

FloBoss™ S600 Flow Manager

The FloBoss S600 Flow Manager is a panel-mount flow computer designed specifically for hydrocarbon liquid and gas measurement where versatility and accuracy matter. The standard features of the unit make it ideal for fiscal measurement, custody transfer, batch loading, and meter proving applications. The unit allows configuration of multi-stream, multi-station applications, enabling you to simultaneously meter liquids and gasses.

The FloBoss S600 Flow Manager is designed for use either as a stand alone Flow Computer or as a system component. The base unit is supplied with a single Input/Output (I/O) board and can be used for both gas and liquid applications. The I/O capability of the single I/O board is detailed on Page 5, but is generally suitable for 2 of 3 streams and a header. Additional I/O boards can be added (maximum of 3) to enable a single FloBoss S600 to handle up to 10 streams and up to 2 headers, with both Gas & Liquid in a single machine. Orifice, ultrasonic, turbine, positive displacement, Coriolis, Annubar, Venturi, and V-Cone flow meter types are all supported.

The FloBoss S600 uses distributed processing to achieve maximum performance. The main CPU incorporates a hardware floating point processor. Each additional card also has local processing to convert inputs and output from engineering units to field values and vice-versa, as well as running background tests and PID loops.



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All metering calculations are performed using 64-bit (double) precision floating point numbers for the highest accuracy. Cumulative totals are stored in three separate memory locations (Tri-reg format) for maximum integrity. The user language Logicalc™ also allows double precision mathematical functions to be performed on the database objects.

The reliability of the analog performance of the FloBoss S600 allows longer intervals between calibration checks.

The FloBoss S600 Flow Manager offers multiple communication interfaces:

- One or two Ethernet 10baseT ports. An optional second Ethernet port can be added if required.
- HART communication is facilitated using a 12-channel HART board, supporting point-to-point and multi-drop architectures (up to 50 transmitters).
- An embedded webserver allows remote access to the flow computer. Security is provided by way of user name and password protection with a detailed event log for audit purposes. Supports Windows® Internet Explorer® version 5 or greater.
- Two configurable EIA-232 (RS-232) serial ports for connection to a printer or RTU.
- Three EIA-422/485 (RS-422/RS-485) serial ports (up to 38400 bps baud) for connection to intelligent meters, Modbus SCADA data networks, or a DCS Supervisory System.
- One dedicated configuration port for connection to the Config600 configuration software.

Use the software interface (Config600 Lite, Config600 Lite+, or Config600 Pro) to upload and download configurations. You can also create or edit configuration files using Config600 Lite+ and Config600 Pro (refer to the Config600 specification sheet, 4:C600). Finally, the keypad interface on the S600/webserver enables you to review or modify system parameters.

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Base Unit Specifications

ENCLOSURE

Painted, welded steel outer case with plastic front panel.

Classification: IP50 from front panel.

Dimensions

Case: 84.5 mm W by 270 mm H by 303.8 mm D (3.327 in. W by 10.63 in. H by 11.94 in. D).

Display Keypad Moulding: 85 mm W by 269 mm H by 28 mm D (3.35 in. W by 10.59 in. H by 1.10 in. D).

Panel Cutout: 66 mm W x 150 mm H (2.6 in. W by 5.9 in. H) with ± 1 mm tolerance.

Pitch Between Cases: 110 mm (4.33 in.) giving 25 mm (0.98 in.) air gap.

Max Panel Thickness: 10 mm (0.39 in.).

Weight: 4.3 kg (9.48 lb) approximate with a single I/O board space configuration.

Circuit Boards: Eurocard-compatible, slide in and out from the rear.

Access: Allow 300 mm (11.81 in.) clearance directly behind case for maintenance.

Operating Temperature: 0°C to 60°C (32°F to 140°F).

Storage Temperature: -40°C to 70°C (-40°F to 158°F).

Relative Humidity: 90% non-condensing.

Safety Classification: For use in a classified safe electrical area.

EMC: Complies with the following European Union EMC regulations.

Emissions: EN55022-B.

Immunity: EN61000-4, IEC-EN 61000-6-2.

DISPLAY-KEYPAD

Graphics Display: LCD 128 x 64 pixel (8 lines of 20 alpha-characters) with LED backlight, using a Toshiba T6963 LCD controller.

Alarm/Status: 3 color LED: green, amber, red.

Keyboard: 29 self-colored silicon rubber keys with tactile feel.

Configuration Port: RJ12 connector for the Config600 package on the bottom of the front panel moulding.

POWER REQUIREMENTS

Supply Voltage: 20-32 V dc, 24 W nominal, 48 W maximum.

Typical: 18 W with 1 I/O board.
24 W with 2 I/O boards.
36 W with 3 I/O boards.

Protection: 2.5 A anti-surge fuse.

Inrush Current: Thermistor protection providing 6 A at 25°C.

Supply Isolation: Three-way, galvanically isolated from input to computer, supply and ground, 50 V.

Hold-up Period: 4 ms after power fail flag.

Maximum Input Ripple: 2 V pk-pk.

Input Power Fail Flag: 17-19 V dc.

Power Outputs: 24 V dc, 500 mA; 15 V dc, 100 mA. 50 V dc isolation. The outputs are together isolated from the supply voltage and from the computer.

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The FloBoss S600 Flow Manager provides the following functions through the Config600 configuration tool:

- Stream and station totalization.
- Batch totalization and correction.
- 3-term PID control.
- Flow balancing.
- Flow scheduling.
- Automatic proving sequence.
- Supports Modbus/TCP or Modbus over Ethernet.
- K factor or Meter Factor linearization.
- Valve monitor/control.
- Sampler control.
- Station densitometer.
- Station gas chromatograph.
- Forward, reverse and error totals.
- Comprehensive maintenance mode.
- Coriolis meter interface.
- Ultrasonic meter interface.

CPU and Calculation Specifications

CPU CAPABILITY

Processor: 50 MHz.

Memory: 16 MB DRAM, 2 MB SRAM (battery-backed), 4 MB Flash.

Real-Time Operating System: Wind River VxWorks.

Battery Backup (SRAM)

Charging time: 48 hours (20%-80%).

Hold-up Time (without recharge): 3 months at 20°C, 1 month at 40°C.

Battery Life (Typical): 5-7 years.

Battery Backup Hold Time (after battery has failed its load test): 6 weeks at 20°C.

Form 'C' Watchdog Relay

Contact Form: Change-over contacts.

Max Current: 1 A.

Max Voltage: 50 V dc.

Maximum Power: 30 VA.

Control: Released on de-power, or watchdog restart, or software-controlled.

Clock Facilities

Type: Battery-backed calendar clock.

Watchdog Period: 2.5 seconds maximum.

Clock Accuracy

Powered On: 0.5 seconds per day.

Battery Supported: 10 seconds per day.

APPROVALS AND COMPLIANCES

Available with European CE Mark.

MID MI-002 (Gas) & MI-005 (Liquid) of European Directive 2004/22/EC

OIML R117 & OIML R117-1

EN12405 For EFM devices compliant.

Approved by NMI (Netherlands Measurement Institute), CMI (Czech Metrology Institute), OMH (Hungarian National Office of Measure), BRML (Romania), SDM (France) GOST (Russia) SMU (Slovak Republic), CSA (Canada), PAC (China), DMDM (Serbia), INMETRO (Brazil), GOST-K (Kazakhstan) and OMNL (Algeria).

CALCULATIONS

Gas: AGA 3 (Volume and Mass), AGA 5, AGA 7, AGA 8, AGA 10, GPA 2172 & 2145, ISO 5167, ISO 6976, ISO12213 – 2 & 3, GOST 8.563.1 & 2 (97), GOST 8.586, GOST 30319, PR 50.2.019, NX 19, NX 19 Mod, S-GERG, M-GERG, VDI/VDE 2040, PTZ, Annubar, V-Cone.

Liquid: API 2540 (Tables 5, 5A, 5B, 5D, 6, 6A, 6B, 6C, 6D, 23, 23A, 23B, 23D, 23E, 24, 24A, 24B, 24C, 24D, 24E, 53, 53A, 53B, 54, 54A, 54B, 54C, 54D, 59A, 59B, 60A, 60B), API 11.1, API 11.2.1, API 11.2.1M, API 11.2.2, API 11.2.2M, API 11.2.4, API 12.2.1, API 12.2.1M, API 12.2.2, API 12.2.2M, ASTM D1555 & D1555M, GPA TP15, GPA TP15M, GPA TP16, GPA TP25, GPA TP27, Steam & Water IAPSW 1967, NPD, Propylene API 11.3.2.2, Ethylene IUPAC, NIST 1045 & API 11.3.2.1, Downer, ISO 91/1 (IP2), ISO 91/2 (IP3).

Solartron/MicroMotion densitometer algorithms, Sarasota/PEEK densitometer algorithms.

Prover: Compact, uni-directional, bi-directional, master meter, dual chronometry. Support for 1, 2, or 4 sphere switches. Each S600 can support up to two provers.

Communication Specifications

COMMUNICATION

Configuration Port (located on the bottom of the front panel)

Connector: 6-pin RJ12.

Communication Standard: RS232D.

Signals Supplied: Tx, Rx, CTS, GND.

Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.

Format: Config600 Protocol.

Ethernet (Ports 1 & 2)

Port 1: Standard.

Port 2: Optional, with P190 board installed.

Speed: 10 Mbit/second.

Media Connectivity: 10baseT, twisted pair utilizing standard RJ45.

Protocol: Modbus/TCP or Modbus over Ethernet.

RS232 Ports (Ports 3 & 4)

Connector: FCC-68 RJ45.

Communication Standard: RS232D.

Signals Supplied: Tx, Rx, RTS, CTS, DTR, DSR, GND, DCD.

Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.

Format: Software configurable.

Data Protocol: ASCII, MODBUS (ASCII, RTU).

RS422/RS485 Ports (Ports 5, 6, & 7)

Connector: standard screw terminals, 3.5 mm pitch, 13-pin.

Communications: RS422 - point-to-point - 4 wire RS422 – multidrop (RS485 4 wire) - 4 wire RS485 - multimaster - 2 wire.

Signals Supplied: Tx+, Tx-, Rx+, Rx-, common shield.

Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.

Format: Software controlled on each channel.

Data Protocol: ASCII, MODBUS (ASCII, RTU).

Expansion Boards

The FloBoss S600 is supplied with one P144 I/O board and one P148 Pulse Mezzanine as standard. There are two additional slots available to accept additional expansion boards, these can be the following:

P144 I/O Board – Provides the S600 with additional analog and digital I/O.

P148 Pulse Mezzanine – Provides pulse input capability. Fits on P144 and P154 boards and does not use an additional slot.

P154 Prover board – For applications with a prover.

P188 HART board – For applications with HART transmitters.

P190 2nd Ethernet board – Provides a second Ethernet port.

Details of these optional boards are as follows:

P144 I/O BOARD (1 standard, additional boards are optional)

Analog Inputs

Quantity: 12

Analog Outputs

Quantity: 4

Digital Inputs

Quantity: 16

Digital Outputs

Quantity: 12

Pulse Inputs-Flow/Turbine (requires Pulse Mezzanine board): 2 dual pulse or 4 single pulse.

Frequency Density Inputs: 3.

PRT (RTD) Inputs: 3, 4-wire.

Pulse Outputs: 5.

Raw Pulse Output: 1, Raw pulse output for proving, 0 to 5 kHz.

P148 PULSE MEZZANINE (1 standard, additional boards are optional)

Fits on P144 and P154 boards to provide pulse input capability.

Quantity: 2 dual pulse or 4 single pulse.

Note: The P148 Pulse Mezzanine board fits on a P144 or P154 board and does not use an additional slot.

P154 PROVER BOARD (optional)

Compact, uni-directional, bi-directional, master meter, dual chronometry. Up to 4 sphere switch.

Digital Inputs

Quantity: 32

P154 PROVER BOARD (continued)

Digital Outputs

Quantity: 12

Pulse Inputs-Flow/Turbine (requires Pulse Mezzanine board)

Quantity: 2 dual pulse or 4 single pulse.

Frequency Density Inputs:

Quantity: 2

Pulse Outputs

Quantity: 4

Raw Pulse Input

Quantity: 3

Phase Loop Lock Input

Quantity: 2

Switch Detect

Quantity: 4

P188 HART BOARD (optional)

Supports dual master (primary or secondary), read only (can not be used to change constants on the HART board). Does not support burst mode.

Quantity: 12 Channels. Each channel can be configured for point-point or multi-drop communications. In multi-drop mode, each channel can support up-to 8 transmitters

Max. Number of HART Transmitters: 50.

P190 ETHERNET BOARD (optional)

Adds a second Ethernet port to the S600. Refer to the Ethernet section of the Communication Specifications table for more information.

Input Specifications

ANALOG INPUTS

Type: 1 to 5 V, 0 to 5 V, 4 to 20 mA, or 0 to 20 mA, opto-isolated. Two groups of 5 single-ended voltage or current inputs with each group sharing a common return; channels 11 and 12 are current input only.

Signal Level: 0 to 5.125 V or 0 to 22 mA.

Scan Rate: All channels can be acquired in less than 1 second.

Resolution: 24 bits, auto-zero, auto-calibrate.

Conversion Time: Less than 100 ms per channel.

Series Mode Rejection: >100 dB at 50 Hz and 60 Hz.

Voltage Common Mode Range: ± 50 V as a group relative to computer ground.

Common Mode Rejection: >100 dB at 50 Hz and 60 Hz.

Input Impedance: >10 M Ω (voltage mode), approx 250 Ω (current mode).

Calibration Period: 2 years to 0.005% of voltage; 5 years to 0.01% of voltage.

A/D Converter Inputs Voltage Mode

Type of Inputs: Single-ended voltage inputs.

Input Range: 0 to 5.2 V.

Accuracy: $\pm 0.005\%$ of FSD at 23°C (73°F).

Ambient Temperature Effect: ± 7 ppm/°C (± 4 ppm/°F) from 23°C (73°F) in the range 0 to 45°C (32 to 113°F).

A/D Converter Inputs Current Mode

Type of Inputs: Single-ended current inputs.

Input Range: 0 to 22 mA.

Accuracy: $\pm 0.02\%$ of FSD at 23°C (73°F).

Ambient Temperature Effect

± 10 ppm/°C (± 5.5 ppm/°F) from 23°C in the range 0 to 45°C (32 to 113°F).

FREQUENCY/DENSITY INPUTS

Type: dc coupled, opto-isolated.

Signal Level: 3 V min pk-pk.

Maximum Input Voltage: 12 V pk-pk.

Current Limit: Internally limited to 3 mA.

Frequency Range: 0 to 10 kHz.

Accuracy of Frequency Measurement: 10 ppm.

Resolution: 5 nanoseconds.

PULSE INPUTS-FLOW/TURBINE

Requires Pulse Mezzanine board to be fitted to a P144 or P154 board.

Type: Dual pulse or single pulse train, opto-isolated.

Signal Level: ± 3.5 V to ± 24 V, minimum 5 mA.

Frequency Range: 0 to 10 kHz.

Security Monitoring: IP 252/76 (ISO 6551), level A or B.

DIGITAL STATUS INPUTS

Type: 16 opto-isolated inputs, arranged in 4 groups of 4 with common positive connection to allow simple interface to open collector outputs.

Max Input Voltage: 30 V.

Min Input On Voltage: 12 V.

Max Input Off Voltage: 3 V.

Input Impedance: 2-2.5 k Ω typical.

Protection: Reverse voltage protection.

PRT (RTD) INPUTS

Type: 4 wire connection using Pt 100 transducers, opto-isolated.

PRT (RTD) Resistance: 100 Ω [Pt 100 to IEC 751/DIN 43760 (Europe 0.00385), IPTS68 (American 0.00392), Calendar-Van Dusen].

Excitation Current: 1 mA nominal.

Measuring Range: 60 to 216 Ω (-100°C to $+300^\circ\text{C}$) (-148°F to $+572^\circ\text{F}$).

Resolution: 0.01°C (0.018°F).

Accuracy: -100°C to 200°C (-148°F to 392°F) $\pm 0.01\%$ -200°C to 300°C (392°F to 572°F) $\pm 0.02\%$.

PRT (RTD) Cables: Core resistance up to 600 Ω .

Barriers: 9 V, 100 Ω are satisfactory.

Security: Continuous cable/PRT (RTD) integrity tests for earths/open circuits.

Output Specifications

ANALOG OUTPUTS

Type: 4 to 21 mA outputs, opto-isolated.

Resolution: 12 bit minimum.

Accuracy: $\pm 0.1\%$ at 23°C (73°F).

Ambient Temperature Effect: 20 ppm/°C (11ppm/°F) from 23°C (73°F).

Load Loop Resistance: 650 Ω maximum when powered by local isolated source, 470W 1000W when powered from +24 V external supply.

Maximum External Supply: 32 V.

Output Form: Controlled active current sink to ground return of local floating supply.

Number of Field Connections: 3 terminals per channel.

Update Time: 100 ms to within 1%.

DIGITAL OUTPUTS

Type: 3 groups of 4 with common negative, opto-isolated.

Frequency Range: 0 to 0.5 Hz.

Max Output Saturation Voltage: 1.5 V @ 100 mA.

Low current Saturation Voltage: 600 mV @ 1 mA to suit TTL style input, with 4.7 k Ω pull up to 5 V.

Max Output Standoff Voltage: 42 V (limited by Transorb).

Max Output Current: 100 mA.

Reset/Power on State: All digital outputs – OFF.

PULSE OUTPUTS

Type: Opto-isolated open-collectors.

Frequency Range: 0 to 100 Hz.

Max Output Current: 100 mA.

Max Output Saturation Voltage: 1.5 V @ 100 mA.

Low Current Saturation Voltage: 600 mV @ 1 mA to suit TTL style input.

Max Output Standoff Voltage: 42 V (limited by Transorb).

RAW PULSE OUTPUTS

Type: Digital ground-referenced open-collector.

Gating: Software controlled.

Max Output Saturation: 1.5 V.

Max Output Standoff Voltage: 26 V (limited by Transorb).

Max Output Current: 100 mA.

Frequency Range: 0 to 5 kHz.

Minimum On Period: 100 μ s (microseconds).

Use: To bus together several streams to a common prover computer.

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