INTRA AUTOMATION GmbH

elektronische Meß- und Regelinstrumente

MESS- UND REGELINSTRUMENTE

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Microprocessor Heat and Energy Flow Computer (Consumption and Specific heat capacity) DigiFlow 516

Functions

- Indication of Flow Rate and Total of Volume, Mass and Energy.
- Temperature and Pressure Compensation.
- Input Signals 4-20 mA analog or frequency for flow input.
- Dual Ranged D.P. Transmitter Inputs
- Simplified 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.
6. *Energy Balance:* Assuming a mass balance in upstream-and downstream pipe, an energy balance of the loop is calculated.

Inputs from various of flowmeters are accepted. Examples of these sensors are (**VORTEX**)**,** turbine, orifice plate, averaging pitot tubes like (**ITABAR**-Flow sensor), wedges and target flowmeters. To increase the measured flowrange 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 scaleable 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, the Alarm Outputs and the Analog Output will operate proportionally to the mass, corrected volume or energy depending on which value will be displayed as Standard Display. The Analog Output can alternatively be assigned to one of the temperature proportional signals from the RTD Inputs.

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.

Flowmeter Inputs

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

1. *Linear frequency producing* flowmeters like (**VORTEX**), turbines or positive displacement.
2. *Non–linear frequency producing* flowmeters.
   A 12 point correction curve can be programmed to linearize the signal.
3. *Volumetric* flowmeters 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).
7. *Non–linear Differential Pressure devices* like laminar flow tubes.
   A 12 point correction curve can be programmed to linearize the signal

Parameters Displayed

During operation the Display shows information which is selected by pressing the SCAN–key. After one minute, without any keypress, 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 (m^3 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 (dm^3/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 (dm^3/kg or kJ/kg) [only when Energy–balance]
- Date and time

Technical Specifications

General:

Display:	Backlighted, alphanumeric LC–Display, 2 rows, 16 cols. Each char is 0.276" high.
Keyboard:	Sealed membrane keyboard with four keys.
Transmitter supply:	18 V / 100 mA; via keyboard adjustable, isolated.
Power:	115/230 V AC; 50/60 Hz internally switchable. Optionally 24-28 V AC/DC Power consumption 10 W @ 230 V AC without Options.
Operating Temperature:	32 – 131 °F
Housing:	Enclosure: glass–fiber reinforced synthetic material; Front: aluminum keyboard membrane.
Face:	Watertight to IP 54 (NEMA 4X equal)
Dimensions:	5.7" W × 2.8" H × 5.1" D
Panel cutout:	5.4" W × 2.6" H

Programming and Configuration:

Handheld:	There is no handheld terminal required. All necessary constants and parameters are 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.

Analog 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:	-310 to +1472°F.
RTD Type:	Pt100 according to DIN 43760.
Non–Linear Correction:	The non–linearity of the RTD is internally compensated.

Pressure Input:

Type:	Absolute or gauge.
Span:	The pressure at 4mA and 20mA 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:	An RS232 interface is provided. Optionally there is a RS485 multipoint communication interface for up to 32 instruments connected to a common bus.
Baud Rate:	300 – 9600 Baud.
Data Bits:	7 or 8 selectable.
Parity:	None, even or odd.
Stop Bits:	1 or 2 selectable.
Data logging:	Output in intervals up to 9999 min or by key stroke.

Relay Output:

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

Options:

Analog Outputs:

Function:	Selectable: Output current proportional to standard display or of one RTD input. Setpoints at 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 >15V the output will be internal 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 maintened.
Time between purging:	10 minutes to 31 days 23 hours 50 minutes.
Purge Duration:	1 to 999 s
Time Constant:	1 to 99 s

Algorithms:

Ideal Gas:

Display:	Corrected Volume (m^3 or SCF), Mass (kg or lbs)
Temperature Range:	-273 °C (-460 °F) to +1,000 °C (1,832 °F)
Pressure Range:	0 kPa_{abs} (0 psia) to 100,000 kPa_{abs} (14,514 psia)

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.

Natural Gas:

Gases:	Natural Gases with a gross caloric value of 31.8 MJ/m^3 to 38.8 MJ/m^3, specific gravity of 0.554 to 0.75, density at reference conditions of 0.716 kg/m^3 to 0.970 kg/m^3, and a CO_2– and N_2– molar fraction of 15% each.
Compressibility:	Uses the AGA–NX–19–mod equation.
Temperature Range:	-40 °C (-40 °F) to 115,6 °C (240 °F).
Pressure Range:	101.325 kPa_{abs} (14.7 psia) to 13,790 kPa_{abs} (2,001 psia).

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 °C (32.02 °F) to 800 °C (1,472 °F).
Pressure Range:	0 kPa_{abs} (0 psia) to 100,000 kPa_{abs} (14,514 psia).
Saturated steam:	Either the temperature or pressure input required (not both).

Ordering-Information

Code	Option or Feature
515	Gas and Steam Flow Computer

Code	**Housing**
S	Panel mounting IP54 (Standard)
T	Panel mounting with lockable transparent door IP55

Code	**Power Supply**
2	230 V AC Line (Standard)
1	115 V AC Line
4	24 V AC/DC

Code	**Analogue Output**
X	No Analog Output
1	One Analog Output
2	Two Analog Outputs

Code	**Communication Ports**
2	RS232-Serial Interface (Standard)
4	RS485-Multipoint Serial Interface

Code	**Sensor--Purge-Unit**
S	Without Relay Output
L	With Relay Output for Sensor-Purge-Unit

[1] Redlich & Kwong,, „An equation of State“, Chem Rev., vol. 44, p233, 1949