In an effort to ensure that prospective vendors have the all necessary information to provide accurate proposals, the University is providing the following relevant information regarding equipment the University has purchased for the project.

1. Please see the equipment submittals attached as Attachment A and Attachment B.

2. For reference, it is anticipated that the Generator System will be delivered in January of 2025, and the Chillers will be delivered in June of 2024.

This document and attachments shall be attached to and become a part of the contract documents for this project. This addendum shall be signed for acknowledgement that you have received Addendum #2 and shall be returned with your proposal.

COMPANY NAME: _____________________________________________________________

STREET ADDRESS: _____________________________________________________________

CITY/STATE: _________________________________________________________________

TELEPHONE AND FAX: __________________________________________________________

SIGNATURE: ___________________________ DATE: __________________________
设备提交

TAMU CC
450REZXD– 450 千瓦发电机系统

账户管理：Jim Lambrecht
210-740-5340
jlambrecht@loftinequip.com

Loftin Equipment Company
1241 Universal City Blvd.
Universal City, TX
85008
(210) 881-1623
www.loftinequip.com
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<td>Circuit Breaker</td>
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<td></td>
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<td>97</td>
</tr>
</tbody>
</table>
Generator

Kohler Model: 450REZXD
This gas generator set equipped with a 5M4028 alternator operating at 120/208 volts is rated for 450 kW/562 kVA. Output amperage: 1560.

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>450REZXD Generator System</td>
</tr>
<tr>
<td>1</td>
<td>450REZXD Generator Set</td>
</tr>
</tbody>
</table>

Includes the following:
- **Literature Languages**: English
- **Approvals and Listings**: UL2200 Listing/cUL Genset List
- **Engine**: 450REZXD, 24V, SINGLE FUEL, NG
- **Nameplate Rating**: Standby 130C Rise
- **Voltage**: 60Hz, 120/208V, Wye, 3Ph, 4W
- **Alternator**: 5M4028
- **Cooling System**: Unit Mounted Radiator, 50C
- **Skid and Mounting**: Skid
- **Controller**: APM603
- **Enclosure Type**: Sound
- **Enclosure Material**: Aluminum
- **Enclosure Electrical Package**: Basic Electrical Pkg, 1 Ph
- **Enclosure Electrical Acc.**: Wire Block Heater
- **Starting Aids, Installed**: 6000W, 208V, 1Ph, w/Valves
- **Electrical Accy., Installed**: Battery, 2/12V, Wet
- **Electrical Accy., Installed**: Battery Charger, 10A
- **Electrical Accy., Installed**: Run Relay
- **Electrical Accy., Installed**: Failure Relay w/Harness, 1Fault
- **Electrical Accy., Installed**: Generator Heater
- **Electrical Accy., Installed**: 15 Relay I/O Board
- **Rating, LCB 1 Right**: 100% Rated
- **Amps, LCB 1 Right**: 1200
- **Trip Type, LCB 1 Right**: Electronic, LSI
LCB 1 Right Interrupt Rating 35kA at 480V
Aux Trip, LCB 1 Right
Rating, LCB 1 Left
Amps, LCB 1 Left
Trip Type, LCB 1 Left
LCB 1 Left Interrupt Rating 35kA at 480V
Aux Trip, LCB 1 Left
LCB Accy. Installed
LCB Accy. Installed
Exceeds LTL Shipping Height
Miscellaneous Accy, Installed
Miscellaneous Accy, Installed
Warranty
Testing, Additional
Testing, Additional
Special Factory Test Options
Special Factory Test Options
Special Factory Test Options
Special Factory Test Options
Total number of running hours
Run at full load (standard)
Run test at 75% Load
Run test at 50% Load
Run test at 25% Load
Standard readings every 15 min
Witnessed Y/N or Virtual
Weeks notice to perform test
* Disclaimer - Special Test
Total unit length in inches
Total unit width in inches
Total unit height in inches
Total unit weight (lbs)
Weight/Dimensions Disclaimer *
1 Weld-On Flange, 5” ANSI
1 Battery Charger Temp. Comp. Sensor
1 NEC Remote, E-Stop
1 Flexible Fuel Line
1 RSA III, Annunciator only
1 Special Test

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RSA III, Annunciator only</td>
</tr>
</tbody>
</table>
Attachment A

Miscellaneous
Stationary Standby and Prime Power
Industrial Generator Set One-Year or
Two Thousand (2000)-Hour Limited Warranty

Your Kohler product has been manufactured and inspected with care by experienced craftsmen. If you are the original end user, Kohler Co. warrants, for the period indicated below, each product to be free from defects in materials and workmanship. In the event of a defect in materials or workmanship, Kohler Co. will repair, replace, or make appropriate adjustment at Kohler Co.’s option if the product upon Kohler Co.’s inspection, is found to be properly installed, maintained, and operated in accordance with Kohler Co.’s instruction manuals. A Kohler distributor, dealer, or authorized service representative must perform startup.

Kohler Product Warranty Coverage

Stationary Standby Generator Set & Accessories
One (1) year from registered startup or two thousand (2000) hours (whichever occurs first). In any event, the warranty period will expire not later than thirty (30) months from the date of shipment from Kohler Co.’s factory.

Stationary Prime Power Generator Set & Accessories
One (1) year from registered startup or two thousand (2000) hours (whichever occurs first). In any event, the warranty period will expire not later than thirty (30) months from the date of shipment from Kohler Co.’s factory.

The following will not be covered by the warranty:

1. Normal wear, routine tuneups, tuneup parts, adjustments, and periodic service.
2. Damage, including but not limited to damage caused by accidents, improper installation or handling, faulty repairs not performed by an authorized Kohler service representative, improper storage, or acts of God.
3. Damage caused by operation at speeds, or with fuel, loads, conditions, modifications or installation contrary to published specifications.
4. Damage caused by negligent maintenance such as:
   a. Failure to provide the specified type and sufficient quantity of lubricating oil.
   b. Failure to keep the air intake and cooling fin areas clean.
   c. Failure to service the air cleaner.
   d. Failure to provide sufficient coolant and/or cooling air.
   e. Failure to perform scheduled maintenance as prescribed in supplied manuals.
   f. Failure to regularly exercise the generator set under load (stationary applications only).
5. Original installation charges and startup costs.
6. Starting batteries and the following related expenses:
   a. Labor charges related to battery service.
   b. Travel expenses related to battery service.
7. Additional expenses for repairs performed after normal business hours, i.e. overtime or holiday labor rates.
8. Rental of equipment during the performance of warranty repairs.
10. Non-Kohler replacement parts. Replacement of a failed Kohler part with a non-Kohler part voids the warranty on that part.
11. Radiators replaced rather than repaired.
12. Fuel injection pumps not repaired by an authorized Kohler service representative.
13. Non-Kohler-authorized repair shop labor without prior approval from Kohler Co. Warranty Department.
14. Engine fluids such as fuel, oil, or coolant/antifreeze.
15. Shop supplies such as adhesives, cleaning solvents, and rags.
16. Expenses incurred investigating performance complaints unless the problem is caused by defective Kohler materials or workmanship.
17. Maintenance items such as fuses, lamps, filters, spark plugs, loose or leaking clamps, and adjustments.
18. Travel time and mileage exceeding 300 miles round trip.

To obtain warranty service, call 1-800-544-2444 for your nearest authorized Kohler service representative or write Kohler Co., Service Department, MS072, Kohler, WI 53044 USA.

KOHLER CO. SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL, AND/OR CONSEQUENTIAL DAMAGES OF ANY KIND including, but not limited to, incidental and/or consequential labor costs, installation charges, telephone charges, or transportation charges in connection with the replacement or repair of defective parts.

This is our exclusive written warranty. We make no other express warranty nor is anyone authorized to make any on our behalf.

ANY IMPLIED OR STATUTORY WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, IS EXPRESSLY LIMITED TO THE DURATION OF THIS WARRANTY. Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental and/or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.
Kohler Standby/Prime Generator Set Test Program

Testing is an integral part of quality assurance. In keeping with our uncompromising commitment to quality, safety, and reliability, every Kohler Standby/Prime power generator set undergoes an extensive series of prototype and production testing.

Prototype Testing

Prototype testing includes the potentially destructive tests necessary to verify design, proper function of protective devices and safety features, and reliability expectations. Kohler’s prototype testing includes the following:

- Alternator temperature rise test per NEMA MG1-32.6. Standby and prime ratings of the alternator are established during this test.
- Maximum power test to assure that the prime mover and alternator have sufficient capacity to operate within specifications.
- Alternator overload test per NEMA MG1-32.8.
- Steady-state load test to ensure voltage regulation meets or exceeds ANSI C84.1, NEMA MG1-32.17 requirements and to verify compliance with steady-state speed control specifications.
- Transient test to verify speed controls meets or exceeds specifications.
- Transient load tests per NEMA MG1-32.18, and ISO 8528 to verify specifications of transient voltage regulation, voltage dip, voltage overshoot, recovery voltage, and recovery time.
- Motor starting tests per NEMA MG1-32.18.5 to evaluate capabilities of generator, exciter, and regulator system.
- Three-phase symmetrical short-circuit test per NEMA MG1-32.13 to demonstrate short circuit performance, mechanical integrity, ability to sustain short-circuit current.
- Harmonic analysis, voltage waveform deviation per NEMA MG1-32.10 to confirm that the generator set is producing clean voltage within acceptable limits.

- Generator set cooling and air flow tests to verify maximum operating ambient temperature.
- Reliability tests to demonstrate product durability, followed by root cause analysis of discovered failures and defects. Corrective action is taken to improve the design, workmanship, or components.
- Acoustical noise intensity and sound attenuation effects tests.

Production Testing

In production, Kohler Standby/Prime generator sets are built to the stringent standards established by the prototype program. Every Kohler generator set is fully tested prior to leaving the factory. Production testing includes the following:

- Stator and exciter winding high-potential test on all generators. Surge transient tests on stators for generators 180 kW or larger. Continuity and balance tests on all rotors.
- One-step, full-load pickup tests to verify that the performance of each generator set, regulator, and governor meets published specifications.
- Regulation and stability of voltage and frequency are tested and verified at no load, 1/4 load, 1/2 load, 3/4 load, and full-rated load.
- Voltage, amperage, frequency and power output ratings verified by full-load test.
- The proper operation of controller logic circuitry, prealarm warnings, and shutdown functions is tested and verified.
- Any defect or variation from specification discovered during testing is corrected and retested prior to approval for shipment to the customer.

Torsional analysis data, to verify torsional effects are not detrimental and that the generator set will provide dependable service as specified, is available upon request.

Kohler offers other testing at the customer’s request at an additional charge. These optional tests include power factor testing, customized load testing for specific application, witness testing, and a broad range of MIL-STD-705c testing. A certified test report is also available at an additional charge.
450REZXD
60 Hz. Gas Generator Set
EPA Certified for Stationary Emergency Applications
EMISSION DATA SHEET

ENGINE INFORMATION

<table>
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<tr>
<th>Model:</th>
<th>D219TIC, 21.9L</th>
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<tbody>
<tr>
<td>Nameplate kW @ 1800 RPM:</td>
<td>510 (NG) 352 (LPG)</td>
</tr>
<tr>
<td>Type:</td>
<td>4-Cycle, V12 Cylinder</td>
</tr>
<tr>
<td>Aspiration:</td>
<td>Turbocharged</td>
</tr>
<tr>
<td>Compression Ratio:</td>
<td>10.5:1</td>
</tr>
<tr>
<td>Catalyst Required:</td>
<td>Yes</td>
</tr>
<tr>
<td>Bore:</td>
<td>128mm (5.0 in.)</td>
</tr>
<tr>
<td>Stroke:</td>
<td>142mm (5.6 in.)</td>
</tr>
<tr>
<td>Displacement:</td>
<td>21.9 L (1336 cu. in.)</td>
</tr>
<tr>
<td>EPA Family (LP):</td>
<td>RPSIB21.9NGP</td>
</tr>
<tr>
<td>EPA Family (NG):</td>
<td>RPSIB21.9NGP</td>
</tr>
<tr>
<td>EPA Certificate (LP):</td>
<td>RPSIB21.9NGP-023</td>
</tr>
<tr>
<td>EPA Certificate (NG):</td>
<td>RPSIB21.9NGP-023</td>
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EXHAUST EMISSION DATA¹:

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<tr>
<th></th>
<th>LPG</th>
<th>NG</th>
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</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>590.7</td>
<td>881.3</td>
</tr>
<tr>
<td>NOx</td>
<td>0.03</td>
<td>0.08</td>
</tr>
<tr>
<td>VOC²</td>
<td>0.05</td>
<td>0.01</td>
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<tr>
<td>CO</td>
<td>0.34</td>
<td>0.13</td>
</tr>
<tr>
<td>BSFC</td>
<td>241</td>
<td>213</td>
</tr>
</tbody>
</table>

¹Emissions shown are certified third-party Zero-hour data points suitable for site permitting calculations
²For NG, NMHC is reported in place of VOC for this report

TEST METHODS AND CONDITIONS

Standby and overload ratings based on ISO3046. Continuous ratings based on ISO 8528.
All ratings are gross flywheel horsepower corrected to 77°F at an altitude of 328 feet with no cooling fan or alternator losses using heating value for NG of 1015 BTU/SCF.
Production tolerances in engines and installed components can account for power variations of +/- 5%. Corrections for altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.
Electrical ratings are an estimate based on assumed fan and generator losses and may vary depending on actual equipment losses.
BSFC is based on 100% gross flywheel power rating and does not include fan or generator losses.

Data and specifications subject to change without notice.
Certificate Issued To: Power Solutions International, Inc.
(U.S. Manufacturer or Importer)
Certificate Number: RPSIB21.9NGP-023

Effective Date: 05/12/2023
Expiration Date: 12/31/2024

Manufacturer: Power Solutions International, Inc.
Engine Family: RPSIB21.9NGP
Mobile/Stationary Certification Type: Mobile and Stationary
Fuel: Natural Gas (CNG/LNG)

Emission Standards:
Part 60 Subpart JJJJ Table 1
NOx (g/Hp-hr) : 1.0
VOC (g/Hp-hr) : 0.7
CO (g/Hp-hr) : 2.0

Mobile Part 1048
NMHC + NOx (g/kW-hr) : 2.7
HC + NOx (g/kW-hr) : 2.7
CO (g/kW-hr) : 4.4

Stationary Part 1048
CO (g/kW-hr) : 4.4
NMHC + NOx (g/kW-hr) : 2.7
HC + NOx (g/kW-hr) : 2.7

Emergency Use Only: N

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 60, 40 CFR Part 1048, 1065, 1068, and 60 (stationary only and combined stationary and mobile) and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 60, 40 CFR Part 1048 and produced in the stated model year.

This certificate of conformity covers only those new nonroad spark-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60, 40 CFR Part 1048 and which are produced during the model year stated on this certificate. As defined in 40 CFR Part 60, 40 CFR Part 1048. This certificate of conformity does not cover nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60, 40 CFR Part 1048. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR Part 60, 40 CFR Part 1048.

This certificate does not cover large nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.
Certificate of Registration

QUALITY MANAGEMENT SYSTEM - ISO 9001:2015

This is to certify that: Kohler Power Systems
N7650 Lakeshore Road
Sheboygan
Wisconsin
53083
USA

Holds Certificate No: FM 727336
and operates a Quality Management System which complies with the requirements of ISO 9001:2015 for the following scope:

Design, manufacture, and distributor support for electrical generators, alternators, fuel tanks, automatic transfer switches and switchgear.

For and on behalf of BSI:

Carlos Pitanca, Chief Operating Officer: Assurance – Americas

Original Registration Date: 1995-02-28
Latest Revision Date: 2021-10-29
Effective Date: 2021-11-07
Expiry Date: 2024-11-06

...making excellence a habit™
<table>
<thead>
<tr>
<th>Location</th>
<th>Registered Activities</th>
</tr>
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<tbody>
<tr>
<td>Kohler Power Systems - GK 900 Highland Drive Bldg 604 Kohler Wisconsin 53004 USA</td>
<td>Manufacture of leads and harness, automatic transfer switches and switchgear. Distribution of generator sets.</td>
</tr>
<tr>
<td>Kohler Power Systems N7650 Lakeshore Road Sheboygan Wisconsin 53083 USA</td>
<td>Design, manufacture, and distributor support for electrical generators, automatic transfer switches and switchgear.</td>
</tr>
<tr>
<td>Kohler Power Systems 300 N Dekora Woods Blvd Saukville Wisconsin 53080 USA</td>
<td>Manufacture of fuel tanks, skids, fabricated components and generators.</td>
</tr>
<tr>
<td>Kohler Power Systems Muth Warehouse 2821 Muth Court Sheboygan Wisconsin 53083 USA</td>
<td>The distribution of generator sets.</td>
</tr>
<tr>
<td>Kohler Power Systems KWIP Warehouse 4327 County EE Sheboygan Wisconsin 53081 USA</td>
<td>Receiving, sequencing and warehousing of generator components.</td>
</tr>
</tbody>
</table>
### Generator Set/Transfer Switch Installation Checklist

This document has generic content and some items may not apply to some applications. Check only the items that apply to the specific application. Read and understand all of the safety precautions found in the Operation and Installation Manuals. Make the following installation checks before performing the Startup Checklist.

**Note:** Use this form as a general guide, along with any applicable codes or standards. Comply with all applicable codes and standards. Improper installation voids the warranty.

<table>
<thead>
<tr>
<th>Equipment Room or Weather Housing</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is the equipment installed in a fire-resistant room (made of non-combustible material) or in an outdoor weather housing?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>2. Is there adequate clearance between the engine and floor for service maintenance?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>3. Is there emergency lighting available at the equipment room or weather housing?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>4. Is there adequate heating for the equipment room or outdoor weather housing?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>5. Is the equipment room clean with all materials not related to the emergency power supply system removed?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>6. Is the equipment room protected with a fire protection system?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Engine and Mounting</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Is the mounting surface(s) properly constructed and leveled?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>8. Is the mounting surface made from non-combustible material?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>9. Was the generator-to-engine alignment performed after attaching the skid to the mounting base?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lubrication</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Is the engine crankcase filled with the specified oil?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cooling and Ventilation</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Is the cooling system filled with the manufacturer’s specified coolant/antifreeze and purged of air?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>12. Is there adequate inlet and outlet air flow (electric louvers adjusted and ventilation fan motor(s) connected to the corresponding voltage)?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>13. Is the radiator duct properly sized and connected to the air vent or louver?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>14. Are flexible sections installed in the cooling water lines?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Is there an adequate/dedicated fuel supply?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>16. Are the fuel filters installed?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>17. Are the fuel tanks and piping installed in accordance with applicable codes and standards?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>18. Is there adequate fuel transfer tank pump lift capacity and is the pump motor connected to the corresponding voltage?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>19. Is the fuel transfer tank pump connected to the emergency power source?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>20. Are flexible fuel lines installed between the engine fuel inlet and fuel piping?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>21. Is the specified gas pressure available at the fuel regulator inlet?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>22. Does the gas solenoid valve function?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>23. Are the manually operated fuel and cooling water valves installed allowing manual operation or by-pass of the solenoid valves?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exhaust</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. Is the exhaust line sized per guidelines and does it have flexible connector(s)? Is the flexible connector(s) straight?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AC Electrical System</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. Is there an exhaust line condensate trap with a drain installed?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>26. Is the specified silencer installed and are the hanger and mounting hardware tightened?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>27. Is a heat-isolating thimble(s) installed at points where exhaust lines pass through combustible wall(s) or partition(s)?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>28. Is the exhaust line free of excessive bends and restrictions? Is the backpressure within specifications?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>29. Is the exhaust line installed with a downward pitch toward the outside of the building?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>30. Is the exhaust line protected from entry by rain, snow, and animals?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>31. Does the exhaust system outlet location prevent entry of exhaust gases into buildings or structures?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>32. Are individuals protected from exposure to high temperature exhaust parts and are hot parts safety decals present?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transfer Switch, Remote Control System, Accessories</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>33. Does the nameplate voltage/frequency of the generator set and transfer switch match normal/utility source ratings?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>34. Do the generator set load conductors have adequate ampacity and are they correctly connected to the circuit breakers and/or the emergency side of the transfer switch?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>35. Are the load conductors, engine starting cables, battery charger cables, and remote annunciator leads installed in separate conduits?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>36. Is the battery charger AC circuit connected to the corresponding voltage?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>37. Is the transfer switch mechanism free of binding? <strong>Note:</strong> Disconnect all AC sources and operate the transfer switch manually.</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>38. Are the transfer switch AC conductors correctly connected? Verify lead designations using the appropriate wiring diagrams.</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>39. Is all other wiring connected, as required?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Batteries and DC Electrical System</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>40. Does the battery(ies) have the specified CCA rating and voltage?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>41. Is the battery(ies) filled with electrolyte and connected to the battery charger?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>42. Are the engine starting cables connected to the battery(ies)?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>43. Do the engine starting cables have adequate length and gauge?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>44. Is the battery(ies) installed with adequate air ventilation?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>45. Are the ends of all spark plug wires properly seated onto the coil/distributor and the spark plug?</td>
<td>☐ ☐</td>
<td>☑</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Special Requirements</th>
<th>Does Not Apply</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>46. Is the earthquake protection adequate for the equipment and support systems?</td>
<td>☐ ☐</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>47. Is the equipment protected from lightning damage?</td>
<td>☐ ☐</td>
<td>☑</td>
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</tbody>
</table>
Attachment A
Generator Set/Transfer Switch Startup Checklist

This document has generic content and some items may not apply to some applications. Check only the items that apply to the specific application. Read and understand all of the safety precautions found in the Operation and Installation Manuals. Complete the Installation Checklist before performing the initial startup checks. Refer to Service Bulletin 816 for Warranty Startup Procedure Requirements regarding generator set models with ECM-controlled engines.

<table>
<thead>
<tr>
<th>Item</th>
<th>Does Not Apply</th>
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<th>Apply</th>
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<tbody>
<tr>
<td>1.</td>
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<tr>
<td>51.</td>
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</tr>
</tbody>
</table>

* Some models with an Engine Electronic Control Module (ECM) may limit or prohibit adjusting the engine speed or testing shutdowns.

Refer to appropriate documentation available from the manufacturer.
Spec Sheets
Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- EPA-Certified for Stationary Emergency Applications
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a cULus listing.
- The generator set accepts rated load in one step.
- The 60 Hz emergency generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- A one-year limited warranty covers all systems and components. Two- and five-year extended warranties are also available.
- Alternator Protection
- Battery Rack and Cables
- Closed Crankcase Ventilation (CCV) Filters
- Dual Fuel Reset Box (standard on dual fuel models)
- Integral Vibration Isolation
- Local Emergency Stop Switch
- Low Coolant Level Shutdown
- Oil Drain Extension
- Secondary Gas Solenoid Value
- Three-Way Exhaust Catalyst

Alternator Features

- The pilot-excited, permanent-magnet (PM) alternator provides superior short-circuit capability.
- The brushless, rotating-field alternator has broad range reconnectability.

Other Features

- Natural gas is the primary fuel. Automatically transfers back to primary fuel when LP fuel becomes low or generator stops and restarts.
- The patented pending reset box on the generator provides the ability to manually transfer back to natural gas. The natural gas rating is available when running on natural gas.
- APM603 controller provides load shed for automatic derate to LP ratings to prevent an overload condition.

Generator Set Rating

<table>
<thead>
<tr>
<th>Alternator</th>
<th>Voltage</th>
<th>Ph</th>
<th>Hz</th>
<th>kW/kVA</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>5M4028</td>
<td>120/208</td>
<td>3</td>
<td>60</td>
<td>450/562</td>
<td>1560</td>
</tr>
</tbody>
</table>

Standby 130C Rise Ratings

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor.
Standby Ratings: The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating.
## Alternator Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Alternator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternator manufacturer</td>
<td>Kohler</td>
</tr>
<tr>
<td>Type</td>
<td>4-Pole, Rotating-Field</td>
</tr>
<tr>
<td>Exciter type</td>
<td>Brushless, Permanent-Magnet Pilot Exciter</td>
</tr>
<tr>
<td>Leads, quantity</td>
<td>10, Reconnectable</td>
</tr>
<tr>
<td>Voltage regulator</td>
<td>Solid State, Volts/Hz</td>
</tr>
<tr>
<td>Insulation</td>
<td>NEMA MG1</td>
</tr>
<tr>
<td>Insulation: Material</td>
<td>Class H, Synthetic, Nonhydroscopic</td>
</tr>
<tr>
<td>Insulation: Temperature Rise</td>
<td>130 ° C, 150 ° C Standby</td>
</tr>
<tr>
<td>Bearing: quantity, type</td>
<td>1, Sealed</td>
</tr>
<tr>
<td>Coupling</td>
<td>Flexible disc</td>
</tr>
<tr>
<td>Amortisseur windings</td>
<td>Full</td>
</tr>
<tr>
<td>Rotor balancing (60Hz)</td>
<td>125%</td>
</tr>
<tr>
<td>Voltage regulation, no-load to full-load RMS</td>
<td>Controller Dependent</td>
</tr>
<tr>
<td>One-Step Load Acceptance</td>
<td>100% of rating</td>
</tr>
<tr>
<td>Unbalanced load capability</td>
<td>100% of Rated Standby Current</td>
</tr>
</tbody>
</table>

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and drip-proof construction.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Brushless alternator with brushless pilot exciter for excellent load response.

## Engine Specification

<table>
<thead>
<tr>
<th>Engine Manufacturer</th>
<th>Doosan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Model</td>
<td>D219L</td>
</tr>
<tr>
<td>Engine: type</td>
<td>21.9 L, 4-Cycle, Turbocharged, Charge Air-Cooled</td>
</tr>
<tr>
<td>Cylinder arrangement</td>
<td>V-12</td>
</tr>
<tr>
<td>Displacement, L (cu. in.)</td>
<td>21.9 (1336)</td>
</tr>
<tr>
<td>Bore and stroke, mm (in.)</td>
<td>128 x 142 (5.0 x 5.6)</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>10.5:1</td>
</tr>
<tr>
<td>Piston speed, m/min. (ft./min.)</td>
<td>511 (1677)</td>
</tr>
<tr>
<td>Main bearings: quantity, type</td>
<td>14, Precision Half-Shell</td>
</tr>
<tr>
<td>Rated rpm</td>
<td>1800</td>
</tr>
<tr>
<td>Max. power at rated rpm, kWm (BHP)</td>
<td>510 (684)</td>
</tr>
<tr>
<td>Cylinder head material</td>
<td>Cast Iron</td>
</tr>
<tr>
<td>Crankshaft material</td>
<td>Forged Steel</td>
</tr>
<tr>
<td>Governor: type, make/model</td>
<td>Electronic</td>
</tr>
<tr>
<td>Frequency regulation, no-load to full load</td>
<td>Isochronous</td>
</tr>
<tr>
<td>Frequency regulation, steady state</td>
<td>± 0.5%</td>
</tr>
<tr>
<td>Frequency</td>
<td>Fixed</td>
</tr>
<tr>
<td>Air cleaner type, all models</td>
<td>Dry</td>
</tr>
</tbody>
</table>
### Exhaust

**Exhaust System**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhaust Manifold Type</td>
<td>Wet</td>
</tr>
<tr>
<td>Exhaust flow at rated kW, kg/hr. (cfm)</td>
<td>1932 (2529)</td>
</tr>
<tr>
<td>Maximum allowable back pressure after catalyst, kPa (in. Hg)</td>
<td>5.1 (1.5)</td>
</tr>
<tr>
<td>Exhaust temperature at rated kW, dry exhaust, °C (°F)</td>
<td>614 (1136)</td>
</tr>
<tr>
<td>Maximum allowable back pressure, kPa (in. Hg)</td>
<td>10.2 (3)</td>
</tr>
<tr>
<td>Exh. outlet size at eng. hookup, mm (in.)</td>
<td>See ADV Drawing</td>
</tr>
</tbody>
</table>

### Engine Electrical

**Engine Electrical System**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery charging alternator: Ground (negative/positive)</td>
<td>Negative</td>
</tr>
<tr>
<td>Battery charging alternator: Volts (DC)</td>
<td>24</td>
</tr>
<tr>
<td>Battery charging alternator: Ampere rating</td>
<td>45</td>
</tr>
<tr>
<td>Starter motor rated voltage (DC)</td>
<td>24</td>
</tr>
<tr>
<td>Battery, recommended cold cranking amps (CCA): Qty., CCA rating each</td>
<td>Two, 925</td>
</tr>
<tr>
<td>Battery voltage (DC)</td>
<td>12</td>
</tr>
</tbody>
</table>

### Fuel

**Fuel System**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel type</td>
<td>Natural Gas</td>
</tr>
<tr>
<td>Fuel supply line inlet</td>
<td>3.0 NPTF</td>
</tr>
<tr>
<td>Natural gas/LPG fuel supply pressure, kPa (in. H2O). Fuel supply pressure measured at the generator set fuel inlet downstream of any fuel system equipment accessories.</td>
<td>1.74-2.74 (7-11)</td>
</tr>
</tbody>
</table>

### Fuel Composition

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas: Ethane, % by volume</td>
<td>4.0 max.</td>
</tr>
<tr>
<td>Natural Gas: Propane, % by volume</td>
<td>1.0 max.</td>
</tr>
<tr>
<td>Natural Gas: Propene, % by volume</td>
<td>0.1 max.</td>
</tr>
<tr>
<td>Natural Gas: C4 and higher, % by volume</td>
<td>0.3 max.</td>
</tr>
<tr>
<td>Natural Gas: Sulfur, ppm mass</td>
<td>25 max.</td>
</tr>
<tr>
<td>Natural Gas: Lower heating value, kJ/m³ (Btu/ft³), min.</td>
<td>33.2 (890)</td>
</tr>
</tbody>
</table>

* Fuels with other compositions may be acceptable. If your fuel is outside the listed specifications, contact your local distributor for further analysis and advice.

### Lubrication

**Lubrication System**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Full Pressure</td>
</tr>
<tr>
<td>Oil pan capacity, L (qt.)</td>
<td>40 (42.3)</td>
</tr>
<tr>
<td>Oil pan capacity with filter, L (qt.)</td>
<td>47.1 (49.7)</td>
</tr>
<tr>
<td>Oil filter: quantity, type</td>
<td>2, Cartridge</td>
</tr>
<tr>
<td>Oil cooler</td>
<td>Water-Cooled</td>
</tr>
</tbody>
</table>
### Cooling

#### Radiator System

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature, °C (°F)</td>
<td>50 (122)</td>
</tr>
<tr>
<td>Engine jacket water capacity, L (gal.)</td>
<td>44 (12)</td>
</tr>
<tr>
<td>Radiator system capacity, including engine, L (gal.)</td>
<td>190 (51)</td>
</tr>
<tr>
<td>Engine jacket water flow, Lpm (gpm)</td>
<td>570 (151)</td>
</tr>
<tr>
<td>Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)</td>
<td>516 (29345)</td>
</tr>
<tr>
<td>Heat rejected to air charge cooler at rated kW, dry exhaust, kW (Btu/min.)</td>
<td>65 (3686)</td>
</tr>
<tr>
<td>Water pump type</td>
<td>Centrifugal</td>
</tr>
<tr>
<td>Fan diameter, including blades, mm (in.)</td>
<td>1321 (52)</td>
</tr>
<tr>
<td>Fan, kWm (HP)</td>
<td>31 (42)</td>
</tr>
<tr>
<td>Max. restriction of cooling air, intake and discharge side of radiator, kPA (in. H2O)</td>
<td>0.125 (0.5)</td>
</tr>
</tbody>
</table>

* Weather and sound enclosures with internal silencer reduce ambient temperature capability by 5 °C (9 °F).

### Operation Requirements

#### Air Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiator-cooled cooling air, m3/min. (scfm) *</td>
<td>870 (30700)</td>
</tr>
<tr>
<td>Combustion air, kg/hr. (cfm)</td>
<td>1821 (829)</td>
</tr>
<tr>
<td>Heat rejected to ambient air: Engine, kW (Btu/min.)</td>
<td>25 (1437)</td>
</tr>
<tr>
<td>Heat rejected to ambient air: Alternator, kW (Btu/min.)</td>
<td>23 (1580)</td>
</tr>
</tbody>
</table>

*Air density = 1.20 kg/m³ (0.075 lbm/ft³)*

### Fuel Consumption

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas, m3/hr. (cfh) at % load</td>
<td></td>
</tr>
<tr>
<td>Standby Fuel Consumption at 100% load</td>
<td>149.9 m3/hr. (5293 cfh)</td>
</tr>
<tr>
<td>Standby Fuel Consumption at 75% load</td>
<td>117.8 m3/hr. (4161 cfh)</td>
</tr>
<tr>
<td>Standby Fuel Consumption at 50% load</td>
<td>86.9 m3/hr. (3068 cfh)</td>
</tr>
<tr>
<td>Standby Fuel Consumption at 25% load</td>
<td>55.3 m3/hr. (2410 cfh)</td>
</tr>
<tr>
<td>Natural gas, MJ/m³ (1000 Btu/ft.3)</td>
<td></td>
</tr>
</tbody>
</table>
## Alternator Data Sheet

**Alternator Model:** 5M4028

<table>
<thead>
<tr>
<th>Kilowatt ratings at 1800 RPM</th>
<th>60 Hertz</th>
<th>10 Leads</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW (kVA)</td>
<td>3</td>
<td>0.8 Power Factor</td>
</tr>
<tr>
<td>240/480</td>
<td>3 Phase</td>
<td>445 (556)</td>
</tr>
<tr>
<td>220/440</td>
<td></td>
<td>535 (669)</td>
</tr>
<tr>
<td>208/416</td>
<td></td>
<td>510 (636)</td>
</tr>
<tr>
<td>200/400</td>
<td></td>
<td>492 (615)</td>
</tr>
<tr>
<td>190/380</td>
<td></td>
<td>470 (588)</td>
</tr>
<tr>
<td>190/380</td>
<td></td>
<td>470 (588)</td>
</tr>
</tbody>
</table>

**Voltage**

- **NEMA B / 80 °C**
- **NEMA F / 105 °C**
- **NEMA H / 125 °C**
- **NEMA F / 130 °C**
- **NEMA H / 150 °C**

- **CONTINUOUS**
- **STANDBY**

**Submittal Data: 480 Volts*, 550 kW, 700 kVA, 0.8 P.F., 1800 RPM, 60 Hz, 3 Phase High Yoke CONNECTION**

### Additional Prototype Mil-Std Methods are Available on Request.

- **Voltage** refers to wye (star) connection, unless otherwise specified.

---

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Alternator Model: 5M4028

TYPICAL DYNAMIC CHARACTERISTICS

Voltage refers to wye (star) connection, unless otherwise specified.
Alternator Model: 5M4028 14-APR-20

SHORT CIRCUIT DECREMENT CURVE
60 Hz, Low Wye or Delta Connection


NOTE: Symmetrical component values are shown, maximum asymmetrical values are 1.732 times the symmetrical values.
Alternator Model: 5M4028

SHORT CIRCUIT DECREMENT CURVE
60 Hz, High Wye Connection


NOTE: Symmetrical component values are shown, maximum asymmetrical values are 1.732 times the symmetrical values.
The APM603 generator set controller provides advanced control, system monitoring, and system diagnostics for a single generator set or paralleling multiple generator sets. The APM603 interfaces the generator set to other power system equipment and network management systems using standard industry network communications. It uses a patented digital voltage regulator and unique software logic to manage alternator thermal overload protection as well as serves as an overcurrent protective relay, features normally requiring additional hardware. The APM603 controller meets NFPA 110, Level 1.

**Display, Interface, and Accessibility**

- A 7-inch color TFT touchscreen for easy local access to data.
  - Home screen can be customized to show critical data at a glance.
  - Create a custom favorites list for quick access to important data
- Measurements are selectable in metric or English units.
- Supports Modbus® protocol through serial bus and Ethernet networks, and supports SNMP and BACnet® through Ethernet networks.

**Global Support**

- Sales, installation, and service support from more than 800 Kohler and SDMO service providers around the world.

**On-board Diagnostics**

- Immediate visibility of warnings and faults with text description and code display.
  - 15 seconds of critical data are captured around each warning and fault
  - Critical data can be viewed on the display and downloaded
- Store up to 10,000 events locally along with historical data logging of successful starts.
  - Accurate time stamp from real-time clock
  - Event log can be downloaded
- Data logging of customized parameter list for report generation and advanced troubleshooting.
  - Store to external USB drive for easy transfer to another device

Modbus® is a registered trademark of Schneider Electric.
BACnet® is a registered trademark of ASHRAE.
Controller Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Output Voltage Regulator</td>
<td>Maximum of ±10% of the system voltage</td>
</tr>
<tr>
<td>Adjustment</td>
<td></td>
</tr>
<tr>
<td>Alarm Horn</td>
<td>Indicates a generator set warning or shutdown condition</td>
</tr>
<tr>
<td>Alarm Silence</td>
<td>For NFPA-110 application or user convenience</td>
</tr>
<tr>
<td>Alternator Protection</td>
<td>Generator set overload and short circuit protection</td>
</tr>
<tr>
<td>Cyclic Cranking</td>
<td>Provides automatic restart after a failed start attempt with programmable on/off time and number of attempts</td>
</tr>
<tr>
<td>ECU Diagnostics</td>
<td>Displays engine ECU fault codes and descriptions for engine troubleshooting</td>
</tr>
<tr>
<td>Emergency Stop Button</td>
<td>Shuts down the generator set immediately, for emergency situations</td>
</tr>
<tr>
<td>Engine Start Aid</td>
<td>Control for an optional engine starting aid</td>
</tr>
<tr>
<td>Environmentally Sealed Membrane Keypad</td>
<td>Three master control buttons with LEDs: Off/Reset, Auto, and Run</td>
</tr>
<tr>
<td>Patented High-Speed RMS Digital Voltage Regulator</td>
<td>±0.25% no-load to full-load regulation with three-phase true RMS sensing</td>
</tr>
<tr>
<td>Lamp Test</td>
<td>Verifies functionality of the indicator LEDs</td>
</tr>
<tr>
<td>Real-time Clock</td>
<td>Includes battery back-up to retain date and time through controller power cycle</td>
</tr>
<tr>
<td>Remote Reset</td>
<td>Allows remote fault resets and restarting of the generator set</td>
</tr>
<tr>
<td>Remote Monitoring Panel</td>
<td>Compatible with the Kohler® Remote Serial Annunciator</td>
</tr>
<tr>
<td>Run Time Hourometer</td>
<td>Displays generator set run time</td>
</tr>
<tr>
<td>Run Relay</td>
<td>Indicates that the generator set is running</td>
</tr>
<tr>
<td>Time Delay Engine Cooldown (TDEC)</td>
<td>Time delay before the generator set shuts down</td>
</tr>
<tr>
<td>Time Delay Engine Start (TDES)</td>
<td>Time delay before the generator set starts</td>
</tr>
</tbody>
</table>

Communication

<table>
<thead>
<tr>
<th>Port type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Port</td>
<td>(1) Mini-USB port for PC connection</td>
</tr>
<tr>
<td>Serial (RS-485) Port</td>
<td>(1) Non-isolated for RSA III</td>
</tr>
<tr>
<td>Ethernet Port</td>
<td>(1) RJ45 for Modbus TCP, SNMP, and BACnet</td>
</tr>
</tbody>
</table>

Controller Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>12 or 24 VDC protected against reverse battery connection</td>
</tr>
<tr>
<td>Power</td>
<td>800 mAmps at 12 VDC</td>
</tr>
<tr>
<td></td>
<td>400 mAmps at 24 VDC</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40 °C to 70 °C (-40 °F to 158 °F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 °C to 85 °C (-40 °F to 185 °F)</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95% non-condensing</td>
</tr>
<tr>
<td>Display Size, W x H</td>
<td>154 x 86 mm (6.0 x 3.4 inches)</td>
</tr>
<tr>
<td>Protection Index</td>
<td>IP65 Front</td>
</tr>
</tbody>
</table>
Paralleling Features
- Isochronous control with real and reactive load sharing with other APM603 controller equipped generator sets
- Supports paralleling up to 8 generators
- Random first-on logic to prevent two or more generator sets from closing to a dead bus and provides the fastest response for a single generator online
- Automatic synchronizer with dead bus closing
- Soft loading and unloading for generator management
- Protective relay functions:
  - Synch check (25C)
  - Over current (51)
  - Over frequency (81O)
  - Over power (32O)
  - Over voltage (59)
  - Reverse power (32R)
  - Reverse reactive power (32RQ)
  - Under frequency (81U)
  - Under voltage (27)
- Generator management to allow the start and stop of generators based on load demand or state of other generators
  - Fuel level
  - Run time
  - Manual order
  - Time of day
  - Efficiency
- Simplified paralleling system view from any generator controller in the system

Overcurrent Protective Device
- Provides protection against line-to-line and line-to-neutral faults
- Uses thermal and instantaneous current limit settings for alternator protection
- Includes a maintenance mode for arc flash reduction per NEC 240.87

Load Management Features
- Programmable outputs included to command the connect and disconnect of loads based on generator or paralleling system state
  - Loads connected based on available capacity
  - Loads disconnected at system startup
  - Loads disconnected based on a maximum kW setting or underfrequency setting
- Supports up to 16 prioritized load steps per system
  - Can be used on a single generator system
  - Can be combined in a paralleling system for a total system load control capability
- Simplified load management system view from any generator controller in the system
- Requires input/output module option

Advanced Programmable I/O
- Configurable inputs and outputs can be programmed for customer specific use
- PLC-like capability for applying logic to customize generator system behavior

Troubleshooting Features
- 15 seconds of key data automatically captured around each warning and shutdown
  - Data can be exported for detailed analysis
  - Data can be viewed on controller for convenient on-site troubleshooting support
- Configurable data logger will allow you to select parameters to monitor
  - Data stored to USB device for flexibility on amount of data stored and ability to export for detailed analysis
  - Data capture controlled by user to allow capturing specific data required

NFPA 110 Requirements
In order to meet NFPA 110, Level 1 requirements, the generator set controller monitors the engine/generator functions/faults shown below.
- Engine functions:
  - Overcrank
  - Low coolant temperature warning
  - High coolant temperature warning
  - High coolant temperature shutdown
  - Low oil pressure shutdown
  - Low oil pressure warning
  - High engine speed
  - Low fuel (level or pressure)*
  - Low coolant level
  - EPS supplying load
  - High battery voltage
  - Low battery voltage
- General functions:
  - Master switch not in auto
  - Battery charger fault*
  - Lamp test
  - Contacts for local and remote common alarm
  - Audible alarm silence button
  - Remote emergency stop*

* Function requires optional input sensors or kits and is engine dependent, see Engine Data.

Standards
The generator set controller has been tested and verified for compliance with the following standards.
- NFPA 99
- NFPA 110, Level 1
- CSA 282-09
- UL 6200
- ASTM B117 (salt spray test)
Controller Functions

The controller displays warning, shutdown, and status messages. All functions are available as relay outputs. Warning causes the yellow fault LED to show and sounds the alarm horn, signaling an impending problem. Shutdown causes the red fault LED to show, sounds the alarm horn, and stops the generator set.

The controller communicates with the engine ECU and supports a large number of warning and shutdown events that are not listed here. This table highlights the items required for NFPA 110.

<table>
<thead>
<tr>
<th>Event</th>
<th>Warning</th>
<th>Shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternator Thermal Protection †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Battery Charger Fault *</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>CAN Option Board1 Comm Loss</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Critically Low Fuel Level (diesel) *</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>ECU Diagnostic Event</td>
<td>▲</td>
<td></td>
</tr>
<tr>
<td>ECU Mismatch Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Fuel Leak Alarm (diesel) *</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>High Battery Voltage Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>High Coolant Temperature Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>High Coolant Temperature Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>High Fuel Level Shutdown (diesel) *</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>High Oil Temperature Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>High Oil Temperature Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Local Emergency Stop Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Loss ECU Comms Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Loss of Signal Low Coolant Level Voltage</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Low Battery Voltage Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Low Coolant Temperature Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Low Coolant Temperature Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Low Fuel Level Shutdown (diesel) †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Low Fuel Level Warning (diesel) *</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Low Oil Pressure Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Low Oil Pressure Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Low RTC (clock) Battery Voltage</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Maintenance Reminder1</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Maintenance Reminder2</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Maintenance Reminder3</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Maximum Power Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Maximum Power Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Not In Auto Alarm</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Over Crank Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Over Current Shutdown (L1, L2, L3) †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Over Current Warning (L1, L2, L3)</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Over Frequency Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Over Frequency Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Over Power Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Over Power Warning</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Over Speed Shutdown †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Over Voltage Shutdown (L- L, L- N, each phase) †</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Over Voltage Warning (L- L, L- N, each phase)</td>
<td>▲</td>
<td>●</td>
</tr>
<tr>
<td>Weak Cranking Battery</td>
<td>▲</td>
<td>●</td>
</tr>
</tbody>
</table>

**Status Messages**

- Auto Button Pressed
- EPS Supplying Load
- Generator Running
- Generator Started
- Generator Stopped
- GFCI Warning *
- Load Shed Overload
- Load Shed Under Frequency
- Off Button Pressed
- RSA Event Programmable Digital Inputs, 1- 8
- Run Button Pressed

* Function requires optional input sensors or kits
† Items included with common fault shutdown

Attachment A
Kohler KG Engine-Powered Models

Inputs and Outputs

<table>
<thead>
<tr>
<th>Standard Dedicated User Inputs</th>
<th>Input Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary Fault (Shutdown)</td>
<td></td>
</tr>
<tr>
<td>Auxiliary Warning</td>
<td></td>
</tr>
<tr>
<td>Battery Charger Fault</td>
<td></td>
</tr>
<tr>
<td>Breaker Closed *</td>
<td>Digital Input</td>
</tr>
<tr>
<td>Breaker Tripped/Open *</td>
<td></td>
</tr>
<tr>
<td>Emergency Stop, Local</td>
<td></td>
</tr>
<tr>
<td>Emergency Stop, Remote</td>
<td></td>
</tr>
<tr>
<td>Excitation Over Voltage</td>
<td></td>
</tr>
<tr>
<td>Ground Fault Relay</td>
<td></td>
</tr>
<tr>
<td>Fuel Type</td>
<td></td>
</tr>
<tr>
<td>Low Fuel Pressure</td>
<td></td>
</tr>
<tr>
<td>Remote Engine Start</td>
<td></td>
</tr>
<tr>
<td>Speed Bias</td>
<td>Two-wire input</td>
</tr>
<tr>
<td>Voltage Bias</td>
<td>Anadig Voltage Input, Scalable up to +/- 10 VDC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Dedicated User Outputs</th>
<th>Output Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close Breaker *</td>
<td>Relay Driver Output</td>
</tr>
<tr>
<td>Common Failure</td>
<td></td>
</tr>
<tr>
<td>Common Warning</td>
<td></td>
</tr>
<tr>
<td>Crank</td>
<td></td>
</tr>
<tr>
<td>High Coolant Temperature</td>
<td></td>
</tr>
<tr>
<td>Horn</td>
<td></td>
</tr>
<tr>
<td>Run</td>
<td></td>
</tr>
<tr>
<td>Trip Breaker / Shunt Trip *</td>
<td></td>
</tr>
</tbody>
</table>

* Only with remote-mounted electrically operated circuit breakers.

Optional Configurable User Inputs and Outputs

<table>
<thead>
<tr>
<th>User Configurable Inputs</th>
<th>2 Analog, 0-5 VDC</th>
<th>4 Dry Contact Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Configurable Relay Outputs</td>
<td>14 NO/NC Relays</td>
<td>1 Common Fault Relay</td>
</tr>
</tbody>
</table>

Note: Programmable I/O is configurable by a Kohler-authorized technician.

PSI/Doosan Engine-Powered Models

Inputs and Outputs

<table>
<thead>
<tr>
<th>Standard Dedicated User Inputs</th>
<th>Input Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary Fault (Shutdown)</td>
<td></td>
</tr>
<tr>
<td>Auxiliary Warning</td>
<td></td>
</tr>
<tr>
<td>Battery Charger Fault</td>
<td></td>
</tr>
<tr>
<td>Breaker Closed *</td>
<td>Digital Input</td>
</tr>
<tr>
<td>Breaker Tripped/Open *</td>
<td></td>
</tr>
<tr>
<td>Emergency Stop, Local</td>
<td></td>
</tr>
<tr>
<td>Emergency Stop, Remote</td>
<td></td>
</tr>
<tr>
<td>Excitation Over Voltage</td>
<td></td>
</tr>
<tr>
<td>Ground Fault Relay</td>
<td></td>
</tr>
<tr>
<td>Fuel Type</td>
<td></td>
</tr>
<tr>
<td>Low Fuel Pressure</td>
<td></td>
</tr>
<tr>
<td>Remote Engine Start</td>
<td>Two-wire input</td>
</tr>
<tr>
<td>Speed Bias</td>
<td>Analog Voltage Input, Scalable up to +/- 10 VDC</td>
</tr>
<tr>
<td>Voltage Bias</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Dedicated User Outputs</th>
<th>Output Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close Breaker *</td>
<td>Relay Driver Output</td>
</tr>
<tr>
<td>Common Failure</td>
<td></td>
</tr>
<tr>
<td>Common Warning</td>
<td></td>
</tr>
<tr>
<td>Crank</td>
<td></td>
</tr>
<tr>
<td>High Coolant Temperature</td>
<td></td>
</tr>
<tr>
<td>Horn</td>
<td></td>
</tr>
<tr>
<td>Run</td>
<td></td>
</tr>
<tr>
<td>Trip Breaker / Shunt Trip *</td>
<td></td>
</tr>
</tbody>
</table>

* Only with remote-mounted electrically operated circuit breakers.

Optional Configurable User Inputs and Outputs

<table>
<thead>
<tr>
<th>User Configurable Inputs</th>
<th>2 Analog, 0-5 VDC</th>
<th>4 Dry Contact Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Configurable Relay Outputs</td>
<td>14 NO/NC Relays</td>
<td>1 Common Fault Relay</td>
</tr>
</tbody>
</table>

Note: Programmable I/O is configurable by a Kohler-authorized technician.

KG Engine Data

The following KG engine data is displayed on the APM603 controller.

<table>
<thead>
<tr>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant Temperature</td>
</tr>
<tr>
<td>ECU Runtime Hours</td>
</tr>
<tr>
<td>Engine Speed</td>
</tr>
<tr>
<td>Intake Manifold Pressure</td>
</tr>
<tr>
<td>Intake Manifold Temperature</td>
</tr>
<tr>
<td>Intercooler Temperature</td>
</tr>
<tr>
<td>Fuel Pressure</td>
</tr>
<tr>
<td>Oil Pressure</td>
</tr>
<tr>
<td>Oil Temperature</td>
</tr>
</tbody>
</table>

PSI/Doosan Engine Data

The following engine data is displayed on the APM603 controller.

<table>
<thead>
<tr>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
</tr>
<tr>
<td>Coolant Temperature</td>
</tr>
<tr>
<td>ECU Runtime Hours</td>
</tr>
<tr>
<td>Engine Speed</td>
</tr>
<tr>
<td>Intake Manifold Pressure</td>
</tr>
<tr>
<td>Intake Manifold Temperature</td>
</tr>
<tr>
<td>Intercooler Temperature</td>
</tr>
<tr>
<td>Fuel Pressure</td>
</tr>
<tr>
<td>Mechanical Engine Load</td>
</tr>
<tr>
<td>Oil Pressure</td>
</tr>
<tr>
<td>Oil Temperature</td>
</tr>
</tbody>
</table>
APM603 Available Options

- Common Failure Relay provides a relay output to signal a generator set fault.
- Battery Charger available with 6 amp, 10 amp, and 20 amp output for 12 and 24V DC voltage output. (Availability is generator model dependent.) The 10 amp and 20 amp models provide NFPA 110 charging and alarming capability.
- Electrically Operated Circuit Breakers
  - For paralleling systems
  - Available generator-mounted or remote-mounted
  - 24VDC
- Ground Fault Relay provides a relay output to signal a ground fault is detected.
- Input/Output Module for Kohler Diesel (KD) and Mitsubishi models provides:
  - 16 digital input connections with connection to ground
  - 8 relay output connections (Form C, rated 8A, 240 VAC or rated 0.5A, 48VDC)
- Input/Output Module for models other than KD or Mitsubishi provides:
  - 2 analog inputs (0-5 VDC)
  - 4 digital input connections with connection to ground
  - 14 relay output connections (Form C, rated 10A, 120V)
  - 1 common fault relay output (NO, rated 2A, 24VDC)
- Key Switch to allow selection of RUN, OFF and AUTO modes. Lockable in the AUTO position by removing the key.
- Remote Emergency Stop Switch available as a wall mounted panel to remotely shut down the generator set.
- Remote Monitoring Panel. The Kohler® Remote Serial Annunciator (RSA) enables the operator to monitor the status of the generator set from a remote location, which may be required for NFPA 99 and NFPA 110 installations, and up to four Automatic transfer switches.
- Shunt Trip Wiring provides relay outputs to trip a shunt trip circuit breaker and to signal the common fault shutdowns. Contacts rated at 10 amps at 28 VDC or 120 VAC.

Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator set distributor for availability.
Remote Serial Annunciator III (RSA III)

for Kohler® Controllers

- Monitors the generator set equipped with one of the following controllers:
  - APM402 Decision-Maker® 3000
  - APM603 Decision-Maker® 3500
  - APM802 Decision-Maker® 6000
  - Decision-Maker® 3+ Decision-Maker® 8000
  - Decision-Maker® 550 KPC 1000

- Allows monitoring of the common alarm, remote testing of the automatic transfer switch, and monitoring of the normal/emergency source for up to four ATS with any of the following controllers:
  - Decision-Maker® MPAC 750, 1200, and 1500
  - MPAC® 1000 and 1500

- Configuration via a personal computer (PC) software.
- Writable surfaces (white boxes in illustrations) for user-defined selections.
- Uses Modbus® RTU protocol.
- Controller connections:
  - RS-485 for serial bus network
  - USB port. Connect a personal computer and use Kohler® SiteTech™ software to view events and adjust settings.
  - 12-/24-volt DC power supply
  - 120/208 VAC power supply (available accessory)

- Meets the National Fire Protection Association Standard NFPA 110, Level 1.

**Dimensions**

- Dimensions—W x H x D, mm (in.).
  - **Surface Mounted:**
    - 203 x 203 x 83 (8.0 x 8.0 x 3.3)
  - **Flush Mounted (Inside Wall):**
    - 203 x 203 x 76 (8.0 x 8.0 x 3.0)
    - Flush mounting plate W1: 254 (10.0)

*SiteTech™ software is available to Kohler authorized distributors and dealers.

**Modbus®** is a registered trademark of Schneider Electric.
### Fault and Status Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Fault LEDs</th>
<th>Fault Horn</th>
<th>System Ready LED</th>
<th>Generator Running LED</th>
<th>Communication Status LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overcrank Shutdown</td>
<td>Red</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>High Engine Temperature Warning *</td>
<td>Yellow</td>
<td>On</td>
<td>Red</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>High Engine Temperature Shutdown</td>
<td>Red</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>Low Oil Pressure Warning *</td>
<td>Yellow</td>
<td>On</td>
<td>Red</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Low Oil Pressure Shutdown</td>
<td>Red</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>Overspeed Shutdown</td>
<td>Red</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>Emergency Stop *</td>
<td>Red</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>Low Coolant Level/Aux. Shutdown</td>
<td>Red</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>Low Coolant Temperature *</td>
<td>Yellow</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>Low Cranking Voltage</td>
<td>Yellow</td>
<td>On</td>
<td>Red</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>Low Fuel—Level or Pressure *</td>
<td>Yellow</td>
<td>On</td>
<td>Red</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>Not-In-Auto</td>
<td>Red</td>
<td>On</td>
<td>Red</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>Common Fault</td>
<td>Red</td>
<td>On</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>Battery Charger Fault (1) *</td>
<td>Yellow</td>
<td>On</td>
<td>Red</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>Battery Charger Fault (2) *</td>
<td>Yellow</td>
<td>On</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>High Battery Voltage *</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>Low Battery Voltage *</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #1 (Warning)</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #3 (Shutdown)</td>
<td>Red</td>
<td>On</td>
<td>Green</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #2 (Warning)</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #3 (Warning) (1) †</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #3 (Shutdown) (1) †</td>
<td>Red</td>
<td>On</td>
<td>Green</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #4 (Warning) (1)</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #4 (Shutdown) (1)</td>
<td>Red</td>
<td>On</td>
<td>Green</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #5 (Warning) (1)</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
<tr>
<td>User Input #5 (Shutdown) (1)</td>
<td>Red</td>
<td>On</td>
<td>Green</td>
<td>Off</td>
<td>Green</td>
</tr>
<tr>
<td>EPS Supplying Load</td>
<td>Yellow</td>
<td>Off</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Communications Status (Fault mode)</td>
<td>—</td>
<td>Off</td>
<td>Green or Red</td>
<td>Green or Off</td>
<td>Red</td>
</tr>
<tr>
<td>ATS Fault (RSA III with ATS Controls only)</td>
<td>Red</td>
<td>On</td>
<td>Red or Yellow</td>
<td>Green or Off</td>
<td>Green</td>
</tr>
</tbody>
</table>

* Green LEDs appear as steady on when activated.
* Yellow LEDs slow flash when activated except steady on with EPS supplying load and high battery voltage.
* Red LEDs slow flash when activated except fast flash with loss of communication and not-in-auto.

### Specifications

- LED indicating lights for status, warning, and/or shutdown.
- Power source with circuit protection: 12- or 24-volt DC
- Power source with 120/208 VAC, 50/60 Hz adapter (option)
- Power draw: 200 mA
- Humidity range: 0% to 95% noncondensing
- Operating temperature range: -20°C to +70°C (-4°F to +158°F)
- Storage temperature range: -40°C to +85°C (-40°F to +185°F)
- Standards:
  - NFPA 110, level 1
  - UL 508 recognized
  - CE directive
  - NFPA 99
  - ENS 61000-4-4
  - ENSII-4-4 fast transient immunity
- RS-485 Modbus® isolated port @ 9.6/19.2/38.4/57.6 kbps (default is 19.2 kbps)
- USB device port
- NEMA 1 enclosure

---

(1) All generator set controllers except Decision-Maker® 3+ controller.
(2) Decision-Maker® 3+ controller only.
* May require optional kit or user-provided device to enable function and LED indication.
† Digital input #3 is factory-set for high battery voltage on the Decision-Maker® 3+ controller.
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### ATS Controls (RSA III with ATS controls only)

- ATS position LED (normal or emergency)
- Power source indicator LED (normal or emergency)
- ATS fault LED
- Key-operated lock/unlock switch for Test feature
- Test pushbutton

### NFPA Requirements

- NFPA 110 compliant
- Engine functions:
  - High battery voltage warning *
  - High engine temperature shutdown
  - High engine temperature warning *
  - Low battery voltage warning *
  - Low coolant level/aux. shutdown
  - Low coolant temperature warning *
  - Low cranking voltage
  - Low fuel warning (level or pressure) *
  - Low oil pressure shutdown
  - Low oil pressure warning *
  - Overcrank shutdown
  - Overspeed shutdown
- General functions:
  - Audible alarm silence
  - Battery charger fault *
  - Lamp test
  - Master switch not-in-auto
Fault and Status LEDs and Lamp Test Switch

**Alarm Horn.** Horn sounds giving a minimum 90 dB at 0.1 m (0.3 ft.) audible alarm when a warning or shutdown fault condition exists except on high/low battery voltage or EPS supplying load.

**Alarm Silenced.** Red LED on lamp test switch lights when alarm horn is deactivated by alarm silence switch.

**Alarm Silence Switch.** Lamp test switch quiets the alarm during servicing. The horn will reactivate upon additional faults.

**ATS Fault.** Red LED lights when ATS fails to transfer.

**Battery Charger Fail.** LED lights if battery charger malfunctions. Requires battery charger with alarm contact.

**Battery Voltage Hi/Lo.** LED flashes if battery or charging voltage drops below preset level. LED lights steady if battery voltage exceeds preset level.

**Common Fault.** LED lights when a single or multiple common faults occur.

**Communication Status.** Green LED lights indicating annunciator communications functional. Red LED indicates communication fault.

**EPS Supplying Load.** LED lights when the Emergency Power System (EPS) generator set is supplying the load (APM402, APM603, APM802, and Decision-Maker® 550, 3000, 3500, 6000, and 8000 controllers) or when transfer switch is in the emergency position (Decision-Maker® 3+ controller).

**Emergency Stop.** LED lights and engine stops when emergency stop is made. May require a local emergency stop switch on some Decision-Maker® 3+ controllers.

**Generator Running.** LED lights when generator set is in operation.

**High Engine Temperature.** Red LED lights if engine has shut down because of high engine coolant temperature. Yellow LED lights if engine coolant temperature approaches shutdown range. Requires warning sender on some models.

**Lamp Test (Switch).** Switch tests all the annunciator indicator LEDs and horn.

**Low Coolant Level/Aux.** LED lights when engine coolant level is below acceptable range on radiator-mounted generator sets only. When used with a Decision-Maker® 3+ controller, the LED indicates low coolant level or an auxiliary fault shutdown. Requires user-supplied low coolant level switch on remote radiator models.

**Low Coolant Temperature.** LED lights if optional engine block heater malfunctions and/or engine coolant temperature is too low. Requires prealarm sender on some models.

**Low Cranking Voltage.** LED lights if battery voltage drops below preset level during engine cranking.

**Low Fuel (Level or Pressure).** LED lights if fuel level in tank approaches empty with diesel models or fuel pressure is low on gas models. Requires customer-supplied switch.

**Low Oil Pressure.** Red LED lights if generator set shuts down because of insufficient oil pressure. Yellow LED lights if engine oil pressure approaches shutdown range. Requires warning sender on some models.

**Not In Auto.** LED lights when the generator set controller is not set to automatic mode.

**Overcrank.** LED lights and cranking stops if engine does not start in either continuous cranking or cyclic cranking modes.

**Overspeed.** LED lights if generator set shuts down because of overspeed condition.

**System Ready.** Green LED lights when generator set master switch is in AUTO position and the system senses no faults. Red LED indicates system fault.

**User-Defined Digital Inputs #1-#5.** Monitors five digital auxiliary inputs (can be configured as warnings or shutdowns). User-defined digital inputs are selected via the RSA III master for local or remote (generator set or ATS). The user-defined digital input can be assigned via PC using SiteTech™ setup software.

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**Accessories**

- Power source adapter kit 120/208 VAC, 50/60 Hz.
- Modbus®/Ethernet converter GM41143-KP2 for serial to Ethernet communication.
- Communication module GM32644-KA1 or GM32644-KP1 is required with Decision-Maker® 3+ controllers.

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Industrial Generator Set Accessories

Line Circuit Breakers 15-3250 kW

Standard Features

- The line circuit breaker interrupts the generator set output during a short circuit and protects the wiring when an overload occurs. Use the circuit breaker to manually disconnect the generator set from the load during generator set service.

- Circuit breaker kits are mounted to the generator set and are provided with load-side lugs and neutral bus bar.

- Kohler Co. offers a wide selection of molded-case line circuit breaker kits including single, dual, and multiple configurations for each generator set.

- Four types of line circuit breakers are available: (see page 2 for definitions and pages 3 and 4 for application details)
  - Magnetic trip
  - Thermal magnetic trip
  - Electronic trip
  - Electronic with ground fault (LSIG) trip

- In addition, line circuit breakers are offered with 80% and 100% ratings.

- Single line circuit breaker kits allow circuit protection of the entire electrical system load.

- Dual line circuit breaker kits allow circuit protection of selected priority loads from the remaining electrical system load.

- Multiple line circuit breaker kits with field connection barrier allow circuit protection for special applications (350-2500 kW models and selected 80-300 kW models).

- Up to four line circuit breakers can be used on 350-2500 kW models.

- Line circuit breakers comply with the following codes and standards unless otherwise stated.
  - UL 489 Molded Case Circuit Breakers
  - UL 1077 Supplementary Protectors
  - UL 2200 Stationary Engine Generator Assemblies
Line Circuit Breaker Types

Magnetic Trip
The magnetic trip features an electromagnet in series with the load contacts and a moveable armature to activate the trip mechanism. When a sudden and excessive current such as a short circuit occurs, the electromagnet attracts the armature resulting in an instantaneous trip.

Thermal Magnetic Trip
Thermal magnetic trip contains a thermal portion with a bimetallic strip that reacts to the heat produced from the load current. Excessive current causes it to bend sufficiently to trip the mechanism. The trip delay is dependent on the duration and excess of the overload current. Elements are factory-calibrated. A combination of both thermal and magnetic features allows a delayed trip on an overload and an instantaneous trip on a short circuit condition.

Electronic Trip
These line circuit breakers use electronic controls and miniature current transformers to monitor electrical currents and trip when preset limits are exceeded. LI breakers are a combination of adjustable trip functions including long-time ampere rating, long-time delay, and instantaneous pickup. LSI breakers have all of the LI breaker features plus short-time pickup, short-time delay, and defeatable instantaneous pickup. LSIG breakers have all of the LSI breaker features plus ground-fault pickup and delay.

NOTE: MG-frame does not have a long-time delay when selected with LI breakers.

Electronic with Ground Fault Trip
The ground fault trip feature is referred to as LSIG in this document. Models with LSIG compare current flow in phase and neutral lines, and trip when current unbalance exists.

Ground fault trip units are an integral part of the circuit breaker and are not available as field-installable kits. The ground fault pickup switch sets the current level at which the circuit breaker will trip after the ground fault delay. Ground fault pickup values are based on circuit breaker sensor plug only and not on the rating plug multiplier. Changing the rating plug multiplier has no effect on the ground fault pickup values.

80% Rated Circuit Breaker
Most molded-case circuit breakers are 80% rated devices. An 80% rated circuit breaker can only be applied at 80% of its rating for continuous loads as defined by NFPA 70. Circuit conductors used with 80% rated circuit breakers are required to be rated for 100% of the circuit breaker’s rating.

100% Rated Circuit Breaker
Applications where all UL and NEC restrictions are met can use 100% rated circuit breakers where 100% rated circuits can carry 100% of the circuit breaker and conductor current rating.

Line Circuit Breaker Options

- **Alarm Switch**
The alarm switch indicates that the circuit breaker is in a tripped position caused by an overload, short circuit, ground fault, the operation of the shunt trip, an undervoltage trip, or the push-to-trip pushbutton. The alarm resets when the circuit breaker is reset.

- **Auxiliary Contacts**
These switches send a signal indicating whether the main circuit breaker contacts are in the open or closed position.

- **Breaker Separators (350-2500 kW)**
Provides adequate clearance between breaker circuits.

- **Bus Bars**
Bus bar kits offer a convenient way to connect load leads to the generator set when a circuit breaker is not present. 15-300 kW. Bus bar kits are available on alternators with leads for connection to the generator set when circuit breakers are not ordered. 350-2500 kW. A bus bar kit is provided when no circuit breaker is ordered. Bus bars are also available in combination with circuit breakers or other bus bars on the opposite side of the junction box. On medium voltage (3.3 kV and above) units, a bus bar kit is standard (not applicable to KD models).

- **Field Connection Barrier**
Provides installer wiring isolation from factory connections.

- **Ground Fault Annunciator**
A relay contact for customer connection indicates a ground fault condition and is part of a ground fault alarm.

- **Lockout Device (padlock attachment)**
This field-installable handle padlock attachment is available for manually operated circuit breakers. The attachment can accommodate three padlocks and will lock the circuit breaker in the OFF position only.

- **Lugs**
Various lug sizes are available to accommodate multiple cable sizes for connection to the neutral or bus bar.

- **Overcurrent Trip Switch**
The overcurrent trip switch indicates that the circuit breaker has tripped due to overload, ground fault, or short circuit and returns to the deenergized state when the circuit breaker is reset.

- **Shunt Trip, 12 VDC or 24 VDC**
A shunt trip option provides a solenoid within the circuit breaker case that, when momentarily energized from a remote source, activates the trip mechanism. This feature allows the circuit breaker to be tripped by customer-selected faults such as alternator overload or overspeed. The circuit breaker must be reset locally after being tripped. Tripping has priority over manual or motor operator closing.

- **Shunt Trip Wiring**
Connects the shunt trip to the generator set controller. (standard on KD models with the APM802 controller)

- **Undervoltage Trip, 12 VDC or 24 VDC**
The undervoltage trips the circuit breaker when the control voltage drops below the preset threshold of 35%-70% of the rated voltage.
### 300- 2250* kW Line Circuit Breaker Specifications

* Includes models 300REZXB and 300RZXB. For models 300REOZJ and 300REZXC, see the 15- 300 kW section. For KD model generator sets, see pages 8 and 9.

#### 80% Rating Circuit Breaker

<table>
<thead>
<tr>
<th>Alt. Model</th>
<th>Ampere Range</th>
<th>Trip Type</th>
<th>C. B. Frame Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-150</td>
<td>15-150</td>
<td>Thermal Magnetic</td>
<td>HD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LI</td>
<td>HD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSI</td>
<td>HD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSIG</td>
<td>HD</td>
</tr>
<tr>
<td>175-250</td>
<td>175-250</td>
<td>Thermal Magnetic</td>
<td>JD</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LI</td>
<td>JD</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LSI</td>
<td>JD</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LSIG</td>
<td>JD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LI</td>
<td>HG</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSI</td>
<td>HG</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSIG</td>
<td>HG</td>
</tr>
<tr>
<td>175-250</td>
<td>175-250</td>
<td>Thermal Magnetic</td>
<td>HG</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LI</td>
<td>JG</td>
</tr>
<tr>
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<td>250</td>
<td>Electronic LSI</td>
<td>JG</td>
</tr>
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<td>250</td>
<td>Electronic LSIG</td>
<td>JG</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>9-325 A. Mag. Trip</td>
<td>HJ</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>84-546 A. Mag. Trip</td>
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<td>180-1040 A. Mag. Trip</td>
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<td>348-1690 A. Mag. Trip</td>
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<td>684-2500 A. Mag. Trip</td>
<td>JJ</td>
</tr>
<tr>
<td>4M</td>
<td>300-400</td>
<td>Thermal Magnetic</td>
<td>LA</td>
</tr>
<tr>
<td>4M</td>
<td>5M/7M</td>
<td>500-1000 A. Mag. Trip</td>
<td>LA</td>
</tr>
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<td>4M</td>
<td>5M/7M</td>
<td>750-1600 A. Mag. Trip</td>
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<td>5M/7M</td>
<td>1000-2000 A. Mag. Trip</td>
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<td>5M/7M</td>
<td>1125-2250 A. Mag. Trip</td>
<td>LA</td>
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<td>4M</td>
<td>5M/7M</td>
<td>1250-2500 A. Mag. Trip</td>
<td>LA</td>
</tr>
<tr>
<td>4M</td>
<td>5M/7M</td>
<td>1500-3000 A. Mag. Trip</td>
<td>LA</td>
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<td>4M</td>
<td>5M/7M</td>
<td>1750-3500 A. Mag. Trip</td>
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<td>5M/7M</td>
<td>2000-4000 A. Mag. Trip</td>
<td>LA</td>
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<tr>
<td>400</td>
<td>400</td>
<td>Electronic LI</td>
<td>LG</td>
</tr>
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<td>Electronic LSIG</td>
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</tr>
<tr>
<td>800</td>
<td>800</td>
<td>Thermal Magnetic</td>
<td>MG</td>
</tr>
<tr>
<td>1000-1200</td>
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<td>Electronic LSI</td>
<td>PG</td>
</tr>
<tr>
<td>1600-2500</td>
<td>1600-2500</td>
<td>Thermal Magnetic</td>
<td>PG</td>
</tr>
<tr>
<td>1600-2500</td>
<td>1600-2500</td>
<td>Thermal Magnetic</td>
<td>RJ</td>
</tr>
</tbody>
</table>

#### 100% Rating Circuit Breaker

<table>
<thead>
<tr>
<th>Alt. Model</th>
<th>Ampere Range</th>
<th>Trip Type</th>
<th>C. B. Frame Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-150</td>
<td>15-150</td>
<td>Thermal Magnetic</td>
<td>HD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LI</td>
<td>HD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSI</td>
<td>HD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSIG</td>
<td>HD</td>
</tr>
<tr>
<td>175-250</td>
<td>175-250</td>
<td>Thermal Magnetic</td>
<td>JD</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LI</td>
<td>JD</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LSI</td>
<td>JD</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LSIG</td>
<td>JD</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LI</td>
<td>HG</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSI</td>
<td>HG</td>
</tr>
<tr>
<td>60-150</td>
<td>60-150</td>
<td>Electronic LSIG</td>
<td>HG</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LI</td>
<td>JG</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LSI</td>
<td>JG</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>Electronic LSIG</td>
<td>JG</td>
</tr>
<tr>
<td>400</td>
<td>400</td>
<td>Electronic LI</td>
<td>JG</td>
</tr>
<tr>
<td>400</td>
<td>400</td>
<td>Electronic LSI</td>
<td>JG</td>
</tr>
<tr>
<td>400</td>
<td>400</td>
<td>Electronic LSIG</td>
<td>JG</td>
</tr>
<tr>
<td>600-1200</td>
<td>600-1200</td>
<td>Electronic LSI</td>
<td>PG</td>
</tr>
<tr>
<td>1200</td>
<td>1200</td>
<td>Electronic LI</td>
<td>PG</td>
</tr>
<tr>
<td>1600-2500</td>
<td>1600-2500</td>
<td>Electronic LSI</td>
<td>PG</td>
</tr>
<tr>
<td>1600-3000</td>
<td>1600-3000</td>
<td>Electronic LSI</td>
<td>PG</td>
</tr>
</tbody>
</table>

#### 100% Rating Electrically Operated Breakers

For use as paralleling breakers.*

<table>
<thead>
<tr>
<th>Alt. Model</th>
<th>Amps</th>
<th>Trip Unit</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>4M</td>
<td>250</td>
<td>3.0 LI</td>
<td>PJ</td>
</tr>
<tr>
<td>5M/7M</td>
<td>400</td>
<td>5.0 LSI</td>
<td>PJ</td>
</tr>
<tr>
<td>5M/7M</td>
<td>800</td>
<td>3.0 LI</td>
<td>PL</td>
</tr>
<tr>
<td>5M/7M</td>
<td>1000</td>
<td>5.0 LSI</td>
<td>PL</td>
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<tr>
<td>5M/7M</td>
<td>1200</td>
<td>5.0 LSI</td>
<td>PL</td>
</tr>
<tr>
<td>5M/7M</td>
<td>1600</td>
<td>Electronic LSI</td>
<td>NW</td>
</tr>
<tr>
<td>5M/7M</td>
<td>2000</td>
<td>Electronic LSI</td>
<td>NW</td>
</tr>
<tr>
<td>5M/7M</td>
<td>2500</td>
<td>Electronic LSI</td>
<td>NW</td>
</tr>
<tr>
<td>5M/7M</td>
<td>3000</td>
<td>Electronic LSI</td>
<td>NW</td>
</tr>
</tbody>
</table>

* P-frame breakers can be used with the Decision-Maker® 6000 Controller/DPS System or APM603 controller. NW breakers are for use with the APM603 only.

All circuit breakers listed in this table include line side bus and load side lugs, 24VDC motor operators, and 1 type C SDE overcurrent switch contact. P-frame breakers include 2 type C auxiliary contacts. NW breakers include 4 auxiliary contacts.

No second breakers are allowed in combination with these breakers.

#### Load Bus Rating

<table>
<thead>
<tr>
<th>Gen. Set kW</th>
<th>Alt. Model</th>
<th>Rating, Amps (Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>350-2250</td>
<td>4M/5M/7M</td>
<td>3000 Load Bus</td>
</tr>
</tbody>
</table>
300-2250* kW Line Circuit Breaker Specifications

* Includes models 300REZXB and 300RZXB. For models 300REOZJ and 300REZXC, see the 15-300 kW section. For KD model generator sets, see pages 8 and 9.

### Interrupting Ratings

<table>
<thead>
<tr>
<th>Circuit Breaker Frame Size</th>
<th>240 Volt, kA</th>
<th>480 Volt, kA</th>
<th>600 Volt, kA</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD</td>
<td>25</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>HG</td>
<td>65</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>HJ</td>
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<td>JD</td>
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<td>JG</td>
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<td>JJ</td>
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<td>LA</td>
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<td>18</td>
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<td>MG</td>
<td>100</td>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td>PG</td>
<td>65</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>PJ</td>
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<td>65</td>
<td>25</td>
</tr>
<tr>
<td>RJ</td>
<td>100</td>
<td>65</td>
<td>25</td>
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</table>

### Circuit Breaker Lugs Per Phase (Al/Cu)

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Ampere Range</th>
<th>Wire Range</th>
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<tbody>
<tr>
<td>H</td>
<td>15-150</td>
<td>One #14 to 3/0</td>
</tr>
<tr>
<td>J</td>
<td>175</td>
<td>One 1/0 to 4/0</td>
</tr>
<tr>
<td>LA</td>
<td>300-400</td>
<td>One #1 to 600 kcmil or Two #1 to 250 kcmil</td>
</tr>
<tr>
<td>LG</td>
<td>400-600</td>
<td>Two 2/0 to 500 kcmil</td>
</tr>
<tr>
<td>M</td>
<td>800</td>
<td>Three 3/0 to 500 kcmil</td>
</tr>
<tr>
<td>P</td>
<td>600-800</td>
<td>Three 3/0 to 500 kcmil</td>
</tr>
<tr>
<td>RJ</td>
<td>1600-2500</td>
<td>Four 3/0 to 500 kcmil</td>
</tr>
<tr>
<td>NW</td>
<td>1600-3000</td>
<td>(8) 1/0 to 750 kcmil or (10) 1/0 to 300 kcmil</td>
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### Multiple Circuit Breaker Combinations

<table>
<thead>
<tr>
<th>Alternator Model</th>
<th>Positions</th>
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<td>H/J</td>
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</tr>
<tr>
<td>LA</td>
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<td>LA</td>
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<td>LA</td>
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<td>LG</td>
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<td>LG</td>
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<tr>
<td>LG</td>
<td>LG</td>
</tr>
<tr>
<td>M/P</td>
<td>H/J</td>
</tr>
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<td>LA</td>
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<td>LG</td>
</tr>
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<td>M/P</td>
<td>M/P</td>
</tr>
<tr>
<td>M/P</td>
<td>H/J</td>
</tr>
<tr>
<td>M/P</td>
<td>LA</td>
</tr>
<tr>
<td>M/P</td>
<td>H/J</td>
</tr>
<tr>
<td>M/P</td>
<td>LA</td>
</tr>
<tr>
<td>M/P</td>
<td>LG</td>
</tr>
<tr>
<td>M/P</td>
<td>LG</td>
</tr>
<tr>
<td>M/P</td>
<td>LG</td>
</tr>
</tbody>
</table>

### Breaker Positions

- **NOTE:** Breaker and load bus phasing on right positions is A- B- C and on left positions is C- B- A.

- **NOTE:** H, HG, J, JG, and LG-frames when selected with LSIG trip require two mounting spaces (one space for the breaker and one space for the LSIG neutral). These combinations are not reflected in the Multiple Circuit Breaker Combinations table on this page.
Notes:
1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal-imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. With zone-selective interlocking on, short-time delay utilized and no restraining signal, the maximum unrestrained short-time delay time band applies regardless of the setting.
4. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
5. For a withstand circuit breaker, instantaneous can be turned OFF. See 613-7 for instantaneous trip curve. See 613-10 for instantaneous override values.
6. Overload indicator illuminates at 100%.
POWERPACT® P- and R-Frame Molded Case Circuit Breakers (Standard or 100% rated up to 2500 A)

The most compact and innovative molded case circuit breakers

POWERPACT Molded Case Circuit Breakers lead the industry with proven, reliable protection and innovative design. Providing unparalleled performance and control, this generation of P- and R-frame circuit breakers features exclusive MICROLOGIC® Trip Units, which allow for a range of sophisticated applications for metering and monitoring. In addition, units can be interchanged to allow for maximum flexibility and are field-installable for easy upgrades as needed.

The compact P- and R-frame circuit breakers permit smaller footprint and higher density installations using I-LINE® Panelboards and Switchboards. These circuit breakers are available in 100% rated construction up to 2500 A to meet a broad range of commercial and industrial application needs.

Full-Featured Performance

- P-frame – 1200 A available in both standard and 100% ratings with sensor sizes 250–1200 A. Interrupting ratings (AIR) G-35kAIR, J-65kAIR and L-100kAIR at 480 VAC
- R-frame – 2500 A available in both standard and 100% ratings with sensor sizes 600–2500 A. Interrupting ratings (AIR) G-35kAIR, J-65kAIR and L-100kAIR at 480 VAC
- Compact breaker size allows for smaller footprint installations using I-LINE Panelboards and Switchboards. 9” width on P-frame designs and 15” width on R-frame designs provide increased density installations
- Most field-installable accessories are common to all frame sizes for easier stocking and installation
- Selection of four interchangeable MICROLOGIC Trip Units with POWERLOGIC® power metering and monitoring capabilities available in advanced trip units
- Compatible with POWERLOGIC® systems and high amperage power circuit breakers
- Built-in MODBUS® protocol provides an open communications platform and eliminates the need to purchase additional, proprietary network solutions
- Connection options include bus, cable or I-Line for installation flexibility
- Additional options are available for 5-cycle closing, stored energy mechanisms and draw-out mounting of 1200 A breakers
Onboard Intelligence

For “smarter breakers,” a range of MICROLOGIC® Trip Units provides advanced functionality, such as a communications interface, and power metering and monitoring capabilities. With the appropriate MICROLOGIC Trip Unit, you can communicate with breakers, gather power information, monitor events and remotely control breakers based on predetermined conditions, leading to substantial savings in electrical system operating costs.

These interchangeable, microprocessor-controlled, plug-in devices provide the next generation of protection, measurement and control functions, delivering not only greater electrical system safety but also improved system integration and coordination.

Choose the Model that Meets Your Needs

**MICROLOGIC 3.0 and 5.0**
- Basic circuit protection including long-time, instantaneous and optional short-time adjustments

**MICROLOGIC 3.0A, 5.0A and 6.0A**
- Long-time, instantaneous and optional short-time adjustments
- Integrated ammeter and phase loading bar graph
- LED trip indicator
- Zone selective interlocking with downstream and upstream breakers
- Optional ground-fault protection
- Optional MODBUS® communications interface

**MICROLOGIC 5.0P and 6.0P**
- Long-time, instantaneous and optional short-time adjustments
- Advanced relay protection (current imbalance, under/over voltage, etc.)
- Inverse Definite Minimum Time Lag (IdmLt) long-time delay curve shaping for improved coordination
- Basic power metering and monitoring functions
- Standard MODBUS communications interface compatibility with POWERLOGIC® installations
- Standard GF alarm on 5.0P. 6.0P has equipment ground-fault tripping protection

**MICROLOGIC 5.0H and 6.0H**
- All 5.0P and 6.0P functions
- Enhanced POWERLOGIC power metering and monitoring capabilities
- Basic power quality (harmonic) measurement
- Waveform capture

Contact your Square D sales representative for additional information. Or, visit www.SquareD.com.
Industrial Generator Set Accessories

System Batteries

Standard Features

- Kohler Co. selects batteries to meet the engine manufacturer's specifications and to comply with NFPA requirements for engine-cranking cycles.
- Heavy-duty starting batteries are the most cost-effective means of engine cranking and provide excellent reliability in generator set applications.
- Tough polypropylene cases protect against life-shortening vibration and impact damage.
- Batteries are rated according to SAE standard J-537.
- All batteries are 12-volts. Kits that contain two or four batteries are available for 24-volt systems and/or systems with redundant starters.
- Wet- and dry-charged batteries have lead-calcium or lead-antimony plates and use sulfuric acid electrolyte. Removable cell covers allow checking of electrolyte specific gravity.
- Absorbant glass mat (AGM) batteries are sealed and maintenance free.
- Batteries are for applications below and above 0 °C (32 °F).

Typical Overall Dimensions

<table>
<thead>
<tr>
<th>Charge Type</th>
<th>Battery Part Number</th>
<th>Battery Qty per Size</th>
<th>BCI Group Size</th>
<th>Battery SAE Dimension, mm (in.)</th>
<th>Cold Cranking Amps at 18°C (0°F) Min.</th>
<th>Reserve Capacity Minutes at 27°C (80°F) Min.</th>
<th>Battery Post Layout and Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet</td>
<td>324586</td>
<td>2</td>
<td>31</td>
<td>330.2 (13.0) 173.0 (6.8) 239.8 (9.4)</td>
<td>950</td>
<td>185</td>
<td>C/3</td>
</tr>
</tbody>
</table>

Battery Specifications
The battery charger is a fully-automatic, high efficiency battery charger that charges batteries rapidly and safely. The battery charger is designed for an industrial environment.

The battery charger is designed for operation with an engine cranking battery.

The battery charger is universal voltage input capable, comes with a standard 120 V/60 Hz AC plug, and charges 12 VDC or 24 VDC battery systems.

Five LED lights indicate power, communication status, temperature compensation status, charge curve, and charger status.

With the optional battery temperature sensor connected, the battery charger can adjust output voltages for optimal charging.

<table>
<thead>
<tr>
<th>DC Output</th>
<th>AC Input</th>
<th>Overall Dimensions</th>
<th>Shipping Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volts (Nominal)</td>
<td>Amps</td>
<td>Volts (Nominal)</td>
<td>Amps</td>
</tr>
<tr>
<td>12/24</td>
<td>10</td>
<td>100-260</td>
<td>3.7</td>
</tr>
</tbody>
</table>
### Specifications

<table>
<thead>
<tr>
<th><strong>AC Input</strong></th>
<th>100–260 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency Input</strong></td>
<td>50/60 Hz</td>
</tr>
<tr>
<td><strong>DC Output</strong></td>
<td>10 Amps @ 12 VDC or 10 Amps @ 24 VDC (On battery voltage regulation ±1%; current is electronically limited)</td>
</tr>
<tr>
<td><strong>Fuse Protection</strong></td>
<td>15 amps ATC</td>
</tr>
<tr>
<td><strong>Battery Types</strong></td>
<td>Flooded Lead Acid (FLA) AGM Gel Cell High Performance AGM Nickel–Cadmium (NiCad)</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td></td>
</tr>
<tr>
<td><strong>LED Indications</strong></td>
<td>Power Communication Temperature compensation Output charger curve and charger status:  ○ Red ○ Green</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Operating</strong></td>
<td>-20° to 70°C (-4° to 158° F)</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>-40° to 85°C (-40° to 185° F)</td>
</tr>
<tr>
<td><strong>Relative Humidity</strong></td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td><strong>Salt Spray Testing</strong></td>
<td>ASTM B117</td>
</tr>
<tr>
<td><strong>Corrosion Resistant</strong></td>
<td>From battery gases</td>
</tr>
</tbody>
</table>

| **Enclosure** | Environmental Resistant From rain, snow, dust, and dripping water |
| **Battery Connections** |  |
| **Lead Length** | 1.8 m (6 ft.) red and black leads |
| **Battery Connections** |  |
| **9.5 mm (3/8 in.) ring terminals** |
| **AC Power Connections** |  |
| **Lead Length** | 1.8 m (6 ft.) |
| **Storage** | Standard US style 3-prong AC plug |
| **Available Options** | Temperature compensation |

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Industrial Generator Set Accessories

Sound Enclosure Standard Features

• Internal silencer, flexible exhaust connector and rain cap.
• Skid-mounted, aluminum construction with hinged doors.
• Fade-, scratch-, and corrosion-resistant Kohler® Power Armor automotive-grade textured finish.
• Enclosure has six large access doors which allow for easy maintenance.
• Lockable, flush-mounted door latches.
• Louvered air inlets on alternator end and roof outlet to redirect air and reduce noise.
• Automatic door holders keep doors open during maintenance.
• Acoustic insulation that meets UL 94 HF1 flammability classification and repels moisture absorption.
Sound Enclosure Features

- Available in aluminum formed panel, solid construction. Preassembled package offering corrosion resistant, dent resilient structure mounting directly to skid.
- Power Armor automotive-grade finish resulting in advanced corrosion and abrasion protection as well as enhanced edge coverage and color retention.
- Internal exhaust silencer offering maximum component life and operator safety.
- Note: Installing an additional length of exhaust tail pipe may increase backpressure levels. Please refer to the generator set spec sheet for the maximum backpressure value.
- Interchangeable modular panel construction. Allows complete serviceability or replacement without compromising enclosure design.
- Cooling/combustion air intake with a horizontal air inlet. Sized for maximum cooling airflow.
- Service access. Multi-personnel doors for easy access to generator set control and servicing of the oil fill and battery.
- Cooling air discharge. The sound enclosures include acoustic insulation with urethane film.
- Available in aluminum formed panel, solid construction.
- Sound-attenuating design. Acoustic insulation UL 94 HF1 listed for flame resistance with up to 51 mm (2 in.) thickness.

Accessories

Miscellaneous Enclosure Accessories
Battery Charger, Mounted. Mounting and prewiring of DC output and AC input when optional BEP is selected. Battery charger located inside the enclosure and accessible through an access door.

DC Light Package - with LED Lights:
Prewired DC light package offering an economical alternative light source within the enclosure, as a complement to the BEP or a source of light when AC power is not available. Battery drain limited with fuse protection and controlled through a 0-60 minute, spring-wound, no-hold timer. Available in either incandescent of LED.

Electrical Accessories
Block heater wiring, single-phase

Basic Electrical Package (BEP)
Distribution panel/load center. Prewired AC power distribution of all factory-installed features including block heater, two GFCI-protected internal 120-volt service receptacles, internal lighting, and commercial grade wall switch. The load center powered by building source power and protected by a main circuit breaker, rated for 100 amps with capacity and circuit positions for future expansion. AC power distribution installed in accordance with NEC and all wiring within EMT thin wall conduit. Four incandescent or fluorescent lights located within UL-listed fixtures designed for wet locations.
## Generator Set Sound Data Sheet

### Sound Pressure Data in dB(A)

<table>
<thead>
<tr>
<th>Generator Set Model</th>
<th>Hz</th>
<th>Load</th>
<th>Raw Exhaust</th>
<th>Open Unit, Isolated Exhaust</th>
<th>Weather Enclosure</th>
<th>Level 2 Sound Enclosure</th>
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<tbody>
<tr>
<td>450REZXD</td>
<td>60</td>
<td>100% Load</td>
<td>102.8</td>
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<td>89.8</td>
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<td>101.9</td>
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<td>71.4</td>
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Note: Sound pressure data is the logarithmic average of eight perimeter measurement points at a distance of 7 m (23 ft.), except Raw Exhaust data which is a single measurement point at 1 m (3.3 ft.) from the mouth of a straight pipe exhaust.

### Sound Pressure Levels, dB(A)

#### 450REZXD 60 Hz

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<th>Distance, m (ft)</th>
<th>Enclosure</th>
<th>Measurement Clock Position</th>
<th>Overall Level</th>
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<td>7 (23)</td>
<td>Level 2 Sound</td>
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<th>Load</th>
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<th>Measurement Clock Position</th>
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8-pos. log avg.
## Specifications

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<td>Main Breaker</td>
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<td>Maximum Number of Tandem Breakers</td>
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<td>Width</td>
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<tr>
<td>Package Weight (Lbs)</td>
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</tbody>
</table>

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
Industrial Generator Set Accessories

Engine Block Heater Kits

Applicable Models
- 250-400RZXB
- 250-450REZXB
- 300REZXC
- 300-400RZXD
- 300-500REZXD
- 900-1250REOZMD
- 1250-2000ROZMC

Standard Features
- UL-C/US listed (60 Hz Models) - E250789CE
- CE compliant
- Controls for automatic operation
- Compact design
- Easy to install

Description

The engine block heater kit heats the engine coolant in cold ambient, warming the cylinders, oil, and charge air circuit which all help to give a faster starting time. The engine block heater has a thermostat, pump, and temperature control system. The pump circulates warm coolant into the engine and supplies constant heating to the engine. The engine block heater kit helps to extend element life and gives a significant reduction in electrical consumption.

The engine block heater has a fixed setting thermostat that turns ON when the engine coolant temperature reaches 38°C (100°F) and turns OFF when the engine coolant temperature reaches 49°C (120°F).

The engine block heater kit is recommended for ambient temperatures below 10°C (50°F).

The engine block heater kits are available in 208 V, 240 V, 380 V, and 480 V versions.

Block Heater Kits, typical

Type 1 and Type 3

Type 2

Attachment A
### Block Heater Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Heating Fluid</th>
<th>Fixed Thermostat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Fluid Engine Coolant (50% Glycol/50% Water)</td>
<td>38°C - 49°C (100°F - 120°F)</td>
<td></td>
</tr>
<tr>
<td>Flow 10 GPM (2.2 m³/hr) @ 10 ft head (3 mWC)</td>
<td>125 psi (860 kPa)</td>
<td></td>
</tr>
<tr>
<td>Pump Power 70W (50 Hz), 97W (60 Hz)</td>
<td>0.2 psi (1.5 kPa)</td>
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</tr>
<tr>
<td>Max. Pressure 1.0 in. NPT</td>
<td>Inlet Plumbing</td>
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</tr>
<tr>
<td>Pressure Loss 1.0 in. NPT</td>
<td>Outlet Plumbing</td>
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<tr>
<td>Main Control Box Ingress Protection NEMA 4 (IP66)</td>
<td>Motor Ingress Protection IP44 (50 Hz), NEMA 2 (60 Hz)</td>
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<td>IP44 (50 Hz), NEMA 2 (60 Hz)</td>
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### Specifications

<table>
<thead>
<tr>
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<th>Component</th>
<th>Watts</th>
<th>Voltage</th>
<th>Phase</th>
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<tr>
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<td>GM77835</td>
<td>6000</td>
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<tr>
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### Dimensions and Weights

<table>
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<tr>
<th>Description</th>
<th>Dimensions (mm)</th>
<th>Dimensions (in)</th>
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<tr>
<td>Block heater type 1 and type 3 size, L x W x H, mm</td>
<td>493.9 x 298.5 x 436.7</td>
<td>19.5 x 11.7 x 17.2</td>
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<tr>
<td>Block heater type 2 size, L x W x H, mm</td>
<td>493.9 x 297.7 x 378.8</td>
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<tr>
<td>Block heater type 1 and 3 weight, kg (lb)</td>
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<tr>
<td>Block heater type 2 weight, kg (lb)</td>
<td>16.8 (37)</td>
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---

![Diagram of Block Heaters](image-url)
## Generator Set Cooling System Data Sheet

<table>
<thead>
<tr>
<th>450REZXD 60Hz (Standby Duty)</th>
<th>50°C Ambient Temperature Cooling System</th>
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<tr>
<td></td>
<td>Pa (in.H₂O)</td>
</tr>
<tr>
<td>Total external restriction on open unit</td>
<td></td>
</tr>
<tr>
<td>Maximum allowable ambient temperature</td>
<td>°C (°F)</td>
</tr>
<tr>
<td>Cooling system airflow</td>
<td>m³/min (ft³/min)</td>
</tr>
</tbody>
</table>

1. The data shown above is the anticipated cooling performance for a typical generator set when following proper installation techniques.

2. Cooling performance is based on operation at 100 m (328 ft.) above sea level. For elevations higher than 100 m (328 ft.), typical cooling performance derate is 1°C (1.8°F) per 250 m (820 ft.).

3. For high ambient conditions, check TIB-101 for the generator set power output derate schedule.

4. Incorrect installation, improper operation, fouling of the cooling system, and other variable conditions may reduce cooling performance.

5. Kohler manufactured sound enclosed models are rated in free air with no additional restriction. Consult factory for other variants or conditions such as additional ducting or hoods.

6. Performance is based on a 50/50 water and ethylene glycol mixture.

7. Total external restriction includes restriction upstream and downstream of the unit – any ducting supplying intake air to the unit and any ducting for the discharge.
## Enclosed Generator Set Exhaust System Data Sheet

<table>
<thead>
<tr>
<th>Model</th>
<th>Enclosure Type</th>
<th>Consumed Back Pressure (in H20)</th>
<th>Consumed Back Pressure (in Hg)</th>
<th>Back Pressure Limit(s) (in H20)</th>
<th>Back Pressure Limit(s) (in Hg)</th>
<th>Flex Exhaust Tube(s)</th>
<th>Silencer</th>
<th>Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>450REZXD</td>
<td>All Weather and Sound Enclosures</td>
<td>48.0</td>
<td>3.5</td>
<td>60.0</td>
<td>4.4</td>
<td>GM69644 FlexTube (Left Side), GM69645 FlexTube (Right Side), Doosan Supplied Dual Catalysts and GM73955 Dual Flex Tubes</td>
<td>GM64224 Dual Mufflers</td>
<td>ADV-9200</td>
</tr>
</tbody>
</table>

1. Total system exhaust back pressure is applicable to generator sets equipped with Kohler standard enclosure packages.
2. For generator sets with multiple exhaust outlets, total system exhaust back pressure value represents each outlet.
3. The total system back pressure should not exceed the manufacturer’s recommended limit.
4. The total back pressure only includes exhaust components installed inside the Kohler enclosure. Customers must calculate any additional back pressure caused by piping, extensions, or components added after the silencer outlet. Refer to the installation manual for additional details.
Dimensional Drawings
Attachment A

RSA III

A maximum of 5 slaves can be connected to a master RSA III, including slaves connected through the Ethernet network. If any RSA II annunciators are on the same network as an RSA III annunciator, the RSA II annunciators must be configured as slaves. RSA 1D00 can't be on the same network as RSAIII; upgrade to RSAII if required.

RSA III Master:
An RSA slave connected through the Ethernet network, requires an RSA Master.
Be connected through the Ethernet network.
The master requires a Modbus/Ethernet converter dedicated exclusively to it.

See sheet 1 for required DC power voltage to each RSA.

RSA Remote Serial Annunciator (Slave)

GENSET controller
(see sheet 1 for battery charger connections)

See sheet 1 for controller connection points

See sheet 1 for required DC power voltage to each RSA.

RSA Remote Serial Annunciator (Slave)

Modbus/Ethernet converter

RS-485 (Modbus RTU) (see note 5)

Module TCP/IP
Category 5 or equivalent

Ethernet network
(Customer supplied)

RS-485 (Modbus RTU) (see note 5)

See sheet 1 for required DC power voltage to each RSA.

RSA Remote Serial Annunciator (Slave)

ATs (Automatic Transfer Switch)

RS-485 (Modbus RTU) (see note 5)

Required for RSA III with ATS option only

RS-485 (Modbus RTU) (see note 5)

See sheet 1 for general notes.

Interconnection diagram controller with RSA annunciator
### Attachment A

**Networked Devices, General Notes, This Sheet**

1. **Conventions:** Ethernet Network, PC, Data Interface System
2. **16-light (DEC-16):** 500 DEC500, RPC 1000 Legacy GenSet Controllers
3. **DEC500:** APAM02 GenSet Controller
4. **DEC5000:** APAM03 GenSet Controller
5. **DEC5000:** APAM03 GenSet Controller for non-RO series, Standard PGEN Network
6. **This Sheet Reserved for Future Features**
7. **APAM03 GenSet Controller for RO Series, Standard PGEN Network**
8. **This Sheet Reserved for Future Features**
9. **APAM02 GenSet Controller**
10. **DEC5000:** APAM03 GenSet Controller
11. **DEC5000:** APAM03 GenSet Controller, Towable 10 Position Customer Terminal Block
12. **Series 1000 (MPACDM-700/900):** DEC5000/HP/DEC5000-HP, Power Monitor Legacy ATS (Automatic Transfer Switch Controllers)
13. **MPACDM100:** MPAC-700/900/1000/1500 (Automatic Transfer Switch Controllers)
14. **Legacy RS485 (Remote Serial Annunciator)**
15. **RS485 (Remote Serial Annunciator)**

---

**Controller Annunciator Compatibility Chart**

<table>
<thead>
<tr>
<th>Member I</th>
<th>RS485</th>
<th>RS485</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 GenSet</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>16-light GenSet</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DEC500</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3K GenSet</td>
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<td>X</td>
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<td>6K GenSet</td>
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<tr>
<td>8K GenSet</td>
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<td>X</td>
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<tr>
<td>APAM02</td>
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<tr>
<td>APAM03</td>
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<td>DEC5000 GenSet</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MPACDM-1500</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Series 1000 ATS</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>340 AIDS</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>340 Power Monitor</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

* "X" Designates supported device; "-" Designates RS-485 Only.

**Networked RS-485 Devices**

1. **Maximun Cable Length for RS-232 is 100 feet. Use RS-485 if longer than 50 feet is required.**
2. **Customer supplied wire, use shielded wire or equivalent cable, use a maximum cable length of 1200 feet (366 m) from the RS-485 converter to the last RS-485 device in the network.**
3. **The last device in the network is the device connected to the controller. Connect the cable shield to "GND" at one end of cable only, leave other end disconnected.**
4. **If operating over 10,000 feet, the RS485 wiring must be limited to a maximum of 5000 feet (1500 m). Connect only one serial device if used. If it is the last device, the terminating resistor is optional when the wiring/grounding connector connects to a remote serial RS485 device in the network.**
5. **If it is the last device. The terminating resistor is required when the wiring/grounding connector connects to a remote serial RS485 device in the network.**
6. **Place the far jumper on the "GND" pin.**
7. **The 500 & 1000 Controller can be used as a RS-232/RS-485 converter, connect the 8-pin male of the connector to the RS-232/RS-485 converter to the controller.**
8. **Connect one end of the converter to the controller and the other end of the converter to the 500 or 1000 controller in the network.**
9. **Each module/terminal converter can communicate with up to 6 Ethernet converts devices.**
10. **If a module/terminal converter is attached to a remote serial device, a module/terminal converter connected to a remote serial terminal converter is required. See NOTE 2 for RS485 terminating resistor settings.**
11. **Only one module is allowed for RS-485 network. Any combination of modules is allowed if communicating via network/ethernet converters.**
12. **This assembly or part must comply with FF4-HALL-001.**
A LEAD ALTERNATOR, 2 WIRE, SINGLE PHASE

60 Hz: 200-240V
50 Hz: 200-240V

CT3 - NOT USED
TO CONTROLLER
A B C
NEU
L1
CT1
2
CT2 L2/LO

NOTE:
NEU MUST BE CONNECTED TO L2/LO, EVEN IF LO IS NOT CONNECTED TO THE LOAD.

NOTES:
CURRENT TRANSFORMER DOT OR "H1" TOWARD GENERATOR.
CURRENT TRANSFORMERS NOT USED ON ALL SETS.
SOME STATORS HAVE DUAL LEADS. ALWAYS CONNECT LEADS
OF THE SAME LABEL TOGETHER.

PHASE ROTATION
A B C
L1 L2 L3
Attachment A

**NOTES:**
1. STYLE 3 CAN BE CONVERTED TO STYLE 1 BY INSTALLATION OF 2541511 STUD CONVERSION KIT.
2. BATTERIES USING STYLE 2 TERMINALS MUST HAVE EITHER THE "POS:" OR "NEG:" STUD CLEARLY IDENTIFIED.
3. STYLE 2 TERMINAL NUT (1/4" HOLE) MUST MATCH DRAWING V49.
4. "POS:" & "NEG:" IDENTIFICATION MUST BE VISIBLE AS SHOWN ON THE PART LAYOUT AND WITHIN 5MM OF THE STUD.

**NOTES:**
1. APPLIES TO ALL BATTERIES.
2. ALL DIMENSIONS ARE MORE THAN ACCEPTABLE VALUES.
3. BATTERY MARKING LABEL MUST BE LOCATED ON TOP OF BATTERY. INCLUDE TERMINALS ON DRAWING LAYOUT.
4. MANUFACTURER MUST PROVIDE CERTIFICATE CONTAINING UP TO 1000 BASE WORDS.
5. Style part number identifying the battery gas suit to industry standards.
6. Style part number indicating the battery is NMT.
7. Style part number indicating the battery is MT.
8. Style part number indicating the battery is NT.

**NOTES:**
1. CHARGE TYPE:
   a. DRY CHARGED BATTERIES MUST BE SUPPLIED WITH ACTIVATION INSTRUCTIONS ADDED TO BATTERY.
   b. DRY CHARGED BATTERIES MUST BE IDENTIFIED ON TOP AS: "DRY CHARGED."

**NOTES:**
1. BATTERY CONSTRUCTION:
   a. MUST BE LEAD-CAUSTIC NICKEL OR LEAD-ANTHONY TYPE.
   b. LEAD-CAUSTIC NICKEL.
   c. LEAD-ANTHONY TYPE.
   d. ASSUMED LEAD NICKEL.

---

**Table:**

<table>
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<th>Capacity</th>
<th>Manufacturer</th>
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<td>80 Ah</td>
<td>MAXIMA</td>
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<tr>
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<th>QTY</th>
<th>DESCRIPTION</th>
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<td>CM8056</td>
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<td>CM840</td>
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<td>HEX CAP SCREW M8 X 1.5 10S</td>
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<tr>
<td>M8X1.5-10S-60</td>
<td>4</td>
<td>HEX CAP SCREW M8 X 1.5 10S</td>
<td></td>
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</table>

**Attachment A**

This is an automated table, all updates must be made in the assembly.

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**NOTE:** For proper assembly method of hardware, use G-585 as a guideline.
### Attachment A

<table>
<thead>
<tr>
<th>BLOCK HUNTER</th>
<th>PART NO.</th>
<th>VOLT/PHASE</th>
<th>REPLACEMENT ELEMENT (SERIES)</th>
<th>BATTERY</th>
<th>TYPE</th>
<th>OPERATING TEMPERATURE</th>
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<td>3</td>
<td>400V/M</td>
<td>K</td>
</tr>
</tbody>
</table>

**NOTES:**
- **LABEL ON FRONT CONTROL BOX DOOR MUST INCLUDE BLOCKER PART NO.**
- **THE HEATING SYSTEM MUST BE MOUNTED IN THE HORIZONTAL POSITION.**
- **DO NOT EXCEED A CONCENTRATION OF MORE THAN 120 ANTIFREEZE LAMB ELEMENTS.**
- **FAILURE CAN OCCUR.**
- **TIGHTEN SETTING SCREW.**
- **MOUNTING BRACKETS SHOWN ATTACHED.**
- **TABLE A - REFERENCE TYPE 2 WIRING DIAGRAM.**
- **THIS ASSEMBLY OR PART MUST COMPLY WITH 22.04-001.**

**INDICATES PART NUMBERS AFFECTED BY LATEST DRAWING REVISION.**
### Table

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>REV</th>
<th>AMPS</th>
<th>% RATING</th>
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<td>CM24181-3</td>
<td>C</td>
<td>600</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36100CU223A</td>
<td></td>
</tr>
<tr>
<td>CM24181-4</td>
<td>C</td>
<td>800</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36100CU444A</td>
<td></td>
</tr>
<tr>
<td>CM24181-5</td>
<td>C</td>
<td>600</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36100CU133A</td>
<td></td>
</tr>
<tr>
<td>CM24181-6</td>
<td>C</td>
<td>600</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36100CU144A</td>
<td></td>
</tr>
<tr>
<td>CM24181-7</td>
<td>C</td>
<td>1000</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36200CU123A</td>
<td></td>
</tr>
<tr>
<td>CM24181-8</td>
<td>C</td>
<td>1000</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36200CU444A</td>
<td></td>
</tr>
<tr>
<td>CM24181-9</td>
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<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36200CU133A</td>
<td></td>
</tr>
<tr>
<td>CM24181-10</td>
<td>C</td>
<td>1000</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36200CU144A</td>
<td></td>
</tr>
<tr>
<td>CM24181-11</td>
<td>C</td>
<td>1000</td>
<td>YES 50A</td>
<td>6.0A LSIG</td>
<td>PDP36200CU133A</td>
<td></td>
</tr>
<tr>
<td>CM24181-12</td>
<td>C</td>
<td>1200</td>
<td>YES 65A</td>
<td>6.0A LSIG</td>
<td>PJP36120CU123A</td>
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</tr>
<tr>
<td>CM24181-13</td>
<td>C</td>
<td>1200</td>
<td>YES 65A</td>
<td>6.0A LSIG</td>
<td>PJP36120CU444A</td>
<td></td>
</tr>
<tr>
<td>CM24181-14</td>
<td>C</td>
<td>1200</td>
<td>YES 65A</td>
<td>6.0A LSIG</td>
<td>PJP36120CU133A</td>
<td></td>
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<tr>
<td>CM24181-15</td>
<td>D</td>
<td>1200</td>
<td>YES 65A</td>
<td>6.0A LSIG</td>
<td>PJP36120CU144A</td>
<td></td>
</tr>
<tr>
<td>CM24181-16</td>
<td>D</td>
<td>1200</td>
<td>YES 65A</td>
<td>6.0A LSIG</td>
<td>PJP36120CU133A</td>
<td></td>
</tr>
<tr>
<td>CM24181-17</td>
<td>D</td>
<td>1200</td>
<td>YES 65A</td>
<td>6.0A LSIG</td>
<td>PJP36120CU144A</td>
<td></td>
</tr>
<tr>
<td>CM24181-18</td>
<td>D</td>
<td>1200</td>
<td>YES 65A</td>
<td>6.0A LSIG</td>
<td>PJP36120CU133A</td>
<td></td>
</tr>
</tbody>
</table>

### Notes
- **NOTE:** KOHLER PART # TO BE CLEARLY VISIBLE ON CIRCUIT BREAKER AND ON INDIVIDUAL PACKAGING.
- **NOTE:** THREADED BAR SUPPLIED WITH BREAKER IS USED WITH LUGS OR WHEN BUS BARS ARE INSTALLED WITH BOLTS INSERTED FROM THE FRONT. REMOVE AND DISCARD BAR WHEN BOLTS ARE INSTALLED FROM THE REAR OF BREAKER.
NOTE:
PAINT MALE ENDS OF FUEL LINE
1200°F, HIGH TEMPERATURE BLACK.

THIS ASSEMBLY OR PART MUST COMPLY WITH PEP-RML-001
ENGINEERING

LETTER OF TRANSMITTAL

DATE: 09/26/2023

TO: Texas A&M University - Corpus Christi
   6300 Ocean Drive
   Corpus Christi, TX 78412-5731

ATTN: Scott Meares

Reference: Corpus Christi Central Plant Mechanical Equipment
NRG #: 22159

WE ARE SENDING YOU: ( ) Attached ( ) Under separate cover via _______ the following items:

☐ Drawings ☐ Documents ☑ Electronic Copies

☐ Specifications ☑ Submittals ☐ Other

<table>
<thead>
<tr>
<th>Copies</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TAMUCC Central Plant Renovations VFD Submittal Rev00 07252023</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED AS CHECKED BELOW:

☐ For Approval ☐ As Requested ☐ Make Corrections Noted

☐ For Your Use ☐ No Exception Taken ☐ Rejected

REMARKS: See attached

Sent by: Sean Rodriguez Received by: ________________

Copy to: binder
Date: 9/26/2023

SUBMITTAL REVIEW

NRG Job #: 22159

Client: TAMU-CC Construction

Subject: Corpus Christi Central Plant Mechanical Equipment

Description: TAMUCC Central Plant Renovations VFD Submittal Rev00 07252023

☐ Reviewed  ☑ Reviewed with Comments

☐ Revise and Resubmit  ☐ Submit Specified Item

This review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with the requirements of the plans and specifications. Review of a specific item shall not include approval of an assembly of which the item is a component. Contractor is responsible for: confirming all quantities, dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of his or her Work with that of all other trades; and for performing all work in a safe and satisfactory manner.

Comments:
Specified electrical is based on the specified equipment. Contractor shall coordinate with other trades providing equipment to ensure that no electrical modifications are required as a result of substituted equipment. If modifications are required, contractor and subcontractors are responsible for coordinating and implementing the required changes at no extra cost.

1. No exceptions taken. Coordinate delivery location and date with Owner's representative.

Review By: Sean Rodriguez, P.E.  Date: 9/26/2023
Attachment B

Review By: Sean Rodriguez, P.E.

Date: 9/26/2023

5656 S. Staples, Suite 360
Corpus Christi, TX 78411
361/852-2727 FX: 361/852-2922
TX Firm Registration No. F-005318
ABB VARIABLE SPEED DRIVE

SUBMITTAL DATA

FOR

TEXAS A&M UNIVERSITY CORPUS CHRISTI

CENTRAL PLANT RENOVATIONS

Corpus Christi, TX

Owner: TAMU Corpus Christi
Mechanical Engineer: NRG Engineering
Mechanical Contractor: Pro Tech Mechanical

Date: 7/19/2023
Revision: Original
Submitted By: Ken Wertz, Texas AirSystems, Inc.
Equipment Manufacturer: ABB
Equipment Type: Variable Speed Drives
Specification Section: 23 68 30
Unit Tags: VFD-CHWP-1,2
(2) Variable speed drives with the following options:

- Model ABB-ACH580 Passive filter drive package with bypass and circuit breaker in NEMA 1 enclosure
  - Qty: 2-20HP
- BACNET Interface capability
- Provided for field installation and wiring by others
- Service switch
- 1st thru 5th Replacement parts and labor warranty
- Startup and owner training is provided by Factory-Authorized Technician
  - M-F, 0800-1500 Local time. Drives must be ready for startup upon arrival

**Notes:** Installation, external mounting hardware, input line filters, and any other products, options, services, and warranties are excluded unless mentioned above. Harmonic analysis is not included in this proposal.

**Deviations:**

1. Extra stock called out in paragraph 1.06 is not included.
2. Servicing technician must be ABB certified to comply with the manufacturer’s terms of the 5 year parts and labor warranty as specified in paragraph 1.09.
3. Output line filtering as specified in paragraph 2.04F is excluded.
## Submittal Schedule

This schedule includes the products supplied as part of this submittal.

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Tag</th>
<th>Motor Data¹</th>
<th>Drive Data</th>
<th>Drive Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>HP</td>
<td>FLA</td>
<td>Volts</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>VFD-CHWP-1,2</td>
<td>20</td>
<td>54</td>
<td>230 VAC</td>
</tr>
</tbody>
</table>

**Notes:**
1. AC motor data is per National Electrical Code Table 430.250 for typical motors used in most applications. It is provided as typical data only. DC motor data is per typical industry standards. Actual motor data may vary.
### Attachment B

### Submittal Schedule Details for VFD-CHWP-1,2

<table>
<thead>
<tr>
<th>Item</th>
<th>Tag / Equipment ID</th>
<th>Product ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VFD-CHWP-1,2</td>
<td>ACH580-BCR-059A-2+E211+F267</td>
</tr>
</tbody>
</table>

**Item Description**

- **Input Voltage:** 208 VAC Three Phase
- **Rated Output Current:** 59.4A
- **Enclosure:** UL (NEMA) Type 1
- **Nominal Horsepower:** 20 HP
- **Frame Size:** R3
- **Input Disconnecting Means:** Circuit Breaker
- **Bypass:** E-Clipse Bypass (Box)
- **Input Impedance:** 5% equivalent impedance
- **Short Circuit Current Rating:** 100 kA
- **Communication Protocols:** Johnson Controls N2, Modbus RTU, BACnet (MS/TP)
- **Other Options:** [+E211]: Passive Filter Drive, [+F267]: Service Switch (+F267)

### Drive Input Fuse Ratings

<table>
<thead>
<tr>
<th>Fuse Class</th>
<th>Amps (600 V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class T</td>
<td>80</td>
</tr>
</tbody>
</table>

### Wire Size Capacities of Power Terminals

<table>
<thead>
<tr>
<th>Input Wiring</th>
<th>Output Wiring</th>
<th>Ground Wiring</th>
</tr>
</thead>
<tbody>
<tr>
<td>#14...#1/0</td>
<td>#8...#2/0</td>
<td>#14...#2</td>
</tr>
<tr>
<td>5.2 lbf-ft</td>
<td>9.1 lbf-ft</td>
<td>3.3 lbf-ft</td>
</tr>
</tbody>
</table>

### Dimensions and Weights

<table>
<thead>
<tr>
<th>Height in (mm)</th>
<th>Width in (mm)</th>
<th>Depth in (mm)</th>
<th>Weight lbs (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.9 (1571)</td>
<td>19.3 (490)</td>
<td>19.0 (482)</td>
<td>279 (127)</td>
</tr>
</tbody>
</table>

### Heat Dissipation & Airflow Requirements

<table>
<thead>
<tr>
<th>Power Losses</th>
<th>Airflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTU/Hr</td>
<td>Watts</td>
</tr>
<tr>
<td>2,660</td>
<td>780</td>
</tr>
</tbody>
</table>
PRODUCT OVERVIEW

ACH580 E-Clipse Bypass

The ACH580 drive sets new standards in both simplicity and reliability, and ensures smooth, energy-efficient operation of your HVAC systems in normal and mission-critical situations.

The ACH580 with ABB E-Clipse bypass is an ACH580 HVAC Drive in an integrated UL (NEMA) Type 1, 12 or 3R enclosure with a bypass motor starter. The ACH580 with ABB E-Clipse bypass provides an input disconnect switch or circuit breaker with door mounted and interlocked operator (padlockable in the OFF position), a bypass starter, electronic motor overload protection, a door mounted control panel with graphical display for local control, provisions for external control connections, and serial communications capability. Configurations with the +F267 option include a drive service switch.

UL (NEMA) Type 1 and 12 E-Clipse units are available from 1 to 100 HP at 208/230V, 1 to 350 HP at 460V, and 2 to 150 HP at 575V. UL (NEMA) Type 1 and 12 units are wall mounted from 1 to 200 HP.

For outdoor applications, UL (NEMA) Type 3R E-Clipse unit are available from 1 to 100 HP at 208/230V, 1 to 350 HP at 460V and 2 to 150 HP at 575V. Construction is sheet steel with a tough powder coat paint finish for corrosion resistance. A thermostatically controlled space heater and forced ventilated air cooling system are standard.

The ACH580 with ABB E-Clipse bypass includes two contactors. One contactor is the bypass contactor, used to connect the motor directly to the incoming power line in the event that the ACH580 is out of service. The other contactor is the ACH580 output contactor that disconnects the ACH580 from the motor when the motor is operating in the Bypass mode. The drive output contactor and the bypass contactor are electrically interlocked to prevent “back feeding”.

The ACH580 with ABB E-Clipse bypass is a microprocessor-controlled “intelligent” system which features programmable Class 10, 20, or 30 overload curves, programmable underload (broken belt) and overload trip or indication. Also included as standard features are single-phase protection in bypass mode, programmable manual or automatic transfer to bypass, fireman’s override, smoke control, damper control, no contactor chatter on brown-out power conditions and serial communications. Should a drive problem occur, fast acting fuses exclusive to the ACH580 drive path disconnect the drive from the line prior to clearing upstream branch circuit protection, maintaining bypass capability.
## Technical specifications

### Product compliance (complete list on following page)
- **ACH580-VxR/BxR**: UL508A

### Supply connection

- **Input voltage (U<sub>i</sub>)**
  - ACH580-xx-xxxA-2: 208/240V
  - ACH580-xx-xxxA-4: 480V
  - ACH580-xx-xxxA-6: 600V

- **Input voltage tolerance**: +10% / -15%

- **Phase**: 3-phase

- **Frequency**: 48 to 63 Hz

- **Line Limitations**: Max ±3% of nominal phase to phase input voltage

- **Power Factor (cos φ) at nominal load**
  - ACH580-VxR: 0.98
  - ACH580-BxR: 0.98

- **Efficiency at rated power**
  - ACH580-VxR: 98.0%
  - ACH580-BxR: 98.0%

- **Power Loss**: Approximately 2% of rated power

### Motor connection

- **Supported motor control**: Scalar and vector

- **Supported motor types**: Asynchronous motor

- **Voltage**: 3-phase, from 0 to supply voltage

- **Frequency**: 0 to 500 Hz

- **Short Term Overload Capacity Variable Torque**: 110% for 1 min/10min

- **Peak Overload Capacity Variable Torque**: 1.35 for 2 second (2 sec / 10 min)

- **Switching Frequency**: 2, 4, 8 or 12 kHz
  - Automatic fold back in case of overload

- **Acceleration/Deceleration Time**: 0 to 1800 s

### Short Circuit Current Rating (SCCR)

<table>
<thead>
<tr>
<th></th>
<th>240V</th>
<th>480V</th>
<th>600V</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCR</td>
<td>100kA</td>
<td>100kA</td>
<td>10 kA</td>
</tr>
<tr>
<td>VDR*</td>
<td>100kA</td>
<td>100kA</td>
<td>100 kA</td>
</tr>
<tr>
<td>BCR</td>
<td>100kA</td>
<td>100kA</td>
<td>10 kA</td>
</tr>
<tr>
<td>BDR*</td>
<td>100kA</td>
<td>100kA</td>
<td>100 kA</td>
</tr>
</tbody>
</table>

* External fuses are required for 100 kA rating as specified in the "Technical Data" section of User Manual 3AXD5000029554.
Attachment B

---

**Technical specifications**

<table>
<thead>
<tr>
<th>Inputs and outputs (drive)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 analog inputs</td>
<td>Selection of Current/Voltage input mode is user programmable.</td>
</tr>
<tr>
<td>Voltage reference</td>
<td>0 (2) to 10 V, $R_{\text{in}} &gt; 200 , \text{k}\Omega$</td>
</tr>
<tr>
<td>Current reference</td>
<td>0 (4) to 20 mA, $R_{\text{in}} = 100 , \text{\Omega}$</td>
</tr>
<tr>
<td>Potentiometer reference value</td>
<td>10 V ±1% max. 20 mA</td>
</tr>
<tr>
<td>2 analog outputs</td>
<td>AO1 is user programmable for current or voltage. AO2 current</td>
</tr>
<tr>
<td>Voltage reference</td>
<td>0 to 10 V, $R_{\text{ref}} &gt; 100 , \text{k}\Omega$</td>
</tr>
<tr>
<td>Current reference</td>
<td>0 to 20 mA, $R_{\text{ref}} &lt; 500 , \text{\Omega}$</td>
</tr>
<tr>
<td>Applicable potentiometer</td>
<td>1 \k\Omega to 10 \k\Omega</td>
</tr>
<tr>
<td>Internal auxiliary voltage</td>
<td>24 V DC ±10%, max. 250 mA</td>
</tr>
<tr>
<td>Accuracy</td>
<td>+/- 1% full scale range at 25°C (77°F)</td>
</tr>
<tr>
<td>Output updating time</td>
<td>2 ms</td>
</tr>
<tr>
<td>6 digital inputs</td>
<td>12 to 24 V DC, 10 to 24 V AC. Connectivity of PTC sensors supported by a single digital input. PNP or NPN connection (5 DIs with NPN connection). Programmable</td>
</tr>
<tr>
<td>Input Updating Time</td>
<td>2 ms</td>
</tr>
<tr>
<td>3 relay outputs</td>
<td>Maximum switching voltage 250 V AC/30 V DC. Maximum continuous current 2 A rms. Programmable, Form C</td>
</tr>
<tr>
<td>Contact material</td>
<td>Silver Tin Oxide (AgSnO$_2$)</td>
</tr>
<tr>
<td>PTC, PT100 and PT1000</td>
<td>Any of the analog inputs, or digital input 6, are configurable for PTC with up to 6 sensors.</td>
</tr>
</tbody>
</table>

Adjustable filters on analog inputs and outputs

All control inputs isolated from ground and power

<table>
<thead>
<tr>
<th>Operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air temperature</td>
<td>0 to -15 °C (32 to 5 °F), -15 to +50 °C (5 to 122 °F): No frost allowed. Output derated above +40 °C (104 °F)</td>
</tr>
<tr>
<td>Installation site altitude</td>
<td>0 to 1000 m (3281 ft) above sea level Output derated above 1000 m (3281 ft)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 to 96% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses</td>
</tr>
<tr>
<td>Atmospheric pressure</td>
<td>70 to 106 kPa (10.2 to 15.4 PSI) 0.7 to 1.05 atmospheres</td>
</tr>
<tr>
<td>Siesmic</td>
<td>Risk category IV Certified (IBC 2018)</td>
</tr>
</tbody>
</table>
Feature overview

Communication
Protocols as standard (EIA-485): BACnet MS/TP, Modbus RTU, Johnson Controls N2
Available as plug-in options: BACnet/IP, Modbus TCP, PROFIBUS-DP, DeviceNet, EtherNet/IP

Application functions
Start interlock
Delayed start
Run permissible (damper monitoring)
Override operation mode
Real-time clock (scheduling)
PID controllers for motor and process
Motor flying start
Motor preheating
Energy optimizer and calculators
Timer
2 or 3 wire start/stop
Ramp to stop
2 independent adjustable accel/decel ramp

Protection functions
Overvoltage controller
Undervoltage controller
Motor earth-leakage monitoring
Motor short-circuit protection
Motor overtemperature protection
Output and input switch supervision
Motor overload protection (UL508C)
Phase-loss detection (both motor and supply)
Under load supervision (belt loss detection)
Overload supervision
Stall protection
Loss of reference
Panel loss
Ground fault
External events
Overcurrent
Current limit regulator
Transient/Surge protection (MOV and choke)

DC Bus Voltage
Output Voltage
Heatsink Temperature
Elapsed Time Meter (resettable)
kWh (resettable)
Input / Output Terminal Monitor
PID Actual Value (Feedback) & Error Fault Text
Warning Text
Three (3) Scalable Process Variable Displays
User-Definable Engineering Units

Motor control features
Scalar (V/Hz) and vector modes of motor control
V/Hz shapes
- Linear
- Squared
Energy optimization
IR compensation
Slip compensation
Three (3) Critical Frequency Lockout Bands

PID control
One (1) Process PID
Four (4) Integral Independent Programmable PID
Setpoint Controllers (Process and External)
External Selection between Two (2) Sets of Process
PID Controller Parameters
PID Sleep/Wake-Up

Panel functions
First start assistant
Primary settings for HVAC applications
Hand-Off-Auto operation mode
HVAC quick set-up
Includes Day, Date and Time
Operator Panel Parameter Backup (read/write)
Full Graphic and Multilingual Display for Operator Control,
Parameter Set-Up and Operating Data Display:
- Output Frequency (Hz)
- Speed (RPM)
- Motor Current
- Calculated % Motor Torque
- Calculated Motor Power (kW)
Control panel features

The ACH580 Assistant Control Panel features:
- Intuitive to operate
- Primary Setting menu to ease drive commissioning
- Real-time clock
- Diagnostic and maintenance functions
- Full-graphic display, including chart, graph, and meter options
- 21 editable home views
- USB interface for PC and tool connection as standard
- Parameters are alpha-numeric
- North American version supports 14 languages as standard
- Dedicated “Help” key
- 4 user sets
- Parameters are stored in control panel memory for later transfer to other drives or for backup of a particular system
- Back-up and restore parameters and/or motor data
- Automatic back-up 2 hours after parameter change
- Modified parameter display
- Creates unique short menu
- Shows parameters that differ from the default
- Bluetooth connectivity for use with mobile device (requires +J429 option)
E-Clipse control panel features

The ACH580 E-Clipse Control Panel features:
- Dedicated programming and operating controls (keys) are logically grouped on the keypad by their function.
  - H-O-A, Drive/Bypass Selection keys (Control)
  - UP/DOWN arrows, ESC, ENTER keys (Programming)
- LCD display provide:
  - Operating Control Status
  - Bypass Status
  - Fault/Warning annunciation
  - Parameter Lists and Values
  - Power On indication
- Individual LEDs arranged to provide a logical control path visual:
  - System Enabled
  - Separate multi colored Drive and Bypass "SELECTED/FAULTED LEDs in separate paths
  - Motor Run Indicator
  - LEDs that illuminate, change color, and flash to provide visible indication of system status
- Provides System control from one location
Cable connections
Control connections

The control wiring includes connections to an analog speed command signal and a start/stop relay contact for controlling the motor in the AUTO mode. There may also be connections to external run permissive interlock contacts and a connection from the Motor Run contact to an external status indication circuit. For a detailed description of the control circuit functions and alternate Control Connection diagrams, refer to the ACH580 E-Clipse bypass and packaged drive manual.
Engineering Data Summary

Replacement Fuses
Drive input fuses are recommended to disconnect the drive from power in the event that a component fails in the drive’s power circuitry. Recommended drive input fuse specifications are listed in the Submittal Schedule Details and in the Fuse Ratings Table. Fuse rating information is provided for customer reference.

<table>
<thead>
<tr>
<th>Item</th>
<th>Catalog Number</th>
<th>Drive Input Fuse Ratings</th>
<th>Bussmann Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ACH580-BCR-059A-2+E211+F267</td>
<td>80</td>
<td>Class T</td>
</tr>
</tbody>
</table>

Terminal Sizes / Cable Connection Requirements
Power and motor cable terminal sizes and connection requirements are shown in the Submittal Schedule Details and in the Terminal Sizes / Cable Connection Requirements Table. The information provided below is for connections to input power and motor cables. These connections may be made to an input circuit breaker or disconnect switch, a motor terminal block, overload relay, and/or directly to bus bars and ground lugs. The table also lists torque that should be applied when tightening terminals and spacing requirements where multiple mounting holes are provided in the bus bar.

<table>
<thead>
<tr>
<th>Item</th>
<th>Catalog Number</th>
<th>Input Wiring</th>
<th>Output Wiring</th>
<th>Ground Wiring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ACH580-BCR-059A-2+E211+F267</td>
<td>#14...#1/0</td>
<td>#8...#2/0</td>
<td>#14...#2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.2 lbf-ft</td>
<td>9.1 lbf-ft</td>
<td>3.3 lbf-ft</td>
</tr>
</tbody>
</table>

Heat Dissipation Requirements
The cooling air entering the drive must be clean and free from corrosive materials. The Submittal Schedule Details and the Heat Dissipation Requirements table below give the heat dissipated into the hot air exhausted from the drives. If the drives are installed in a confined space, the heat must be removed from the area by ventilation or air conditioning equipment.

<table>
<thead>
<tr>
<th>Item</th>
<th>Catalog Number</th>
<th>Watts</th>
<th>BTU/Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ACH580-BCR-059A-2+E211+F267</td>
<td>780</td>
<td>2,660</td>
</tr>
</tbody>
</table>

Dimensions and Weights
Dimensions and weights of the drives provided are given in the Submittal Schedule Details and in the Dimensions and Weights Table. The table also lists the applicable dimension drawings that include additional detail. Dimension drawings may be provided in the back of this submittal.

<table>
<thead>
<tr>
<th>Item</th>
<th>Catalog Number</th>
<th>Height mm (in)</th>
<th>Width mm (in)</th>
<th>Depth mm (in)</th>
<th>Weight kg (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ACH580-BCR-059A-2+E211+F267</td>
<td>1571 (61.86)</td>
<td>490 (19.30)</td>
<td>482 (18.98)</td>
<td>127</td>
</tr>
</tbody>
</table>

Product Short Circuit Current Rating
Short circuit ratings shown below are as show on the device rating label.

<table>
<thead>
<tr>
<th>Item</th>
<th>Catalog Number</th>
<th>Short Circuit Current Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ACH580-BCR-059A-2+E211+F267</td>
<td>100 kA</td>
</tr>
</tbody>
</table>