

KOLBENSCHMIDT PIERBURG GROUP



**ELECTRIC DRIVE MODULE –**  
Fast and Precise Adjustment of  
Distance and Angle

## General description

On gasoline and diesel engines there are a large number of control and regulating functions involving adjustments to distances and angles. Included is the adjustment of the flaps on high-performance (variable) intake manifolds or the positioning of the control flaps (swirl and tumble) located in the intake system for best possible charge mixture. In the exhaust system, flaps are used for fine-tuning sound and for emission control. Nowadays, many of these control and regulating functions are still performed by vacuum driven positioners although new vehicles and engines (direct injection, VVT, fuel cell, electrically powered vehicles) increasingly dispense with vacuum as an auxiliary or secondary source of energy. At the same time, however, there is a call to reduce system complexity since dependability inevitably suffers from component and interface proliferation. Universal electric positioners such as the Pierburg EDM electric-motor or motorized module are used wherever fast and precise adjustment of distances and angles is required. When switching over from vacuum positioners to motorized mod-

ules, functionality gains both in terms of improved control precision and the ever more important onboard diagnosis (OBD) requirements.

On the Pierburg EDM positioner, the rotating movement of a DC motor is converted with the aid of a gear unit into an angle. The combination of DC motor and gear allows both high positioning speeds and forces for a large number of final actuating devices such as valves, flaps, etc. Since the direction of rotation on the EDM is reversed by switching polarity, the dynamic level is high in both directions. Depending on requirements, a single- or dual-stage spur or worm gear is used. The former allows spring-loaded resetting and in the event of any system malfunction, the device reaches a defined final position (fail-safe function).

Pierburg's EDMs are chiefly intended for engine compartment installation. Depending on their size, the housings may be of high-grade plastic with integrated connecting plug or die-cast aluminum.



## EDM-B

This is a no-frills positioner designed to replace a simple ON/OFF vacuum system. When the final position is reached, a logic module cuts off power. The self-locking action of the worm gear makes sure that a final position is then retained. A fresh switching pulse from the controller causes adjustment to the alternative position. Power for the EDM-B is from the on-board system. A signal line connects with the controller (open-collector interface). Position monitoring is optionally available on the EDM-B too.

## EDM-S

The EDM-S comes with an integrated sensor (potentiometer) for position feedback. Together with a H-bridge located in the engine controller and corresponding position control (closed-loop), the EDM-S can be used for selecting and maintaining a position anywhere between two extremes. The EDM-S has a five-pin connecting plug (2x engine +/-, 1x voltage supply angle sensor, 1x earth, 1x output signal).

## EDM-i

The “i” stands for an electric positioner with integrated “intelligence.” This unit allows both stepless adjustment between the two extremes and selective positioning at any point within the operating angle. Conversion to the desired angle is effected by the electronics integrated in the components and the motorized actuator. The engine controller transmits to the actuator in the form of a PWM signal the desired angle and this signal is then converted into the corresponding angle by the module’s integrated position control electronics. Internal feedback of the actual position is taken care of by an angle sensor (either potentiometer or contact-free sensor). For actuation purposes, the EDM-i needs only three leads – battery, ground, PWM signal. Any malfunctioning is reported to the engine controller via ground of the control signal lead or a separate diagnose (fourth) pin.

The electronic unit of the control valve is equipped with a processor and offers extended diagnosis options via high-capacity data memories. This allows highly flexible, tailored adjustment of the interface parameters. There is also a serial interface for communicating with BUS systems. To upgrade positioning precision in the installed state (system precision), the EDM-i in its standard version allows self-calibration (zero setting, full-scale deflection). Extensive self-diagnosis reports permit customer-specific analysis of any system failures (OBD).

## Philosophy

Pierburg’s EDM modular kit allows positioning times and positioning forces as required in most of today’s gasoline and diesel engine environments. The Company’s experience in motorized drives for throttle and control plates has helped in effectively translating the requirement profiles into reliable and perfectly functioning components. The various units of the Pierburg Group have contributed to the complete products their expertise in the engineering and manufacture of the mechanical components, the electric actuators, and the angle sensors. This is after all the only way to ensure an integrated design that achieves functional reliability and cost-efficient engineering.



Fig. 1: EDM-B

Fig. 2: EDM-S



Fig. 3: EDM medium

Fig. 4: EDM large

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