated voltage and power.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CE-Marking

Generator fulfills the requirements of Low Voltage Directive (2006/95/EC)
Generator supplied to EEA-area will be CE-marked
2 PERFORMANCE CURVES

THREE PHASE EFFICIENCY CURVES, 50 Hz/380–440 V

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**380 V / 50Hz / 1900kVA**

P.F. = 1.0

---

**400 V / 50Hz / 2100kVA**

P.F. = 1.0

---

**415 V / 50Hz / 2100kVA**

P.F. = 1.0

---

**440 V / 50Hz / 1900kVA**

P.F. = 1.0
THREE PHASE EFFICIENCY CURVES, 60 Hz/415–480 V

- **415V / 60Hz / 2180kVA**
  - P.F.: 1.0
  - Efficiency [%]:
    - 96.05
    - 96.71
    - 96.97
    - 96.96
    - 96.97
    - 96.78

- **440V / 60Hz / 2310kVA**
  - P.F.: 1.0
  - Efficiency [%]:
    - 96.96
    - 97.03
    - 97.09
    - 97.09
    - 96.98
    - 96.78

- **460V / 60Hz / 2415kVA**
  - P.F.: 1.0
  - Efficiency [%]:
    - 96.04
    - 96.98
    - 97.04
    - 97.04
    - 96.94
    - 96.78

- **480V / 60Hz / 2520kVA**
  - P.F.: 1.0
  - Efficiency [%]:
    - 96.08
    - 96.78
    - 97.02
    - 97.02
    - 96.92
    - 96.78

S [p.u]
TRANSIENT VOLTAGE REGULATION CURVES

Load application (Auxiliary winding or PMG excitation):

<table>
<thead>
<tr>
<th>Voltage dip [%]</th>
<th>0.00</th>
<th>0.15</th>
<th>0.30</th>
<th>0.45</th>
<th>0.60</th>
<th>0.75</th>
<th>0.90</th>
<th>1.05</th>
<th>1.20</th>
<th>1.35</th>
<th>1.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>S [p.u]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Load rejection (Auxiliary winding or PMG excitation):

<table>
<thead>
<tr>
<th>Voltage rise [%]</th>
<th>0.00</th>
<th>0.15</th>
<th>0.30</th>
<th>0.45</th>
<th>0.60</th>
<th>0.75</th>
<th>0.90</th>
<th>1.05</th>
<th>1.20</th>
<th>1.35</th>
<th>1.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>S [p.u]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Locked Rotor Motor Starting Curve (Auxiliary winding or PMG excitation):

Note 1

S [P.U] = S/S(Rated), S stands for the actual operation capacity, S(Rated) stands for the generator rated output capacity.
THREE PHASE SHORT-CIRCUIT CURVES (At no-load and rated speed, base on star connection)

50Hz

Note 2
Curves are for star connection. For other connection, please use following multiplication factors:
Series delta: Current values x 1.732
Parallel star: Current values x 2

Curves are for 3-phase short-circuit. For other types of short-circuit, please use following multiplication factors:

<table>
<thead>
<tr>
<th></th>
<th>Instantaneous</th>
<th>Continuous</th>
<th>Maximum duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-phase</td>
<td>1</td>
<td>1</td>
<td>10 sec.</td>
</tr>
<tr>
<td>2-phase L/L</td>
<td>0.87</td>
<td>1.5</td>
<td>5 sec.</td>
</tr>
<tr>
<td>1-phase L/N</td>
<td>1.3</td>
<td>2.2</td>
<td>2 sec.</td>
</tr>
</tbody>
</table>

60Hz
3 CONFIGURATION AND SCOPE OF SUPPLY

GENERAL
The generator is designed to operate together with a diesel or gas engine.

CONSTRUCTION
The stator frame is a rigid welded steel structure construction. The stator core is built of thin electric sheet steel laminations which are insulated on both sides with heat-resistant inorganic resin.

The rotor consists of a shaft and a star shape rotor core. The shaft is machined of rolled steel. Special heat treatment is used if shaft operates under heavy conditions. The poles are manufactured of 0.5 mm sheet steel. The pole laminations are pressed and welded together with steel bars. These bars are then welded to the end plates. Rotor balancing is done acc. to ISO 1940/1. The standard balancing quality grade is G2.5.

All windings are completely vacuum pressure impregnated with high quality resin. The windings are provided with very strong bracing which withstands all expected mechanical and electrical shocks and vibrations as well as chemicals.

End shields are made of casted steel. The stator frame and stator core are welded together, and bolted with end shields.

MAIN TERMINAL SPACE
Protection class IP44, Integrated into the top module of the generator.
Supply cable entries: Closed terminal box. Cable inlet to the main terminal box to be done by the customer.
Six (6) terminals: U1, V1, W1 and U2, V2, W2 brought to the main terminal box. Neutral point (N) made inside the terminal box by separate copper bar connecting U2, V2, W2 together. Main terminals U, V, W and neutral point N in the main terminal box for external connection.
Terminal marking acc. to IEC.
Designed for continuous current load.

FOUNDATION
The machine can be mounted using shimming, machined blocks, chock fast or on grouted sole plates or bed plate. Before using other mountings, contact us.

CONTROL SYSTEMS
General
Brushless excitation.

Automatic Voltage Regulator System
Mounted inside the main terminal box.

Analog type AVR.

Functions:
  a) 1-channel AVR.
  b) Excitation power from auxiliary winding or PMG.
  c) Voltage set-point adjustment (local).
  d) U/f limiter.
  e) Paralleling operation.
Static voltage regulation accuracy +/- 1.0 %.
Voltage recovery time after transient < 1.5 s, +/- 3.0 % (acc. to IEC 60034).
Nominal Um, range: < 90 VDC at 110 VAC input, 170 VDC at 220 VAC input.
Nominal Im, range: continuous 5 ADC.

**BEARINGS**

Non Drive-end: Rolling, re-grease, free.
Drive-end: Rolling, re-grease, locked (Double bearing).
Not electrically insulated.
Maximum bearing temperature 90 °C at ambient 40 °C.

**TESTING**

Testing is according to IEC and ABB internal requirements. The test may be observed by the customer
without extra charges. The test procedures are described in the following documents which are
available on request:
- Routine tests: MDD 8006327 (for all machines).
- Type tests: MDD 8006328 (optional, to be agreed separately).
- Special tests: MDD 8006329 (optional, to be agreed separately).

**PERFORMANCE CHARACTERISTICS AND OPERATIONAL LIMITS**

Rating for continuous running duty:
Duty type S1.

Rating for short-time duty:
10 % overload at nominal power factor for one hour at twelve hour intervals.

Overcurrent withstand capability:
1.5 times nominal current for 2 minutes.

Sustained short-circuit current:
More than 3 times nominal current for 10 seconds.

Generator shall be suitable for supplying circuits which, when supplied by a system of balanced and
sinusoidal voltages:
Result in currents not exceeding a harmonic current factor of 0.05 and
Result in a system of currents where neither the negative-sequence component nor the zero-
sequence component exceed 5% of the positive-sequence component.

Maximum voltage unbalance is 0.5 %.

Maximum I2/IN value for continuous operation is 8 %.

Maximum (I2/IN)^2 x t in seconds for operation under fault conditions is 20.

Maximum continuous voltage variation with rated output is ±5 %.

Maximum continuous frequency variation with rated output is ±2 %.

Maximum combined voltage and frequency variation and maximum short-time limits are acc. to IEC
60034-1:2004, Section 7.3.

Electromagnetic Compatibility (EMC)
Radiated and conducted emissions comply with the requirements of CISPR 11, Class B, Group 1,
Table B.1. (IEC 60034-1, Annex B).
TOLERANCES

Efficiency $\eta$

- Machines up to and including 150 kW (or kVA) $-15\%$ of $(1-\eta)$
- Machines above 150 kW (or kVA) $-10\%$ of $(1-\eta)$

Total losses (applicable to machines with ratings >150 kW or kVA) $+10\%$ of the total losses

Peak value of short-circuit current under specified conditions $\pm 30\%$ of the value in the technical specification

Steady short-circuit current at specified excitation $\pm 15\%$ of the value in the technical specification

Moment of inertia $\pm 10\%$ of the value in the technical specification

SURFACE TREATMENT

Grade: C2, Standard color

Surface treatment C2 according to the ISO 12944 standard, for standard industrial environment.
### 4 ACCESSORIES

#### OPTIONAL ACCESSORIES

<table>
<thead>
<tr>
<th>No</th>
<th>pc/pcs</th>
<th>Item</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td>Anti-condensation heater</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Current transformer</td>
<td>For parallel operation with other generators</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>PT100 for stator winding</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>PTC sensor (triple)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>PMG</td>
<td></td>
</tr>
</tbody>
</table>
5 DIMENSIONS

MAIN DIMENSIONS

Single bearing

Double bearing

<table>
<thead>
<tr>
<th>Flange dimensions (mm)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S.A.E</td>
<td>AK</td>
<td>AJ</td>
<td>BD</td>
<td>BF</td>
<td>n</td>
<td>a</td>
</tr>
<tr>
<td>0</td>
<td>647.7</td>
<td>679.45</td>
<td>711</td>
<td>14</td>
<td>16</td>
<td>11.25°</td>
</tr>
<tr>
<td>00</td>
<td>787.4</td>
<td>851</td>
<td>883</td>
<td>14</td>
<td>16</td>
<td>11.25°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flex disc dimensions (mm)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S.A.E</td>
<td>BX</td>
<td>P</td>
<td>AH</td>
<td>y</td>
<td>m</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>571.5</td>
<td>543.0</td>
<td>15.7</td>
<td>18</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>673.1</td>
<td>641.3</td>
<td>0</td>
<td>18</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>
**Single bearing**

**Double bearing**