

ST51 / ST51 A Mass Flow Meters

For Biogas, Digester Gas, Methane and Natural Gas



- **Wastewater Treatment Plant Digester Systems**
- **Biogas Production and Recovery**
 - Anaerobic Digester Processes
 - On-Farm Systems
 - Fermentation Systems
- **Landfill Gas Recovery Systems**
- **Co-Gen Power Systems**
- **Coal Mine and Coal Bed Methane Recovery**

Features

- **No Moving Parts, Non-Clogging**
- **Small, Compact Design**
- **Easy to Install**

Dual 4-20 mA outputs per NAMUR NE43
500 Hz pulse output
HART (v7) 1/0
Modbus (485 RTU/ASCII)
Dual line LCD readout *Optional*
Process operating temperature
Remote distance *Maximum*
SIL compliance rating
Ex hazardous location approvals
Warranty

	ST51	ST51 A
Dual 4-20 mA outputs per NAMUR NE43	■	■
500 Hz pulse output	■	■
HART (v7) 1/0		■
Modbus (485 RTU/ASCII)		■
Dual line LCD readout <i>Optional</i>	■	■
Process operating temperature	To 250 °F [to 121 °C]	To 350 °F [to 177 °C]
Remote distance <i>Maximum</i>	50' [15 m]	100' [30 m]
SIL compliance rating		■
Ex hazardous location approvals	■	■
Warranty	1 year	2 years

The **ST51 Series Flow Meter** is an accurate, easy to install, no moving parts solution for measuring and controlling biogases, digester gases, methane and natural gas flow. ST51 utilizes FCI proven thermal dispersion technology to provide direct mass flow measurement resulting in higher performance at a lower cost than orifice plates, DP, Vortex shedding and other thermal devices.

Biogas and digester gas applications are challenged by wide flow variations and dirty, wet gas. Flow variation is experienced as these processes move from low production start-up phases to a consistent, sustainable process and by seasonal temperature change, where cold temperatures slow gas production and higher temperature accelerate gas production. While the primary composition of these gases is methane and CO₂, residual H₂S and wet vapor leave deposits and corrode surfaces. ST51 provides the solution to these challenges. It features a wide-turndown ratio, up to 100:1 and is highly sensitive to low flow measurement. To measure correctly in fluctuating temperatures, flow meters must include temperature compensation circuitry and it is standard in ST51. ST51 has no moving parts to foul or clog and is easily pulled from the pipe for occasional cleaning.

ST51 installs in line sizes ranging from 2 1/2 inch to 24 inch [64 mm to 610 mm] with 1/2 inch or 3/4 inch NPT.

The ST51 uses precision, lithography structured platinum RTD sensors embedded in FCI's equal mass small diameter thermowells. Combined with microprocessor electronics and precision calibration, the ST51 achieves excellent accuracy, fast response and virtually maintenance free operation.



Biogas, digester gas and landfill gas compositions are dominated by methane (CH₄) and present a potentially hazardous installation environment. Sound engineering practice and often regulations mandate that instrumentation meet guidelines and have agency

approvals for installation zone safety. Depending on actual installation location, at a minimum the environment will require Class I, Division II and often a more rigorous Class I, Division I [Zone 1] approvals. FCI ST51 meets all of these and has obtained the global agency approvals that ensure your installation is always safe and complies with regulations. And, unlike manufacturers who merely provide their transmitter electronics in an approved OEM enclosure, FCI submits its entire instrument to agency testing. FCI product approvals are different because they are comprehensive system approvals that also take into account the sensor and seal requirements as well the "T" (temperature) ratings. FCI agency approvals are on the total instrument. With ST51 you are assured of the integrity of total instrument approvals that meet or exceed safe engineering practice for your applications.

ST51 Specifications

Instrument

Media Compatibility: Biogas, digester gas, methane, natural gas, air, compressed air, nitrogen

Pipe/Line Size Compatibility: 2 1/2" to 24" [64 mm to 610 mm]¹

Flow Range: 0.3 SFPS to 400 SFPS [0,08 MPS to 122 MPS]

Accuracy: (at ≥ 0.75 SFPS [$\geq 0,21$ NMPS])²

Standard: $\pm 2\%$ reading $\pm 0.5\%$ full scale

Optional: $\pm 1\%$ reading $\pm 0.5\%$ full scale

Repeatability: $\pm 0.5\%$ reading

Temperature Compensation

Standard: 40 °F to 100 °F [4 °C to 38 °C];

Optional: 0 °F to 350 °F [-18 °C to 177 °C]

Temperature Coefficient

With temperature compensation; valid from 10% to 100% of full scale calibration

Flow: Maximum $\pm 0.015\%$ of reading / °F up to 350 °F [$\pm 0.03\%$ of reading / °C up to 177 °C]

Turndown Ratio: 3:1 to 100:1

Agency Approvals

FM, FMc: Explosion-Proof for Class I, Division 1, Groups B, C and D;
Dust-Ignition-proof for Class II/ III, Division 1, Groups E, F and G;
Nonincendive for Class I, Division 2, Groups A, B, C and D
Hazardous (Classified) Locations;
Type 4X, IP66; T4 Ta = 60°C.

ATEX/UKEX: II 2 G Ex db IIC T6...T1 Gb
II 2 D Ex tb IIIC T85°C...T300°C Db; IP66/IP67
Ta = -40°C to +65°C

IECEX: Ex db IIC T6...T1 Gb;
Ex tb IIIC T85°C...T300°C Db; IP66/IP67
Ta = -40°C to +65°C

Other: EAC/TR CU, NEPSI, CE Marking, CRN, EQM ECAS, CPA,
Compliances: PED, RoHS Compliant
SIL (ST51A): SIL 1 compliant; Safe Failure Fraction (SFF) 78.5% to 81.1%
Probe complies with NEC & CEC code requirement of ANI/ASI 12.27.01-2011 as single seal device.

Warranty: ST51 – 1 year; ST51 A – 2 years

¹ For line sizes 2" [51 mm] or smaller, see FCI ST75 Series

² Contact FCI for accuracy below 0.75 SFPS [0,21 NMPS]

Flow Element

Installation: Insertion, variable length with 1/2" or 3/4" MNPT compression fitting

Type: Thermal dispersion

Material of Construction: 316L stainless steel body with Hastelloy-C22 thermowell sensors, 316 stainless steel compression fitting with Teflon or stainless steel ferrule

Pressure (Maximum Operating without Damage)

Stainless steel ferrule: 500 psig [34 bar(g)]

Teflon ferrule: 150 psig [10 bar(g)]

Operating Temperature

Stainless steel ferrule

ST51: -0 °F to 250 °F [-18 °C to 121 °C]

ST51 A: -0 °F to 350 °F [-18 °C to 177 °C]

Teflon ferrule: -0 °F to 200 °F [-18 °C to 93 °C]

Process Connection

Compression Fittings: 1/2" MNPT or 3/4" MNPT with stainless steel or Teflon ferrule

Retractable

Packing Gland: Medium pressure 500 psig [34 bar(g)] with 1/2" MNPT or 3/4" MNPT, and either graphite or Teflon packing

Teflon packing is required if media is ozone, chlorine, or bromine

Insertion Length (Field Adjustable)

1" to 6" [25 mm to 152 mm]

1" to 12" [25 mm to 305 mm]

1" to 18" [25 mm to 457 mm]

Flow Transmitter

Enclosure

Rating: NEMA 4X, IP66/IP67

Material: Standard – aluminum, polyester powdered coated
Optional – 316 stainless steel

Conduit/Cable Port: Dual 1/2" NPT or M20x1.5

Operating Temperature: 0 °F to 140 °F [-18 °C to 60 °C]

Input Power

DC: 18 Vdc to 36 Vdc (6 watts max.)

AC: 85 Vac to 265 Vac (12 watts max.; CE Marking approval from 100 Vac to 240 Vac)

Analog Output Signals: Dual 4-20 mA, user assignable to flow rate and/or temperature and a 0-500 Hz pulse output for total flow; output #1 has fault indication per NAMUR NE43 guidelines, user selectable for high (>21.0 mA) or low (<3.6 mA)

Bus Communications (ST51 A): HART or Modbus

HART: Version 7; FieldComm Group certified; available over output #1; DD file included

Modbus: RS485 (in accordance with EIA/TIA-485 standard)

Modbus device type: Slave

Address range: 0-255

Supported function codes: 03,04

Supported baud rate: 9600,19200

Transmission mode: RTU and ASCII; standard MS (16 bit), standard LS (16 bit), Daniel extensions (32 bit)

Response time (delay between polls): 50 ms or greater

Functions

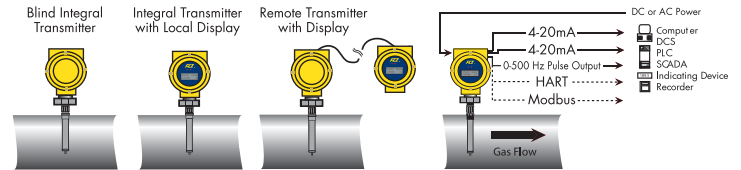
Readings: Flow rate, temperature, totalized flow (single precision), flow engineering units, temperature engineering units

Other: Enable (activate) totalizer, reset totalizer, change K factor

Communication Port: RS-232C

Digital Display (Optional): Two-line x 16 character LCD; displays measured value and engineering units; top line assigned to flow rate, second line user assignable to temperature reading, as flow totalizer or alternating; display can be rotated in 90° increments for optimum viewing orientation

Installation and Mounting: Integral with sensor element or remote mountable up to 50' [15 m] with Model ST51, and up to 100' [30 m] with Model ST51A



Optional Ball Valves

Part Number	Description
025172-09	1/2" ball valve; standard-duty, full port, 2-piece, 1000 psi [70 bar] max, -40 °F to 450 °F [-40 °C to 232 °C] Pressure rating derated above 100 °F [38 °C]
025172-10	3/4" ball valve; standard-duty, full port, 2-piece, 1000 psi [70 bar] max, -40 °F to 450 °F [-40 °C to 232 °C] Pressure rating derated above 100 °F [38 °C]
011144-05	3/4" ball valve; heavy-duty, full port, 3-piece, 1440 psi [99 bar] max, -40 °F to 550 °F [-40 °C to 288 °C]

FCI FLUID COMPONENTS INTERNATIONAL LLC

www.FluidComponents.com

FCI's Quality Management System is ISO 9001 and AS9100 Certified

A PST BRAND

FCI World Headquarters 1755 La Costa Meadows Drive | San Marcos, California 92078 USA **Phone:** 760-744-6950 **Toll Free (US):** 800-854-1993

FCI Europe Persephonestraat 3-01 | 5047 TT Tilburg, The Netherlands | **Phone:** 31-13-5159989

FCI Measurement and Control Technology (Beijing) Co., LTD

Room 107, Xianfeng Building II, No.7 Kaituo Road, Shangdi IT Industry Base, Haidian District | Beijing 100085, P. R. China | **Phone:** 86-10-82782381

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TEMPCO
MEASUREMENT & CALIBRATION

www.tempeco.be

tempeco@tempeco.eu

tel: +32 4 2489260