

SERIES 2400 PARALLELING SWITCHGEAR



TYPICAL SERIES 2400 MULTIPLE GENERATOR/UTILITY PARALLELING SWITCHGEAR

- Intelligent, Configurable Switchgear for Distributed Generation, Automatic Standby or Prime Power Systems
- Superior Control & Monitoring using the Integrated **PGC 4000 Power Generation Controller**
- Integrated Revenue Grade, Utility and Generator Metering with Power Quality Measurement (exceeds ANSI C12.20 Revenue Class 0.2 accuracy)
- Digital Engine-Generator Controls with Automatic Synchronizing & kW/kVAR Load Sharing
- User Friendly 15" Color Touch Screen Operator Display with Run-time Configurable Graphics.
- Digital Protective Relaying for Generator & Utility Supply per IEEE & ANSI standards
- High Speed/Noise Immune Ethernet-based Communications exceeds Industry standards and provides reliable real-time system data transfer
- Integrated Web/Internet-based Remote Monitoring and Controls Provide On-Line Service, Support and System Upgrades
- Compliant with IEEE 1547 Distributed Generation Interconnect Standard
- Certifications to UL, CSA and ANSI Switchgear Standards
- High Short Circuit Withstand Ratings up to 100kA and 1000 MVA

GENERAL DESCRIPTION

Series 2400 Paralleling Switchgear is the most intelligent, advanced Switchgear available today designed specifically for use in the Power Generation Industry. **Series 2400 Paralleling Switchgear** is configurable using standard designs allowing automatic paralleling of single or multiple generators for an unlimited number of Power Generation System applications including Distributed Generation, Automatic Standby or Prime Power systems. **Series 2400 Paralleling Switchgear** is available for low or medium voltage applications and can be applied with all types of generators and a variety of prime movers including gas or diesel reciprocating engines and gas or steam driven turbines.

The power of the **Series 2400 Paralleling Switchgear** is the **PGC 4000 Power Generation Controller**. The **PGC 4000** integrates a vast array of advanced generator control and monitoring features with run-time configurability. Advanced integrated features include utility and generator revenue grade power metering, protective relaying, engine control, load sharing and synchronizing. The **PGC 4000's** color touch screen graphical operator interface display combined with internet/web ready Ethernet communications makes it the most user friendly, integrated power generation controller on the market. By incorporating advanced communication interfaces, **Series 2400 Paralleling Switchgear** can operate in harmony with any PLC or building management system, providing maximum equipment utilization and total energy management.

SWITCHGEAR CONSTRUCTION FEATURES



- Freestanding NEMA 1 structure constructed of heavy gauge steel, painted ASA 61 gray with white interior sub-panels
- Tin-plated round edge high conductivity copper bus bars sized for 100% continuous operation braced for short circuit currents up to 100kA per UL/CSA and ANSI standards
- Switchgear structures can accommodate 480V – 15kV applications with suitably rated vacuum or air circuit breakers of drawout or fix mounted designs
- Metalclad construction is available with fully barriered breaker, bus, cable and control compartments
- Standard modular construction offers single or multiple generator applications to fit most applications. Structures available in 30" or 36" widths, and 90" or 95" heights
- Structure design meets or exceeds UL/CSA and ANSI regulatory standards as required for the specific applications
- Standard configurations available for shipment 8 – 10 weeks from date of approval

APPLICATIONS

The **Series 2400 Paralleling Switchgear** can be applied to many types of power generation systems used in the industry today. **Series 2400 Paralleling Switchgear** can be applied to new installations as well as existing systems when generators require upgrading for parallel or peaking operation with the utility supply. Typical system applications include the following:

- **Distributed Generation (DG):** Distributed Generation **Series 2400 Paralleling Switchgear** provides the capability of synchronizing single or multiple generators to the utility grid to allow soft load transfer, parallel generation, peak shaving, or Cogeneration operation. These systems can incorporate control logic & software programming for automatic synchronizing, soft load transfer and automatic load (kilowatt) and VAR/PF control. **Series 2400** Distributed Generation Paralleling Switchgear may also incorporate a variety of industry standard communications for remote monitoring, control, and data logging.
- **Auto Standby (AS):** Automatic Standby **Series 2400 Paralleling Switchgear** allows control of single or multiple generator sets to provide automatic standby power during a utility power failure. Auto standby switchgear can be designed with an integral transfer system between the utility supply and emergency bus. Auto standby switchgear can also work with external distributed transfer schemes. Many standard transfer control schemes are available. Load demand starting can be incorporated to maintain optimal efficiency and reliability of your gen-sets during a power failure. Load management schemes can be provided to prevent your system from being overloaded, resulting in costly and dangerous downtime.
- **Prime Power (PP):** Prime Power **Series 2400 Paralleling Switchgear** provides power and control for applications where local utility supply is unreliable, unavailable, or uneconomical to install. Prime power sites require unique control solutions because of their critical nature. These systems can incorporate automatic synchronizing, soft load transfer, fuel economizing, or run-time hour balancing. Prime Power **Series 2400 Paralleling Switchgear** can also be provided with modem or high-speed Ethernet/Internet communication for remote monitoring, control, and data logging.

POWER CIRCUIT BREAKERS

Series 2400 Paralleling Switchgear can be supplied with industry standard power circuit breakers to meet the applicable voltage classes, interrupting ratings, amperage ratings, and approval requirements. The switchgear can accommodate numerous configurations utilizing main power source breakers as well as distribution feeder requirements. Main power switching source circuit breakers are supplied with the following features:

- **Breaker Auxiliary Contacts:** 4 sets of 10A contacts are supplied. 2 for integral switchgear logic and 2 for customer use
- **AC or DC powered Motor Mechanism:** Fast acting motor mechanisms provide automatic operation
- **Integral 50/51 Overcurrent Protection:** Available on low voltage applications, microprocessor –based overcurrent relays can be provided with integral LSI overcurrent protective functions
- **Stored Energy Shunt Trip/Close:** Fast acting shunt trip/close automatic operation
- **DC Under voltage Release Mechanism:** To ensure fail-safe operation due to loss of control voltage
- **Anti-pumping Operation:** To ensure correct operation during complex automatic control sequences
- **Draw-out Construction:** Circuit breakers are provided with draw-out construction as standard in medium voltage applications with positions for connected, test and disconnected with padlocking provisions. Draw-out construction is also available on low voltage systems

PGC 4000 POWER GENERATION CONTROLLER

The **PGC 4000** provides the advanced monitoring and control features required for operation of the generator. The **PGC 4000** is comprised of a door mounted operator interface and a control wiring interface module, which is mounted in the switchgear control compartment. The display & controller modules are interconnected via ethernet communication cable.

One controller is required for each generator set. Only one operator interface display is required for the complete system.



PGC 4000 CONTROLLER &
SYSTEM OPERATOR INTERFACE

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POWER GENERATION CONTROL

Synchronizing: The *Series 2400 Paralleling Switchgear* provides as standard fully automatic or manual synchronization via the *PGC 4000* controller. Synchronizing controls are designed to interface with industry standard engine electronic governors and automatic voltage regulators. The following synchronizing functionality is provided as standard:

- Speed matching
- Fail to Sync Alarming
- Voltage matching
- Auto/Test/Manual Sync Modes
- Dead-bus Sync Bypass
- Voltage Monitoring
- Synchroscope Graphical Display

Engine Control: The *PGC 4000* can be configured to operate with external unit mounted engine/generator controls or with its own integral engine controls as required for the application. The following engine/generator controller features provided are available:

- Auto Start Control
- 12 Digital/Analog Fault Alarms/Shutdown Inputs
- Configurable Set-Points/Time Delays
- Engine Parameter Display
- 16 Programmable Output Contacts

Remote Communication: The *Series 2400 Paralleling Switchgear* can be provided with the following communication ports for customer connection with local and remote communication interface systems:

- MODBUS™ Serial
- MODBUS™ TCP
- Remote Access (LAN/Internet) Web Server
- Email/Pager on alarm

Additional remote communication methods are also available with *Series 2400 Paralleling Switchgear*. Please consult factory for details. Please refer to Remote Communication Technical Bulletin for more details.

Programmable Logic Inputs/Outputs: The *Series 2400 Paralleling Switchgear* control via the *PGC 4000* has the following programmable logic for internal and output control devices:

- Digital Inputs
- Digital Outputs
- Analog Inputs
- Analog Outputs

Manual Override Control & Monitoring Stations: The *Series 2400 Paralleling Switchgear* provides an extra level of system control & monitoring equipment that allows system operators the ability to manually override system automation controllers/operator interface displays to restore power in an emergency condition. The control stations provide hardwired pushbuttons, switches, pilot lights as required for an operator to easily and safely start engine generator set, synchronize, transfer them on or off load and monitor their status completely independently of the system automation control software/hardware as may be required. The following modules are provided:

Generator Set:

- Engine Start/Stop push buttons
- Emergency Stop push button
- Running, Alarm, Shutdown Pilot Lights
- Sync Initiate push button

Circuit Breaker:

- Breaker Control - Trip/Close push buttons
- Breaker Open/Close Pilot Lights

System Control:

- Auto/Manual Control Switch
- Common System Alarm Pilot Light
- Alarm Silence push button
- System Alarm Horn

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POWER GENERATION CONTROL

Operator Interface: *Series 2400 Paralleling Switchgear* provides one 15" color touch screen operator interface display for the system. Additional operator interfaces can be added as required. All system control and monitoring data can be accessed via a single operator interface display. The display(s) are factory programmed to provide the following system information:

- **Generator Power Metering (Analog & Digital)**
- **Generator Power Quality Data**
- **Generator Protective Relaying Status**
- **Engine/Generator Start/Stop Control**
- **Engine/Generator Shutdown & Alarm Annunciation**
- **Engine/Generator Data Logging**
- **Utility Power Metering (Analog & Digital)**
- **Utility Power Quality Data**
- **Utility Protective Relaying Status**
- **System Single Line Diagram Mimic Bus**

Power Metering: The *Series 2400 Paralleling Switchgear* is provided with digital and analog metering via the system operator interface display. The following metering data is provided as standard:

- **Generator Supply:** Revenue accurate, 3 phase voltage, current, frequency, kilowatts, kilovars, kVA, power factor, kW hours, kVAR hours
- **Utility Supply:** Revenue accurate 3 phase voltage, current, frequency, kilowatts, kilovars, kVA, power factor.
- **Load Bus:** High accuracy, 3 phase voltage and frequency

Additional metering data for individual feeders are also available with the *Series 2400 Paralleling Switchgear*.

Protective Relaying: The *Series 2400 Paralleling Switchgear* is provided with configurable protective relaying functions. The following protective functions are provided as standard:

- **Generator:** Utility grade relay protection for the generator (25, 32, 27, 40, 59, 81o/u, 50/51)
- **Utility:** Utility grade relay protection for the utility supply (25, 32, 27, 59, 81o/u, 50/51)

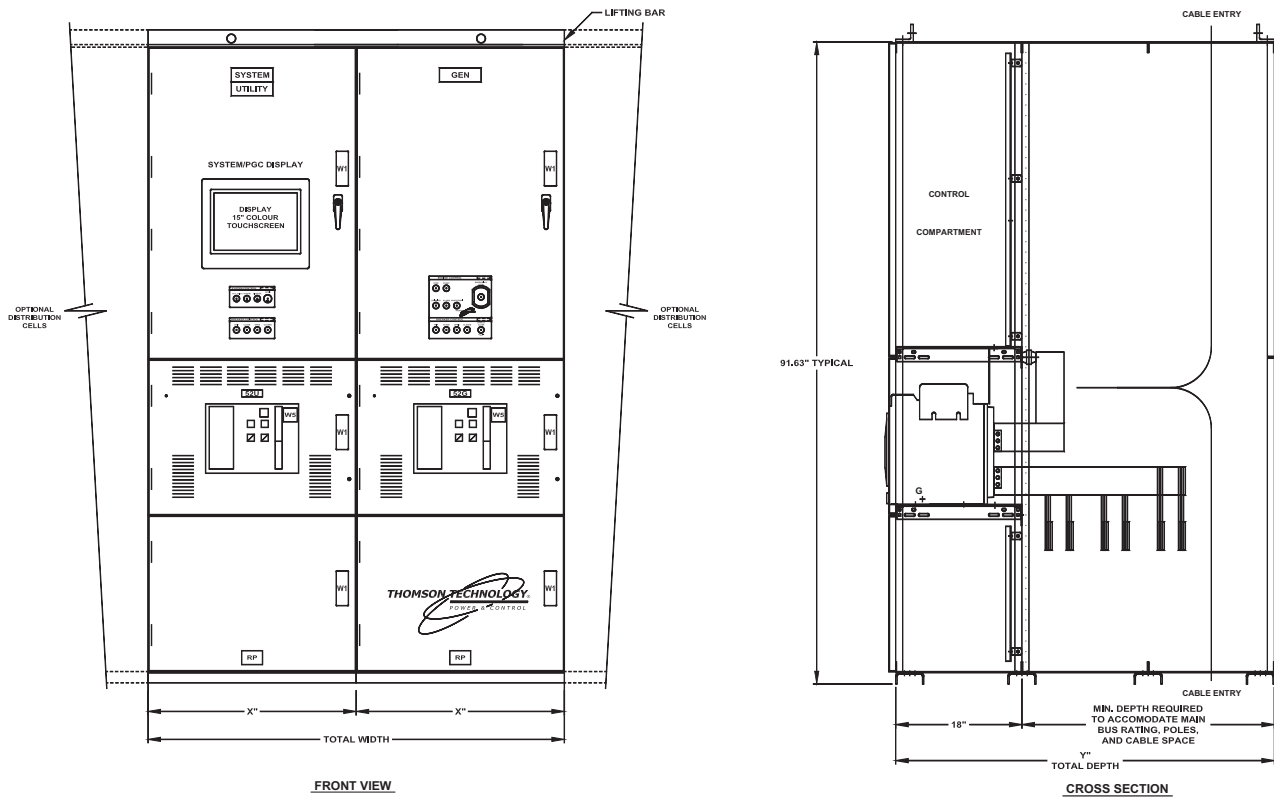
Additional protective relaying functions are available with *Series 2400 Paralleling Switchgear* as follows:

- **Generator:** 46,47,87G,67,50/51G
- **Utility:** 47,67,50/51G
- **Bus:** 87B

Automatic Load Sharing: The *Series 2400 Paralleling Switchgear* provides kW & kVAR load sharing control when multiple generators are paralleled on an isolated grid or to a utility supply. The *PGC 4000* is designed to interface with industry standard electronic governors and automatic voltage regulators. The following kW and kVAR control functionality is provided as standard:

- **kW Load Ramping**
- **kW Base Loading**
- **Min/Max kW/kVAR Load limits**
- **kVAR (Power Factor) Control**
- **Import/Export kW Control**

TYPICAL SERIES 2400 LOW VOLTAGE, DISTRIBUTED GENERATION, SINGLE GEN/UTILITY PARALLELING SWITCHGEAR PHYSICAL LAYOUT



SPECIFICATIONS AND STANDARDS

- UL 891 LV Switchgear
- ANSI C37.20.1 LV Switchgear
- ANSI C37.20.2 MV Switchgear
- CSA C22.2 No. 31 Switchgear
- Load Bus Ampacity Ratings up to 10,000A @ 600V
- UL 1558 LV Switchgear
- NEMA 1, 2 & 3 Indoor/Outdoor Applications
- UL 489 Rated Insulated Case Circuit Breakers (UL 891)
- UL 1066/ANSI Rated Power Circuit Breaker (UL 1558)
- Short Circuit Bus Ratings up to 100kA @ 600V
- Short Circuit Bus Ratings up to 49kA at 15kV
- Load Bus Ampacity Rating up to 3,000A at 15kV
- ANSI C37.04 - 1979, C37.06 /ANSI Rated Power Circuit Breaker (ANSI MV SWGR)

NOTE: Specifications subject to change without notice.
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