

# MONITORING OF MEDIUM CONSUMPTION OVER LEVIFLOW

### **Application Note**

#### PR-2400-10 Rev01

Introduction

**Schematics** 

In most instances semiconductor Fabs have no (or limited) control of their medium consumption. Chemicals, which are in use, are very expensive in both the acquisition and disposal. With LeviFlow<sup>™</sup> from Levitronix<sup>®</sup>, semiconductor Fabs are able to monitor/control their facility consumption in an easy and precise manner and can react in the event of an unusual and/or unexpected high consumption of medium. LeviFlow is a ultrasonic flowsensor based on transit time measurement.

A "Volume Counter" function that is a feature of LeviFlow enables monitoring of the overall weekly, monthly and annual consumption of each chemistry.

Main background for this application is to waste NO medium in an uncontrolled way.

This application note provides a technical overview in order to monitor the consumption flow.



### Benefits

- Precise flow measurement with High Purity ultrasonic flowsensor
- Secure monitoring of medium consumption per tool
- Configurable measurement options for volume ml, ltr or m<sup>3</sup>
- Simple flowsensor installation
- Chemically inert flow path PFA wetted components, high chemical compatibility to highly aggressive chemicals (including HF) up to 100°C (higher temperatures on request)
- No moving parts no particle generation in flowsensor or maintenance.
- Very competitive pricing at high performance
- Correction factor for fluids with higher viscosity
- 6-channel converter available for highly cost effective solutions
- Simple to connect a high number of flowsensors by bus system (RS485 Modbus)
- Bubble tolerant for use with gaseous liquids



# PR-2400-10 Rev01

## LeviFlow<sup>™</sup> Sensor (available in U- and Z-shape):

Product range



LeviFlow<sup>™</sup> Converter:



There are two types of converter available:

- 1) Single channel converter (left side, connects to an individual flowsensor)
- 2) Multi channel converter (right side, conntects up to 6 flowsensors)



# MONITORING OF MEDIUM CONSUMPTION OVER LEVIFLOW

### Application Note

PR-2400-10 Rev01

Crossview through wafer Fab / Proposal





# MONITORING OF MEDIUM CONSUMPTION OVER LEVIFLOW

### **Application Note**

#### PR-2400-10 Rev01

Our Proposal for implementing such a monitoring/control function is to use our datalog software (LeviFlow Config Software) and collect all data in a central HDD storage (PC/Laptop), other data logging systems can be used as well. For detail please see schematic below:





PR-2400-10 Rev01

The way how this feature works:

We are using our LeviFlow<sup>™</sup> software feature "volume counter". Volume Counter Setup (Totalizer):

- Counter per volume (.1ml, 1ml, 10ml, etc) and Pulse Length per count
- Volume settings per Output Signal activation
- N.O. or N.C. Contact Operation for Digital Outputs

| ) Parameter Settings   |   | _ 🗆 X  |
|--|---|--|
| Basic<br>Sensor Size<br>4mm(LFS-04) ▼<br>Full Scale ( 0.010 to 100.000 )<br>4.000 L/min<br>Unit of Flow in Display<br>L/min ▼<br>Damping Time ( 0.0 to 25.0 )<br>0.2 s<br>Low Cutoff ( 0.0 to 25.0 )<br>0.0 %<br>Kinematic | Flow Alarm Settings         Hysteresis (0.0 to 20.0)       0.0       ≈         Alarm High       Value (0.0 to 125.0)       Contact Type         105.0       ≈       N.0.       ▼         Alarm Low       Value (-10.0 to 125.0)       Contact Type       •         -10.0       ≈       N.0.       ▼         Volume Counter Settings       Volume Counter Enable       ▼         Volume Counter Base Unit       1       ▼         Multiplier Factor       ×1       ▼ | Flow Signal Error Behavior<br>Flow Level on Error<br>-25%<br>Error Ignore Time ( 0 to 99 )<br>2 s<br>Bubble Detection Settings<br>Bubble Detect Hold Time ( 0 to 99 )<br>0 s |
| Viscosity (0.0 to 99.99) 1.00 cSt Analog Output Settings 4.20 mA   | Volume Counter Pulse Length 50 ms 💌<br>Volume Counter Alarm Enable 🗖  | Firmware Version<br>1601<br>Serial Number<br>1C09F087  |
| Digital Injud Settings       Volume Counter Reset       Digital Output Settings       Digital Output 1       Flow Signal Error       Digital Output 2       Flow Signal Error  | Volume Counter Alarm H       Contact         Value       Contact         (0 to 999999)       equals         50       50 L       N.O. ▼         Volume Counter Alarm HH       Contact         Value       Type         (0 to 999999)       equals         0       0 L         Volume Counter Reset       Reset   | Device No. Select<br>No.1<br>Zero Adjust<br>Data Transfer<br>Write to<br>Converter<br>Converter  |

The settings above mean that when 1 liter (volume) has passed through the sensor, a pulse signal is created that can be additionally logged via our datalogging software. To summarize, this feature provide the chemical consumption data on a daily, weekly, monthly or yearly basis, along with flow rate (Max, Min and average).





PR-2400-10 Rev01

The "volume counter" has an additional function over a digital input where it is possible to reset the counter back to zero.

| ļ le  | ¥IFLO₩™ Co        | nfig Software ¥1.14  |                                  |                   |            |                             | ×                |
|-------|-------------------|----------------------|----------------------------------|-------------------|------------|-----------------------------|------------------|
| File  | Calibration       | n Parameter Settings | s Configuration File             | Wave Monitor Help |            |                             | EVITRONIX        |
| _     |                   |                      |                                  |                   |            |                             |                  |
|       |                   |                      | Flow Graph                       |                   |            | Device No.1 Flow            | Device No.4 Flow |
|       |                   |                      | FLOW CH1                         |                   |            | Full Scale<br>4000 mL (min  | Full Scale       |
|       | 1400 £.           |                      |                                  |                   |            | Flow Quantity               | Flow Quantity    |
|       | 1.00              |                      |                                  |                   | :          | -0.800 mL/min               | mL/min           |
|       | 1200 <del> </del> |                      |                                  |                   |            | mL/min                      | mL/min           |
|       | 4000              |                      |                                  |                   | : (        | Volume Counter              | Volume Counter   |
|       | 1000 +···<br>7 I  |                      |                                  |                   |            | Device No 2 Eleve           | Device No 5 Flow |
| , ini | 800 +             |                      |                                  |                   |            | Full Scale                  | Full Scale       |
|       | , į               |                      |                                  |                   | 1          | Flow Quantity               | Flow Quantity    |
| - B   | 600 <del>[</del>  |                      |                                  |                   |            | mL/min                      | mL/min           |
|       | 400 +             |                      |                                  |                   | 1          | Average Value               | Average Value    |
|       | 400 +             |                      |                                  |                   |            | Volume Counter              | Volume Counter   |
|       | 200 ‡             |                      |                                  |                   |            | Device No 3 Flow            | Device No 6 Flow |
|       | Ŧ                 |                      |                                  |                   |            | Full Scale                  | Full Scale       |
|       | ــل 0             | 115 17               | <del>                     </del> | 120 125           | 140        | Elow Quantity               | Elow Quantity    |
|       |                   | 115 12               | ZU 125<br>Time [s]               | 130 135           | 140        | mL/min                      | mL/min           |
|       |                   |                      |                                  |                   |            | Average Value               | Average Value    |
|       | 0.02.15.710       | Communication        | Mode Select                      | Data Logging      | _          | Volume Counter              | Volume Counter   |
|       | 0.02.10.110       |                      | LFC-6C Mode                      | Data Log Enable   |            |                             |                  |
|       |                   | Interval             | Average Mode                     | Directory Select  |            | Status Monitor 🔤 🗖 Flow Mor | nitor Setting    |
|       |                   | 50 m                 | 15                               | Selected!!        |            | STATUS Flow Unit            | Min Flow         |
|       | START             | Top Device No.       |                                  | (100 to 60000)    |            | mL/min                      | ▼ 0 mL/min       |
|       |                   | No.1 💌               |                                  |                   | Data / TCH |                             | 1500             |
|       | 1                 | Device Count         |                                  |                   |            |                             | Time Scale       |
|       | STOP              |                      |                                  |                   |            |                             | 30 8             |
| _     |                   |                      |                                  |                   |            |                             |                  |



| PR | -240 | 0-1 | 0 R | ev/01 |
|----|------|-----|-----|-------|
|    | 2    |     |     |       |

| Media waste<br>– cause and | <ul> <li>Needle valve adjustment for flow is not a calibrated method</li> <li>→ actual flows can be higher from process specified or requested.</li> </ul>   |  |  |  |  |  |
|----------------------------|--|--|--|--|--|--|
| effect                     | <ul> <li>Defective pneumatic valves, valve closes not correctly or is damaged , jammed poppet in the valve body</li> <li>→ low flow or total loss of flow that can lead to process drift or loss of yield when no feedback signal is available.</li> </ul> |  |  |  |  |  |
|                            | <ul> <li>Process to drain applications</li> <li>→ facility shut of valves are damaged or defect.</li> </ul>  |  |  |  |  |  |
|                            | <ul> <li>2 or 3-way valves in recirculation line         <ul> <li>→ switching between CDS reclaim and drain line is not correct that can result in chemical loss.</li> </ul> </li> </ul>   |  |  |  |  |  |
|                            | <ul> <li>Tank maximum fill sensor is not responding         <ul> <li>→ facility shut off valve get no signal from fill sensor so an overflow into the chemical drain is possible.</li> </ul> </li> </ul>   |  |  |  |  |  |
|                            | <ul> <li>Leak Sensor in chemical cabinet is defect</li> <li>→ fluids can't be detected and a leake ca damage the tool</li> </ul>   |  |  |  |  |  |
| Technical<br>Support       | For troubleshooting, support and detailed technical information contact <i>Levitronix</i> <sup>®</sup> <i>Technical Service Department</i> :   |  |  |  |  |  |
|                            | Levitronix Technical Service Department<br>Technoparkstr. 1<br>CH-8005 Zurich<br>Switzerland<br>Phone: +41-44-445 19 13<br>E-Mail: TechSupport@levitronix.com  |  |  |  |  |  |