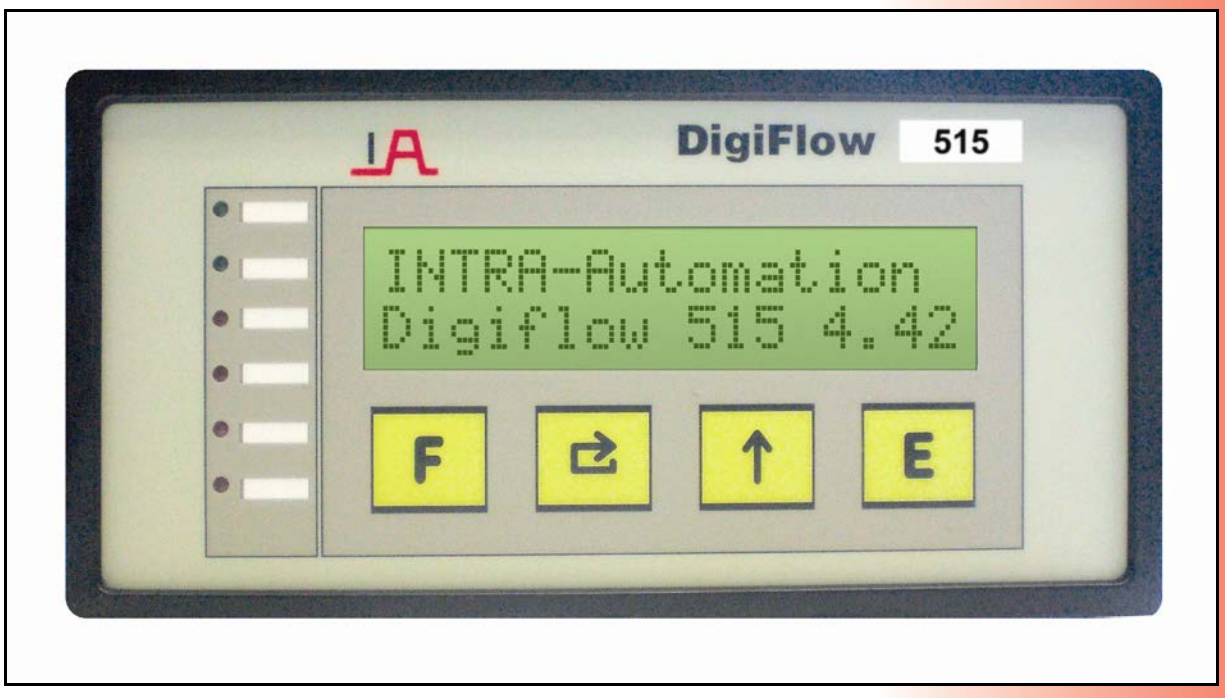
INTRA-AUTOMATION

MESS- UND REGELINSTRUMENTE / MEASUREMENT AND CONTROL

Certified according to ISO 9001; PED 97/23/EC; ATEX 2014/34/EU

Microprocessor Gas and Steam Flow Computer
Energy Flow Computer
(Consumption and Enthalpy for Steam)

Series: DigiFlow
Type: 515



Technical Information

03/2012

FLOW

THE EXPERT IN LEVEL AND FLOW

Intra-Automation
Technical Information
03/2012

Technical details subject to be changed without notice.

For comments regarding this brochure, please contact
info@intra-automation.de

Series: DigiFlow
Type: 515

Microprocessor Gas and Steam Flow Computer
Energy Flow Computer
(Consumption and Enthalpy for Steam)

List of Contents:

1 Functions

- Indication of flow rate and total of volume, mass and energy
- Temperature and pressure compensation
- Input signals 4…20 mA analogue or frequency for flow input
- Dual ranged ∆p-transmitter inputs
- Simple programming
- User menus in three languages
- Control of a sensor-purge-unit
- Data logging output

The **DigiFlow 515** combines compensation for gas and vapors to the following equations:

1. *Ideal Gas:* Temperature and pressure correction; compressibility correction not required.
2. *General Gas:* Temperature and pressure correction with compressibility correction calculated using the Redlich-Kwong state equation. This equation is suitable for gases with known properties. Information about common industrial gases are provided in the operating manual.
3. *Natural Gas:* Compressibility is calculated using the AGA-NX-19-mod equation for natural gases of low gross caloric value.
4. *Steam Flow Computer*: Based on the IFC 1967. Mass flow correction of the flowing steam using pressure and temperature.
5. *Energy*: The heat quantity is calculated based on enthalpy and mass flow.(for steam)
6. *Energy Balance:* Assuming a mass balance in upstream-and downstream pipe, an energy balance of the loop is calculated. (for steam in upstream)

Inputs from several flow meters are accepted. Examples of these sensors are (**VORTEX**)**,** turbine, orifice plate, averaging pitot tubes like (**ITABAR**-Flow sensor), wedges and target flow meters. To increase the measured flow range of an **ITABAR**-Flow sensor, it is possible to use two differential pressure transmitters whose ranges overlap with automatic crossover in the computer.

The backlit two rows alphanumeric display shows the instantaneous readings of Flow or Totals, and the four key touchpad it is used to program and configure the unit.

All **DigiFlow 515's** are equipped with 4 analog inputs 4 – 20mA, 2 frequency inputs and 2 Pt100– inputs for RTD according to DIN 43760 in 2–,3– or 4–wire connection.

A scalable Pulse Output to drive external counters, 2 Relay Outputs for Low/High-Flow alarms and an RS232 interface are also standard features of the **DigiFlow 515**.

Optionally there are up to two scaleable Analog Outputs available.

There is also a capability to control an Sensor Purge Unit for automatic purge control in hazardous environments.

The Pulse Output, and the Alarm Outputs will operate proportionally to the mass, corrected volume or energy depending on which value will be displayed as Standard Display.

The Analog Output can be assigned to one of measured or calculated values, shown on the display.

The RS232/RS485 Interface will output all parameters which are displayed. This can be done to a printer or a host computer.
An integrated real time clock is included to send protocols in selectable intervals, up to 9999min. Accumulated totals may be reset.

The Totals can be reset by pressing the related key on the keyboard or by a voltage input at the related rear-terminal jack.

The **DigiFlow 515** is powered by AC of 115/230 VAC 50/60 Hz. Optionally voltages between 24 and 28 V AC/DC.

The **DigiFlow 515** provides an adjustable voltage of 18V DC for powering sensors. Maximum current is 100mA.

2 Flow Meter Inputs

Most types of flow meters can be used in conjunction with the **DigiFlow 515**. Including:

1. *Linear frequency producing* flow meters like (**VORTEX**), turbines or positive displacement.
2. *Non–linear frequency producing* flow meters. A 12 point correction curve can be programmed to linearize the signal.
3. *Volumetric* flow meters with outputs of 4 – 20mA such as (**VORTEX**) or turbine meters with a frequency to current converter on the output.
4. *Differential Pressure devices* for **ITABAR–**sensors or orifice plates, where a square law relationship applies.
5. *Linear Differential Pressure devices* where the 4 – 20mA output is proportional to the flow rate.
6. *Dual Range Differential Pressure devices* where two separately spanned transmitters are used across a common flow device (**ITABAR**–sensor).

Non–linear Differential Pressure devices like laminar flow tubes. A 12 point correction curve can be programmed to linearize the signal.

3 Displayed Parameters

During operation the display shows information which is selected by pressing the SCAN-key. After one minute, without any key press, the display will return to the selected standard display.

Standard display :
- Flow rate of the mass, corrected volume or energy is displayed in units per day, hour, minute or second.
- By pressing the TOTAL-key the display changes to show the accumulated totals of mass, volume or energy. These counters can be reset by pressing the RESET-key if allowed.

Gas flow :
- Corrected volume (m³ or SCF)
- Mass (kg or lbs)
- Temperature and pressure (°C or °F, kPa or psi)
- Compressibility [except ideal gas]
- Date and time

Steam flow :
- Mass (kg or lbs)
- Energy (MJ or BTU)
- Temperature and pressure in upstream (°C or °F, kPa or psi)
- Specific weight and enthalpy in upstream (dm³/kg or kJ/kg)
- Temperature and pressure in downstream (°C or °F, kPa or psi) [only when energy-balance]
- Specific weight and enthalpy in downstream (dm³/kg or kJ/kg) [only when energy-balance]
- Date and time

4 Technical data

General:

Display	:	backlit, alpha-numeric LC-display, 2 rows, 16 cols, 0.276” char. Height
Keyboard	:	sealed membrane keyboard with four keys
Transmitter supply	:	18 V/100 mA, adjustable via keyboard, isolated
Power	:	115/230 V AC; 50/60 Hz, internally switchable option: 24…28 V AC/DC power consumption: 10 W @ 230 V AC without options
Operating temperature	:	0...55 °C (32…131 °F)
Housing	:	enclosure: glass-fiber-reinforced plastic material; front: aluminium keyboard
Face	:	watertight to IP54
Dimensions	:	144 mm (B) x 72 mm (H) x 130 mm (T)
Panel cut-out	:	137 mm (B) x 67 mm (H)

Programming and configuration:

Handheld	:	No handheld terminal needed. All necessary constants and parameters can be programmed using the keypad.
Language	:	German, English or French selectable

Frequency input:

Frequency range	:	0,25…10 kHz Input 1 0,25…500 Hz Input 2
Input circuits	:	Most AC, logic and proximity switches accepted. 0,5…50 V_{PP}
Non-linear correction	:	Up to 12 points for curve fit

Analogue input 4…20 mA:

Inputs	:	2 for flow (split range), 1 for pressure and 1 for temperature **or** 2 for flow (split range) and 2 for pressure for energy-balance.
Input impedance	:	120 Ω
Circuit	:	All inputs are isolated, no common ground

RTD-input:

Range	:	-190...+800 °C [-310…+1472 °F]
RTD type	:	Pt100 acc. to DIN 43760
Non-linear correction	:	The non-linearity of the RTD is internally compensated.

Pressure input:

Type	:	absolute or gauge
Span	:	The pressure values at 4 mA and 20 mA are programmable. Linear interpolation for all other points.
Atmospheric pressure	:	If a gauge pressure sensor is used, the atmospheric pressure must be entered.

Pulse output:

Pulse width	:	adjustable between 10 ms and 90 ms.
Duty cycle	:	≥1 : 1
Logic	:	open collector, active low
Current sinking	:	max. 100 mA
Pulse generation	:	The pulse count is proportional to the counter difference in selectable units of 10 (1, 10, 100,…, 100000)

External keyboard:

Function	:	One input controls the display and one input resets the total counters.
Circuit	:	An input voltage higher than +18 V is detected

Communication port:

Type	:	A RS232 interface is provided. Option: RS485 multipoint communication interface for up to 312 instruments connected to a common bus.
Baud rate	:	300…9600 Baud
Data bits	:	7 or 8 selectable
Parity	:	Non, even or odd
Stop bits	:	1 or 2 selectable
Data logging	:	Output in intervals up to 9999 minutes or by key stroke.

Relay output:

Function	:	High and Low-flow rate alarms based on the flow rate, corrected volume, or energy.
Form	:	Normally open (SPST)
Max. voltage	:	250 V AC
Max. current	:	6 A AC

Options:

Analogue outputs:

Function	:	Free selectable: Output current proportional to one of the displayed values. Set points at 0/4 mA and 20 mA, linear interpolation between.
Output span	:	0…20 mA or 4…20 mA selectable
Resolution	:	12 Bit
Max. load	:	500 Ω internally powered 800 Ω externally 24 V powered
Powering	:	If there is no external supply >15 V, the output will be internally powered automatically

Control of a sensor-purge-unit:

Function	:	Two relays control the solenoid activated valves of a sensor purge unit. During the purging time and an additional selectable time after purging, the flow input is maintained.
Time between purging	:	10 minutes to 31 days 23 hours 50 minutes
Purge duration	:	1…999 s
Time constant	:	1…99 s

Algorithms:

Ideal gases:

Display	:	Corrected volume (m³ or SCF), mass (kg or lbs)
Temperature range	:	-273…+1000 °C [-460…+1832 °F]
Pressure range	:	0…100000 kPa_{abs} [0…14514 psi a]

General Gas:

Gases	:	Handles most gases where critical temperature, critical pressure and specific gravity are known.
Compressibility	:	Calculation using the Redlich-Kwong[1] equation
Ranges	:	Same as ideal gas.

[1] Redlich & Quong “An Equation of State”, Chem Rev., vol. 44, p. 233, 1949

Natural Gas:

Gases	:	Natural gases with a gross caloric value of 31,8 MJ/m³ to 38,8 MJ/m³, specific gravity ot 0,554 to 0,75, density at reference conditions of 0,716 to 0,970 kg/dm³ and a and a CO2 and N2 modular fraction of 15 % each.
Compressibility	:	Uses the AGA-NX-19-mod equation.
Temperature range	:	-40…+115,6 °C [-40…+240 °F]
Pressure range	:	101,325…13,790 kPa_{abs} [14,7…2,001 psi a]

Steam:

Calculation	:	Uses 1967 IFC Formulation (ASME) equations to calculate specific weight and enthalpy of steam.
Steam type	:	Liquid water, saturated and superheated steam
Temperature range	:	0,01…800 °C [32,02…1472 °F]
Pressure range	:	0…100000 kPa_{abs} [0…14514 psi a]
Saturated steam	:	Either the temperature or pressure input required (not both).

5 Ordering codes

Code	Description					
515	Gas- and Steam-Flow-Computer, Type DigiFlow-515					
	Housing					
	S	Panel mounting IP54 (Standard)				
	T	Panel mounting with lockable transparent door				
		Power supply				
		2	230 V AC (Standard)			
		1	115 V AC			
		4	24 V AC/DC			
			Analogue output			
			X	without		
			1	One analogue output		
			2	Two analogue outputs		
			3	Three analogue outputs		
				Communication port		
				2	RS232 – Serial interface (Standard)	
				4	RS485 – Multipoint serial interface	
					Sensor-purge-unit	
					S	without relay output
					L	with relay output for sensor purge unit
515						

Besides the products covered by this brochure, Intra-Automation GmbH also manufactures other high-quality and high precision instruments for industrial measurement tasks. For more information, please contact us (contact details on the backside of this brochure).

Flow measurement

Itabar®-Flow Sensor

IntraSonic IS210 Ultrasonic Flow Meter

Level measurement

ITA-mag. Level Gauge

MAGLINK Level Indicator

Other Measurement Tasks:

DigiFlow Flow and Level Computers

IntraCon Digital Controllers

IntraDigit Digital Indicators / Meters

INTRA-AUTOMATION

MESS- UND REGELINSTRUMENTE / MEASUREMENT AND CONTROL

International Headquarters:
Intra-Automation GmbH
Otto-Hahn-Str. 20
41515 Grevenbroich
GERMANY

☎ +49 – (0) 21 81 / 7 56 65-0
🖷 +49 – (0) 21 81 / 6 44 92

🖱 info@intra-automation.de

Sales Office for the BENELUX:
B.V. Intra-Automation HTP
PO Box 10
4730 AA Oudenbosch
THE NETHERLANDS

☎ +31 – (0)165 – 32 22 01
🖷 +31 – (0)165 – 32 29 70

🖱 info@intra-automation.nl

💻 www.intra-automation.com