# **EV Series Metering Pumps**



# **Doing What is Right for Our Customers Since 1930**



Modular EV-1 pumps are the most versatile and adaptable metering pumps on the market today.

Durameter, a Haskel International, Inc. product is synonymous with expertise in the design and manufacture of metering pumps.

Our Evolution (EV) Series Metering Pumps are the culmination of more than 70 years experience of listening and responding to the needs of our customers.

We asked engineers, buyers, production, plant maintenance personnel and others who purchase, use and service metering pumps: "What would make the perfect metering pump?"

Then we built it.

As a result, tens of thousands of EV Series metering pumps are in operation worldwide.

Naturally we agree with our customers who say that the world can be divided into two camps: those who use EV Series metering pumps...and those who wish they did.



Heavy-duty EV-2 and EV-3 pumps provide accurate injection services in high-pressure and high-flow applications.

#### **Designed to API 675**

All Durameter pumps are built in accordance with API 675 specifications.

#### **Designed to Adapt**

We understand that operating conditions are not constant. That is why EV Series



Compact EVA pumps are ideal for low flow single point injection.

metering pumps are designed for maximum flexibility. Most are easily expandable to dual heads with multiplexing capability up to 12 feeds. This means that when your processing requirements change, so too can your system—readily and inexpensively. Our unique wet ends handle clear, slurry or viscous process fluids with ease. In addition, we offer a variety of options, such as DURAmatic electronic stroke control and DURAlert leak detection, to meet your specific needs.

Drivecase Cartridge

Hydraulic Cartridge

Liquid End Cartridge

#### Keeping it Simple to Make it Cost-Effective

Based upon a revolutionary modular design concept, each metering pump in the EV Series has just four independent cartridges, all field-convertible. Routine maintenance is quick and easy. This reduces your downtime and increases your savings.

Utilizing only four drivecase sizes, Haskel's Durameter EV Series covers a flow range from less than .05 to more than 2,000 gph. Every drivecase accommodates a number of interchangeable plunger and liquid end cartridges. This

modularity and component compatibility streamlines parts stores, lowers inventory costs and virtually eliminates the nightmares of replacement parts delivery.

#### **Cartridges to Meet All Service Requirements**

Each EV Series Metering Pump features our unique hydraulic system and liquid end cartridge. The complete plumbing system is contained in the EV Hydraulic Cartridge for easy maintenance or replacement. The EV Liquid End Cartridge features a hydraulically balanced double or single PTFE diaphragm design to seal process fluid from the environment for leakfree performance.

#### **Electronic Actuation**

The DURAmatic electronic actuation option allows you to fully automate your Durameter pump with a state-ofthe-art electric actuator responding to a 4 to 20 mA signal. Our actuator is available in NEMA 4, 4X and 7 and equivalent IEC standards.

Actuators can be used for remote operation of the pump or recipe setting on a multihead pump with each head being controlled from a process controller.



### **10-4 WARRANTY**

#### **Built to Last**

We are so confident of the Durameter Pump Series that we give it the most comprehensive warranty in the business, guaranteeing the drivecase for 10 years and the liquid end for 4 years. Please ask for full details of this unique warranty program.



Stroke Length Adjustment Cartridge

An example of the four cartridges used in an EV-1 pump.



Hydraulic and Liquid End Cartridges plus the PTFE Diaphragm are designed for leak-free performance.



Compact and designed for low flow ranges, EVA is the permanent solution to your metering pump needs.

# **Operating Specifications**

- Flow range: 0.049 GPH (0.18 LPH) to 23.4 GPH (88.5 LPH)
- Pressure range: to 3500 psig (241 bar)
- Maximum temperatures:
- Metallic to 250°F (121°C)
- Non-metallic to 150°F (66°C)
- Flow turndown ratio: 10:1 (optional 100:1)
- Footprint: 3" x 8" (9 x 18 cm)
- Weight: 29 lbs. (13.2 kg)

# **Options Available**

- DURAmatic electronic stroke control
- Double diaphragm DURAlert leak detection:
  - 1. Gauge leak detection
- 2. Pressure switch leak detection
- EV-Ready spare parts kit
- Variable speed drive
- Range of accessories

# The Affordable Compact Metering Pump Designed to Outlast and Outperform the Competition

EVA metering pumps offer a cost-effective solution to single point chemical injection.

With four independent, interchangeable cartridges, EVA brings all of the advantages of EV Series pumps into a pump with a small, space-saving footprint.

It is ideal for a wide range of applications where low flow ranges are desired.

Various pumphead options, materials and designs are available.

# **Benefits of the EVA Modular Concept**

#### **Drivecase Cartridge**

- · Accepts both NEMA and IEC frame motors.
- Heavy duty construction gives strength and durability beyond anything in its class.
- Incorporates stroke adjuster cartridge providing infinite flow adjustment from 0 to 100% capacity.
- Flow adjustment readout graduated in 1% increments.
- Standard flow adjustment is manual while pump is stationary or running.
- Manual capacity adjustment can be easily upgraded to DURAmatic electronic actuation on site.
- Drivecase fully sealed with our unique drivecase breather to prevent drive case contamination.

#### **Hydraulic Cartridge**

- Reciprocating plunger design with a 3/4" (19 mm) stroke length and six interchangeable plunger sizes.
- Field replaceable plunger seal.
- Adjustable internal hydraulic relief valve fully protects the pump when the discharge line is blocked or shut off.
- Air bleed valve continually bleeds air from the hydraulic chamber improving the efficiency of the pump.
- Mechanical refill valve provides excellent suction lift and eliminates the need for front and back contour plates.

#### **Liquid End Cartridge**

- Hydraulically balanced single or double diaphragm design, without process side contour plate, permits use in almost all service conditions.
- Optional check valves (double ball, soft or hard seats) available for special applications.
- Standard wetted parts include 316 stainless steel, Alloy 20, Hastelloy C, PVC and PVDF.
- Most machinable metallic and non-metallic materials are available.
- High integrity double diaphragm with DURAlert leak detection available as an option.

The benefits of the Durameter EVA modular system are that with only nine subassemblies, anyone of the EVA pump sizes can be built. This reduces your spares inventory and dramatically reduces costs.

# **EVA Flow Chart**

Plunger Size	Maximum Pressure		Maximum Flow at 115 spm		Connection
	PSIG	Bar g	USGPH	Lt/hr	Size
03D	3,500	241.38	0.495	1.87	1/4" NPTF
04D	3,500	241.38	0.880	3.33	1/4" NPTF
06D	3,464	238.90	1.979	7.49	1/4" NPTF
10D	1,247	86.00	5.500	20.82	3/8" NPTF
14D	636	43.86	10.780	40.80	3/8" NPTF
20D	312	21.52	23.370	88.46	3/8" NPTF

Stroke length: 0 to 0.75" (19mm) Weight with 1/3 hp motor: Approx. 65 lbs.

The flows above are rated using 60hz motors at a plunger stroking speed of 115 spm. Other standard speeds available are 58 spm, 86 spm and 173 spm.

To determine the flow at other plunger speeds use this formula:

operating spm x flow at 115 spm 115 = actual flow



# **EV-1 Metering Pump**



#### **Operating Specifications**

- Flow range: .049 GPH (0.18 LPH) to 168.8 GPH (638 LPH) with independent flow control for each feed
- Pressure range: to 3500 psig (241 bar)
- Maximum temperatures:
  - Metallic to 250°F (121°C)
  - Non-metallic to 150°F (66°C)
- Flow turndown ratio: 10:1 (optional 100:1)

#### **Options Available**

- DURAmatic electronic stroke control
- Double diaphragm DURAlert leak detection:
  - 1. Gauge leak detection
- 2. Pressure switch leak detection
- EV-Ready spare parts kit
- · Variable speed drive
- Range of accessories

# The Modular Pump that Adapts to Your Changing Process Requirements

EV-1 is considered the most versatile pump on the market today. It is completely modular and can be engineered with a variety of features and options to meet many different requirements. In addition, the EV-1 can be readily converted in the field with minimal downtime to adapt to your new or changing processing needs.

Designed for general metering duty, including routine chemical, viscous and slurry services, the EV-1 features a sealess, single-flat diaphragm, simplex, duplex or multiplex feeds and a choice of several metallic and non-metallic liquid end cartridge materials.

# **Benefits of the EV-1 Modular Concept**

#### **Drivecase Cartridge**

- Symmetrical design permits one or two pumpheads to be fitted with vertical or horizontal motor mounting.
- Multiplexing allows as many as 12 feeds to run off one motor.
- Accepts both NEMA and IEC frame size motors.
- Drivecase fully sealed with our unique drivecase breather to prevent drivecase contamination.
- Incorporates stroke adjustment cartridge providing infinite flow adjustment from 0 to 100% capacity.
- Flow adjustment graduated in 1% increments.
- Standard flow adjustment is manual while pump is stationary or running.
- Manual capacity adjustment can easily be upgraded to DURAmatic electronic actuation on site.

#### **Hydraulic Cartridge**

- Reciprocating plunger design with a 3/4" (19 mm) stroke length and six interchangeable plunger sizes.
- · Field replaceable plunger seal.
- Adjustable internal hydraulic relief valve fully protects the pump when the discharge line is blocked or shut off.
- Air bleed valve continually bleeds air from the hydraulic chamber improving the efficiency of the pump.
- Mechanical refill valve provides excellent suction lift and eliminates the need for front and back contour plates.

#### **Liquid End Cartridge**

- Hydraulically balanced single or double diaphragm design, without process side contour plate, permits use in almost all service conditions.
- Optional check valves (double ball, soft or hard seat) available for special applications.
- Standard wetted parts include 316 stainless steel, Alloy 20, Hastelloy C, PVC and PVDF.
- Most machinable metallic and non-metallic materials are available.
- High integrity double diaphragm with DURAlert leak detection available as an option.

The EV-1 modular system reduces inventory and replacement costs and also allows you to easily add additional pumpheads and drivecases on site to upgrade your system without the cost of returning the pump to the factory.

# **EV-1 Flow Chart**

Plunger Size	Maximum Pressure		Maximum Flow at 115 spm		Connection
	PSIG	Bar g	USGPH	Lt/hr	Size
03D	3,500	241.38	0.495	1.87	1/4" NPTF
04D	3,500	241.38	0.880	3.33	1/4" NPTF
06D	3,464	238.90	1.979	7.49	1/4" NPTF
10D	1,247	86.00	5.500	20.82	3/8" NPTF
14D	636	43.86	10.780	40.80	3/8" NPTF
20D	312	21.52	23.370	88.46	3/8" NPTF
28D	159	10.97	45.800	173.35	3/4" NPTF
38D	86	5.93	84.360	319.30	3/4" NPTF

Stroke length: 0 to 0.75" (19 mm)

Weight with 1/3 hp motor: Approx. 110 lbs. (one feed) Weight with 1/3 hp motor: Approx. 125 lbs. (two feeds)

The flows above are rated using 60hz motors at a plunger stroking speed of 115 spm. Other standard speeds available are 58 spm and 138 spm.

To determine the flow at other plunger speeds use this formula:

# operating spm x flow at 115 spm 115 = actual flow



The EV-2/EV-3 pumps bring state-of-the-art amplitude modulation drivecases for use on higher flows, pressures and service in the most arduous operating conditions.

> EV-2 and EV-3 rugged, heavy-duty pumps are specially designed for a wide range of accurate injection services, in the most demanding environments.

#### **Operating Specifications**

- Flow range: 0.97 GPH (3.6 LPH) to 1515.6 GPH (5736 LPH)
- Pressure range: to 3500 psig (241 bar)
- Maximum temperatures:
  - Metallic to 250°F (121°C)
  - Non-metallic to 150°F (66°C)
- Flow turndown ratio: 10:1 (optional 100:1)

# Heavy-Duty Metering Pumps for Accurate High-Pressure and High-Flow Injection Services

The EV-2 and EV-3 metering pumps feature a special heavy-duty design capable of handling all of your highpressure chemical, viscous and slurry services. Features include a sealess, single-flat diaphragm and simplex, duplex or multiplex feeds. A variety of metallic and non-metallic liquid end cartridge materials are also available.

# Benefits of the EV-2 and EV-3 **Modular Concept**

#### **Stroke Adjustment**

- · Spin handle with 0% to 100% digital readout manual flow adjustment.
- Flow adjustable while pump is stationary or running.
- Available with DURAmatic electronic stroke control.

#### **Drivecase Cartridge**

- · Two part epoxy coat finish resistant to most chemicals.
- · Amplitude modulation design.
- · Separate hydraulic sump.
- Fully isolated drive case giving extended life.
- · Accepts NEMA and IEC frame motors—flange or footmounted.
- Drivecase is capable of single or dual pumphead design.
- · Drivecase multiplexing allows up to 8 pumpheads to be driven from the same motor.

### **Hydraulic Cartridge**

- EV-2 has a reciprocating plunger design with a 1-3/8" (35 mm) stroke length.
- EV-3 has a reciprocating plunger design with a 2" (51 mm) stroke length.
- · Field replaceable plunger seal.
- · Adjustable internal hydraulic relief valve fully protects the pump when the discharge line is blocked or shut off.
- · Air bleed valve continually bleeds air from the hydraulic chamber improving the efficiency of the pump.
- Mechanical refill valve provides excellent suction lift and eliminates the need for front and back contour plates.

### **Liquid End Cartridge**

- · Hydraulically balanced single diaphragm design, without process side contour plate, permits use in almost all service conditions.
- Optional check valves (double ball, soft or hard seat) available for special applications.
- Standard wetted parts include 316 stainless steel, Alloy 20, Hastelloy C, PVC and PVDF.
- Most machinable metallic and non-metallic materials are available.
- High integrity double diaphragm DURAlert leak detection available as an option.
- Offset check valves eliminate "settling out" of solids in the pumphead.
- Flow-through porting positively vents all air from liquid end on start up or when pumping air entrained liquids.

EV-2 Flow Chart								
Plunger Size	Maximum Pressure		Maximum Flow at 111 spm		Connection			
	PSIG	Bar g	USGPH	Lt/hr	Size			
10D	3,600	248.28	9.760	36.94	3/8" NPTF			
14D	3,228	222.62	19.120	72.37	3/8" NPTF			
18D	1,953	134.69	33.580	127.10	3/8" NPTF			
22D	1,307	90.14	50.170	189.89	3/4" NPTF			
28D	807	55.66	81.260	307.57	3/4" NPTF			
34D	547	37.72	119.820	453.52	1" NPTF			
38D	438	30.21	149.670	566.50	1" NPTF			
44D	267	18.41	200.670	759.54	1-1/4" NPTF			

Stroke length: 0 to 1.375" (35 mm) Weight with 3/4 hp motor: Approx. 285 lbs. (one feed) Weight with 1 hp motor: Approx. 335 lbs. (two feed)

These flows are rated using 60hz motors at a plunger stroking speed of 111 spm. Other standard speeds available are 58 spm, 84 spm, 111 spm and 178 spm.

To determine the flow at other plunger speeds use this formula:

operating spm x flow at 111 spm = actual flow 111

#### Maximum Pressure Maximum Flow at 111 spm Connection Plunger Size Size PSIG Bar g USGPH Lt/hr 248.28 14.19 3/4" NPTF 10D 3,600 53.71 248.28 27.81 105.26 3/4" NPTF 14D 3,600 248.28 60.31 20D 3,600 228.27 1" NPTF 1.600 110.34 118.20 447.39 1" NPTF 28D 1,004 69.24 217.70 823.99 38D **1**" NPTF 37.93 291.90 44D 550 1104.84 1-1/2" NPTF 1789.55 1-1/2" NPTF 56D 462 31.86 472.80

**EV-3 Flow Chart** 

Stroke length: 0 to 2" (51 mm)

Weight without motor: Approx. 675 lbs. (one feed) Weight without motor: Approx. 870 lbs. (two feed)



# **EV-P Flow Pump**



# **Constant Flow Metering for the EV-1 Metering Pump**

The EV-P Flow option of the EV-1 metering pump features a unique linear flow that eliminates the need for pulsation dampeners and replaces maintenance-intensive gear pumps. Even-flow metering is accomplished through a dual-feed design utilizing two identical feeds and a programmed cam for smart plunger control. Other features include:

- Dual-feed unit delivering up to 220 gph (833 LPH) per drivecase of smooth flow metering for either suction or discharge. Provides the accuracy of a metering pump without the concern of reciprocating flow patterns.
- Linear flow control to 10:1 turn down ratio via standard variable speed drive packages for superior process control.
- Multi-fluid handling capabilities with sealless design, suitable for viscous and corrosive fluids and abrasive slurries to 250°F (121°C).
- •Reduces pipe and instrument damage.

*Note:* Variable speed motor is required.

# The EV-P Flow Option: A Comparison

#### **EV-P Flow**

The EV-P Flow pump offers the unique feature of constant flow metering. Pumped fluid develops nearly 0% flow variation resulting in reduced fluid velocity.

#### **Programmed Cam**

- Special drive mechanism is designed for dual feed pump to provide overlapping flow pattern.
- Flow pattern is optimized to reduce check valve transition. (Graph A)
- Pump flow is proportional to motor speed. (Graph B)



#### **Simplex**

Standard Simplex flow patterns reflect reciprocating flow patterns. This may not offer suitable dosing patterns or may create a situation where large suction or discharge acceleration losses exit. Flow undergoes 100% variation.



#### **Duplex**

Standard Duplex flow pattern offers slightly better flow transfers. However, pumped fluid still undergoes 100% flow variation.

#### **EV-P Flow**

The EV-P Flow pump offers the unique feature of constant flow metering. Pumped fluid develops nearly 0% flow variation resulting in reduced fluid velocity.







EV metering pump with DURAlert double diaphragm Gauge Leak Detection.

# Cartridge-Style Double Diaphragm and Leak Detection Systems to Maintain Product Integrity and Help Ensure Plant and Personnel Safety

Many Durameter applications involve pumping highly toxic, corrosive or environmentally damaging liquids. If allowed to leak, these chemicals can be a danger to your operators, equipment and the environment.

Prevent leaks by using the Durameter state-of-the-art High Integrity Double Diaphragm and rupture detection.

The secret of the DURAlert double diaphragm system is its simplicity. Two diaphragms held together by a vacuum, form a barrier between the process fluid and the environment. If either of these diaphragms should rupture the vacuum will be broken and the process pressure will immediately be shown on the pressure gauge and pressure switch (if fitted). This gives immediate indication that the pump should be stopped and the diaphragm replaced. Even with one diaphragm perforated, the pump will still operate and prevent chemical leaking to the environment.

- · Leak-free integrity maintained in the event of a diaphragm rupturing.
- · No barrier fluid or complex phasing procedure.
- · Immediate indication of rupture.
- Does not affect accuracy of the pump.
- · Quick and easy to replace a ruptured diaphragm assembly on site.

# DURAlert

### **Pressure Switch Leak Detection**

- Compound pressure gauge for visual indication along with a pressure switch for immediate electronic indication of a failed diaphragm.
- Switches are available in NEMA 4, NEMA 4X, NEMA 7 or equivalent IEC designs and can be field wired to an alarm panel, independent indicators, or to stop the pump automatically.
- Applications include: Corrosive or hazardous chemical applications and for installations where routine visual inspection does not occur.



#### DURAlert Gauge Leak Detection

- Compound pressure gauge to visually indicate a failed diaphragm.
- Economical and reliable system for applications where pump is installed in a high-visibility location or where immediate rupture indication is not critical.
- Applications include: Polymer, corrosion inhibitors, enzymes, catalysts or other non-hazardous products.





# Consider the benefits of owning a Durameter pump.

- With subsidiaries and distributors around the world your pump can be serviced by Haskel trained technicians wherever the installation.
- A wide range of pump flows using only four drivecase sizes.
- Over 70 years experience of solving customers liquid metering and blending problems.

# All of this backed by a world class international company.

## Haskel Durameter offices around the world.

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