

GraviProfi

Gravimetric throughput measurement and control for extruders and blend feeders



Functionality in the right place

GraviProfi is used together with a weighing unit to measure the throughput of an extruder or a blending unit using the loss-in-weight principle. As a controller it acts on the screw or feeder to keep throughput at the setpoint. A complete interface to the drive controller can be provided.

The communication to a supervisory PLC is made by communication links according to:

- ▶ **Profibus DP**
- ▶ **Modbus RTU or EI-Bisynch**
- ▶ **digital / analogue I/O**

The instrument can be installed at the weighing unit or in a cabinet.

Extension of the PLC capability

GraviProfi takes the complete function of throughput measurement and control support from the PLC.

System implementation is easy to do

GraviProfi makes it easy to integrate a complex function into a PLC program.

An example of a PLC program, an electronic simulation model and configuration software help to implement and to test the gravimetric function.

The most interesting features:

Flexibility:

- Modular hardware
- Configurable software
- Structured functions for measurement, control and sequencing to derive:
 - throughput
 - feed rate
 - speed setpoint
 - material consumption

Functions:

- Precise measurement, optimal control
- Adaptive hopper refilling
- Adaptive control
- Start-up and change of working points in control
- Diagnostics by detailed status information
- Configurable alarms
- Supervision and control of the drive module

Hardware Interface:

Weighing unit:

- Supply of load cell
- Direct input of the load cell mV-signal; distance <200m
- Output to shutter valve, incl. position feedback

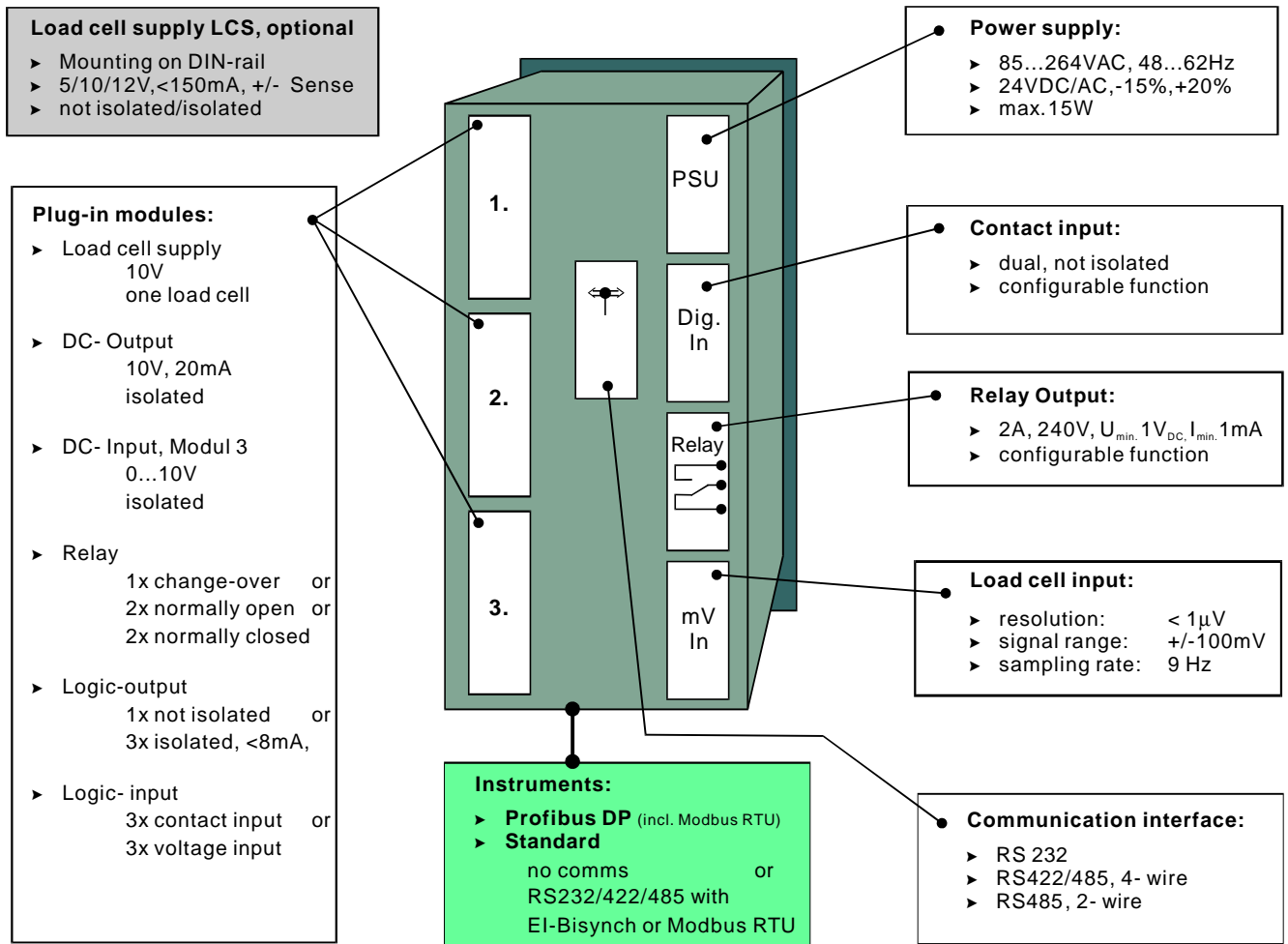
Drive control:

- Speed setpoint: 10V/20mA
- Speed feedback signal: 0...10V
- Drive enable and alarm feedback

Tools:

- The **electronic simulation** of the weighing unit and feeder or extruder helps to check the PLC-program and significantly reduces tests on a machine.
- **Example programs** help to start up a PLC project in short time.
- **Configuration software** makes it possible to set up an instrument and to store data for maintenance.
- GSD-file config.-SW supports the set-up of the Profibus DP.

Hardware options and configurations



Profibus features

Protocol	Profibus DP, no FMS-support	Slave type	intelligent
Baudrate	9,6k ... 1,5 Mbaud autom. baudrate detection	Sync/Freeze	yes
		Stationsmax.	32 per segment max. 127 with repeaters

I/O functions

Analogue-inputs

- ▶ mV- In load cell signal
- ▶ DC-Input drive speed or (in slot 3) remote setpoint

Digital- inputs

(Dig.In 1/2 or module 1...3)

- ▶ Setpoint select 1/2
- ▶ Manual/automatic
- ▶ Drive enable
- ▶ Drive status feedback
- ▶ Material totalisation - hold
- ▶ Material totalisation - reset
- ▶ Enable valve position feedback
- ▶ Valve position feedback
- ▶ Init feeding rate
- ▶ Init feeding rate adaptation
- ▶ Init adaptation of operating point

Analogue- outputs

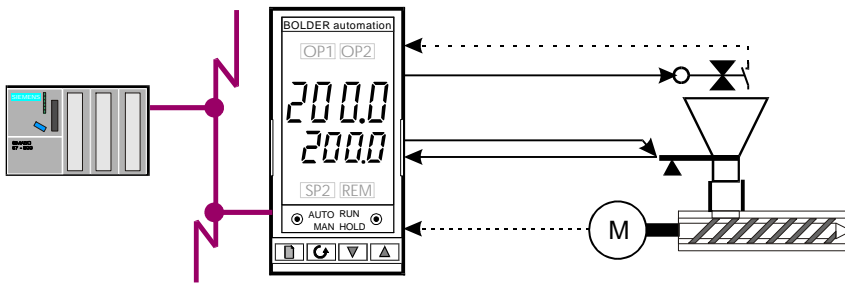
- ▶ Drive output ♦ Setpoint
- ▶ Throughput ♦ control error
- ▶ Feed rate

Digital- outputs

(relay or module 1...3)

- ▶ Valve control
- ▶ Enable drive
- ▶ Manual/Automatic setpoint
- ▶ Manual/Automatic process value
- ▶ Throughput value valid
- ▶ Alarm: hopper empty OR valve failure
- ▶ Alarm: throughput tolerance
- ▶ Alarm: feed rate tolerance
- ▶ Alarm: material blockage
- ▶ All configurable alarms

Typical applications



Throughput measurement:

GraviProfi offers throughput measurement, including refilling sequencing, as a basic function.

If the instrument reads the screw speed as a remote DC-signal, or via serial communication, the material consumption and feeding rate can be calculated.

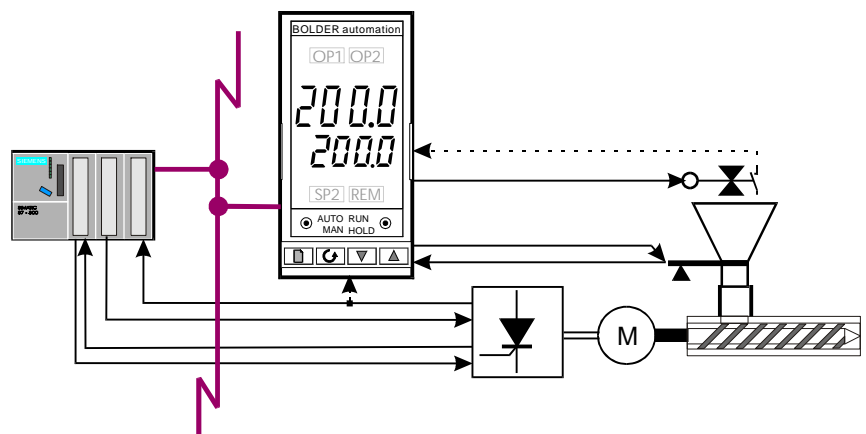
An independent closed loop throughput controller in the PLC can be fed with relevant values from the instrument.

Throughput control as a retrofit to existing installations

GraviProfi as a controller is suited for retrofit applications where the drive control is connected to the PLC. All additional features are carried out in the instrument so as not to burden the PLC program.

For control, a set of data has to be exchanged between the instrument and the PLC. All calculations and checks run on the GraviProfi.

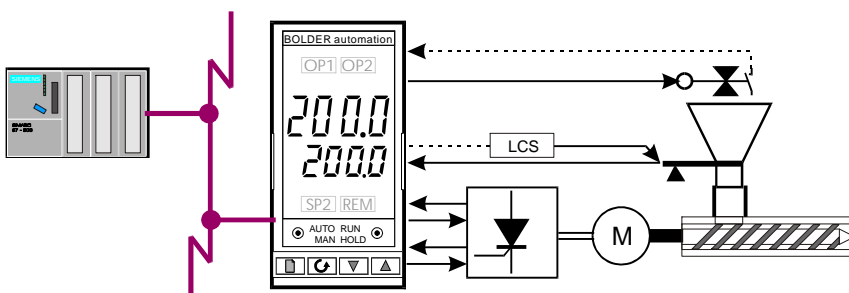
Just a small change in the PLC program is necessary to use throughput instead of screw speed settings.



Distributed gravimetric control

GraviProfi's biggest advantage is the gravimetric package for distributed control, including the drive interface. The instrument is simply supplied with power and connected to the communication link. The supervision of the drive is included.

That concept is especially suited for single blend feeders. Each gets its own distributed instrument for control.



Tool-Set:

ProfiConf	GSD- file configurator to set-up the GSD file from available instrument parameters.
GraviConf	Configuration- and application revision control software.
GraviSim	Electronic simulation of weighing hopper and feeder/ extruder
PLC project example	ready to use PLC project showing the integration of GraviProfi into Simatic S7-300 (CPU315-2 DP).

Ancillary electronic components:

LCS	Load cell power supply in 6-wire technology (lead and temperature compensation) length < 200m, max. 4 load cells in parallel
IFMA	Frequency-/voltage converter to read the speed from an encoder or a counter 0.1 Hz ... 25kHz
ISC	Comms converter: RS 232 to RS422 or RS485
Modules	GraviProfi- Module to be added later on, see below

Order code:

GraviProfi/instrument/function/supply/module1/module 2/module 3/comms/docu

Instrument	2408 2408f	Instrument, 96x48x150mm, relay, 2x contact input, ambient temperature: 0...55°C Instrument, 96x48x150mm, relay, 2x contact input, Profibus DP- HW, 0...55°C
Function	M C	throughput measurement controller for throughput or blend feeding
Supply	VH VL	wide range power supply, 85-264VAC, 49...62Hz, <15W low voltage, 24VDC/AC, -15%,+20%
Module 1...3	XX R2 R4 RR D2 D4 D6 TK TL TP L2 WP G5 TS	none relay, normally open 1x $I_{max.}: 2A$ $U_{max.}: 264V_{AC}$ $U_{min.}: 12V_{DC}$ $I_{min.}: 100mA, R-load$ relay, change-over 1x $I_{max.}: 2A$ $U_{max.}: 264V_{AC}$ $U_{min.}: 12V_{DC}$ $I_{min.}: 10mA, R-load$ relay, normally open 2x $I_{max.}: 2A$ $U_{max.}: 264V_{AC}$ $U_{min.}: 12V_{DC}$ $I_{min.}: 100mA, R-load$ DC output 1x n. isolated U: 0...10V, $R_L > 500R$ I: 0...20mA, $R_L < 600R$ DC output 1x isolated U: 0...10V, $R_L > 500R$ I: 0...20mA, $R_L < 600R$ DC retransm. output 1x isolated U: 0...10V, $R_L > 500R$ I: 0...20mA, $R_L < 600R$ contact input 3x n. isolated. logic-input 3x isolated. U: 11... 30V _{DC} logic-output 3x isolated U: 12...132V _{DC} , I: < 8 mA logic-output 1x n. isolated U: 18V _{DC} , $I_{max.}: 24mA$ only in slot 3 remote input 1x isolated U: 0...10V _{DC} or U: +/-100mV _{DC} , $R_i > 100M$ load cell supply 1x isolated U: 10V _{DC} , $R_L > 300R$ transmitter PSU. 1x isolated U: 24V _{DC} , $I_{max.}: 20 mA$
Comms	XX A2 F2 Y2 PB	none comms interface RS232 isolated comms interface RS422 isolated comms interface RS485 isolated Profibus DP comms interface isolated
Docu	XX D E	none german english

Examples of order coding :

Throughput instrument: GraviProfi/2408/M/VH/R2/XX/G5/XX/E

	2408	Instrument, 96x48x150mm, relay, 2x contact input
	M	throughput measurement
	VH	wide range power supply, 85-264VAC, 49...62Hz, <15W
Dev. band alarm:	R2	relay, N.O.
	XX	none
	G5	load cell supply 10V
	XX	no comms
	E	documentation in English

with: relay: valve control output

Distributed controller: GraviProfi/2408f/C/VL/D4/R2/WP/PB/XX additional LCS

	2408f	Instrument, 96x48x150mm, relay, 2x contact input, Profibus DP- HW
	C	controller for throughput or blend feeding
	VL	low voltage, 24VDC/AC, -15%,+20%
DC- output to drive:	D4	DC output, isolated
Drive enable:	R2	relay, N.O
Feedback drive speed:	WP	signal- input, 0...10VDC
	PB	Profibus DP comms interface
	XX	no documentation

including: relay: valve control output
digIn 1: drive alarm feedback

Ancillary component: **LCS** load cell power supply