



MEDENUS

Gas Pressure Regulation



GMF - Gas Mass Flow Controller

General Description

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1 General Description

The GET GMF Gas Mass Flow Controller realizes a closed-loop control of the fuel gas used for large gas engines, gas turbine furnaces, or burners. It comprises an electromechanical actuator, a butterfly valve, a gas flow sensor, and the FECU control unit.

The FECU is a derivative [further development] of the AKR 3 Anti-Knock Control, applied a.o. on the MTU gas BR4000 gas engines. The FECU software comprises additional software for gas engine controls. Gas mass flow control via the GMF is one of them.

The GMF/FECU receives flow set point information via a CAN J1939 or CAN-open interface from the customer's engine management system. Said set-point information can be synchronously or asynchronously to the engine cycle.

In default configuration, the refresh rate of the set point is every 20ms.

This document mentions the specifications for GMF (valve, flow meter, pressure sensors, and actuator) and the FECU as a controller. The turndown ratio is at least 1:45. The resolution is 1000 digits, of which 978 digits are effective. Both 15V or 24 V power supplies apply to the GMF device without extra modification. The FECU needs a 24V supply voltage. While the power supply is disconnected, the GMF enters a closed position due to Internal spring pre-load. Maximum flow is 375 [m³n/h, methane, @ 100 mbar delta-p] GMF Type B, C, D- GMF versions describe max flow rates. Respectively

375 Nm³; 750 Nm³; 1350 Nm³ Methane. Adaption to the gas composition goes through configuring the GMF software before commissioning. Reconfiguration can be taken care of in the case of a change in gas composition onsite, remotely via internet access. when appropriate.

Accuracy, for steady-state conditions, in terms of reproducibility in gas mass flow adjustment is +/- 0.2% of the GMF range. For transient conditions, the accuracy is +/- 2%. Both apply to the input gas temperature range of -10°C to +70°C. For extended gas temperature ranges, solutions can be made available on demand.

2 Unique product features

- GMF can cope with high (boost) pressure gas admission.
- GMF provides gas mass flow measurement with high accuracy and repeatability.
- GMF provides the gas-mass-flow-measurement value via CAN message. (CAN J1939)
- GMF optimizes closed-loop engine efficiency by validating the ratio between engine/generator power output and the GMF's gas-mass-flow-measurement-value.
- GMF offers fast, closed-loop control of gas mass flow with high accuracy.
- GMF offers model-based feed-forward control of lambda set point value
- GMF offers the integral value of accrued gas mass consumption after defined reset events

Maximum flow conditions					
GMF Type	Intake	Flange	Outlet	Flange	Max. Flow
B	2"	DN 80	2"	DN 80	375 Nm ³ /h
C	3"	DN 100	2"	DN 100	750 Nm ³ /h
D	4"	DN 100	3"	DN 100	1350 Nm ³ /h

3 GMF preliminary specification

Operating Conditions

Fuel blends	Landfill, Methane, Propane, Butane, Biogas
Flow range	Size B: 375 Nm³/h CH ₄ Size C: 750 Nm³/h CH ₄ Size D: 1350 Nm³/h CH ₄
Turndown ratio	1:45 up to 1:180, depending on the set-up
Max. Design pressure	1.6 MPa
Max. inlet pressure (operating pressure)	500 kPa (Gauge pressure)
Recommended minimum differential pressure	4 kPa (for turbocharged engines, gas admission into the high-pressure manifold) 15 kPa for naturally aspirated engines
Gas temperature	-10°C 70°C (full accuracy) Extended temperature ranges on request
Fuel cleanliness max. particle size	5 µm

Performance

Control operating modes	Position control, flow control, fault control
0-100% step flow control (t10-t90)	50-70 ms
Repeatability flow control	0.2% of range
Settling time flow control	160 ms
Accuracy flow control	1% of range for size B and C ~1% on demand, depending on D

Electrical / Mechanical

Power supply	18-32 V DC, 4.5 A
CAN bus protocol	J1939
CAN bus baud rate	250 kBit, 500 kBit, 1 Mbit
Actuator flow update rate	20 ms
Standard flange for the whole GMF family	DN 80 PN16 /10 (DIN 2501)
Weight	B: 10.5 kg / C: 11 kg / D: 12 kg
Dimensions, standard length	395 mm
Mounting position	Recommended position, vertical or horizontal. Throttle shaft in a horizontal position for appliances where condensate is expected.

Environmental

Ambient Humidity	noncondensing 0-97% rel.
Ambient and storage temperature	-20°C - +70°C storage temp max 60°C
Vibration test	5Hz - 2000Hz, 3g, no resonances below 90Hz
Shock test	IEC 60068-2-27 Test EA, 30g
EMC	EN 61000-6-2, EN 61000-6-4
Protection	IP 65, according to IEC60529
Intake deflagration (backfire pressure pulse)	900 kPa
Intake deflagration (flame protection)	The mixer design should act as a flame quencher, and the Laminar flow element of the flow sensor should act as a flame quencher.
Corrosive gases	H ₂ S max. 0.1 Vol% (gas has to be dry max. relative humidity < 60%) For well head gases: TBD, appropriate measures have to be taken to clean these gases Tri-Ethylene-Glycol resistant

Safety

Power loss	Fail-safe position = closed position
Communication loss	Fail-safe position = closed position
Safety requirements electrical	EN 61010-1
Sealing	Released for 1.6 MPa

Reliability / Durability

Service Life	40,000 h overhaul by manufacturer
continuous operation	Yes, without interruption
number of closed-open cycles	10E6

Other standards

EX standards US and CA	pending
ATEX standards	pending
Machine directive	compliant
CE conformity	89/336/EEC (electromagnetic compatibility) 89/392/EEC (machinery) 90/396/EEC (appliances burning gaseous fuels)

4 FECU - GMF Controller Specification

Operating temperature	-25 to 105 °C (-13 to 221 °F)
Storage temperature	-40 to 105 °C (-40 to 221 °F)
Climate	97 % RH to IEC 60068-2-30
Operating altitude	0 to 4000 m above sea level
Aux. supply	18 to 32 V DC Max. 400 mA
Inputs, vibration	Up to 24 sensor signals, Sensor type: Bosch
Inputs, speed	1 camshaft sensor input 1 crankshaft sensor input (optional) Range: 300 to 2800 RPM Pickup type required: Differential Hall effect sensor with push-pull output stage or inductive sensor
Communication	1 x CAN bus J1939 1 x RS-232 for PC tool
Mounting	Any direction
Safety	To EN 61010-1, installation category III, 24 V DC, pollution degree 2
EMC/CE	To EN 61000-6-2, EN 61000-6-4 IEC 60533 Power distribution zone IACS UR E10 Power distribution zone
Vibration	Amplitude +/-1.6 mm, acceleration +/-4.0 g Test frequency 30 Hz if no resonance frequencies are found Duration 90 min To IEC 60068-2-6/Test Fc & IACS UR E10
Shock	50 g, 11ms, half sine. To IEC 60068-2-27
Material	Housing: Aluminum Connectors: Polyamide PA66 materials according to UL94 (HB) Additional connector cover for UL and Marine approvals: Plastic material self-extinguishing according to UL94 (V0)
Plug connections	AMP
Protection	IP65 to IEC/EN 60529
Approvals	CE marking, Inquire for marine approvals
Weight	1.5kg

Contact

Shanghai DYD Industrial Equipment Co., Ltd.

1/4, Building 1, No.111 Zhiye Road, Pudong, Shanghai

William Wang

 william.wang@dydtec.com

Tel.: +86 13917939376

 www.dydtec.com