What is an MFC & How Does it Work? An Introduction to MFCs
Burkert Mass Flow Controllers are a competitive product group in the market and an opportunity for Distributors.

The “IT” List – New Product Types Added to our Catalog & QDP
4 new product types added to both the short form catalog and quick delivery program.

Updates to the Burkert Quick Delivery Program & Short Form
Our product offering featured in the Short Form Catalog and Quick Delivery Program have been refreshed based on your needs.
Updated & Refreshed **Short Form Catalog**

- Updated Solenoid Valve Types for the latest generation product releases
- Addition of proportional valves & more combination system solutions
- Added Item Types based on Distributor Feedback & Demand planning (NEW: 2871, 2873, 2875, 3285, 7011, 7012, 8605, 8693, 7012, 8653)
- Inclusion of more items in the QDP utilizing a strategic inventory plan and distribution insights/requests

**Expanded Quick Delivery Program Offering**

- Increased # of items included in the QDP based on distribution requests
- New solenoid valves included
- Proportional valves were introduced
- Added focus products that have seen upgrades (e.g. Rockwell AOP/AOI enabled devices)

**‘I Need A’ Sheets Updated on Website**

The Burkert ‘I Need A’ sheets that assist our technical team in specifying the correct Burkert item # to fit specific requirements have been integrated directly onto the burkert-usa.com website.

The MFC/MFM ‘I Need A’ sheet has also been added to the available forms to better assist with specifying MFCs and/or MFMs.

As always – directly linked on the **Distributor Toolbox**
The “IT” List – New QDP Product Types Added

Your purchases and feedback pushes our Quick Delivery Program stocking plan and inventory! The following 4 product types are new additions to both the Short Form Catalog and Quick Delivery Program.

**Type 8681** - Control head for decentralized automation of hygienic process valves
- Universal attachment for hygienic process valves
- Contactless position measurement system with 3 switching points (Teach-In function)
- Coloured status display
- Manual override operative with closed housing
- *AS-Interface, IO-Link, büS/CANopen*

**Type 8691/ 8692/ 8693** - Control heads for decentralized automation of ELEMENT process valves
- Servo-assisted diaphragm valve up to DN65 orifice
- Contact-free inductive valve position registration (Teach-In function) (8691)
- Easy start-up by automatic X-Tune function (8692/93)
- Colored illuminated status display (8691)
- Integrated control air routing in the actuator
- Fieldbus interface, IO-Link, *AS interface, EtherNet/IP, PROFINET, Modbus TCP, PROFIBUS DP-V1* or *Bürkert system bus (büS)*
- Compact, robust stainless steel design

**Type 8652** - AirLINE - the valve island optimized for process automation
- Safety-related shut-off of valves possible
- Easy diagnostics via LC display
- Process reliability through pneumatic functions
- Optimized for installation at the bottom of the control cabinet
- Explosion-proof variants according to ATEX / IECEx Zone 2

**Type 8653** - AirLINE Field - the valve island optimized for process automation
- Fieldbus interface, *CANopen, IO-Link* or *büS (Bürkert System Bus)*
- Easy diagnostics via LC display
- Process reliability through pneumatic functions
- Optimized for installation in the field (IP65/67)
What is an MFC & How Does it Work?

A mass flow controller (MFC) is a device used to measure and control the flow of liquids and gases.

Made up of these primary components
- Mass flow meter (sensor)
- Proportional control valve
- Solenoid: 2871, 2873, 2875, 2836
- Motor: 3285
- Controller/Control electronics

Working principle
- Closed loop control
- Set point - external signal sent to controller (analog or digital)
- Feedback from sensor to controller, compares SP to PV
- Controller adjusts proportional valve to match SP & PV

Mass Flow vs. Volume Flow

Why is mass flow measurement for gases important?

Because gases are compressible!

Ideal Gas Law:

\[
\frac{p \cdot V}{T} = \text{const} \\
\frac{p_1 \cdot V_1}{T_1} = \frac{p_2 \cdot V_2}{T_2} = \text{const}
\]

- Density changes significantly with changing temperature and/or pressure

Mass \( m = \rho \cdot V \), with density \( \rho = \rho(T,p) \)

Volume flow measurement: Measures the volume of gas. For accurate results the pressure and temperature must be measured, additionally to the volume

Mass flow measurement: measures the quantity of gas molecules. Independent from pressure and temperature

<table>
<thead>
<tr>
<th>Temperature (^\circ)C</th>
<th>Density - ( \rho \cdot m^-3 )</th>
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<tbody>
<tr>
<td>40</td>
<td>1.514</td>
</tr>
<tr>
<td>-20</td>
<td>1.395</td>
</tr>
<tr>
<td>0</td>
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<tr>
<td>300</td>
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<tr>
<td>400</td>
<td>0.5243</td>
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<td>500</td>
<td>0.4565</td>
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Air Density @ atmospheric pressure
What is an MFC and how does it work?  
Mass Flow vs. Volume Flow

Example:

<table>
<thead>
<tr>
<th></th>
<th>Volume flow</th>
<th>Temperature</th>
<th>Pressure</th>
<th>Density</th>
<th>Mass flow</th>
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</thead>
<tbody>
<tr>
<td>Flowmeter 1</td>
<td>1 m³/h</td>
<td>293 K</td>
<td>1 bar(g)</td>
<td>1.205 kg/m³</td>
<td>1.205 kg/h</td>
</tr>
<tr>
<td>Flowmeter 2</td>
<td>0.172 m³/h</td>
<td>353 K</td>
<td>7 bar(g)</td>
<td>7.001 kg/m³</td>
<td>1.205 kg/h</td>
</tr>
<tr>
<td>Flowmeter 3</td>
<td>0.167 m³/h</td>
<td>293 K</td>
<td>6 bar(g)</td>
<td>7.23 kg/m³</td>
<td>1.205 kg/h</td>
</tr>
</tbody>
</table>

Density \( \rho = \frac{m}{V} \rightarrow \)  
Mass \( m = \rho \cdot V \)

\[
\frac{p_1 \cdot V_1}{T_1} = \text{const}
\]
\[
\frac{p_2 \cdot V_2}{T_2} = \text{const}
\]

Why Burkert?

<table>
<thead>
<tr>
<th>Features</th>
<th>Burkert Unique Benefits</th>
</tr>
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</table>
| Compact and integrated flow control loop      | • Reduction of electrical and mechanical interfaces  
• Space saving and easy to install  
• Optimized PID controller |
| Flow measurement without moving parts within the flow channel | • Pressure and temperature independent measurement  
• Long lifetime |
| Low pressure drop design                     | More efficient processes, suitable for applications with low \( \Delta p \)             |
| Direct acting, simple solenoid control valves | • Cost-effective  
• high span  
• excellent repeatability |
| Flow measurement directly in the gas         | Short response and settling time                                                        |
| Integrated flow conditioner                  | No special inlet and/or outlet requirements necessary                                    |
| Real gas calibration                         | High precision mass flow measurement                                                    |
| Burkert Communicator                         | Free software: command and monitor, customer recalibration                             |
Burkert MFCs Type 8741/8742 Overview

Mass Flow Controller (MFC)/ Mass Flow Meter (MFM) for Gases

- Nominal flow ranges from 0.010 l/min to 160 l/min
- High accuracy and repeatability
- Very fast response times
- Easy device exchange through configuration memory
- Optional: USP Class VI, FDA, EG 1935 conformity

Interfaces:
- Analog
  - 0/4...20 mA
  - 0...5/10 V
- büS / CANopen
- Industrial Ethernet
  - PROFINET
  - Ethernet/IP
  - Modbus-TCP
  - EtherCAT
- IP Protection
  - IP20 - 8741
  - IP65 - 8742

Table of Approvals and Descriptions:

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<th>Description</th>
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<td>Approval UL 61010 – 1 (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - Part 1: General Requirements)</td>
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<td>Conformity of all materials in contact with the medium USP Class VI &quot;In vitro&quot; and &quot;In vivo, Implantation&quot; – Code of Federal Regulations Title 21 Paragraph 177 (CFR 21 177.2600)</td>
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</tr>
<tr>
<td>FDA</td>
<td>Description</td>
</tr>
<tr>
<td>Regulation (EC) No 1935/2004 on materials and objects intended to come into contact with food</td>
<td></td>
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</table>

Burkert MFCs Type 8745/8746 Overview

Mass Flow Controller (MFC)/ Mass Flow Meter (MFM) for gases

- Nominal flow ranges from 20 l/min up to 2500 l/min
- High accuracy and repeatability
- Communication via standard signals or Industrial Ethernet
- Electromagnetic and motor-driven valve actuation available
- Easy device exchange through configuration memory

Interfaces:
- Analog
  - 0/4...20 mA
  - 0...5/10 V
- Industrial Ethernet
  - PROFINET
  - Ethernet/IP
  - Modbus-TCP
  - EtherCAT
  - CAN open
- IP Protection
  - IP20 – 8745
  - IP65 - 8746

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<td>FDA</td>
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Applications for MFCs

Applications of gases can be seen in:
- Metallurgy
- Surface technology/ thin films
- Producing glass and ceramics
- Medical, pharmaceutical or biotech devices
- Chemical industry: foaming/ aeration of PVC or PU
- Food & Beverage industry
- Water treatment: Aeration
- Analytics – Test benches
- Semiconductor industry
- Fuel Cells
- Gas scrubber/ Abatement

Applications for MFCs: **Metal and Glass**

Metal Manufacturing & Processing : Gas flow control
- Gas nitriding
  - N2, NH3,
- Carburizing
  - C3H8, CH4, NG
- Bottom gas stirring:
  - Ar, N2
- Flame spraying carrier gas
  - Ar, N2

Metal and Glass Processing : Flame control
- Burner control
  - C3H8, CH4, H2, O2, N2, Ar

Applications for MFCs: **Food & Beverage**

Inert gas filling/ modified atmosphere packaging (MAP)
To avoid chemical reactions with ambient air and increase shelf life
- Potato chips, Meat
- Gases used: O2, CO2, N2, Ar

Foaming/ Aeration
- Ice cream, Chocolate, Marshmallows
- Gases: Air, N2
Literature & Video Content Featuring MFCs/MFM

Best Practice | SWTZ GmbH
High-strength metals for more safety
Reliable gas supply and atmosphere for the precise hardening of steel, aluminium and non-ferrous metals.

Best Practice
Härterei Carl Gommann GmbH
Optimising the furnace atmosphere in heat treatment plants.

Precise gas control
for exact analyses

Faster disinfection process increases efficiency and reliability

Precise gas flow control
for repeatable fermentation processes

Molten Metal Treatment

Coriolis for Surface Treatment

Fluently measure and control precise coating

Fermentation with mass flow controllers
Type 8714 / 8712 / 8515 / 8714

Product Overview:
Mass Flow Controllers for Gases

Literature items shown are available in digital format only.
Success Sharing! Building Business with MFCs

Application: Coating Equipment

Burkert Advantage: Worked with end user to define requirements

Key to success:
• Response time
• Attention to technical details
• Distributor has strong position with integrator
• Persistence: customer took 10 months to place order

Results:
• Order even bigger than first quoted
• Nearly $40,000 order for the distributor

Success Sharing! Joint Webinar Event

Joint webinar with your existing customers and contacts
• Burkert prepares presentation and presents content
• Q&A session
• Good to check customer interest
• Position your company as a resource

Success Sharing!
Congratulations to French Gerleman!

Moving up from a Gold to Platinum Level Distribution Partner!

AND… the announcement of the merger with IAC Supply Solutions to form the all new Agilix Solutions!
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**SERVICE ANNOUNCEMENT:**

Burkert will be upgrading our SAP sales and order processing platform on Thursday, November 11th through the weekend. During this time, orders and shipments will not be processed, however regular business activities will resume on Monday the 15th of November. This will impact both our inside sales processes and the E-Shop.

Want to help us make this newsletter more relevant for you?  
Email feedback on what you would like to see included in upcoming issues to us at marketing-usa@burkert.com.