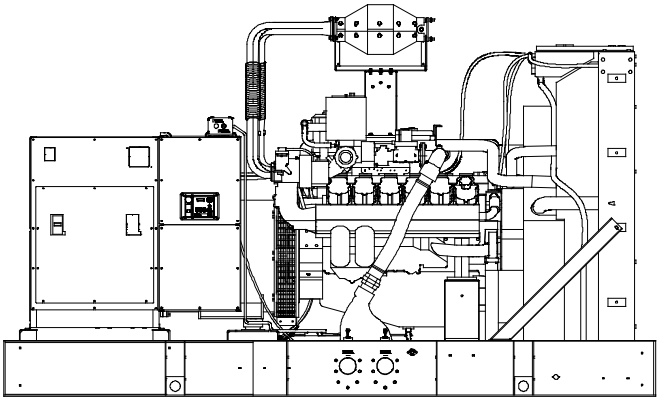
Industrial Generator Set - 450REZXD

208-600 V **Gas**

EPA-Certified for Stationary Emergency Applications

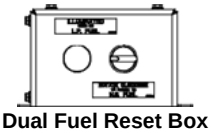
Ratings Range

		60 Hz
Standby:	**kW**	450
	kVA	562



Standard Features

- Rehlko provides one-source responsibility for the generating system and accessories.
- 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 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 generator set systems and components. Two- and five-year extended limited warranties are also available for purchase in some jurisdictions.
- Alternator features:
  - The pilot-excited, permanent magnet (PM) alternator provides superior short-circuit capability.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Dual fuel model features:
  - Natural gas is the primary fuel. Automatically transfers back to primary fuel when LP fuel becomes low or generator stops and restarts.
  - The patent 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.



Dual Fuel Reset Box

Generator Set Ratings

				Rich-Burn Natural Gas 130°C Rise Standby Rating		Rich-Burn LP Gas (Vapor) 130°C Rise Standby Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
5M4028	120/208	3	60	450/562	1560	295/369	1025
	127/220	3	60	450/562	1475	295/369	969
	139/240	3	60	450/562	1352	295/369	888
	220/380	3	60	450/562	854	295/369	561
	240/416	3	60	450/562	780	295/369	513
	277/480	3	60	450/562	676	295/369	444
5M4270	347/600	3	60	450/562	541	295/369	356

RATINGS: All three-phase units are rated at 0.8 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. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. Obtain technical information bulletin (TIB-101) for ratings guidelines, complete ratings definitions, and site condition derates. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

Alternator Specifications

Specifications		Alternator
Type		4-Pole, Rotating-Field
Exciter type		Brushless, Permanent- Magnet Pilot Exciter
Leads: quantity, type		10, Reconnectable
Voltage regulator		Solid State, Volts/Hz
Insulation:		NEMA MG1
Material		Class H, Synthetic, Nonhygroscopic
Temperature rise		130°C, 150°C Standby
Bearing: quantity, type		1, Sealed
Coupling		Flexible Disc
Amortisseur windings		Full
Voltage regulation, no-load to full-load		Controller Dependent
Rotor balancing		125%
One-step load acceptance		100% of Rating
Unbalanced load capability		100% of Rated Standby Current
Peak motor starting kVA:		(35% dip for voltages below)
480 V	5M4028 (10 lead)	2550 (60Hz)
600 V	5M4270 (4 lead)	1250 (60Hz)

- 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 dripproof construction.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Brushless alternator with brushless pilot exciter for excellent load response.

Application Data

Engine

Engine Specifications	
Manufacturer	PSI/Doosan
Engine model	PSI22LT
Engine type	21.9 L, 4-Cycle, Turbocharged, Charge Air-Cooled
Cylinder arrangement	V-12
Displacement, L (cu. in.)	21.9 (1336)
Bore and stroke, mm (in.)	128 x 142 (5.0 x 5.6)
Compression ratio	10.5:1
Piston speed, m/min. (ft./min.)	511 (1677)
Main bearings: quantity, type	14, Precision Half-Shell
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	
Natural Gas	510 (684)
LP Gas	352 (472)
Cylinder head material	Cast Iron
Piston: type, material	--
Crankshaft material	Forged Steel
Valve material	--
Governor: type	Electronic
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.5%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Wet
Exhaust flow at rated kW, kg/hr. (cfm)	1932 (2529)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	614 (1136)
Maximum allowable back pressure overall, kPa (in. Hg)	17.9 (5.3)
Maximum allowable back pressure after catalyst, kPa (in. Hg)	8.0 (2.4)
Engine exhaust outlet size, mm (in.)	Flanged Outlet at Catalyst, see ADV drawing

Engine Electrical

Engine Electrical System	
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	24
Ampere rating	45
Starter motor rated voltage (DC)	24
Battery, recommended cold cranking amps (CCA):	
Qty., CCA rating each	Two, 925
Battery voltage (DC)	12

Fuel

Fuel System - Rich Burn	
Fuel type	Natural Gas, LP Gas, or Dual Fuel
Fuel supply line inlet	3.0 NPTF
Natural gas fuel supply pressure, kPa (in. H_2O)	1.74- 2.74 (7.0-11.0)
LPG vapor withdrawal fuel supply pressure, kPa (in. H_2O)	1.74- 2.74 (7.0-11.0)
Dual fuel engine, LPG vapor withdrawal fuel supply pressure, kPa (in. H_2O)	1.74 (7.0)

Fuel supply pressure, measured at the generator set fuel inlet downstream of any fuel system equipment accessories.

Fuel Composition Limits*	Nat. Gas	LP Gas
Methane, % by volume	90 min.	--
Ethane, % by volume	4.0 max.	--
Propane, % by volume	1.0 max.	85 min.
Propene, % by volume	0.1 max.	5.0 max.
C_4 and higher, % by volume	0.3 max.	2.5 max.
Sulfur, ppm mass	25 max.	
Lower heating value, MJ/m^3 (Btu/ft^3), min.	33.2 (890)	84.2 (2260)

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

Application Data

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.) §	40 (42.3)
Oil pan capacity with filter, L (qt.) §	47.1 (49.7)
Oil filter: quantity, type §	2, Cartridge
Oil cooler	Water-Cooled

§ Rehlko recommends the use of Rehlko Genuine oil and filters.

Cooling

Radiator System	
Ambient temperature, °C (°F)*	50 (122)
Engine jacket water capacity, L (gal.)	44 (12)
Radiator system capacity, including engine, L (gal.)	190 (51)
Engine jacket water flow, Lpm (gpm)	570 (151)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	516 (29345)
Heat rejected to air charge cooler at rated kW, dry exhaust, kW (Btu/min.)	65 (3686)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	1321 (52)
Fan, kWm (HP)	31 (42)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

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

Operation Requirements

Air Requirements	
Radiator-cooled cooling air, m^3/min. (scfm)†	870 (30700)
Combustion air, m^3/min. (cfm)	1821 (829)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	25 (1437)
Alternator, kW (Btu/min.)	27.8 (1580)

† Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

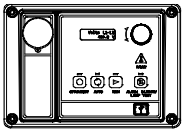
Fuel Consumption‡

Natural Gas, m^3/hr. (cfh) at % load	Standby Rating	
100%	149.9	(5293)
75%	117.8	(4161)
50%	86.9	(3068)
25%	55.3	(2410)
LP Gas, m^3/hr. (cfh) at % load	**Standby Rating**	
100%	43.9	(1552)
75%	35.2	(1242)
50%	26.7	(943)
25%	18.1	(638)

‡ Nominal fuel rating: Natural gas, 37 MJ/m^3 (1000 Btu/$ft.^3$)
LP vapor, 93 MJ/m^3 (2500 Btu/$ft.^3$)

LP vapor conversion factors:
8.58 $ft.^3$ = 1 lb.
0.535 m^3 = 1 kg.
36.39 $ft.^3$ = 1 gal.

Controllers

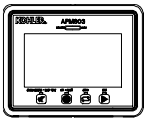


APM402 Controller

Provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility.

- Digital display and menu control provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or serial configuration
- Controller supports Modbus® protocol
- Integrated hybrid voltage regulator with ±0.5% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-161 for additional controller features and accessories.



APM603 Controller

Provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility.

- 7-inch graphic display with touch screen and menu control provides easy local data access
- Measurements are selectable in metric or English units
- Paralleling capability to control up to 8 generators on an isolated bus with first-on logic, synchronizer, kW and kVAR load sharing, and protective relays
  Note: Parallel with other APM603 controllers only
- Generator management to turn paralleled generators off and on as required by load demand
- Load management to connect and disconnect loads as required
- Controller supports Modbus® RTU, Modbus® TCP, SNMP and BACnet®
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- UL-listed overcurrent protective device
- NFPA 110 Level 1 capability

Refer to G6-162 for additional controller features and accessories.

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

Industrial Generator Set - 450REZXD
208-600 V Gas

Standard Features

- Alternator Protection
- Battery Rack and Cables
- Closed Crankcase Ventilation (CCV) with Filters
- Integral Vibration Isolation
- Local Emergency Stop Switch
- Low Coolant Level Shutdown
- Oil Drain Extension
- Operation and Installation Literature
- Secondary Gas Solenoid Valve
- Three-Way Exhaust Catalyst

Available Options

Circuit Breakers

Type

- ❑ Magnetic Trip
- ❑ Thermal Magnetic Trip
- ❑ Electronic Trip (LI)
- ❑ Electronic Trip with Short Time (LSI)
- ❑ Electronic Trip with Ground Fault (LSIG)

Rating

- ❑ 80%
- ❑ 100%

Operation

- ❑ Manual
- ❑ Manual with Shunt Trip
- ❑ Electrically Operated (for paralleling)

Circuit Breaker Mounting

- ❑ Generator Mounted
- ❑ Remote Mounted
- ❑ Bus Bar (for remote mounted breakers)

Enclosed Remote Mounted Circuit Breakers

- ❑ NEMA 1 (15-5000 A)
- ❑ NEMA 3R (15-1200 A)

Approvals and Listings

- ❑ cULus (UL 2200 and CSA)
- ❑ Hurricane Rated Enclosure
- ❑ IBC Seismic Certification

Enclosed Unit

- ❑ Sound Enclosure with Internal Silencer (Aluminum)
- ❑ Sound Enclosure with Internal Silencer (Steel)
- ❑ Weather Enclosure with Internal Silencer (Steel)

Open Unit

- ❑ Exhaust Silencer, Critical (Kit includes two silencers)
- ❑ Flexible Exhaust Connector, Stainless Steel (Kit contains two flexible exhaust connectors)

Controller

- ❑ Common Failure Relay
- ❑ Communications Products and PC Software
- ❑ Two Input/Five Output Module (APM402 controller only)
- ❑ Four Input/Fifteen Output Module (APM603 controller only)
- ❑ Pre-Alarms, NFPA110
- ❑ Remote Emergency Stop
- ❑ Lockable Remote Emergency Stop
- ❑ Remote Serial Annunciator Panel
- ❑ Run Relay (standard with APM603)
- ❑ Manual Key Switch (APM603 controller only)
- ❑ Manual Speed Adjust (APM402 controller only)

Cooling System

- ❑ Block Heater, 6000 W, 208 V; 1Ph
- ❑ Block Heater, 6000 W, 240 V, (Select 1 Ph or 3 Ph)
- ❑ Block Heater, 6000 W, 480 V, (Select 1 Ph or 3 Ph) Required for ambient temperatures below 10°C (50°F)
- ❑ Radiator Duct Flange

Electrical System

- ❑ Generator Heater
- ❑ Battery
- ❑ Battery Charger
- ❑ Battery Charger Temperature Compensation
- ❑ Battery Heater

Fuel System

- ❑ Dual Fuel, NG/LPG (Automatic Changeover)
- ❑ Flexible Fuel Lines (required when the generator set skid is spring mounted)
- ❑ Gas Filter

Miscellaneous

- ❑ Air Cleaner Restriction Indicator
- ❑ Certified Test Report
- ❑ Engine Fluids Added
- ❑ Rated Power Factor Testing

Literature

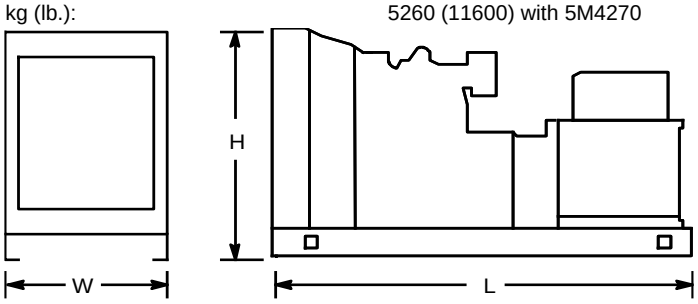
- ❑ General Maintenance
- ❑ NFPA 110
- ❑ Overhaul
- ❑ Production

Warranty

- ❑ 2-Year Basic Limited Warranty
- ❑ 2-Year Prime Limited Warranty
- ❑ 5-Year Basic Limited Warranty
- ❑ 5-Year Comprehensive Limited Warranty
- ❑ 10-Year Major Component Limited Warranty

Dimensions and Weights

Overall Size, L x W x H, max., mm (in.):	4100 x 2190 x 2464 (161.4 x 86.2 x 97.0)
Weight (radiator model), wet, max., kg (lb.):	5360 (11820) with 5M4028 5260 (11600) with 5M4270



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.