

## Electromechanical Valve Design and Development

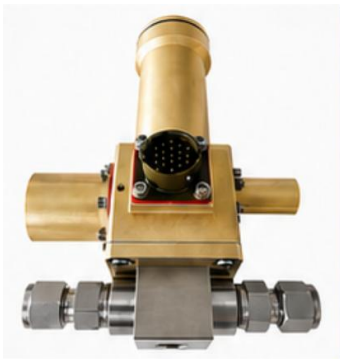
M-D2 develops mission-critical electromechanical valves for defense, aerospace and space applications. Its integrated product development capability brings together mechanical, fluid, electrical/electronic and control engineering.

### Core Capabilities

- Custom valve design for high-pressure gas, pneumatic, hydraulic and liquid lines
- Isolation, on/off and motor-driven valve architectures
- Complete electromechanical actuator and drive system design
- BLDC motor, gearbox and power transmission integration
- Custom mechanical locking and solenoid mechanism development
- Open/closed position sensing and feedback systems
- Embedded motor driver electronics and operating algorithms
- High-reliability sealing and fluid compatibility engineering
- Flow, pressure drop and torque analyses
- Structural, pressure, shock and vibration analyses
- Materials, coatings, heat treatment and special process engineering
- Compact, application-specific mechanical and electrical interface design
- Military-grade connector and harness integration
- Engineering from prototype through series production
- Custom functional and performance test system development
- Leakage, pressure, torque and functional verification
- Analysis-test correlation and design optimization
- Requirements-based qualification for demanding defense and space environments



From valve mechanisms and drive systems to electronics, controls, analysis and qualification, M-D2 has the engineering capability to develop high-performance electromechanical valves to mission and application requirements, without the constraints of a standard valve architecture.



# High-Pressure Isolation Valve

## EV-I-300-12

Designed to safely isolate high-pressure nitrogen lines, this electrically driven electromechanical valve provides reliable isolation in demanding pressure and environmental conditions through open/closed position sensing and mechanical locking.

### Pressure and Flow Performance

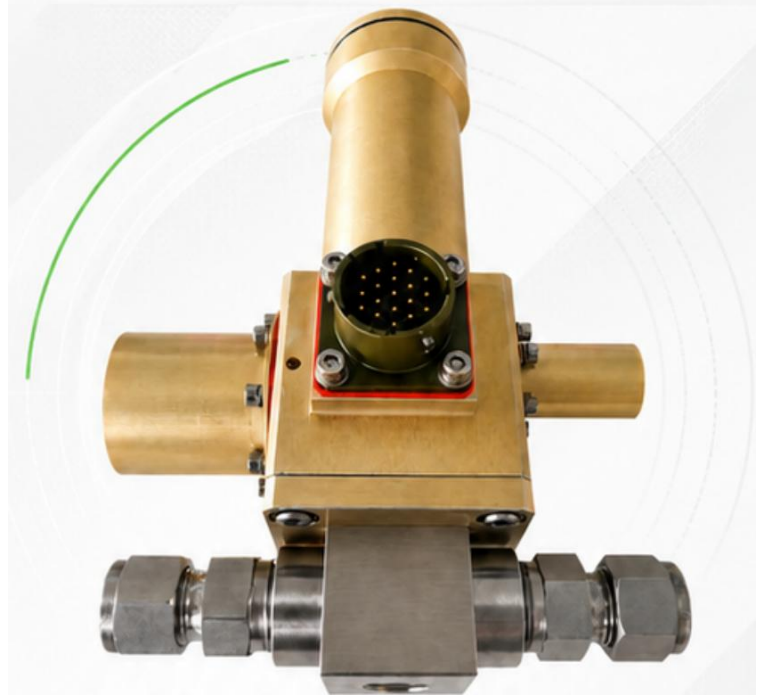
|                          |                               |
|--------------------------|-------------------------------|
| Operating Inlet Pressure | 1–300 barA                    |
| Proof Pressure           | 413 barA                      |
| Max. Internal Leakage    | $6.3 \times 10^{-4}$ scc/s He |
| Max. External Leakage    | $1 \times 10^{-4}$ scc/s He   |
| Opening Time             | 1.5 s                         |
| Closing Time             | 1.5 s                         |

### Electrical Specifications

|                           |                                   |
|---------------------------|-----------------------------------|
| Nominal Operating Voltage | 24 VDC                            |
| Motor Type                | DC                                |
| Motor Power               | 9 W                               |
| Max. Motor Current        | 2.6 A                             |
| Control Electronics       | Integrated control board          |
| Communication             | Position feedback (open/closed)   |
| Position Sensing          | Proximity sensors                 |
| Electrical Interface      | (38999 Series) military connector |
| Cable                     | Military-standard cable           |

### Physical Specifications

|            |                       |
|------------|-----------------------|
| Mass       | 1150 ± 20 g           |
| Dimensions | 175.5 × 117 × 76.5 mm |



\*For detailed technical information, test results and endurance data, please contact us. Custom electromechanical valve design and development solutions are available.

### Environmental Limits

|                          |                                   |
|--------------------------|-----------------------------------|
| Operating Temperature    | –10 to +30 °C                     |
| Max. Ambient Temperature | –10 to +70 °C                     |
| Fluid                    | Nitrogen                          |
| Max. Relative Humidity   | 95%                               |
| Storage Life             | ≥2 years @ –10 to +70 °C, ≤70% RH |

"Across several projects, six different products—an on/off valve; HP12-L, HP12-R and HP12-A hydraulic/pneumatic (12 mm) valves; a P10 pneumatic (10 mm) valve; and an isolation valve—were designed and manufactured by M-D2 Engineering to the supplied technical requirements. Used in flight tests conducted by a defense company on different dates, they achieved the desired results."

Thank you for your contributions to the development, production and demonstrated performance of these products.

— ROKETSAN A.Ş.

# On/Off Valve

## EV-O/O-40-12

Developed for fast, reliable flow control in high-pressure liquid lines, this electromechanical ball valve integrates a BLDC drive, open/closed position feedback and RS-422 communication. It offers precise flow control and reliable operation in harsh environments.

### Pressure and Flow Performance

|                           |                             |
|---------------------------|-----------------------------|
| Operating Inlet Pressure  | 40 barA                     |
| Proof Pressure            | ≥50 bar @ 40 °C             |
| Cv                        | ≥5                          |
| Leakage                   | <1 × 10 <sup>-5</sup> scc/s |
| Opening Time (adjustable) | 100–400 ms                  |
| Closing Time (adjustable) | 100–400 ms                  |

### Electrical Specifications

|                           |                                   |
|---------------------------|-----------------------------------|
| Nominal Operating Voltage | 28 VDC                            |
| Motor Type                | BLDC                              |
| Motor Power               | 70 W                              |
| Max. Motor Current        | 5 A                               |
| Control Electronics       | Integrated control board          |
| Communication             | RS-422                            |
| Position Sensing          | Proximity sensors                 |
| Electrical Interface      | (38999 Series) military connector |
| Cable                     | Military-standard cable           |

### Physical Specifications

|                 |                         |
|-----------------|-------------------------|
| Mass            | 1960 ± 20 g             |
| Dimensions      | 218.8 × 117.6 × 76.6 mm |
| Flow Connection | 12 mm                   |

Opening/closing speed and flow limit can be adjusted by the user within a specified range.



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### Environmental Limits

|                        |                                   |
|------------------------|-----------------------------------|
| Operating Temperature  | –10 to +70 °C                     |
| Fluid                  | Nitric acid                       |
| Max. Relative Humidity | 95%                               |
| Storage Life           | ≥2 years @ –10 to +70 °C, ≤70% RH |

"Across several projects, six different products—an on/off valve; HP12-L, HP12-R and HP12-A hydraulic/pneumatic (12 mm) valves; a P10 pneumatic (10 mm) valve; and an isolation valve—were designed and manufactured by M-D2 Engineering to the supplied technical requirements. Used in flight tests conducted by a defense company on different dates, they achieved the desired results."

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## HP12 High-Pressure Valve

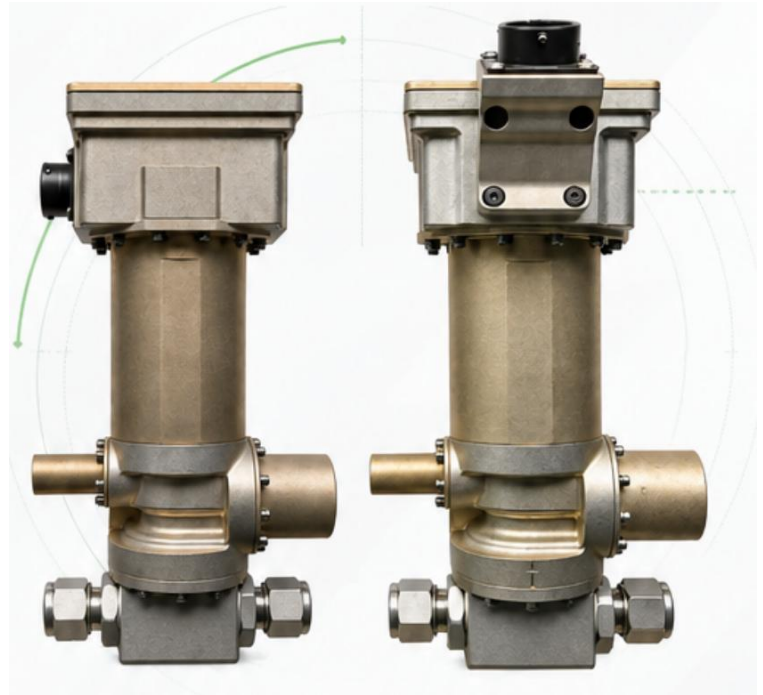
**EV-HP12-30-12-A, EV-HP12-30-12-L, EV-HP12-30-12-R**

HP12 motor valves are 12 mm electromechanical valves designed for fast, reliable opening, closing and line isolation in high-pressure liquid or gas lines. They include open/closed position sensing, mechanical locking and RS-422 status feedback. HP12-L, HP12-R and HP12-A differ only in connector placement.

| Pressure and Flow Performance |            |
|-------------------------------|------------|
| Operating Inlet Pressure      | 30 barA    |
| Proof Pressure                | 60 barA    |
| Cv                            | ≥5         |
| Opening Time                  | 360-400 ms |
| Closing Time                  | 360-400 ms |

|                           |                                   |
|---------------------------|-----------------------------------|
| Nominal Operating Voltage | 28 VDC                            |
| Motor Type                | BLDC                              |
| Motor Power               | 30 W                              |
| Max. Motor Current        | 2.6 A                             |
| Control Electronics       | Integrated control board          |
| Communication             | RS-422                            |
| Position Sensing          | Proximity sensors                 |
| Electrical Interface      | (38999 Series) military connector |
| Cable                     | Military-standard cable           |

|                 |                         |
|-----------------|-------------------------|
| Mass            | 1475 ± 15 g             |
| Dimensions      | 218.8 × 117.6 × 76.6 mm |
| Flow Connection | 12 mm                   |



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| Environmental Limits   |                                   |
|------------------------|-----------------------------------|
| Operating Temperature  | -10 to +70 °C                     |
| Max. Relative Humidity | 95%                               |
| Storage Life           | ≥2 years @ -10 to +70 °C, ≤70% RH |

"Across several projects, six different products—an on/off valve; HP12-L, HP12-R and HP12-A hydraulic/pneumatic (12 mm) valves; a P10 pneumatic (10 mm) valve; and an isolation valve—were designed and manufactured by M-D2 Engineering to the supplied technical requirements. Used in flight tests conducted by a defense company on different dates, they achieved the desired results."

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## P10 High-Pressure Valve

### EV-P10-414-10

The P10 motor valve is a 10 mm electromechanical valve developed for reliable opening, closing and isolation of flow in high-pressure pneumatic lines. It includes open/closed position sensing, mechanical locking and RS-422 status feedback.

| Pressure and Flow Performance |            |
|-------------------------------|------------|
| Operating Inlet Pressure      | 414 barA   |
| Opening Time                  | 360–400 ms |
| Closing Time                  | 360–400 ms |

| Electrical Specifications |                                   |
|---------------------------|-----------------------------------|
| Nominal Operating Voltage | 28 VDC                            |
| Motor Type                | BLDC                              |
| Motor Power               | 30 W                              |
| Max. Motor Current        | 2.6 A                             |
| Control Electronics       | Integrated control board          |
| Communication             | RS-422                            |
| Position Sensing          | Proximity sensors                 |
| Electrical Interface      | (38999 Series) military connector |
| Cable                     | Military-standard cable           |

| Physical Specifications |                         |
|-------------------------|-------------------------|
| Mass                    | 1475 ± 15 g             |
| Dimensions              | 218.8 × 117.6 × 76.6 mm |
| Flow Connection         | 10 mm                   |



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| Environmental Limits   |                                   |
|------------------------|-----------------------------------|
| Operating Temperature  | –10 to +70 °C                     |
| Max. Relative Humidity | 95%                               |
| Storage Life           | ≥2 years @ –10 to +70 °C, ≤70% RH |

"Across several projects, six different products—an on/off valve; HP12-L, HP12-R and HP12-A hydraulic/pneumatic (12 mm) valves; a P10 pneumatic (10 mm) valve; and an isolation valve—were designed and manufactured by M-D2 Engineering to the supplied technical requirements. Used in flight tests conducted by a defense company on different dates, they achieved the desired results."

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# High-Pressure Isolation Valve

## EV-I-320-1/2

Designed for reliable opening, closing and line isolation in high-pressure gas lines, this 1/2-inch electromechanical ball valve includes an integrated BLDC drive, position feedback and RS-422 communication for dependable operation in demanding environments.

### Pressure and Flow Performance

|                          |                               |
|--------------------------|-------------------------------|
| Operating Inlet Pressure | 1–320 barA                    |
| Proof Pressure           | ≥400 barA                     |
| Burst Pressure           | ≥480 barA                     |
| Flow Range               | 0–0.1 kg/s                    |
| Kv                       | ≥5 m³/h/bar                   |
| Max. Pressure Drop       | ≤0.2 bar @ max. flow          |
| Max. Internal Leakage    | 1 × 10 <sup>-4</sup> scc/s He |
| Max. External Leakage    | 1 × 10 <sup>-6</sup> scc/s He |
| Opening Time             | 1000 ms ±5%                   |
| Closing Time             | 1000 ms ±5%                   |

### Electrical Specifications

|                           |                                   |
|---------------------------|-----------------------------------|
| Nominal Operating Voltage | 28 VDC                            |
| Motor Type                | BLDC                              |
| Motor Power               | 70 W                              |
| Max. Motor Current        | 8.5 A                             |
| Control Electronics       | Integrated control board          |
| Communication             | RS-422                            |
| Position Sensing          | Proximity sensors                 |
| Electrical Interface      | (38999 Series) military connector |
| Cable                     | Military-standard cable           |

### Physical Specifications

|                 |                         |
|-----------------|-------------------------|
| Mass            | 2060 ± 20 g             |
| Dimensions      | 218.8 × 117.6 × 76.6 mm |
| Flow Connection | 1/2 in                  |

### Environmental Limits

|                          |                                    |
|--------------------------|------------------------------------|
| Operating Temperature    | –30 to +50 °C                      |
| Max. Ambient Temperature | +120 °C                            |
| Fluid Temperature        | 190–323 K                          |
| Max. Relative Humidity   | 95%                                |
| Storage Life             | ≥17 years @ +10 to +30 °C, ≤50% RH |

Opening/closing speed and flow limit can be adjusted by the user within a specified range.



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# M-D2 | Solenoid Valve Series

## High-Pressure Pulse Valve

SV-P-80/120

### Pressure and Flow Performance

|                          |             |
|--------------------------|-------------|
| Operating Inlet Pressure | 80–120 barA |
| Proof Pressure           | 140 barA    |
| Burst Pressure           | 250 barA    |
| Cv                       | 2.16        |
| Opening Time             | 5 ms        |

### Electrical Specifications

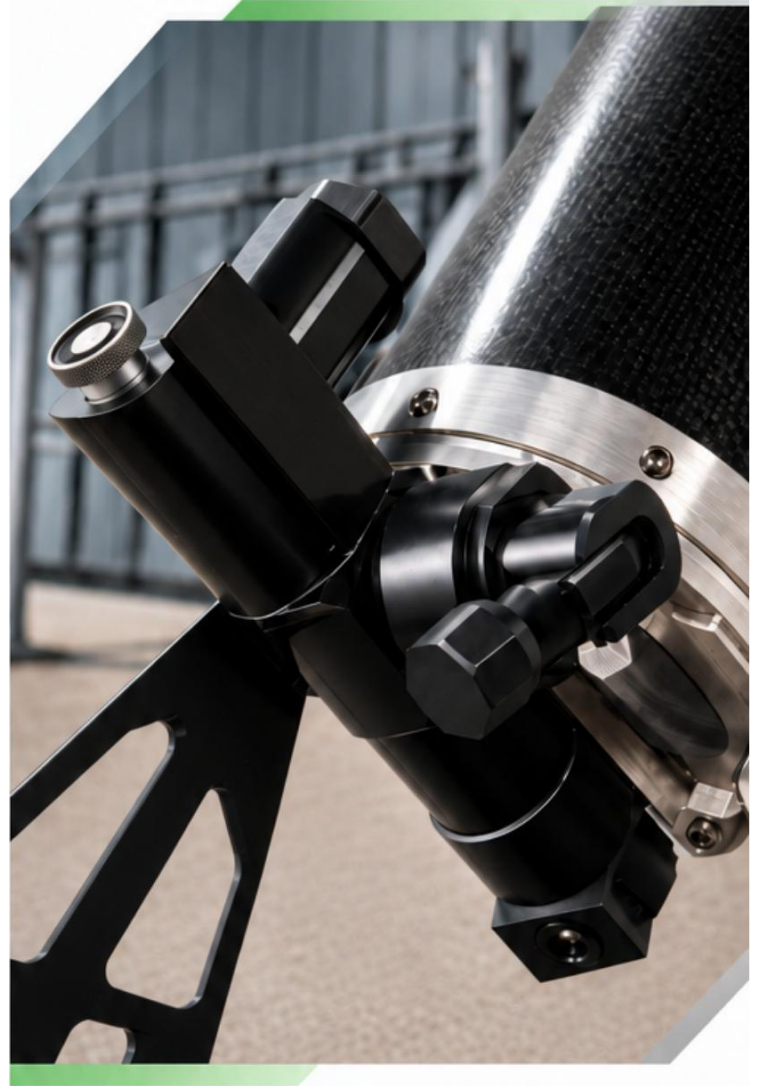
|                           |             |
|---------------------------|-------------|
| Nominal Operating Voltage | Min. 12 VDC |
| Solenoid Activation Time  | 300 ms      |
| Max. Solenoid Current     | 2.7 A       |
| Control Electronics       | DC input    |

### Physical Specifications

|                 |                    |
|-----------------|--------------------|
| Mass            | 700 ± 20 g         |
| Dimensions      | 172 × 77 × 80.5 mm |
| Flow Connection | 7 mm               |

### Environmental Limits

|                       |                                      |
|-----------------------|--------------------------------------|
| Operating Temperature | –10 to +50 °C                        |
| Fluid                 | Nitrogen, dry air                    |
| Storage Life          | ≥2 years @ –10 to +70 °C,<br>≤70% RH |



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