

FXi Series5 PRODUCT SPECIFICATIONS

PSS FXI-S5

Process Gas Chromatograph

The FXi Series5 Process Gas Chromatograph (PGC) continuously analyzes, measures, and reports concentrations of components in process streams. This new generation “open communication” analyzer can be seamlessly integrated into any Distributed Control System. It provides data for process control and complete maintenance information including real-time chromatograms, trend graphics, and remote analyzer configuration.

The PGC consists of both an analyzer, microprocessor-based controller and optional front panel display. The analyzer (lower section) provides a controlled environment (air bath oven) for the sample separation assembly, and detector. The controller (upper section), dedicated to the analyzer, performs all chromatographic operations from stream switching in the sample conditioning system through data processing and presentation.

SEPARATION ASSEMBLY

The separation assembly is designed to simplify both application and maintenance. The valves, columns, and flow controllers required to perform a desired separation are mounted on this assembly, which mounts inside the oven. This allows the assembly to be easily removed and replaced with a fully-checked alternate assembly, thereby minimizing downtime for new applications or for routine maintenance.

CHOICE OF DETECTORS

The Thermal Conductivity Detector (TCD) is used to measure percent level of components. The detector current is automatically disconnected upon loss of carrier gas to prevent filament damage.



The Flame Ionization Detector (FID) is used for measuring ppm or ppb levels of hydrocarbons in the process stream. Automatic hydrogen shutoff occurs with loss of detector flame.

The Flame Photometric Detector (FPD) is used for measuring ppm or ppb levels of sulfur compounds. Automatic hydrogen shutoff occurs with loss of detector flame.

The Helium Ionization Detector (HID) is used for trace level measurements of contaminations at ppb levels .

NONVOLATILE MEMORY

The microprocessor-based controller features nonvolatile memory, eliminating the need for such maintenance items as battery back-up or magnetic storage devices. After power loss, the operating program parameters are automatically reloaded when power is restored. A battery backed-up clock protects against loss of time and date information.

SECURITY

The microprocessor and optional local/remote operator interface panel is dedicated to a single analyzer. This ensures that the loss of any one analyzer does not affect the performance of any other analyzer on the process. A software lock is available that prevents unauthorized tampering with analyzer operation. Manual calibration can be initiated at any time and can also be automatically programmed to occur at pre-timed intervals. A full set of system function alarms, warning alarms, and data alarms are available to monitor system integrity. Provision for monitoring sample conditioning system performance via digital inputs is also available.

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SYSTEM CONFIGURATION

NETWORKING AND COMMUNICATION CAPABILITIES

The PGC can function in a variety of system architectures from a stand-alone unit to large scale analyzer redundant networks and Distributed Control Systems.

- The PGC has full open communications that can be connected to industry standard networking serial communications (RS232, RS485) and MODBUS® (both Modicon and Daniel). Dual-Port media redundancy option available.
- Open Ethernet TCP/IP communications using OPC, Modbus/TCP or remote control software.
- Fully configurable analog (4-20mA) and digital I/O outputs, data multiplexing.
- Modem capability allows secure remote access for maintenance.
- Analyzer to analyzer communications for configuration flexibility.

Workstation Option

- Remote PC for interfacing to single or multiple PGCs as an Analyzer Management Workstation for functions such as real-time chromatograms, analysis data reports, printer ports and programming control.
- Multiple PGCs can be configured without the touch screen and be interfaced to a single remote workstation for cost savings.

The PGC is an intelligent analyzer that is capable of use with Invensys/Foxboro I/A Series system release 4.0 or later. The PGC can be connected directly to an I/A Series Fieldbus. It provides analysis data and status information for direct input to the control environment. Additionally, analyzer management and maintenance information can be communicated to higher level applications. This capability, combined with the optional AMS, allows direct programming of any analyzer on the network. It also provides for viewing chromatograms and trend graphs at an I/A Series console. The PGC requires the I/A Series system to have either: (1) a Control Processor 30 (CP30), 51 Series Application Processor (AP), and Workstation Processor (WP); or (2) a CP30 and an Application Workstation (AW).

The standard PGC product contains the following features:

PROCESS GAS CHROMATOGRAPH

Analyzer Isothermal Oven

The Analyzer Oven includes the detector and separation assembly as determined by specific application requirements.

Controller and Service Panel

- I/A Series Fieldbus Interface (Option)
- Powerful 10.4" color graphical display using Windows® (Option)
- RS-232 Serial Port
- Digital and Analog I/O
- System and Data Alarms
- On-line Diagnostics
- Chromatogram Outputs (Analog and Digital)
- Local and Remote Programming
- EEPROM Program Backup
- Clock with Battery Backup
- Software Security Lock
- Advanced Analysis Algorithms
- Windows-based

DIGITAL INPUTS

Sixteen digital inputs for monitoring the analyzer or sample conditioning functions are provided as standard. Inputs are sensed by contact closure to common ground. Internal +5 Vdc pull-up through 10K ohms is used. The inputs are assigned as follows:

1. Low carrier gas pressure
2. Low instrument air pressure
3. Low sample system pressure
4. Detector failure
5. Low calibration gas pressure
6. Low hydrogen fuel gas pressure (FID only)
7. Low zero air (FID only)
8. Low oven air pressure
9. 9-16 spare (user-assignable)

SYSTEM CONFIGURATION (cont.)**ANALOG INPUTS**

Two non-isolated analog input channels are available for reporting data from external analyzers or measurement devices. The instrument can accept 0 to 10 Vdc signal range. The data values are integrated into the system data report format.

ANALOG OUTPUT (TRENDS)

Up to twenty-four (24) analog outputs are optionally available. These trend outputs are used to report concentration data from any assigned stream and measured component (peak). Each output is an isolated 4 to 20 mA signal proportional to the measured range, updated at the end of the measured cycle.

PRINTER, AND PC INTERFACE

Remote programming and data reporting are accomplished via ASCII, full-duplex, RS-232 serial ports and are intended for communication to a printer or PC. The serial port can be configured as a 20 mA current loop for communications over distances greater than 15 m (50 ft).

STANDARD SPECIFICATIONS**Gas Requirements****OPERATING AIR**

Dry and oil-free air at 345 kPa (50 psi) minimum and 3.4 to 5.1 m³/h (2 to 3 ft³/min) at standard conditions. Maximum supply pressure is 690 kPa (100 psi).

ZERO HYDROGEN

Hydrocarbon-free, dry hydrogen at 40 cm³/min (2.4 in³/min) required for FID. Maximum supply pressure is 414 kPa (60 psi).

ZERO AIR

Hydrocarbon-free, dry air at 300 cm³/min (0.64 ft³/h) required for FID. Maximum supply pressure is 414 kPa (60 psi).

STANDARD SPECIFICATIONS (cont.)**CARRIER GAS**

Per application (e.g., He, N₂, H₂). Chromatograph grade required. Maximum supply pressure is 414 kPa (60 psi).

System Repeatability

±1% of upper range value, typical. Refer to Factory for specific application.

Output Range

Either in ppm or percentage; depending on application.

Ambient Temperature Limits

-15 and +50°C (5 and 122°F)

Relative Humidity Limits

0 and 95%, noncondensing

Power Requirements

120 Vac, ±10%, 50/60 Hz, or
220 Vac, ±10%, 50/60 Hz, or
240 Vac, ±10%, 50/60 Hz,

Power Consumption

1100 VA

Inside Dimensions of Oven (W X H X D)

457 x 356 X 254 mm (18 X 14 X 10 in)

Inside Oven Wall Material

AISI Type 316 stainless steel (316 ss)

Valve Material

Nitronic-60

Approximate Mass

118 kg (260 lb)

ELECTRICAL SAFETY SPECIFICATIONS

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions
ATEX certified explosion-protected with approved pressurization EEx pd [ia.] IIB + H ₂ , Zone 1 or Zone 2. It is also accepted for use in all other EU member countries.	Temperature Code T3.
NEC compliant explosion-protected, purged for Class I, Groups, B, C, and D, Division 1.	Temperature Class T3.

STANDARD SYSTEM HARDWARE, DIAGNOSTICS, AND SOFTWARE

The standard system incorporates a microprocessor and programming platform. The optional front panel display provides a convenient graphical user interface for quick program editing in real time. Nonvolatile memory (EEPROMs) ensures program backup in case of power failure. Advanced programming is available to the user through the Command Line Interface (CLI). An RS-232 serial port is provided for communication to an external workstation. It also supports a modem for remote data reporting, diagnostics, or programming.

System Hardware

- System hardware includes the following:
 - Fxi front Panel Interface (optional)
 - Front panel display with complete programming functions from PGC
 - Real-time chromatograms and overlay of saved chromatograms
 - Front panel with 10.4”(diagonal) color touch screen display with 640x480 resolution
 - User configurable and optional displays available
 - Menu-driven with HELP displays
- Internal service panel provides the following:
 - Service jack for chromatogram recording (0 to 10 mV).
NOTE: The chromatogram is also available as 0 to 10 V from internal terminals or can be optionally assigned to a 4 to 20 mA trend channel.
 - RS-232 service jack for connection to local maintenance terminal, printer, or PC.
 - Detector offset control

- TCD current and Auto Zero on/off switches
- Analyzer Oven, consisting of the following:
 - Temperature controlled isothermal oven
 - Separation assembly with columns, valves, flow restrictors and mounting bracket
 - Detector
 - High temperature cutout switch and instrument oven air pressure switch to protect against heater damage due to low air flow
 - Oven temperature control set point adjustable from front panel

Diagnostics

The following on-line diagnostics are available for fault reporting:

- Hardware:
 - Low instrument air pressure
 - Low carrier gas pressure
 - Low hydrogen fuel gas pressure (FID only)
 - Low zero air (FID only)
 - Low purge air pressure
- Software:
 - EEPROM test
 - PROM test
 - RAM test
 - Watchdog timer
 - Two high and two low data alarms
 - Calibration tolerance alarm
 - Peak simulator, user programmable, for use in testing entire controller and communications functions
 - Real-time chromatogram available with event markers on or off.

Total chromatogram of previous cycle as well as stored chromatogram on alarm is available to Remote Analyzer Management System and the I/A Series AMS.

STANDARD SYSTEM HARDWARE, DIAGNOSTICS, AND SOFTWARE (cont.)**System Software**

- Key analysis and programming functions:
 - Peak identification by forced, slope or tangent skim detection methods
 - Chromatogram Analysis Report for full identification of all peaks and event markers
 - Unlimited number of components analyzed and reported
 - Advanced analysis techniques for precision analysis and calibration results
 - Peak processing by selected peak height or area integration
 - Continuous integration with zero deadtime between programmed events
 - Programmed Auto-Zero for automatic baseline correction
 - Peak drift limits, monitors peak elution times
 - Control of up to six analyzer valves with unrestricted number of times
 - Display peak names, value, engineering units and status
 - Complete system status and alarm display
 - Calibration on demand or programmable automatic calibration
- Programmable alarm contact assignments
- Oven temperature control set point via front panel
- Programmable trend assignments
- Automatic start-up sequence for column purge
- Failsafe valve positions for column protection in power off condition
- Programmable chromatogram attenuation and offset as a function of cycle time
- Programmable Stream sequence of up to 32 streams (includes calibration streams)
- Ghost peak detection
- Relative retention program
- Relative response program
- Display integration factor as Multiplication Factor (MF) or Response Factor (RF)
- Time and Date edition (battery backed up)
- Advanced Math-Pak for analysis calculations and report configuration

NOTE: All programmable functions are available from the optional front panel or the Remote Analyzer Management System.

MODEL CODE

MODEL	DESCRIPTION
FXi	FXi process Gas Chromatograph with/
1	Power: 115 Vac / 50-60 Hz
2	Power: 220 Vac / 50-60 Hz
3	Power: 240 Vac / 50-60 Hz
A	Detector: None (custom)
B	Detector: 4 port TCD
C	Detector: 8 port TCD
D	Detector: FID
E	Detector: 4 port TCD, CENELAC/ATEX
F	Detector: 8 port TCD, CENELAC/ATEX
G	Detector: FID, CENELAC/ATEX
H	Detector: HID
P	Detector: FPD
M	Detector: Micro TCD
1	Stream Switching: 4 SS relays
2	Stream Switching: 8 SS relays
3	Stream Switching: 12 SS relays
4	Stream Switching: 16 SS relays
5	Stream Switching: 20 SS relays
6	Stream Switching: 24 SS relays
7	Stream Switching: 28 SS relays
8	Stream Switching: 32 SS relays
A	Alarm Relay Type, None
B	Solid State Relays
C	Voltage Free Relays
1	Alarm Relays, None
2	4 Alarm Relays
3	8 Alarm Relays
4	12 Alarm Relays
5	16 Alarm Relays
6	20 Alarm Relays
7	24 Alarm Relays
8	28 Alarm Relays
9	32 Alarm Relays
A	Analog Outputs, None:
B	Invalid Entry
C	Analog Outputs, 8 Trend
D	Invalid Entry
E	Analog Outputs, 16 Trend
F	Invalid Entry
G	Analog Outputs: 24 Trend
ASZ	Elec Cert: SAA
CSZ	Elec Cert: CSA
ESZ	Elec Cert: CENELAC/ATEX, Zone 2
FSZ	Elec Cert: FM, Div. 2
GSX	Elec Cert: ATEX, Zone 1
HSX	Elec Cert: FM, Div. 1
ZZZ	Elec Cert: None
-1	I/A Fieldbus Interface
-2	MODBUS Interface, embedded
-2M	RS-485 MODBUS
-2E	S-485 MODBUS Expanded BTU
-3	Internal Modem
-4	Dual MODBUS Interface
-5	TCP/IP Network OPC Interface

APPLICATION PACKAGE

The application package, consisting of the Separation Assembly, Application Engineering, Design, and Checkout, must be quoted on a per-application basis. Refer to Hamilton Sundstrand AIT for information and price quotation.

OPTIONAL FEATURES

Optional Feature	Description	AS Reference(1)
Clean Air Set (FID Only)	Provides hydrocarbon-free instrument air as required by FID. Eliminates need for bottled hydrocarbon-free instrument air.	CAS
Methanator (FID Only)	Converts CO and CO ₂ to methane, thereby allowing detection and measurement by FID.	METH
Electronic Pressure Regulator	Provides for electronic pressure control of PGC carrier gas supply. Pressure control is displayed and controlled on FXi front panel display. It does not include control of instrument air or FID fuel/air supply.	EPR

(1) For safety considerations, the watchdog timer and alarm relays (refer to Alarm Relays Code) must be connected when measuring hazardous components.

Hamilton Sundstrand Applied Instrument Technologies (AIT) acquired all rights to manufacture and market the Foxboro® 931C and Foxboro 931D instruments under the FXi brand name.

AIT supports the installed base with spare parts and service.

Foxboro is a registered trademark of Invensys.

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