Weighing Electronics

SIWAREX for SIMATIC

Belt scales / SIWAREX FTC weighing electronics

Overview

The SIWAREX FTC (Flexible Technology for Continuous Weighing) is a versatile and flexible weighing module for belt scales, loss-in-weight feeders and solids flowmeters. It can also be used to record weights and measure force. The SIWAREX FTC function module is integrated in SIMATIC S7/PCS 7 and uses the features of this modern automation system, such as integrated communication, diagnostics and configuration tools.

Benefits

SIWAREX FTC is characterized by the following features:
- Uniform design and totally integrated communication in SIMATIC S7 and SIMATIC PCS 7
- Uniform configuration with SIMATIC
- Direct use in the SIMATIC automation system
- Use in distributed plant concept through connection to PROFIBUS DP/PROFINET using ET 200M
- Measurement of weight or force with high resolution of 16 million intervals
- High accuracy 3 × 6 000 d
- For use with analog strain gauge load cells
- Alternative option of connecting individual load cells from the manufacturers METTLER TOLEDO, WIPOTEC and PESA
- Display with SIMATIC standard operator panels
- Parameterizable inputs and outputs
- Parameterizable for highly versatile applications
- Flexible adaptation to different requirements with SIMATIC
- Simple adjustment of scale using the SIWATOOL FTC program
- Theoretical adjustment without calibration weights
- Replacement of module without renewed adjustment of scale
- Recording of weighing sequence
- 8 totalization memories with different digit intervals
- Can be used in Ex applications

Application

The SIWAREX FTC weighing module is the optimum solution wherever high demands are placed on continuous weighing procedures. Thanks to its outstanding measuring properties, weights can be measured with extreme accuracy in up to three ranges. In the case of force measurements, the value can be measured bidirectionally.
Typical applications for SIWAREX FTC include:
- Flowrate/flow measurement
- Belt volume measurement
- Material loading, summation
- Flowrate/flow control
- Belt load measurement
- Belt scale / weighfeeder
- Loss-in-weight scale
- Force measurement

Design

SIWAREX FTC is a function module of SIMATIC S7-300 which can be directly snapped onto the SIMATIC S7-300 or ET 200M backplane bus. The rail mounting of the 80 mm wide weighing module means that it is extremely easy to mount/wire.
The load cells, the RS 485 serial interface, the analog output and the digital inputs and outputs are connected by means of the 40-pin standard front connector, the PC (RS 232) by means of a 9-pin SUB-D connector and the power supply by means of a separate 2-pin connector.
Operation of SIWAREX FTC in SIMATIC enables the belt scale to be completely integrated into the automation system.

Function

The main tasks of SIWAREX FTC are the high-precision measurement of the current weight, and the exact calculation of the conveyed quantity or flow. In "Force measurement" operation mode, SIWAREX FTC measures the force in both directions.
The conveyed quantity can be recorded in 8 totalization memories. Through integration in SIMATIC it is also possible to directly control scale operation by means of a PLC program. This means that the tasks can be sensibly divided: The weighing functions are implemented in the SIWAREX FTC and the interlocking and logic functions for the plant control in the SIMATIC CPU.

Weighing functions
The following operating modes can be set:

Weight measurement and force measurement

In this operating mode, the weight value or the force is determined, processed in the PLC and then displayed.
For this purpose, the configuration package can be selected.

Belt scale / weighfeeder

The functions of a belt scale are implemented in this operating mode. Calculations are performed for the typical process values; belt load, flowrate and belt speed. Commands can be used to control the belt and display the required values. A weighfeeder can be implemented by activating the SIMATIC PID controller.
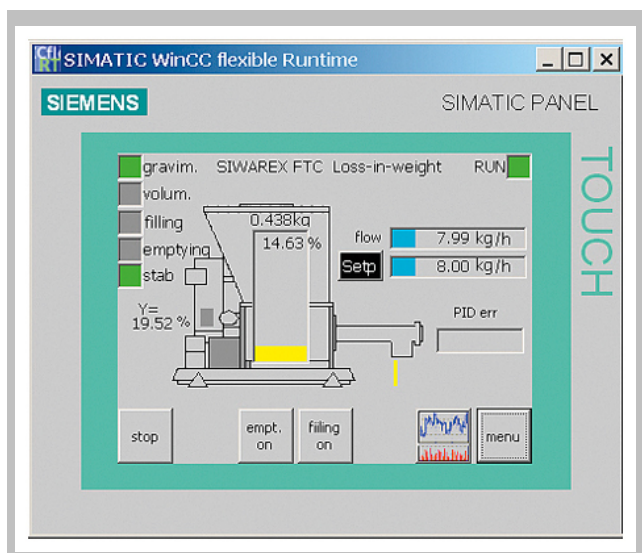
Function (Continued)
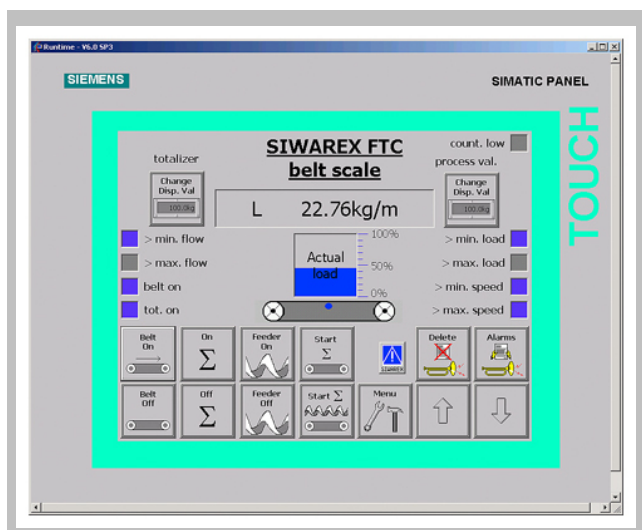
Scale faceplate of a belt scale

Loss-in-weight scale

The typical functions of a loss-in-weight scale are implemented in this operating mode. The actual weight of the vessel is measured and the flowrate is regulated according to the preset setpoint. Application-specific parameters, such as proportioning parameters, and device and material characteristics, can be set directly in SIWAREX FTC. Various commands are available that have been fine-tuned to the requirements of the loss-in-weight scales, such as proportioning (manual, automatic, gravimetric, volumetric), filling and emptying.

The high measurement resolution, real-time signal processing, detection and filtering of signals in the electronic weighing system enable extremely high proportioning accuracy.


Scale faceplate of a loss-in-weight scale

Solids flowmeter

The typical functions of a solids flowmeter are implemented in this operating mode. The calculations for the typical process values;

Function (Continued)

flow and conveyed quantity, are performed in the SIWAREX module. Application-specific parameters for setting the scales and commands for their operation are also available.
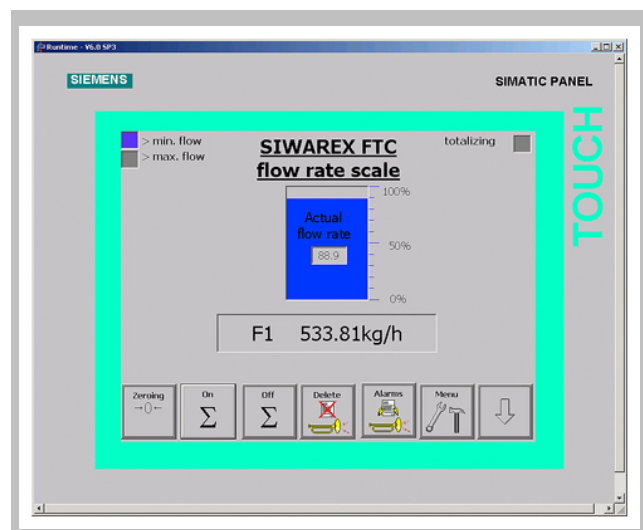
View of a solids flowmeter

Monitoring and control of the load cell signals and statuses

The SIWAREX FTC weighing module monitors the statuses during the weighing process, and informs the operator of any irregularities. The optimized exchange of data within SIMATIC permits direct evaluation of the load cell signals in the PLC program.
Influencing of the weighing sequences by the PLC means that the SIWAREX FTC can be easily adapted to any modifications in system technology.
A module can be replaced without recalibrating the scales. When using "active bus modules", replacement is also possible during operation.

Applications of SIWAREX FTC

Integration in SIMATIC

SIWAREX FTC is completely integrated into the SIMATIC S7 and SIMATIC PCS 7. Users can freely configure their automation solution – including the weighing application.
The right combination of SIMATIC components can produce optimum solutions for small, medium-size and large plants. The scales are operated and monitored using SIMATIC standard operator panels.
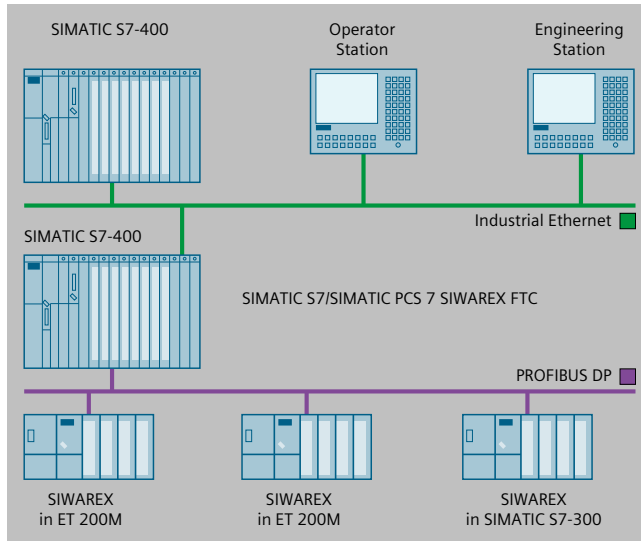
Weighing Electronics

SIWAREX for SIMATIC

Function (Continued)

Needless to say, these operator panels can also be simultaneously used for the operator control and monitoring of the plant. Custom design or sector-specific solutions can be developed extremely quickly using the configuration package and example applications for SIMATIC.

SIMATIC S7/PCS 7 configuration with SIWAREX FTC (medium-sized plants)

Software

Adjustment of the scale using SIWATOOL FTC

SIWATOOL FTC is a special program for adjusting and servicing the scale and runs with Windows operating systems.
The program enables the scales to be commissioned without the need for prior knowledge of the automation system. During servicing, the technician can use a PC to analyze and test the procedures in the scale. Reading out the diagnostics buffer from the SIWAREX FTC is extremely helpful when analyzing events.
The following are just some of the tasks that can be carried out using SIWATOOL FTC:
• Parameter assignment and calibration of the scale
• Testing of scale properties
• Saving and printing scale data
• Recording and analysis of weighing sequence

Function (Continued)
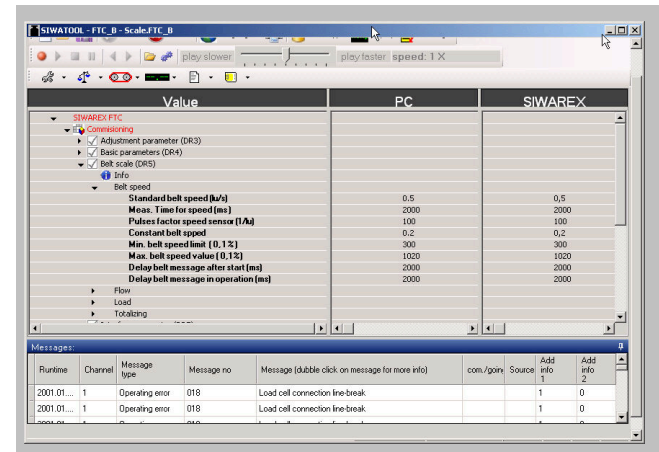
Settings in SIWAREX FTC software

It is also extremely helpful to analyze the diagnostics buffer which can be saved together with the parameters following reading out from the module.
The SIWAREX FTC weighing module includes a trace mode for checking of weighing sequences. The recorded weight values and associated statuses can be displayed as traces using SIWATOOL FTC and MS Excel.

Upgrading firmware

A further program function can be used to download a new firmware version onto the SIWAREX FTC on site. This means that firmware upgrades can be carried out on site as required anywhere in the world.

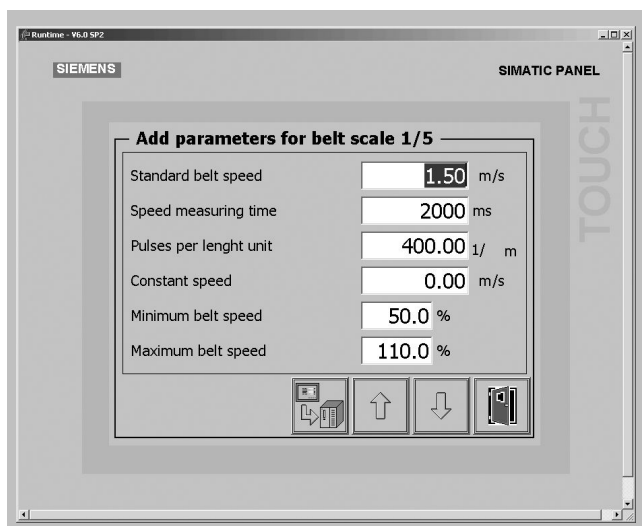#### Reading out of weighing reports

The totalization memories can be saved on a MMC (Micro Memory Card) inserted into the SIWAREX FTC.

SIWAREX FTC – simple configuring

Integration in SIMATIC means that freely-programmable, modular weighing systems for belt scales, solids flowmeters and loss-in-weight scales can be created and modified to meet individual operational requirements.
A free version of the ready-to-use SIWAREX FTC "Getting Started" software is also available for the belt scale, solids flowmeter and loss-in-weight scale operation modes. It shows beginners how to integrate the module into the STEP 7 program and provides a basis for application programming. This allows you to implement the belt scale very easily with an operator panel connected directly to the SIMATIC CPU.

Function (Continued)

Scale faceplate in the SIWAREX FTC "Getting Started" software

Selection and ordering data

	Article No.
SIWAREX FTC Electronic weighing system for S7-300 and ET 200M. Applications: Belt scales, force measurement, loss-in-weight scales and solids flowmeters	7MH4900-3AA01
SIWAREX FTC_B Equipment Manual for belt scales Available in a range of languages Free download on the Internet at: http://www.siemens.com/weighing/documentation	
SIWAREX FTC_L Equipment Manual for solids flowmeters and loss-in-weight scales Available in a range of languages Free download on the Internet at: http://www.siemens.com/weighing/documentation	
SIWAREX FTC "Getting Started" for belt scales Sample software shows beginners how to program the scales in STEP 7 for belt scale mode Free download on the Internet at: http://www.siemens.com/weighing/documentation	
SIWAREX FTC "Getting Started" for solids flowmeters Sample software shows beginners how to program the scales in STEP 7 for solids flowmeter mode Free download on the Internet at: http://www.siemens.com/weighing/documentation	

Selection and ordering data (Continued)

	Article No.
SIWAREX FTC "Getting Started" for loss-in-weight scales Sample software shows beginners how to program the scales in STEP 7 for loss-in-weight scale mode Free download on the Internet at: http://www.siemens.com/weighing/documentation	
SIWATOOL V4 & V7 Service and commissioning software for SIWAREX weighing modules	7MH4900-1AK01
SIWAREX PCS 7 AddOn Library for PCS7 V8.x and V9.0 • Supports PROFINET APL faceplates and function blocks for: • SIWAREX U • SIWAREX FTA • SIWAREX FTC_B (belt scale) • SIWAREX WP321 Classic faceplate and function block for: • SIWAREX FTC_L (Loss-in-weight)	7MH4900-1AK61
SIWATOOL connection cable from SIWAREX FTC with serial PC interface, for 9-pin PC interfaces (RS 232)	
• 2 m long (6.56 ft)	7MH4702-8CA
• 5 m long (16.40 ft)	7MH4702-8CB
40-pin front connector with screw contacts Required for each SIWAREX module	
• With screw contacts	6ES7392-1AM00-0AA0
• With spring-loaded terminals	6ES7392-1BM01-0AA0
Shield connection element Sufficient for one SIWAREX FTC module	6ES7390-5AA00-0AA0
Shield connection clamp Content: 2 units (suitable for cable with diameter 4 ... 13 mm / 0.16 ... 0.51 inch) Note: One shield connection clamp is required for each of the following: • Scale connection • RS 485 interface • RS 232 interface	6ES7390-5CA00-0AA0
S7 DIN rail	
• 160 mm (6.30 inch)	6ES7390-1AB60-0AA0
• 480 mm (18.90 inch)	6ES7390-1AE80-0AA0
• 530 mm (20.87 inch)	6ES7390-1AF30-0AA0
• 830 mm (32.68 inch)	6ES7390-1AJ30-0AA0
• 2 000 mm (78.74 inch)	6ES7390-1BC00-0AA0
MMC memory For data logging up to 32 MB, only for legal-for-trade applications R76, R51 and R107	7MH4900-2AY21
Accessories	
SIWAREX EB extension box For extending sensor cables.	7MH4710-2AA

Weighing Electronics

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Selection and ordering data (Continued)

	Article No.
SIWAREX JB junction box, aluminum housing For connecting up to 4 load cells in parallel, and for connecting multiple junction boxes.	7MH5001-0AA20
SIWAREX JB junction box, stainless steel housing For connecting up to 4 load cells in parallel.	7MH5001-0AA00
SIWAREX JB junction box, stainless steel housing (ATEX) For parallel connection of up to 4 load cells (for zone allocation, see manual or type-examination certificate).	7MH5001-0AA01
Ex interface SIWAREX IS For intrinsically safe connection of load cells. With ATEX approval (not UL/FM). Suitable for SIWAREX electronic weighing systems. Compatibility of load cells must be checked separately.	
• With short-circuit current < 199 mA DC	7MH4710-5BA
• With short-circuit current < 137 mA DC	7MH4710-5CA
Cable (optional)	
Cable Li2Y 1 × 2 × 0.75 ST + 2 × (2 × 0.34 ST) – CY For connecting SIWAREX electronic to junction box (JB), extension box (EB), digital junction box (DB), Ex interface (IS) or between two extension boxes. For permanent installation. Occasional bending is possible. External diameter: approx. 10.8 mm (0.43 inch) Permissible ambient temperature -40 ... +80 °C (-40 ... +176 °F) Sold by the meter.	
• Sheath color: orange	7MH4702-8AG
• For hazardous atmospheres. Sheath color: blue	7MH4702-8AF
Remote display (optional) The Siebert S102 and S302 remote digital displays can be directly connected to the SIWAREX FTC via an RS 485 interface. (not suitable for belt scale mode) **Siebert Industrieelektronik GmbH PO Box 1180 D-66565 Eppelborn Tel.: +49 6806/980-0 Fax: +49 6806/980-999** Internet: http://www.siebert-group.com/en Detailed information is available from the manufacturer.	

Technical specifications

SIWAREX FTC	
Use in automation systems	
S7-300	Directly or via ET 200M
S7-1500	Through ET 200M
S7-400 (H)	Through ET 200M
PCS 7 (H)	Through ET 200M
Communication interfaces	
S7	Through backplane bus
RS 232	For SIWATOOL or printer connection
RS 485	For remote display or digital load cell
Module parameterization	
	Using SIMATIC S7
	Using SIWATOOL FTC software (RS 232)
Measuring properties	
Accuracy according to EN 45501	$3 \times 6\,000\ d \geq 0.5\ \mu V/e$
Internal resolution	+/- 8 million parts
Internal/external updating rate	400/100 Hz
Several parameterizable digital filters	Critically dampened, Bessel, Butterworth (0.05 ... 20 Hz), mean-value filter
Weighing functions	• Non automatic weighing instrument, force measurement • Belt scale • Loss-in-weight scale • Solids flowmeters
Load cells	Strain gauges in 4-wire or 6-wire system
3 characteristic value ranges	1, 2 or 4 mV/V
Load cell powering	
Supply voltage U_s (rated value)	10.3 V DC
Max. supply current	184 mA
Permissible load cell resistance	
• R_{Lmin}	> 56 Ω > 87 Ω with Ex interface
• R_{Lmax}	≤ 4 010 Ω
Max. distance of load cells	
When using the recommended cable:	
Standard	1 000 m (3 280 ft)
In hazardous area [1]	
• For gases of group IIC	300 m (984 ft)
• For gases of group IIB	1 000 m (3 280 ft)
Connection to load cells in Ex zone 1	Optionally via SIWAREX IS Ex interface
Ex approvals zone 2 and safety	ATEX 95, FM, cUL_US Haz. Loc.
Auxiliary power supply	
Rated voltage	24 V DC
Max. power consumption	500 mA
Current consumption on backplane bus	Typ. 55 mA
Inputs/outputs	
Digital inputs	7, electrically isolated
Digital outputs	8, electrically isolated
Counter input	Up to 10 kHz
Analog output	
• Current range	0/4 ... 20 mA
• Updating rate	100 Hz
Degree of protection according to EN 60529; IEC 60529	IP20
Climatic requirements $T_{min\,(IND)} ... T_{max\,(IND)}$ (operating temperature)	
• Horizontal installation	-10 ... 60 °C (14 ... 140 °F)
• Vertical installation	-10 ... 40 °C (14 ... 104 °F)
EMC requirements	EN 61326, EN 45501, NAMUR NE21, Part 1
Dimensions	80 × 125 × 130 mm (3.15 × 4.92 × 5.12 inch)

Technical specifications (Continued)

SIWAREX FTC	
Weight	600 g (0.44 lb)

[1] For further details, see Ex interface, type SIWAREX IS.