

# Installation and Maintenance Manual

## EV10 Electronic Proportional Flow Controller



### 1 SAFETY INSTRUCTIONS

This manual contains very important information to protect users from potential injuries and to safeguard the system from possible damages. This manual must be read to guarantee the correct use of the product; Prior to use, reading the manuals of the devices connected to the Electronic proportional flow controller is also recommended.

Keep this manual readily available in a secure and easily accessible location.

Potential hazardous situations are classified into three different levels, indicated by the terms "**DANGER**," "**WARNING**," and "**CAUTION**." Each hazard indication comes along with important pieces of information that must always be strictly observed.

To ensure safety, also refer to the following norms:

- **UNI EN ISO 4414:** Pneumatics - General rules and safety requirements for pneumatic fluid power and components used on machinery
- **JIS B 8370:** Pneumatic fluid power - General rules and safety requirements for systems and their components

▲ DANGER	Under extreme conditions, severe injury or death may occur.
▲ WARNING	Failure to follow instructions may result in serious injury or death.
▲ CAUTION	Failure to follow instructions may result in personal injury or damage to the system.

#### ▲ WARNING

The system designer or the person defining the technical specifications are responsible for selecting the pneumatic equipment suitable for use. Since pneumatic components may be used in various working conditions, their proper integration into a specific pneumatic system must be based on their technical specifications or on analyses and tests carried out for the intended application. Only properly trained personnel are authorized to operate pneumatic machinery and equipment.

Compressed air can be hazardous if used by untrained personnel. The assembly, the use, and the maintenance of pneumatic systems must be carried out exclusively by experienced, specifically trained personnel. Prior to performing any operations on the machinery or on the system, ensure safe working conditions.

The inspection and maintenance of machinery and systems must be performed only after securing all moving parts. Before working on a single component, ensure that all required safety lockout procedures are in place. Shut off the electrical and pneumatic supply and vent the compressed air left in the circuit.

Before restarting the machinery/system, make sure that all safety measures have been taken to prevent sudden cylinder movements (slowly introduce air into the system to create back pressure, i.e by installing a progressive start-up valve).

Do not operate the product under conditions different from those specified. Contact **Cmatic S.p.A.** if the electronic proportional flow controller needs to be used under any of the following conditions:

- Operating and environmental conditions are different from the specified parameters, or in case of outdoor use of the product.
- Installations in nuclear and medical power systems, railway or in general transportation systems, food and beverage

processing plants, recreational facilities emergency stop circuits, presses, or safety-related installations.

- Applications that could negatively impact people, properties, or animals and therefore require specific safety studies;

**Cmatic S.p.A.** shall not be held liable for direct or indirect damages resulting from improper use of its products, or from a use not consistent to the provided instructions and guidelines. The responsibility for improper use of the product lies with the operator, who is therefore required to verify the safety requirements specified by the manufacturer.

**▲ CAUTION**

Ensure that the pneumatic supply system is equipped with a **5-micron filtration system**.

**2 SPECIFICATIONS**

**2.1 Electric Connection**

Model		ø6 (mm)	ø8 (mm)	ø10 (mm)
Power supply		24 Vdc ± 10%		
Standby current		20 mA		
Maximum current		130 mA		
Maximum supply pressure		10 Bar		
Operating temperature		0-50° C		
Linearity		Max ± 1% f.s.		
Repeatability		±0.5% f.s.		
Hysteresis		Max 1% f.s.		
Sensitivity		Max 0.25% f.s.		
Maximum standby power		0.48 W		
Nominal power during movement		3.5 W		
Maximum Flow Rate (P= 6 bar & ΔP=1)	470 NI/min	620 NI/min	1070 NI/min	Maximum Flow Rate (P= 6 bar &
Maximum response time	Power on: 20 s			
	4 s	4 s		
	Displacement 10% f.s.			
	Displacement 30% f.s.	7 s	10 s	
Displacement 50% f.s.	10 s	16 s		
Digital Interface		RS485 – Half Duplex		
Analog Input		0-10 Vdc		

Impedance	10 kOhm	
Low-pass filter	1.5 kHz	
Digital Output		Mosfet open drain
Pull-up	24 Vdc – pull-up 100 kOhm	
Current	500 mA max	
Cable		6 poles, 28AWG, PVC Ø5 shielded L=250mm
Standards		CE, ROHS, REACH, EMC (EN IEC 61000-6-2 & 61000-6-4)
IP Protection Rating		IP40

The Electric connection is to be made by a 6-pole shielded cable, 25 cm in length, according to the indications below:

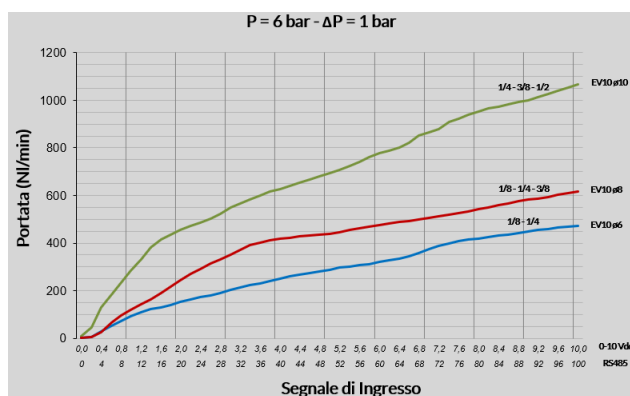
Red: Power supply (+) 24 Vdc	Power supply (+) 24 Vdc
Orange: RS485 A	RS485 A
Yellow: RS485 B	RS485 B
Green: Analog Input 0-10 Vdc	Analog Input 0-10 Vdc
Brown: Digital output	Digital output
Black: Power supply (-) Ground	Power supply (-) Ground

To connect the EV10, use a cable suitable for the physical, chemical, and electromagnetic conditions of the environment. The EV10 is very sensitive; using a cable with shielding features equal to or greater than the one supplied is therefore recommended.

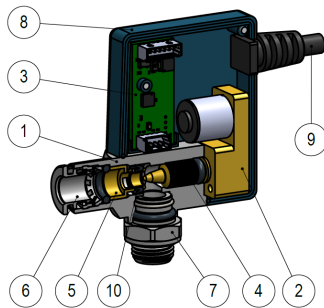
**NOTE:** The electronic proportional flow controller is equipped with ESD protection, overvoltage and reverse polarity protection.

## 2.2 Pneumatic Connection

Recommended hoses: PA11, PA12, PA6, PE, PU. Ensure that the pneumatic supply system has a 5-micron filtration system.



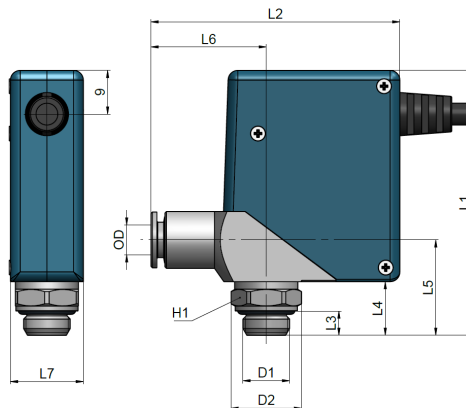
### 2.3 Definition of the EV10 Components



No.	Description	Note
1	Body	Anodized aluminum
2	Servomotor	
3	Electronic board	
4	Needle	CW614N brass
5	Bushing	CW614N brass
6	Push-in fitting	Nickel-plated CW614N brass, POM.
7	Threaded fitting	Nickel-plated CW614N brass, AISI
8	Housing	ABS
9	Cable	PVC Ø5 shielded L=250mm
10	O-ring	NBR

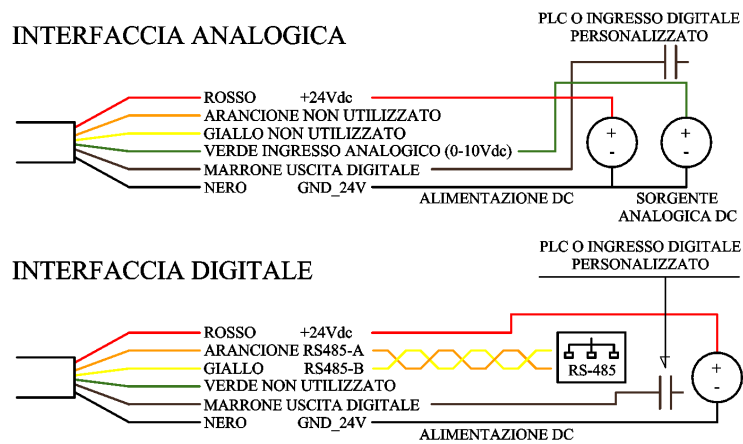
## 3 INSTALLATION

### 3.1 Sizes in mm



OD	D1	D2	L1	L2	L3	L4	L5	L6	L7	H1
6	G1/8	14.5	54.6	50.9	5	11.1	19.7	23.4	15	13
	G1/4	16	58.1	50.9	6.5	14.6	23.2	23.4	15	13
8	G1/8	14.5	55.6	55.1	5	12.1	20.7	26.3	15	13
	G1/4	16	59.1	55.1	6.5	15.6	24.2	26.3	15	13
	G3/8	20	61.1	55.1	7	17.6	26.2	26.3	15	16
10	G1/4	18	59.7	65.5	6.5	16.2	24.8	31.6	16	16
	G3/8	20	63.2	65.5	7	19.7	28.3	31.6	16	16
	G1/2	25	65.2	65.5	8.5	21.7	30.3	31.6	16	16

### 3.2 Wiring Diagram



### 3.3 Assembly Instructions

#### ⚠ CAUTION

Before use, ensure that the EV 10 connections are clean and free from debris, cutting oil, or chips. Avoid pulling, compressing, or applying any bending forces on the regulator body during any connection operation.

Following steps to be observed to guarantee a correct assembly of the EV10:

1. Tighten the threaded fitting abiding by the torque values indicated below:

Thread	G 1/8	G 1/4	G 3/8	G 1/2
Torque	1.2	1.5	2.5	3.5

2. Insert hoses with the following features into the push-in fitting:

Material	PA11, PA12, PA6, PE, PU
Diameter Tolerance	± 0.07mm UP TO Ø10mm

Ensure that during the EV10 connection, no shavings, chips, or sealing material enter the regulator

To avoid system corrosion do not ground the regulator to pipelines.

Before connecting the regulator electrically, check that the voltage is 24 Vdc and that a 5A protection fuse is installed.

Do not pull the electrical cable and ensure that during use, it is not subject to mechanical stress

Observe the minimum bending radius of the cable (10 times the cable diameter) both during installation and when in use. If the cable is subject to a bending radius smaller than the minimum value set or if subject to a pull force, the electronic flow controller can be irreparably damaged

Use only the cables and wiring provided by C.matic S.p.A. along with the control device

For the proper use of the EV10, refer to the assembly diagram.

The Electrical connections and the startup of the EV10 must be performed by specialized personnel.

### 3.4 Operating Principles

#### Premise:

The operating principle of the EV10 controller is based on discretizing the needle stroke into a precise number of positions managed by the stepper motor. EV10 is supplied with this a pre-setup discretization(CALIBRATION process) and in a closed position. For more information, refer to the MODBUS Protocol, which can be downloaded from [www.cmatic.com](http://www.cmatic.com).

#### START-UP:

Once powered up, the electronic flow controller executes the following steps:

- It returns to the last received and saved setpoint. During the entire movement phase, the LED indicator blinks green (500ms ON & 500ms OFF).
- The green LED indicator stops blinking and remains solid when the setpoint is reached,

#### SHUTDOWN:

Turn off the flow controller only after the needle has reached the last setpoint

The flow controller is designed to receive two alternative control modes:

- **Digital RS485 interface**
- **Analog 0-10 Vdc interface (default configuration)**

The control mode is set by a PLC in the configuration menu. For this operation, refer to the MODBUS Protocol, downloadable from [www.cmatic.com](http://www.cmatic.com). The selected operating mode is stored in the EV10 and remains configured until a new setting is applied.

#### DIGITAL INTERFACE (RS485):

This control mode uses a 2-wire RS485 connection to communicate with a PLC or to any compatible host.

- The PLC configuration menu must be used to set the interface and assign a node ID between 1 and 254, as the EV10 operates as a SLAVE device (the value is saved in E2P memory).
- The communication protocol complies with the MODBUS standard and is detailed in the related document.
- The protocol allows full control and diagnostics of the EV10.
- During movement in response to a command, the orange LED indicator blinks (500ms ON / 500ms OFF). Once the movement is completed, the orange LED turns off, and the green LED turns on.
- If the electronic flow controller receives a command while in motion, the new setpoint value will be recorded and processed only after the current movement is completed. If multiple commands are received during a single movement, only the last command received will be executed.
- To ensure that the desired setpoint is correctly stored for the next power-up, make sure it is the last one recorded in E2P memory.
- The minimum signal variation required to trigger movement is 1%

#### ANALOG INTERFACE (0-10 Vdc):

This control mode uses an analog signal with an input range of 0 to 10 Vdc. The regulator provides a digital output signal indicating its status or possible errors (1 = normal operation, 0 = error condition). The analog signal value corresponds to the needle movement as a percentage.

- The EV10 needle moves from setpoint1 to setpoint2 each time a new analog signal value is received. Sending a new setpoint is recommended only after reaching the previous one.
- The minimum signal variation required to trigger movement is 0.1 Vdc. Below some representative values:

0.0V = 0%	5.0V= 50%	10.0V =
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- The signal must be averaged and verified multiple times within a 1-second acquisition window.

During movement in response to a command, the green LED indicator blinks (500ms ON & 500ms OFF). Once movement is completed, the green LED remains constant.

**TROUBLESHOOTING:** The regulator can indicate **six types of errors**, each signaled by specific LED patterns:

Issue	LED	Description
Missing or incorrect command	Red blinking (500ms ON & 500ms OFF)	When the Electronic flow controller receives an unrecognized command (via RS485) or an incorrect CRC, the red LED blinks (500ms ON & 500ms OFF). The Electronic flow controller remains in standby, waiting for a correct command.
Invalid setpoint	Red blinking (2s ON & 2s OFF)	If the regulator receives a positioning setpoint outside the allowed range, the red LED blinks (2s ON & 2s OFF) until a valid command is received.
Positioning issue	Red blinking (2s ON & 2s OFF)	If the Electronic flow controller detects positioning problems (e.g., excessive servomotor strain or the motor not moving), the red LED blinks (2s ON & 2s OFF) the EV10 will attempt an automatic homing and retry positioning. If the second attempt fails, the EV10 remains in an error state until a new command is given.
Homing failure	Red blinking (3s ON & 3s OFF)	If the Electronic flow controller fails to perform homing, the red LED blinks (3s ON & 3s OFF). The regulator will attempt automatic homing and retry positioning. If the second attempt fails, the regulator remains in error status until a new command is given.
Initialization and/or	Red blinking (3s)	If an initialization or communication error occurs in the TMC2300 driver,

communication error	ON & 3s OFF)	the red LED blinks (3s ON & 3s OFF). In this case, turn off the regulator and restart it. If the error persists, contact C.matic S.p.A..
System lock	Solid red LED	A solid red LED indicates an electronic flow controller lockup. The device must be powered off and restarted. If the issue persists, contact C.matic S.p.A..

Power off the Electronic flow controller to reset the alarms, ensuring that the system is safely secured beforehand.

**⚠ CAUTION**

Without electrical power, the electronic flow controller will maintain the position reached; when power is restored, it will perform an initialization procedure, moving the needle to the shut-off position before returning to the requested position. In the presence of strong electromagnetic interference, the regulator's needle may not keep the set position and may move erratically.

### 3.5 Use

**⚠ CAUTION**

The product is supplied in accordance with the factory settings. Do not disassemble the product or remove its parts, as this may cause damage. Protect the product from vibrations and shocks, as they may affect the flow rate.

### 3.6 Environment

**⚠ WARNING**

- Do not use the EV10 in the presence of corrosive gases, chemicals, water, or steam.
- Do not use the EV10 in explosive atmospheres.
- Do not use EV10 in environments subject to strong vibrations or impacts.
- Do not use the EV10 near heat sources.
- Provide suitable protection when using the EV10 in environments exposed to water splashes, oil, welding spatter, etc.

## **4 MAINTENANCE**

**⚠ WARNING**

### **Removal of the product from the system:**

- Shut off the air supply and vent the pneumatic circuit.
- Disconnect the power supply.
- Remove the product.



Low-frequency maintenance operations : to avoid malfunctions operate the electronic flow controller at least once a month. For optimal performance, perform a check every 6 months. Do not disassemble the electronic flow controller, as disassembly will cause irreparable damage.

**⚠ CAUTION**

Air treatment: pay attention to possible blockages in the filter regulators and/or lubricators as this may affect the electronic flow controller performance. Replace the filters after the first year of use or when the pressure drop reaches 0.1 MPa. Periodically remove the impurities from the air filter.

**5 USAGE LIMITATIONS**

**⚠ CAUTION**

- Do not use as an emergency shut-off valve. The regulator is not designed for safety applications, such as an emergency shut-off valve.
- Extended energization: NONE. The use of a servomotor allows the electronic flow controller to maintain a fixed position without power, preventing overheating issues. Upon restoration of power, an automatic zeroing procedure will be performed.
- Industrial use: the electronic flow controller is intended for industrial applications. For use outside this context, contact C.matic S.p.A.
- Maintenance space: The electronic flow controller must be installed in such a way that enough space for easy maintenance is guaranteed (e.g., EV10 removal or similar actions).
- Actuator drive: If actuators like cylinders are driven by the electronic flow controller, ensure appropriate safety measures are in place to prevent potential hazards arising from the actuator's operation.
- Pressure maintenance (full closure): The electronic flow controller does not guarantee perfect tightness in the closed position.
- Interference in the input signal: The electronic flow controller is highly sensitive to the input signal. The needle's position control depends on the voltage applied to the input signal; therefore, even minimal voltage fluctuations due to signal oscillations (or noise picked up along the line) can interfere with positioning and affect the flow rate. Use shielded cables and a sufficiently stable signal generator.
- WARNING: Continuous oscillation around a position leads to premature wear of the motor brushes reducing thereby the electronic flow controller's lifespan.
- Operation with vacuum (-99 kPa): The Electronic flow controller operates with any pressure differential between the two ends, up to the maximum value stated in technical specifications. Pay attention to the direction of operation: the EV10 behaves exactly in the opposite manner if used with vacuum to when under pressure

**6 DISPOSAL**

The product must be disposed of in accordance with the legislation in force in the country where the disposal operation takes place.

**7 CONTACTS**

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