

SIEMENS



Process Instrumentation

# Solid impact

SITRANS WF solids flowmeters monitor the rate of gravity fed bulk material

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# Solid solutions for bulk material flow



In selecting the correct flowmeter to fit your operations, choose from a product line that will do what you need it to do, no matter what your application. SITRANS WF solids flowmeters offer reliable, accurate, and dependable results in literally thousands of applications. From food or chemical industries to plastics, grain, or cement, the Siemens range of flowmeters will suit your needs, even in the toughest operating conditions. Installation and maintenance are easy and hassle-free, and our technical support team is available to help you at every step of the way.

Simply put, SITRANS WF solids flowmeters monitor the rate of bulk material flow in a process. They continuously measure the impact force of the material under gravity feed conditions, and convert this signal into a flow rate used to control the material into a process or blending operation. Solids flowmeters can function in stand-alone measuring operations, or they can work with a facility's process control system using standard industry protocols.

Siemens SITRANS WF product line includes two basic types of impact flowmeters: strain gauge load cell, and Linear Variable Differential Transformer (LVDT). Each uses a different sensor to convert the horizontal force on the sensing plate to flow rate.

The totally enclosed design of these heavy-duty flowmeters eliminates product waste or contamination, and reduces plant maintenance. The dust-tight design creates a healthier work environment, especially when monitoring hazardous substances.

#### Advantages

- Continuous monitoring of the material flow without interrupting the process.
- Unaffected by material buildup, so monitoring remains reliable.
- Require minimal maintenance or recalibration after the initial installation and material tests.
- Perform in situations where other weighing devices cannot

be integrated into an existing process: their compact size makes them easy to install without major modification.

- Dust-tight construction: suitable for use in hazardous areas and in wash-down applications that require frequent cleaning.
- Calibration is easy and accurate: by using static weights, or by comparing the weight of a measured material sample to the weight totalized by the flowmeter, and then correcting the integrator.
- With a choice of local, integrated, and remote communications options, SITRANS WF flowmeters fit seamlessly into any type of process solution.

#### Performance

The entire range of SITRANS WF flowmeter models produces accurate, repeatable results, and may be used for critical functions such as batch load-out and blending. Safe overload protection is standard.

SITRANS WF flowmeters monitor powders, granulates, and other dry bulk materials in sizes up to 25 mm (1") in diameter. They handle flow rates from 200 kg/h to 900 t/h (440 lbs/h to 990 STPH).

By using material samples, SITRANS WF solids flowmeters operate to  $\pm 1\%$  within a range of 33 to 100%, and provide  $\pm 0.2\%$  repeatability; accuracies of  $\pm 0.5\%$  or better are common.



# A choice of two technologies for thousands of applications

Both of Siemens flowmeter technologies-Linear Variable Differential Transformer (LVDT) and strain gauge load cell flowmeters-offer a wide range of options for monitoring in all types of industrial settings: from food to chemical, and from mineral to cement.

## Principle of operation

Flowmeters are installed in a gravity fed process. SITRANS WF solids flowmeters are unaffected by vertical force changes caused by material buildup on the non-impact area of the sensing plate. Consequently, this eliminates the need for frequent recalibration.

SITRANS WF flowmeters measure only the horizontal force component of material flow striking the sensing plate. The horizontal force is dependent on particle mass and velocity, angle of particle impact against the plate, and the energy absorbing characteristics of the particle. The flowmeters respond to the force of the material striking the plate.

Material entering the flowmeter through the flowguide produces a mechanical deflection as it strikes the flowmeter's sensing plate. SITRANS WF flowmeters convert the deflection into an electrical signal that feeds into an accompanying integrator, which instantaneously provides the flow rate and totalizes the material.

## Strain gauge load cell based flowmeters

SITRANS WF100 and 200 series flowmeters use triple beam parallelogram strain gauge style load cells that register the horizontal impact of the material flow. These are the same load cells that have proven their reliability and durability in Siemens MSI heavy-duty belt scales. Their patented design offers superior accuracy and repeatability.

With its rugged steel construction, SITRANS WF200 series is ideal for low flow rates of 200 t/h (220 STPH), and high flow rates up to 900 t/h (990 STPH). SITRANS WF100 offers a compact, reliable solution for applications with limited installation space.

## LVDT based flowmeters

SITRANS WF300 series flowmeters use SITRANS WFS300 and SITRANS WFS320 sensing heads. These out-of-process sensing heads apply only the horizontal deflection created by the product impact on the sensing plate to a highly reliable Linear Variable Differential Transformer (LVDT). Frictionless pivots exclude the vertical force, and a viscous fluid damper provides mechanical damping in the event of pulsating flows. This method of sensing material flow has been proven in thousands of applications throughout the world.



### Aerated flowmeters

Siemens developed SITRANS WF250 and SITRANS WF350 specifically for use with air-activated gravity conveyors or air slides, typically found in cement processing.

Their unique design offers an accurate and simple solution for separating aerated material into two flows. Because of a separate air chamber, the air follows a path of least resistance as the material and air enter the flowmeter. This removes the impact of air onto the flowmeter sensing plate.

### Applications

SITRANS WF flowmeters measure with precision any dry material from powders to granulates. Material densities range from puffed wheat to iron ore, while fluidity covers the spectrum from fluidized powder, such as fly-ash, to sluggish flowing material such as lathe turnings.

Typical materials monitored include cement, gravel, coke, coal, minerals, wood chips, cereals, seeds, grains, soybean and rice hulls, unshelled peanuts, starch, sugar, potato flakes, grain tailings and screenings, and plastic pellets.

### Application considerations

Siemens helps select the right SITRANS WF solids flowmeter for your application, considering a number of process variables.

- Material type
- Flow rate
- Bulk density
- Temperature
- Particle size
- Abrasiveness
- Accuracy required
- Material testing
- Air flow
- Material aeration
- Corrosiveness
- Moisture content
- Hazardous area classification

# Different applications ...

Strain gauge load cell based flowmeters	SITRANS WF100	SITRANS WF200	SITRANS WF250
			
Order number	7MH7108	7MH7115	7MH7115
Typical industries	Food, grain, milling, animal feed, plastics, glass	Aggregates, grain, cement	Cement, mineral processing
Typical applications	Monitoring of food ingredients, pet food blending, plastic pellet production, silica sand in glass making	Grinding mill rejects in cement, load-out of grains and seeds	Cement in aerated gravity conveyor
Max. process temperature	65 °C (150 °F)	100 °C (212 °F)	100 °C (212 °F)
Accuracy*	±1% (33 to 100% of rate)		
Options	304 or 316 stainless steel construction (meets FDA and USDA requirements for food processing)		
Sensing element 	One triple beam parallelogram style, stainless steel, strain gauge load cell, 304 stainless steel sensing plate <b>Sensing plate options</b> • 316 stainless steel <b>Liner options</b> • PTFE • Polyurethane	Two triple beam parallelogram style, stainless steel, strain gauge load cells, 304 stainless steel sensing plate <b>Sensing plate options</b> • 316 stainless steel <b>Liner options</b> • Polyurethane • Alumina ceramic	Two triple beam parallelogram style, stainless steel, strain gauge load cells, 304 stainless steel sensing plate <b>Sensing plate options</b> • 316 stainless steel <b>Liner options</b> • Polyurethane • Alumina ceramic
Capacity range	1 to 200 t/h (1 to 220 STPH)	200 to 900 t/h (220 to 990 STPH)	200 to 900 t/h (220 to 990 STPH)
Particle size (max.)	6 to 13 mm (0.25 to 0.5")	25 mm (1")	25 mm (1")
Inlet sizes	100 to 250 mm (4 to 10") in universal ANSI/DIN flanges	305 x 533 mm (12 x 21") 305 x 635 mm (12 x 26")	406 x 635 mm (16 x 25") 508 x 940 mm (20 x 37")
Approvals	CE , C-TICK, CSA, FM, ATEX, IECEx		

\*Accuracy subject to the following: on factory approved installations the flowmeter system's totalized weight will be within the specified accuracy when compared to a known weighed material test sample. The test rate must be within the specified range of the design capacity and held constant for the duration of the test. The minimum material test sample must be equivalent to a sample obtained at the test flow rate for at least ten minutes running time.



## Solids flowmeters monitor fly-ash for power generation





Monitoring fly-ash is a requirement for a coal-fired power generation plant in India. Fly-ash material solidifies while suspended in the exhaust gases and is collected by electrostatic precipitators or filter bags.

Since the particles solidify, they are generally spherical in shape, and range in size from 0.5 to 100 µm.

The system generates a flow rate of anywhere between 25 to 90 t/h at 100 °C (212 °F).

With ten SITRANS WF330 flowmeters, the power plant can now accurately monitor the amount of fly-ash from the process rather than estimating production totals.

# ... need different solutions

LVDT based flowmeters	SITRANS WF330	SITRANS WF340	SITRANS WF350
			
Order number	7MH7102	7MH7104	7MH7106
Typical industries	Food, grain, milling, animal feed, chemicals, plastics, glass, cement, mineral processing	Food, grain, milling, animal feed, chemicals, plastics, glass, cement, mineral processing	Cement, mineral processing, mining
Typical applications	Fly-ash, lime dosing, cement flow and control in mining, flour stream monitoring	Fly-ash load-out, lime dosing, gypsum flow	Powders and granulates conveyed by aerated gravity conveyors, fly-ash load-out, precipitator dust
Max. process temperature	232 °C (450 °F)		
Accuracy*	±1% (33 to 100% of rate)		
Options	<ul style="list-style-type: none"> <li>• 304 or 316 stainless steel construction (meets FDA and USDA requirements for food processing)</li> <li>• Food grade epoxy coating on sensing head</li> </ul>		
Sensing element   <small>SITRANS WFS300 (order no. 7MH7110)</small> <small>SITRANS WFS320 (order no. 7MH7112)</small>	<b>Sensing plate</b> <ul style="list-style-type: none"> <li>• 304 stainless steel</li> <li>• option: 316 stainless steel</li> </ul> <b>Liners</b> <ul style="list-style-type: none"> <li>• Plasma A/R</li> <li>• PTFE</li> <li>• Polyurethane</li> <li>• Alumina ceramic</li> </ul>		
Capacity range	Sensing element dependent		
• SITRANS WFS300	0.2 to 40 t/h (0.2 to 44 STPH)		
• SITRANS WFS320	20 to 300 t/h (22 to 330 STPH)		
Particle size (max.)	Sensing element dependent		
• SITRANS WFS300	12 mm (0.5")	12 mm (0.5")	2 mm (0.1")
• SITRANS WFS320	25 mm (1")	25 mm (1")	2 mm (0.1")
Inlet sizes	Sensing element dependent		
• SITRANS WFS300	50 to 250 mm (2 to 10") (ASME or DIN flanges)	<ul style="list-style-type: none"> <li>• 76 x 152 mm (3 x 6")</li> <li>• 102 x 254 mm (4 x 10")</li> <li>• 127 x 305 mm (5 x 12")</li> </ul>	<ul style="list-style-type: none"> <li>• 203 x 203 mm (8 x 8")</li> <li>• 203 x 305 mm (8 x 12")</li> </ul>
• SITRANS WFS320	150 to 400 mm (6 to 16") (ASME or DIN flanges)	<ul style="list-style-type: none"> <li>• 127 x 406 mm (5 x 16")</li> <li>• 152 x 508 mm (6 x 20")</li> </ul>	<ul style="list-style-type: none"> <li>• 305 x 254 mm (12 x 10")</li> <li>• 305 x 356 mm (12 x 14")</li> <li>• 305 x 508 mm (12 x 20")</li> </ul>
Approvals	CE, C-TICK, CSA, FM, ATEX, IECEx		

\*Accuracy subject to the following: on factory approved installations the flowmeter system's totalized weight will be within the specified accuracy when compared to a known weighed material test sample. The test rate must be within the specified range of the design capacity and held constant for the duration of the test. The minimum material test sample must be equivalent to a sample obtained at the test flow rate for at least ten minutes running time.

# Siemens integrators control and connect

Completing the solids flow monitoring system is the stand-alone MILLTRONICS SF500 integrator or SIWAREX FTC module. These devices process signals into operating data for exact flow measurement and control.



## Accurate monitoring

Electronic integrators process sensor signals into operating data for continuous in-line weighing/flow measurement. They offer basic control functions like PID and batch control. Easy to install, commission, and maintain, Siemens integrators perform basic and sophisticated weighing and flow control functions.

Integrators process the rate signals and convert them into totalization data for direct local control or for integrating the data into an industrial network.

Siemens provides communication flexibility. Siemens Totally Integrated Automation (TIA) approach offers ease of connection to a DCS system such as SIMATIC PCS 7.

## MILLTRONICS SF500

MILLTRONICS SF500 is an advanced integrator for use with SITRANS WF solids flowmeters. It offers online calibration so the process does not need to be shut down to calibrate the integrator. It also offers field mount enclosure, local display and full feature keypad, linearization, batch control, multi-span and auto zero, and optional PID.

- Compatible with all SITRANS WF flowmeters; one- or two-load cell flowmeters; LVDT-equipped solids flowmeters, using optional interface board
- Displays rate, totalized weight, PID, and batching
- Standard Modbus and Profibus DP, Allen-Bradley RIO, and DeviceNet communication options
- Two adjustable totalizer outputs
- Multi span calibration
- Linearization function
- Five programmable SPST Form A contact relays rated 5A at 250 V AC non-inductive, reversible
- Type 4X/NEMA 4X/IP65 rated, CSA, FM, CE and C-TICK approvals

## SIWAREX FTC

SIWAREX FTC is a versatile and flexible weighing integrator module for conveyor scales, loss-in-weight scales, and solids flowmeters. It integrates into SIMATIC S7/PCS 7, and provides integral communication, diagnostics, and configuration tools.

- Fully embedded in SIMATIC S7/PCS 7
- Use in distributed plant concept through PROFIBUS DP/PROFINET using ET 200M
- Optically isolated 4 to 20 mA
- 24 V DC, 500 mA
- Eight programmable digital outputs
- PLC rack mounted
- CE, FM, cUL<sub>us</sub> approvals



# A choice of communications options

From anywhere in your facility, monitor data with SITRANS RD200.

On the go? With SITRANS RD500, stay connected anywhere-at anytime-via the web, ethernet, or cell phone.



## SITRANS RD200

SITRANS RD200 is a universal remote display for process instruments. You can collect and log data remotely from as many as 100 displays on your local computer using the free downloadable RD Software.

- Universal input: accepts current, voltage, thermocouple and RTD signals
- Single or dual 24 V DC transmitter power supply
- Serial communication using built-in protocol or Modbus RTU

## SITRANS RD500

SITRANS RD500 is an easy-to-use remote data manager, using a web-based application – a standard browser is all you need to configure your system. A modular approach allows a variety of process signals to be monitored, while the serial ports collect data from any Modbus RTU device.

SITRANS RD500 monitors the process remotely via its built-in web server, FTP, and email client. It communicates alarm notifications through email and SMS text messages to one or more recipients.

SITRANS RD500 supports modems, providing flexibility for applications with GSM/GPRS, ethernet, or landline connectivity.

In addition, SITRANS RD500:

- Supports up to 128 devices with the flexible I/O modules and addressing for 247 Modbus serial devices
- Provides up to 2 gigabytes of expandable memory for data capture and storage with its compact flash slot
- Supports Modbus TCP via ethernet and GPRS for easy integration into control systems

## Cost savings with SITRANS WF flowmeter

A large potash mine produces KCl (potassium chlorate) in the form of K-Prills and soluble granules. A SITRANS WF solids flowmeter with stainless steel sensing plate and flow guide replaced a nuclear densitometer used to measure prill flow on an inclined conveyor belt. It measures flow rates up to 15,000 kilograms per hour of the dusty and slightly corrosive material.

A MILLTRONICS SF500 integrator processes the signal from the SITRANS WFS300 sensing head into a material flow rate to calculate daily totals. Siemens flowmeter solution meets the company's strict reliability and accuracy requirements. Furthermore, substantial long-term cost savings have been realized by eliminating the nuclear source from the plant.



# Flow detection

Protect your operations with SITRANS AS100 and SITRANS CU02. These acoustic sensors provide up-to-the-minute flow detection as an early warning system for your process.



SITRANS AS100 detects high frequency acoustic emissions from friction or the impact of dust, powders, granules, and solids in motion. It detects flow/no flow or high/low flow. It is a non-invasive acoustic sensor for mounting on the outside of chutes, pipes, and fan housings for non-wetted plugged chute, and product/no-product detection.

SITRANS CU02 processes signals from the sensor, providing relay and analog outputs for interface into a process. The two relays are fully programmable and independent of each other, and can be used to operate an alarm or control device.

## Cement manufacturer monitors dust reclamation system

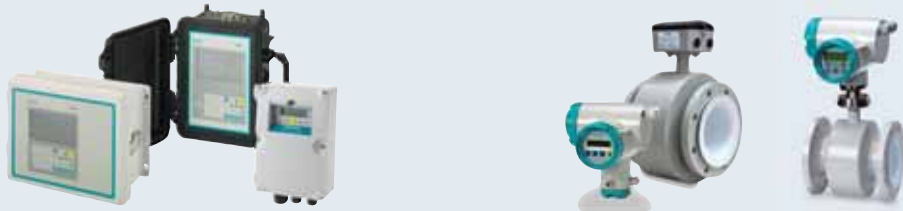
A cement plant in Ontario, Canada effectively monitors the flow of cement dust in a pneumatic conveying line that is part of its dust collection and reclamation system. SITRANS AS100 monitors flow through the conveying line and indicates that the system is operating properly.

The acoustic sensor has proven a cost-effective investment in productivity. Operators can now maintain the system efficiently because the SITRANS AS100 provides them with constant flow monitoring data. They are immediately aware of a plugged chute, blower shutdown or rotary airlock feeder failure, and can take quick action to correct the problem.



# Reliable liquid flow measurement

In addition to solids flowmeters, Siemens offers accurate and reliable solutions for monitoring liquid flow.



## SITRANS F US Ultrasonic flowmeters

SITRANS F US clamp-on ultrasonic flowmeters are recognized worldwide for their quality, performance, versatility, and ease of use even in the most challenging environments.

### Maximum versatility

SITRANS FUS1010 is the most versatile clamp-on ultrasonic flowmeter on the market. It can operate in either WideBeam transit time or Doppler mode, making it suitable for virtually any liquid.

### Portability and convenience

SITRANS FUP1010 clamp-on ultrasonic flowmeter offers maximum versatility plus portable field use. Battery power allows for easy transportation between installations. It is ideal as a check meter or to monitor applications without existing metering.

### Affordable alternative

SITRANS FST020 is a basic, dedicated single-channel clamp-on ultrasonic flowmeter. An affordable alternative to more complex measurement solutions, it offers easy-to-use functionalities and a compact, integral design.

### High-precision energy measurement

Featuring built-in BTU measurement, SITRANS FUE1010 clamp-on ultrasonic flowmeters provide revenue-grade thermal energy sub-metering and energy efficiency distribution monitoring.

## SITRANS F M Electromagnetic flowmeters

### Rugged and reliable

SITRANS F M MAG 911/E sensor with SITRANS F M TRANSMAG 2 transmitter ensures reliable flow measurement under harsh process conditions. Rugged in design and unaffected by electrode noise, disturbances, or vibrations, this flowmeter is ideal for any environment with solid content up to 70% and fluids with magnetic particles.

### Dedicated solution

SITRANS F M MAG 3100 sensor with SITRANS F M MAG 6000I transmitter offers a flexible and comprehensive sensor program combined with full input and output transmitter functionality in the harshest industrial environments – including media containing chemicals.

More information:

[www.siemens.com/weighing](http://www.siemens.com/weighing)

[www.siemens.com/processprotection](http://www.siemens.com/processprotection)

[www.siemens.com/flow](http://www.siemens.com/flow)

[www.siemens.com/processautomation](http://www.siemens.com/processautomation)

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Industry Sector  
Sensors and Communication  
76181 KARLSRUHE  
GERMANY

Subject to change without prior notice  
Order No.: 7ML1996-5LX03  
Printed in Canada  
© Siemens AG 2011

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