



Standard & Optional Items, Certifications and RFQ

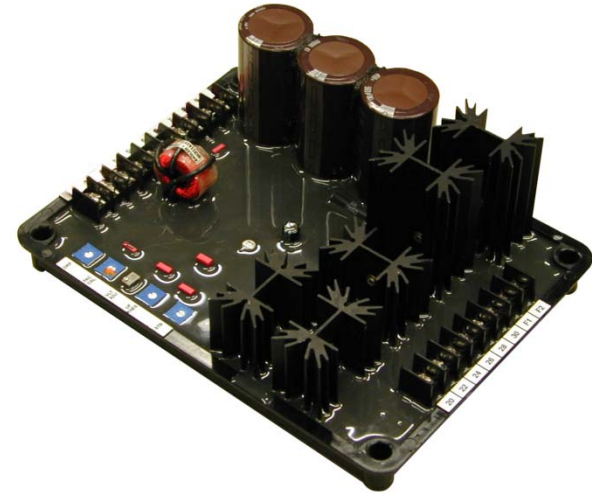


Standard & Optional Items, Certifications and RFQ

- Standard Items
- Optional Items
- Hazardous Certifications
- Marine Certifications
- API-546
- Request for Quote

Standard Items

- Voltage regulator (exception: oil drilling)
 - Kato K65, K125
 - Basler SSR63, SSR125
 - Basler DECS-100, DECS-200
 - Basler DECS-250
- Permanent magnet generator (PMG) (exception: oil drilling) – Powers voltage regulators





Advantages of a PMG

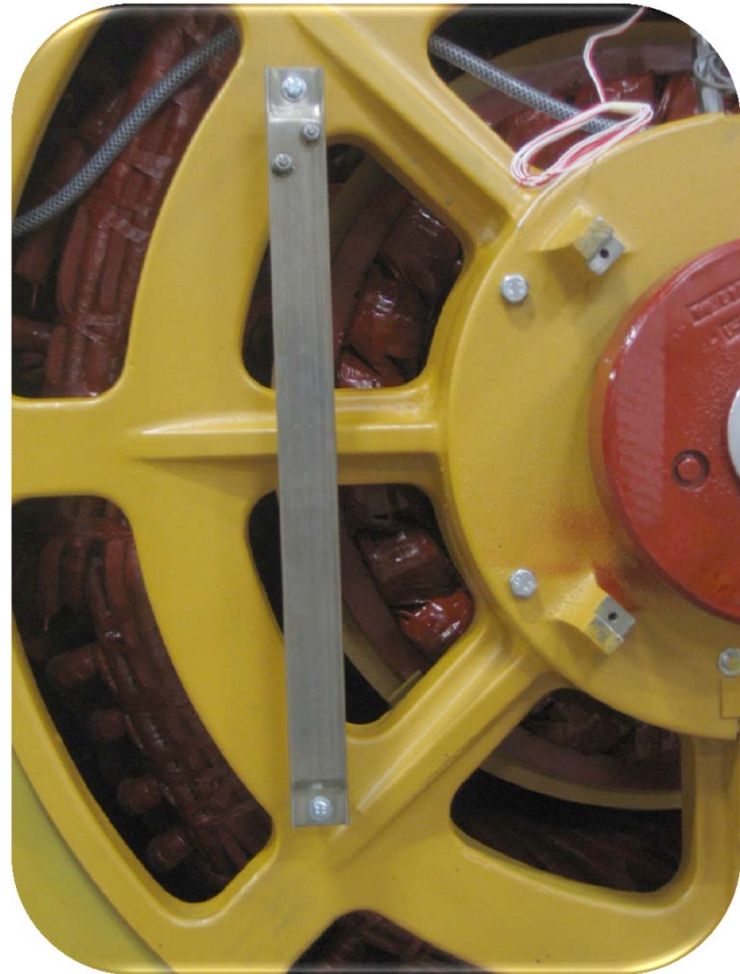
- Provides an economical and simple means of reliable, responsive and stable input power to the voltage regulator.
- Supplies continuous power to the exciter through the voltage regulator to maintain up to 300% short-circuit current from the generator during a fault condition.
- Provides full exciter power, regardless of generator voltage, for motor starting and is a separate voltage source for use external to the generator set, such as a tachometer and relay options.
- Reduces the effects of both conducted and radiated electromagnetic interference (EMI). With an EMI filter, the PMG and a KATO™ voltage regulator will meet the emissions requirements of Mil-Std. 461C, Part 9, Class C2.
- Enhances manual voltage control regulation as the PMG provides a more stable power source to the manual control.

Types of Excitation

	Self excited	AREP	PMG
Motor starting	Standard	High	High
Short-circuit capability	None	300% @ 60 Hz	300% @ 60 Hz
Susceptibility to non-linear loads	Maximum	Minimum	Minimum
Number of components	Minimum	Minimum	Maximum
Retrofitability	N/A	No	Yes
Generator length	Minimum	Minimum	Maximum
Price	\$\$	\$\$	\$\$\$
Stator design	Standard	Special	Standard with PM attachment
Voltage build up	Residual magnetism	Residual magnetism and permanent magnet inserts on some frames	Positive from permanent magnets

Standard Items (cont.)

- Space heaters
 - In generator frame
 - Commercial version
 - Maintain the temperature of the stator housing slightly above ambient air temperature to prevent condensation on generator windings.
 - Require a separate power source
 - Need to be de-energized during generator operation
 - Variety of configurations depending on application



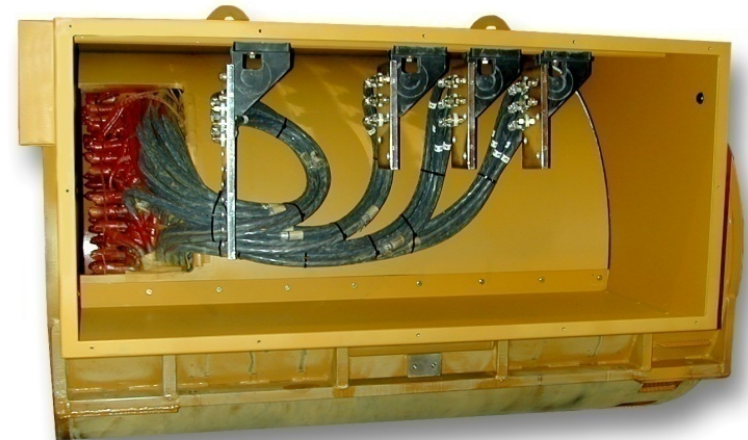
Standard Items (cont.)

- Main stator RTDs
 - Used to measure internal hot spot temperatures of a machine's winding
 - Placed in between coils
 - Two per phase
 - 100-ohm platinum
 - May be required by specification or application



Standard Items (cont.)

- Generator enclosure
 - Open drip proof (IP-23)
- Terminal box (main and auxiliary boxes)
 - Steel (IP-43) side with bottom entry
 - Standoff terminals for customer connections



Standard Items (cont.)

- Two-bearing configuration
 - Regreasable anti-friction for small machines
 - Grease lubricated split roller for medium machines
 - Oil lubricated split sleeve for large machines



Standard Items (cont.)

- Form-wound main stator (armature) coils



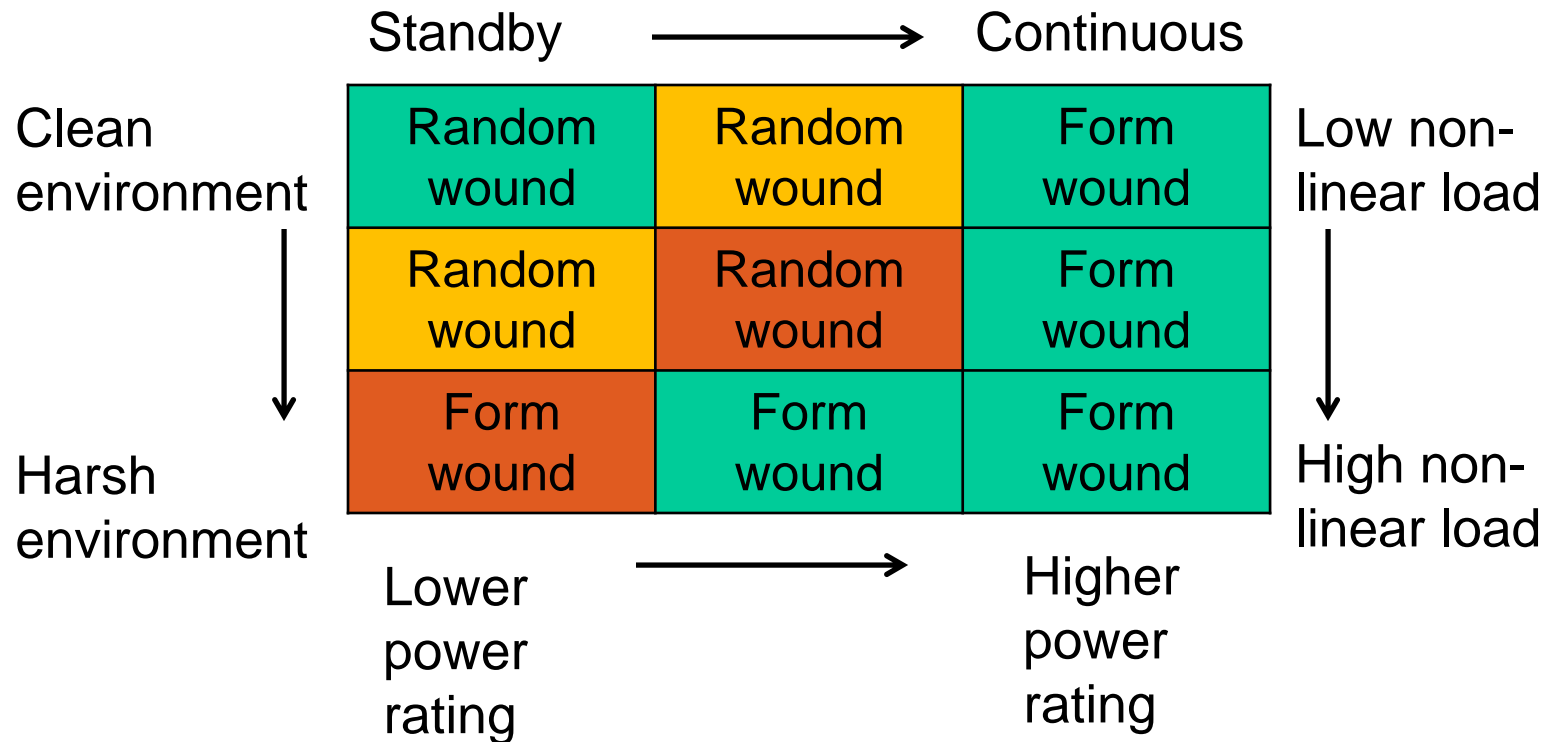
Form-Wound vs. Random-Wound

Form-Wound Coils	Random-Wound Coils
Wire is rectangular or square with Dacron glass cover or mica turn tape over 200° C heavy film. The wire is more costly and inventory costs are increased because many different sized wires are used.	Round wire with 200° C heavy film is used. Fewer sizes need to be kept on hand, and the wire is more economically priced.
Individual turns are systematically arranged throughout the coil.	Turns have a random location; wires from a turn can touch any other turn.
Coils have insulation tapes	Coils are not taped.
The slots have uniform copper fill. Individual wires are tightly held in the slot.	Wire fit in slots is not uniform.
Coil-to-coil connections are usually required.	Only phase connections are required.
End windings are shaped to form a basket with large openings between the coils to promote cooling and reduce coil contamination.	End of windings are completely covered. Excessive resin can build up and seal all openings. Moisture and contaminate can accumulate.

Form-Wound vs. Random-Wound

Form-Wound Coils	Random-Wound Coils
There is uniform resin buildup in VPI and uniform temperature distribution.	Resin builds up unevenly based upon the looseness of the wires in the slots. Design is more sensitive to localized hot spots due to internal voids.
There is uniform turn-to-turn voltage stress	Turn-to-turn voltage can be as high as $(\#1 \text{ of turns} - 1) \times \text{volts/turn}$.
There is minimum potential for wire damage during assembly or disassembly.	There is a higher potential of wire damage during assembly or disassembly.

FW vs RW Application Guide



Applicable/ recommended	Choice exists. Use caution and review all factors	Review all factors to avoid premature failure
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FW vs. RW Application Guide

- Type of generator set rating
 - Standby load applications, which have limited running time, may not require form-wound generators, especially with optional space heaters.
 - Prime and continuous applications, especially when running at high load factors, should have form-wound generators.
- Power rating
 - Smaller generator sets at lower power ratings (under 800 kW) may use random-wound generators if no other adverse conditions exist. (Form-wound generators may not be offered and available for the low power ratings.)
 - With high-power generator sets (above 2 MW) and critical power installations, consider form-wound generators.
 - Applications in the middle of the rating range (800 to 2250 kW) merit careful consideration.



FW vs. RW Application Guide

- Installation environment
 - When installed in the corrosive, coastal (salt-laden), dusty or any other adverse environment without the protection of air filters, protective enclosures or a filtered building, generators with form-wound coils should be used. Additionally, the optional coastal insulation winding protection may be applicable.
- Type of load
 - High SCR and non-linear loads may cause winding end turn vibration, which results in insulation cracking that makes the generators more susceptible to moisture failures. Form-wound generators are inherently more robust and suitable for these applications.

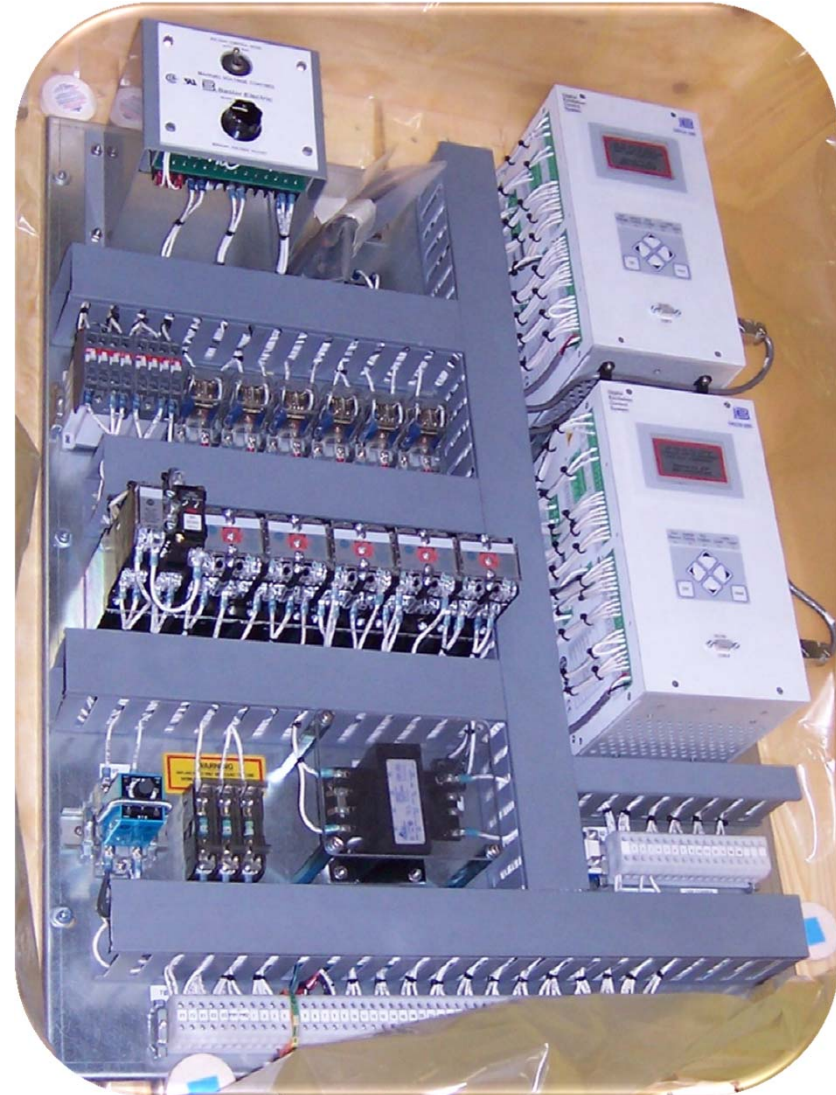


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- [Optional Items](#)
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Optional Items

- Dual-redundant voltage regulator system
 - Near bumpless transfer from auto-manual voltage control
 - Applications: Generally offshore in the petroleum industry



Offshore petroleum, critical apps.

Optional Items (cont.)

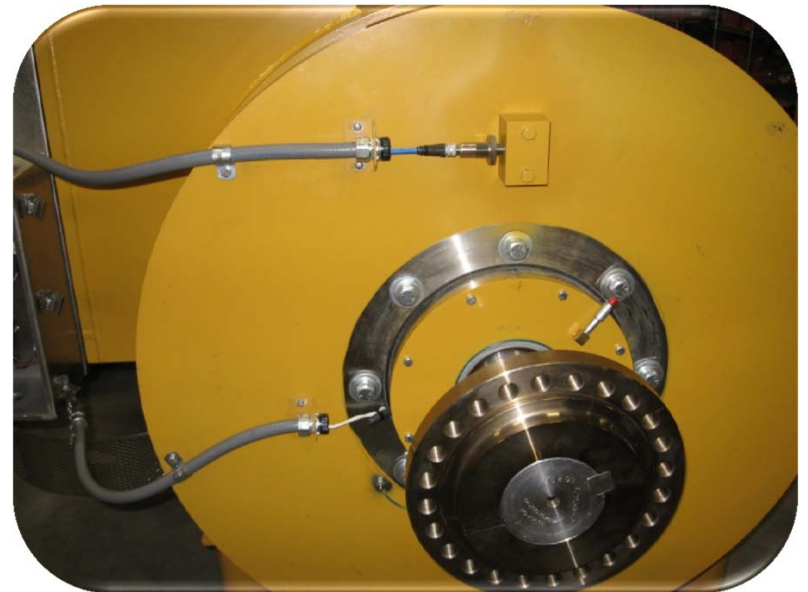
- Vibration proximity probes & proximitors for sleeve bearings



Petroleum, larger apps.

Optional Items (cont.)

- Velocity probes for ball and split roller bearings



All

Optional Items (cont.)

- Sleeve bearing oil coolers.



Large generators

Optional Items (cont.)

- Stator RTDs increased to three or four maximum per phase
- Bearing RTDs - Up to two per bearing
- Both are 100-ohm platinum but also available in the following:
 - 10-ohm copper
 - 120-ohm nickel
 - Thermocouples (less than 5000 V)

Petroleum, larger apps.



Optional Items (cont.)

- Low surface temp. space heater (generator frame)
- Low surface temp. space heater (main terminal box)



Hazardous areas

Optional Items (cont.)

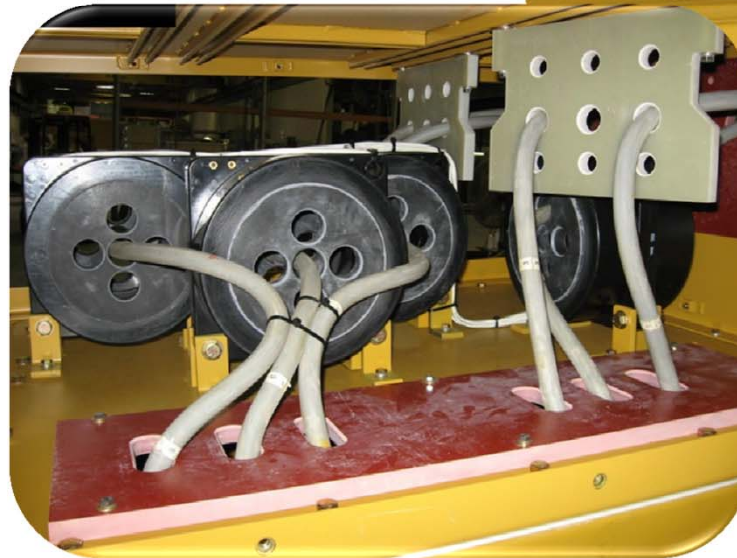
- Space heater thermostat
- Redundant series connected rotating rectifiers



Any critical application

Optional Items (cont.)

- Current transformers (CTs) installed in the main and/or neutral terminal boxes



All

Optional Items (cont.)

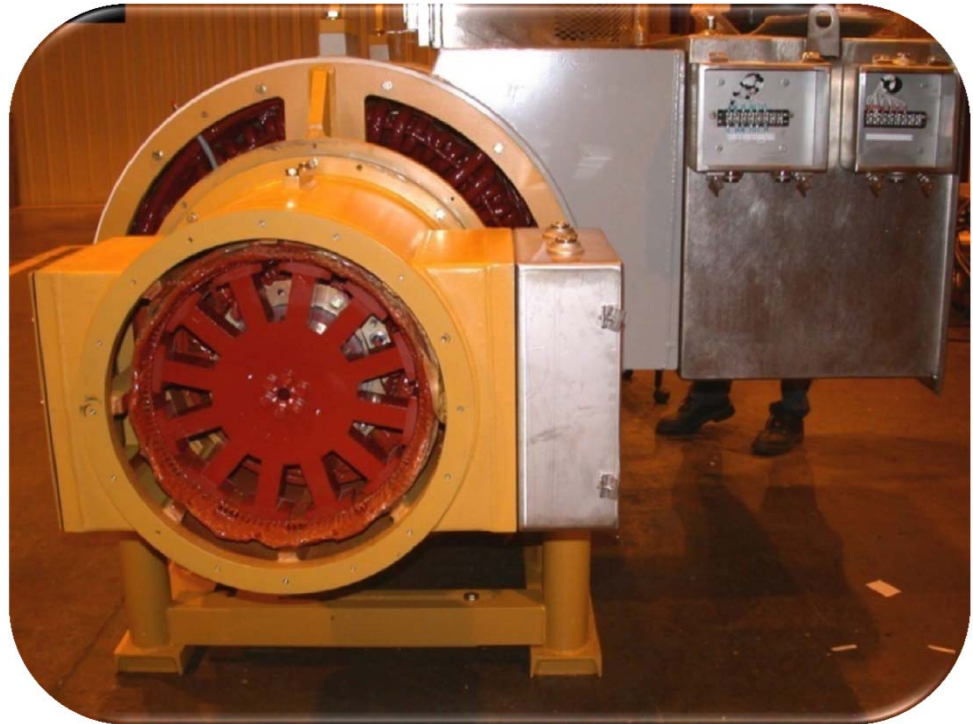
- Voltage clamping module for CTs mounted in main or neutral box on hazardous applications



Hazardous Zone II areas

Optional Items (cont.)

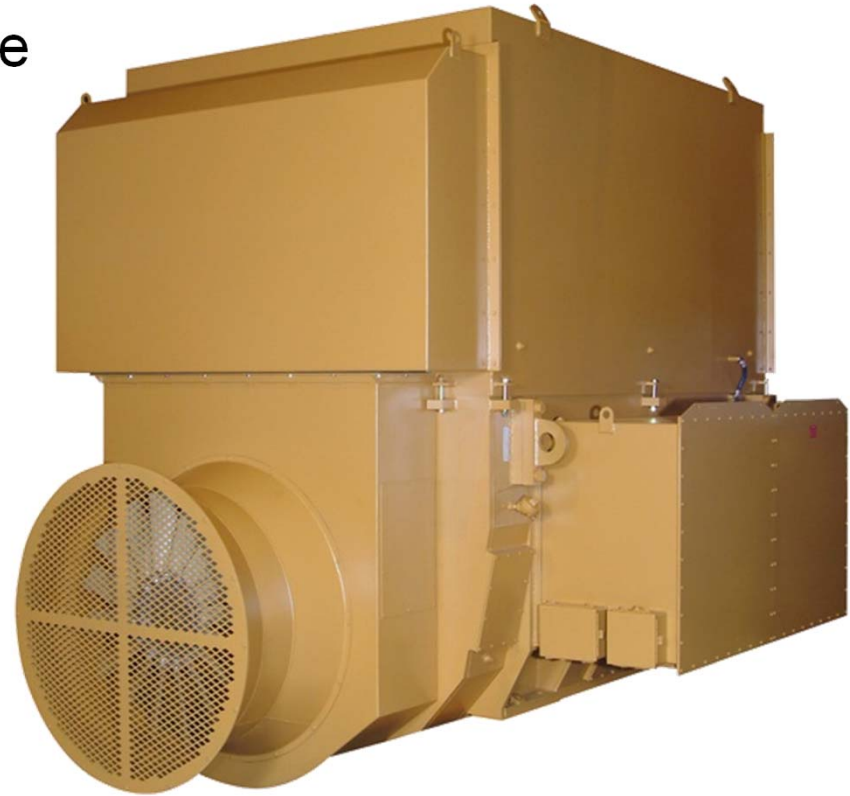
- IP54 exciter rectifier assembly for hazardous applications



Hazardous Zone II areas

Optional Items (cont.)

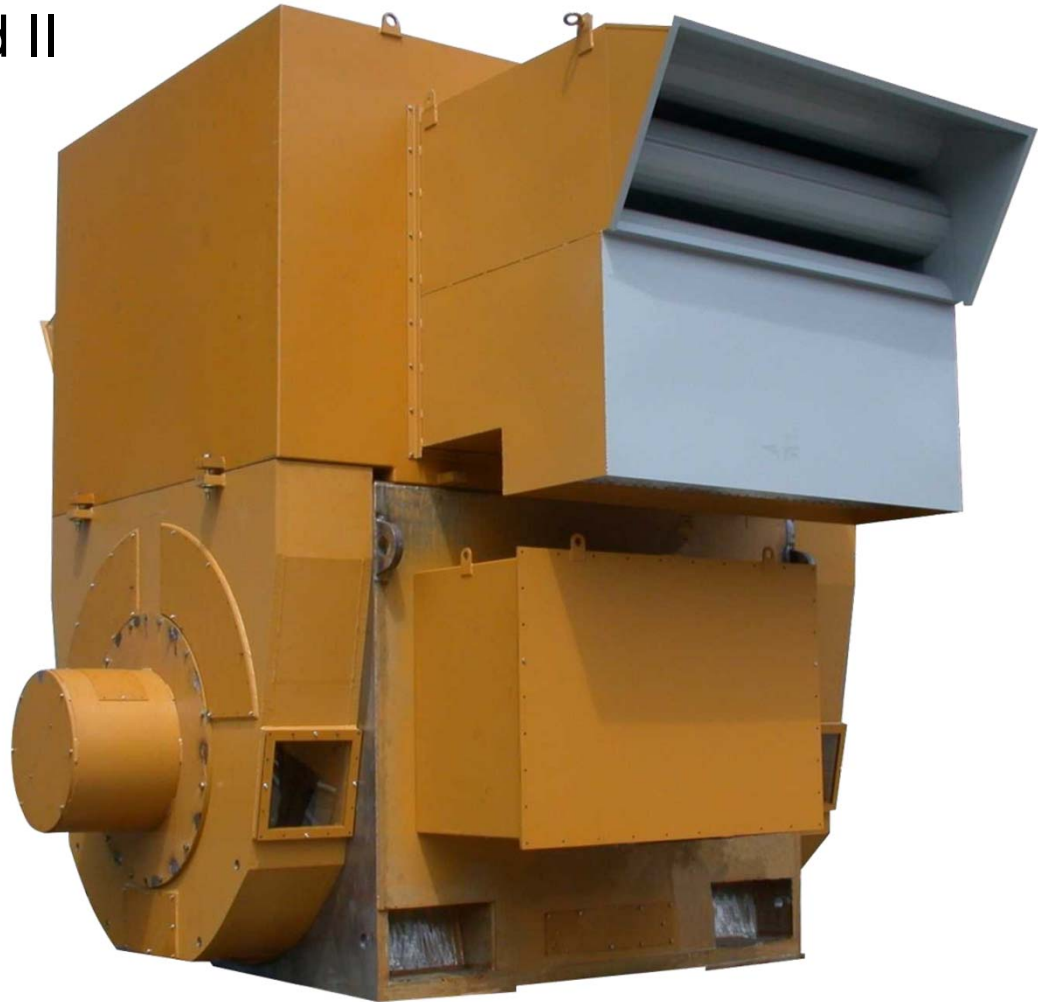
- TEAAC / CACA enclosure
 - 304 stainless tubes
 - 316 stainless tube
- TEFC enclosure



Offshore petroleum where exposure to corrosive atmosphere is likely. Water is not readily available to be used for TEWAC / CACW.

Optional Items (cont.)

- Weather protected II enclosure



Land-based gas and steam turbine applications

Optional Items (cont.)

- Air filters for inlet and/or outlet
 - A differential pressure safety switch is included. If the filter becomes clogged, the switch actuates.
 - alarm
 - indicator lights
 - shutdown circuitry
 - Removable for easy cleaning



Dusty or dirty areas

Optional Items (cont.)

- Separate main and neutral terminal boxes
 - Mount on opposite sides
 - May be specified when differential and neutral CTs are required
 - Provide more space for mounting other current transformers and components
- Terminal box enclosures available from IP43 thru IP65.

Dusty, dirty and wet areas

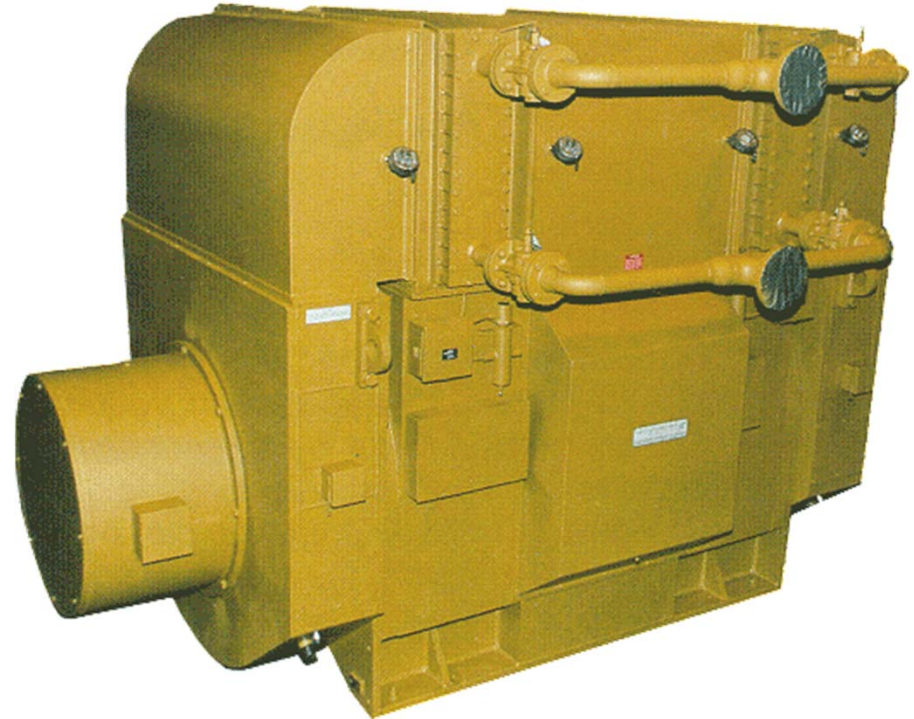


Optional Items (cont.)

- TEWAC / CACW enclosure radiator available in two types:

- Single tube
- Double tube

Note: Standard is 90/10 CuNi tubes. Other materials available upon request



Optional Items (cont.)

- Sealed insulation system (water immersion for API)
- Severe environment epoxy paint system



Petroleum, larger apps.

Optional Items (cont.)

- Stainless steel terminal boxes (304 or 316)



Offshore petroleum and marine

Optional Items (cont.)

- Lightning arrestors and surge capacitors



All applications that could be exposed to direct lightning strikes or susceptible to voltage surges.

Rotor Monitoring

- Measures insulation resistance on a stationary or operational generator.
- Measures generator rotor voltage.
- Transmits diode fault signal.
- Ultra-low power design (powered from stationary inductive loop).
- Wireless digital data transmission to stationary receiver.
- Field-programmable for additional features / upgrades.

Larger generators typically powered by gas or steam turbines. Also specified on some diesel or natural gas applications.



Optional Items (cont.)

- 316-CE marking (European conformity):
Declaration that the product complies with the essential requirements of the relevant European health, safety and environmental protection legislation
- CSA label for non-hazardous areas

SYNCHRONOUS AC GENERATOR							
SERIAL NUMBER	CODE	MODEL NUMBER	WEIGHT				
24091-01	4P4-0950	AA28S27000	3,500 lb				
IMPORTANT: WHEN ORDERING PARTS INCLUDE SERIAL NUMBER AND MODEL NUMBER							
ALTERNATOR						EXCITER	
KW	PHASE	WIRE	HERTZ	FIELD AMPS	FIELD VOLTS		
60	3	6	50	4.5	50		
KVA	P.F.	RPM	FIELD VOLTS		FIELD AMPS		
75	0.8	1500	120		150		
VOLTAGE		AMPERES		ATEX Certificate number			
231/400		108		BASEEF10ATEX0191X			
TEMP RISE	AMBIENT	INSUL. CL.	SEQUENCE	(Ex) II 3G Ex nA II A&B T3 Gc			
80 °C	40 °C	F	T1, T2, T3	(Tamb: -20 deg C to max. ambient listed)			
ENCLOSURE	MFR. YEAR	ROTATION					
IP55	2010	CWFDE					
DUTY	CONT.	X'd SAT.	5.6%	X'd SAT.	5.6%		
ASSEMBLED IN THE U.S.A.				Kato Engineering			

SYNCHRONOUS AC GENERATOR							
SERIAL NUMBER	CODE	MODEL NUMBER	WEIGHT				
31302-01	GPC-3150	AA327673012	11,400 lb				
IMPORTANT: WHEN ORDERING PARTS INCLUDE SERIAL NUMBER AND MODEL NUMBER							
ALTERNATOR						EXCITER	
KW	PHASE	WIRE	HERTZ	FIELD AMPS	FIELD VOLTS		
1225	3	6	60	7.9	100		
KVA	P.F.	RPM	FIELD VOLTS		FIELD AMPS		
1750	0.7	1200	---		---		
VOLTAGE		AMPERES		ATEX Certificate number			
345/600		1604					
TEMP RISE	AMBIENT	INSUL. CL.	SEQUENCE				
85 °C	40 °C	F	T1, T2, T3				
ENCLOSURE	MFR. YEAR	ROTATION					
OCIP	2013	CWFDE					
DUTY	CONT.	X'd SAT.	22.6%	X'd SAT.	18.0%		
LR9868 ABL-1-0P; 10 PERCENT OVERLOAD FOR 2 HOURS IN A 24 HOUR PERIOD							
ASSEMBLED IN THE U.S.A.				Kato Engineering			



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Hazardous Certifications

- Canadian Standards Association (CSA) Certified for Class 1, Division 2 or Class 1, Zone 2. T3 Temperature.
- BASEEFA Certified for EEx nA II T3 (ATEX or IECEx) requirements





Hazardous Certifications (cont.)

- Minimum requirements for hazardous duty (Class 1, Div 2):
 - Non sparking
 - Low temperature space heater (200°C maximum surface temperature)
 - CSA certified
 - Heat test is performed on 1st of design



Hazardous Certifications (cont.)

- Additional requirements for Class 1, Zone 2:
 - IP54 terminal boxes
 - Voltage clamping device - Used if CTs are mounted in the terminal box

Hazardous Certifications (cont.)

- Additional requirements for ATEX or IECEx EEx nA II T3
 - Final vacuum test
 - Totally enclosed - on generator and terminal boxes
 - Open drip proof (IP23) - vacuum test on each terminal box
 - Design requirements must meet IEC EN60079-15. Special clearances, creepage, enclosures, air gaps, terminals, rotor cage, bearing and shaft seals, ventilation, auxiliary devices, and markings
 - All components used must be approved and certified by an approved agency. Kato uses BASEEFA for this certification.



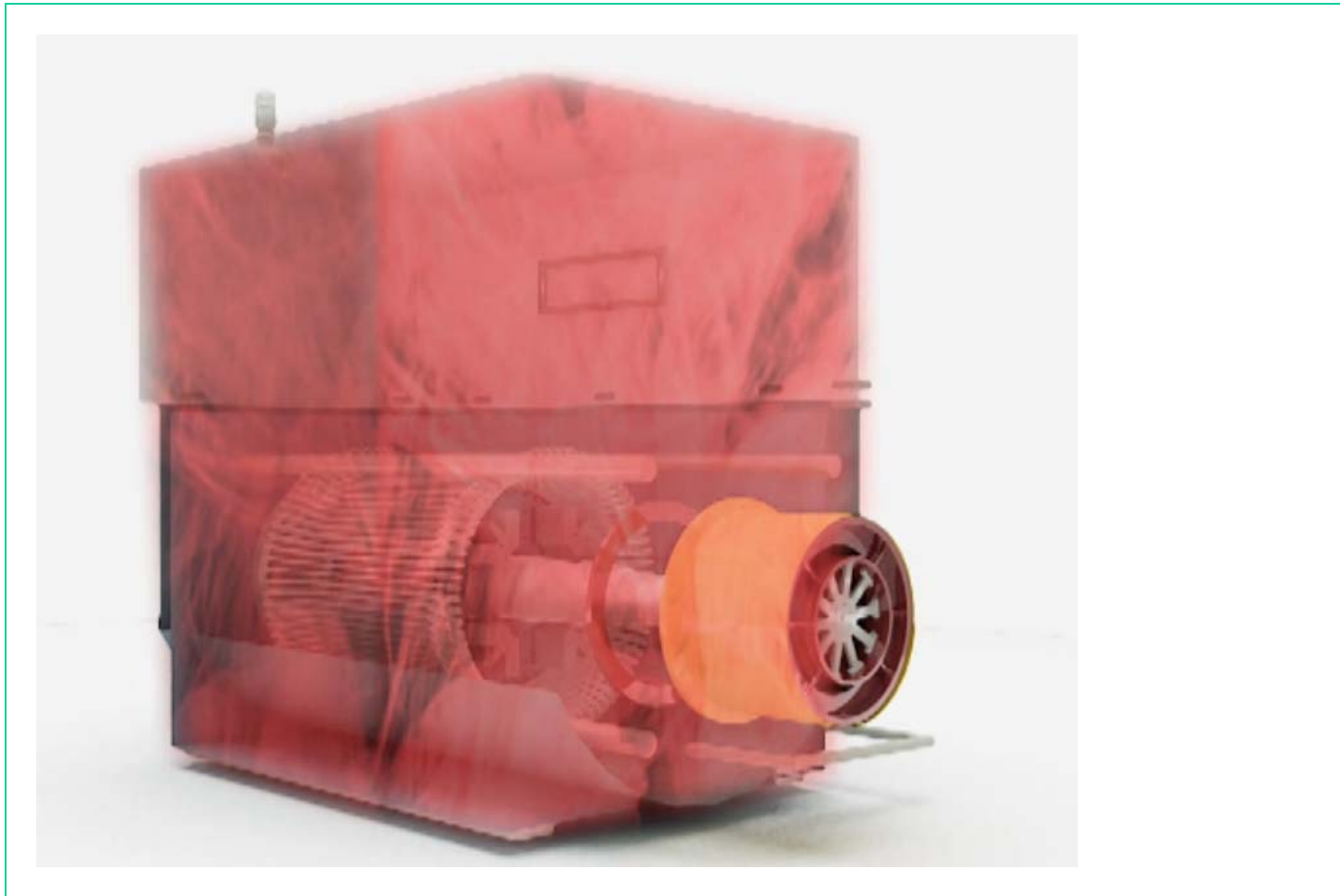


Hazardous Certifications (cont.)

- Additional requirements for ATEX or IECEx EEx p II T3:
 - Purging system and fresh air intake to ensure a combustible gas-free environment
 - Over pressure test
 - Enclosure purge test

Hazardous Certifications (cont.)

- EEx p II T3 video



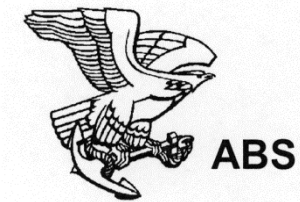


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Marine Certifications

- American Bureau of Shipping (ABS)
- Det Norske Veritas (DNV)
- Bureau Veritas (BV)
- British Lloyds
- Russian Maritime





Marine Certifications (cont.)

- Minimum features for typical certification:
 - Space heater
 - PMG
 - Stator RTDs
 - Specific shaft material
- Minimum additional tests for certification:
 - Overspeed test
 - Overload test
 - Steady state short-circuit test
 - Heat test on 1st of design



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API-546

- American Petroleum Institute (3rd Edition 2008):
- This standard is used globally by the petroleum industry to do the following:
 - improve performance and reliability
 - facilitate communication between users and suppliers
 - enhance quality
 - increase safety
 - encourage rational and fair regulations





API-546 (cont.)

- Available on most Kato Engineering generator frames
 - Premium design and construction
 - Sealed insulation system with form coils
 - Special lamination steel
 - Special precision balancing
 - Special shaft, coil, and stator tests
 - 120° C maximum total insulation temperature 80°C rise/40°C ambient or 70°C rise/50°C ambient
 - Special data sheets are filled in by specifying engineer that can include additional construction features and special tests
 - IP23 thru IP56 can be specified



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Request for Quote

- The generator manufacturer is the expert on interpreting detailed specifications.
- If the bid package can be sent electronically, please include the complete package in your Email.
- Other sections of the specification may include information relevant to the generator design and construction.



Request for Quote (cont.)

- Supply the following info:
 - Country of destination
 - User name
 - Project name and application
 - Complete specification
 - Number of units
 - Generator delivery date



Request for Quote (cont.)

- Supply the following info:
 - kW, voltage, frequency, speed, power factor
 - Enclosure type
 - Temperature rise
 - Options required
 - Driver model
 - Does it parallel with another generator? Give details.
 - Is there motor starting involved? Give details.
 - Is it for a marine or offshore application? Indicate pitch & roll expected.

