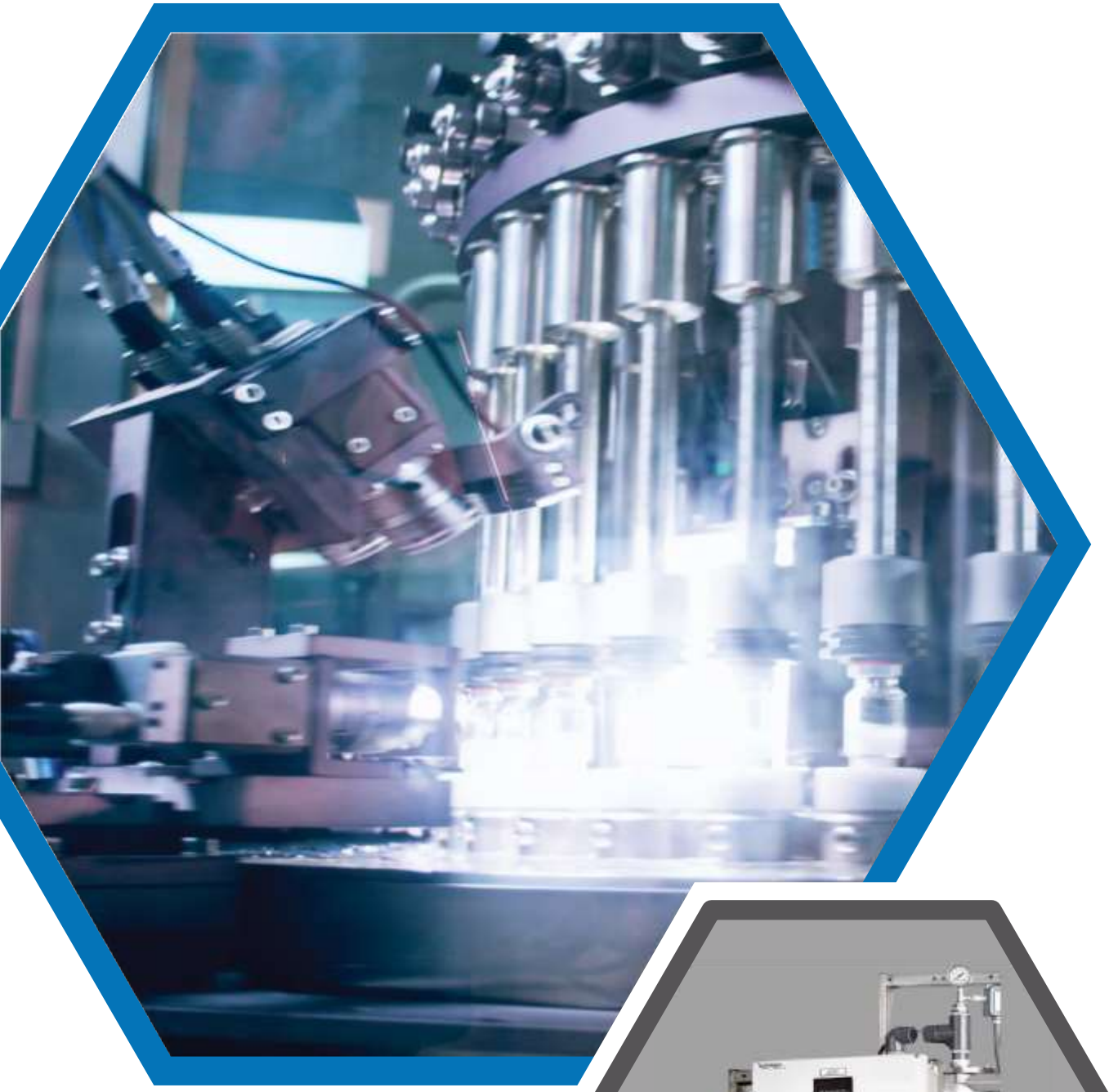
DRAGON WATER TECHNOLOGIES

dynaBLEND™ Liquid Polymer Blending System



Liquid Polymer Blending System

Our History

In 1985 Fluid Dynamics developed the high energy, non-mechanical dynaBLEND™ liquid polymer activation and blending technology. Immediately it proved to be a revolutionary and great improvement in polymer activation and blending performance. Today, the dynaBLEND™ system remains the most effective and reliable polymer activation technology—rendering mechanical blenders obsolete except for low flow applications.

Polymer Blending

Knowing the critical requirements of polymer blending is the first step in understanding the numerous benefits of dynaBLEND™ technology. Over the years, the spectrum of available polymers has widened. Today there are more difficult to blend polymers than ever before. Some polymer blending systems work well on simple-to-blend polymers but fail to effectively activate many other polymers.

As-Supplied or Concentrated Polymer—Polymer is a long chain molecule having positive (cationic), negative (anionic) or neutral (nonionic) charge sites. In its as supplied, concentrated form, the polymer is tightly coiled. In this state, the polymer is not susceptible to damage from high mixing energy.

Effects of Insufficient Mixing Energy—When insufficient mixing energy is applied, polymer gelling or agglomeration occurs, resulting in the charge sites not being fully exposed. Overdosing of polymer is required to achieve desired performance.

Effects of Overexposure to Mixing Energy—Overexposing polymer to mixing energy after initial activation will damage the fragile long chain molecule. Again, overdosing of polymer is required.

Fully Activated Polymer—Unwinding and elongating the coiled polymer molecule is necessary to expose the maximum number of charge sites to your process. The job of the polymer activation and blending system is to gently and thoroughly activate polymer. Fully elongated, undamaged polymer is the most active and effective form yet also the most fragile state. Continued exposure to mixing energy in this state will damage the fragile polymer.

The Way to Optimum Polymer Performance

- "Infinite Shear in Zero Time." Apply ultra-high mixing energy at the point of initial polymer and water contact to prevent polymer gelling or agglomeration. Currently the polymer is coiled-up and not susceptible to damage.
- Create the right environment. Polymer solution has proven to be the ideal environment for polymer activation, as opposed to raw water. Inject neat, concentrated polymer into polymer solution, not raw water.
- Prolonged turbulence. Expose polymer to prolonged turbulence in order to complete the blending process gently and fully.
- Avoid damaging mixing energy after the polymer is initially activated so as not to break the fragile molecular chain.

Proven Performance

While some polymer systems can only work well on the simple-to-blend polymers, dynaBLEND™ has a proven track record of effectively activating all types of polymer. dynaBLEND™ is the standard for manufacturers of ultra-high molecular weight and high solids type polymers.

Proven Reliability

dynaBLEND™ is designed for reliability. The non-mechanical dynaBLEND™ mixing chamber design inherently delivers an unequalled degree of reliability over many mechanical technologies. But we don't stop there. The polymer injection check valve is a potential maintenance issue in any polymer system. Fluid Dynamics designed the PCV valve, a large port check valve with spring-loaded stainless-steel ball and PVC body. The PCV valve easily disassembles for inspection or cleaning simply by pulling a two-prong stainless steel pin.

Proven Quality

Highest Quality = Lowest Life-Cycle Cost! dynaBLEND™ is the benchmark for quality in our industry. Why? Because of the value of longevity. dynaBLEND™ quality is achieved by building a more rugged system with higher quality components and tight quality control using highly skilled people.

With quality comes confidence. dynaBLEND™ is backed by the longest warranty in our industry—two (2) year system warranty and lifetime mixing chamber warranty.

The Choice is Clear

Consider your investment—whether it be a centrifuge, belt filter press, clarifier, filter, paper machine, or whatever your process requires, your investment is substantial. Doesn't it make sense to protect this investment? A polymer blending and activation system can dramatically affect the performance and reliability of this process.

You Should Expect:

- Proven Performance
- Proven Reliability
- Proven Quality

What Does This All Mean?

A system that will deliver the lowest life-cycle cost.

dynaBLEND™

The Proven Solution

Real Confidence

- Two Year System Warranty
- Lifetime Mixing Chamber Warranty
- Total Satisfaction Guarantee

* See Fluid Dynamics warranty for further details.

dynaBLEND L4S-1200-5.OPS

Simply the Best Polymer System Available

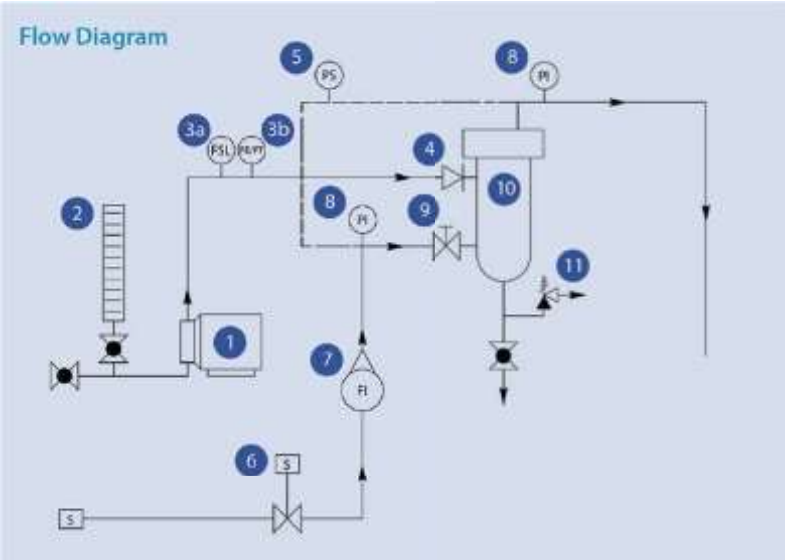
dynaBLEND™ L Series systems are designed to easily accept a wide range of flexible features and options. All dynaBLENDs utilize only the finest components, are built on all stainless-steel frames and are designed to stand the test of time in extreme conditions and harsh environments.

dynaBLEND™ Construction Features:

- All Piping Components Rigidly Mounted to Skid
- Gusseted Uprights for Rigidity
- NEMA 4X FRP Control Panel. Fluid Dynamics is a ULC-Certified Panel Shop3
- Control Panel at Operator Eye-Level
- Open Frame Design for Ease of Accessibility Constructed of 304-SS
- Sealtite for All Power Wiring

Basic dynaBLEND™ and Options:

- Metering Pump[1]
- Calibration Column
- Loss of Polymer Flow Switch
- Polymer Flow Measurement (optional)
- Proprietary Design Polymer Check Valve
- Differential Pressure Switch
- Solenoid Valve
- Water Flow Measurement[2]
- Liquid Filled SS Pressure Gauges
- Variable Orifice Water Control Valve
- dynaBLEND™ Mixing Chamber
- Pressure Relief Valve

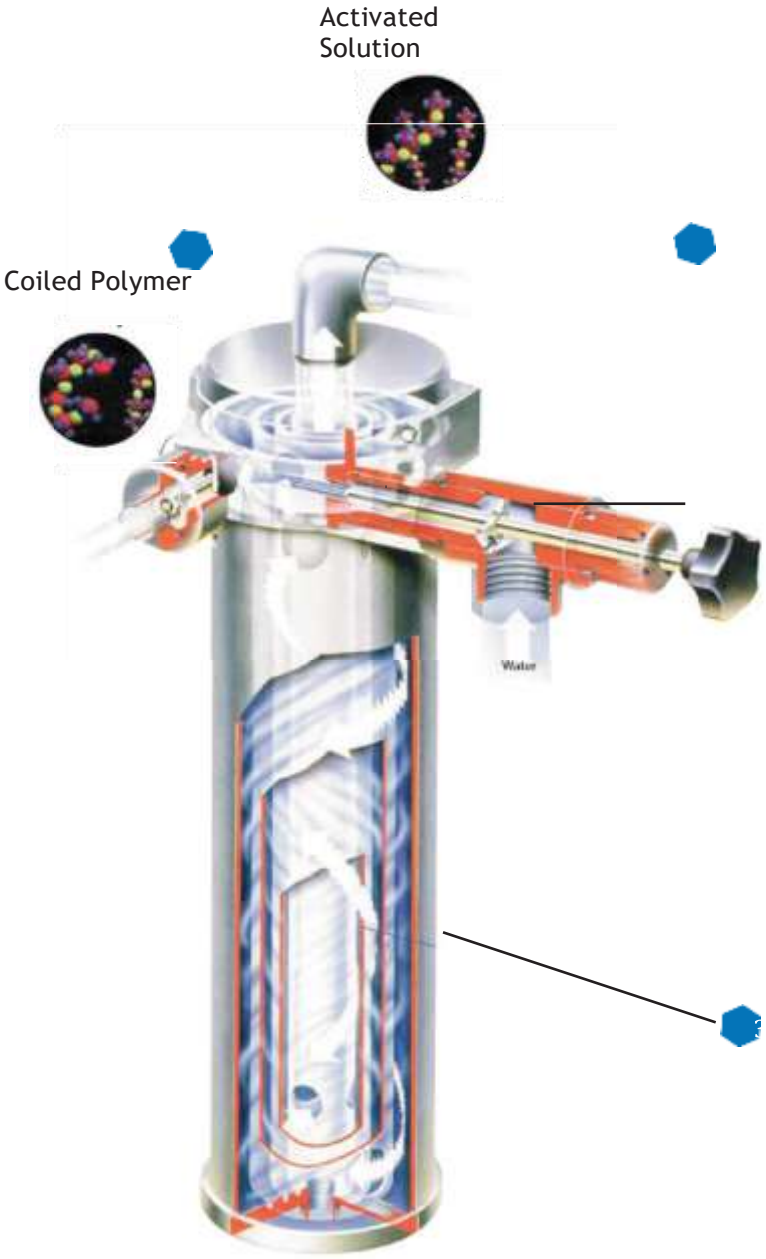


1 Can be peristaltic or progressing cavity.
2 Can be Rotameter, Turbine Flow Meter or Magnetic Flow Meter.
3 Optional stainless-steel panels. Controls also available for hazardous locations.

Inside the dynaBLEND System

In twenty years of independent side-by-side trials, the dynaBLEND™ system has proven itself superior to alternative blending methods. Success is due to its patented, non-mechanical Hydro Action Technology— a technology that produces in excess of six times the mixing energy per unit volume than a comparable sized mechanical mixer.

dynaBLEND induces high mixing energy without the use of mechanical impellers to ensure a blending process free from polymer damage, while preventing polymer gelling. Preventing polymer gelling or damage maximizes your polymer investment by reducing your polymer use. Thousands of installations worldwide validate dynaBLEND's track record for superior performance and reliability.



The Three Stages of hydro

Action Stage 1

Initial Ultra-High Energy:
A pressure drops occurring across the specially designed variable orifice water control valve produces a high-velocity water jet. This water jet, traveling at approximately 21.3 m (70 ft) per second, is aimed directly at, and impinges on the polymer as it enters the mixing chamber. At this point, the only point where high energy exists in the mixing chamber, the polymer is coiled up and not susceptible to damage

Stage 2

Recirculation:
In dynaBLEND's concentric mixing chambers, newly blended polymer recirculates multiple times for additional exposure to non-damaging turbulence, completing the blending process. This recirculation ensures that polymer solution is present directly after the point of neat, concentrated polymer injection, for an ideal activation and blending environment.

Stage 3

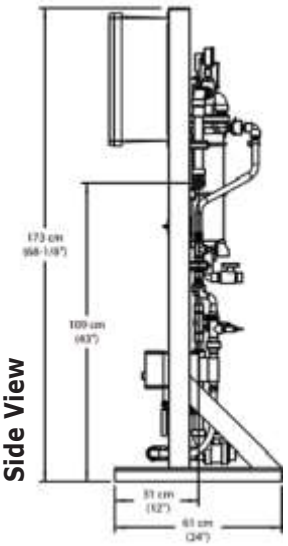
Diminishing Mixing Energy:
Mixing energy naturally diminishes in dynaBLEND's concentric chambers. The flow path through the system's concentric chambers further ensures optimum polymer performance by preventing polymer from short-circuiting the three-stage process.

1 Can be peristaltic or progressing cavity.
2 Can be Rotameter, Turbine Flow Meter or Magnetic Flow Meter.
3 Optional stainless-steel panels. Controls also available for hazardous locations.

Technology: Systems L4PS-L6PS

The L4PS/L6PS Series dynaBLEND is a full-featured liquid polymer blending system. These are the smallest dynaBLEND units and the use of a peristaltic pump makes them the most economical polymer blending system offered by Fluid Dynamics.

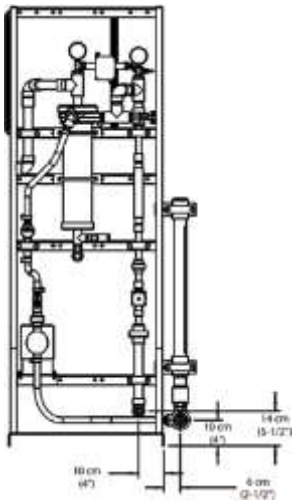
Side View



dynaBLEND Model Example
L4-600-2.5 PS fits applications with

227-2271 lph (60-600 gph) dilution water and 0.47-9.5 lph (0.125-2.5 gph) polymer.

Back View



Water Supply Pressure:

Water supply must be able to provide the maximum flow rate at 2.41- 3.45 bar (35-50 psi) greater than the pressure at point of use.

Operating Pressure:

6.89 bar (100 psi) maximum

Power Requirements:

Single phase 115 VAC standard

Weight:

Series L4-PS: 80 kg (175lbs)
Series L6-PS: 100 kg (220lbs)

Series	Dilution Water
L4-120-	45-454 lph (12-120 gph)
L4-300-	113-1136 lph (30-300 gph)
L4-600-	227-2271 lph (60-600 gph)
L4-1200-	151-1513 lph (120-1200 gph)
L4-1800-	681-6814 lph (180-1800 gph)
L4-2400-	909-9085 lph (210-2100 gph)
L4-3000-	1136-11356 (300-3000 gph)

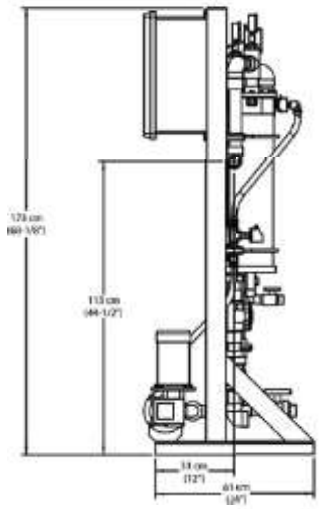
Pump	Polymer Range*
0.24PS	0.05-0.9 lph (0.0125-0.24 gph)
0.5PS	0.10-1.9 lph (0.025-0.5 gph)
1.0PS	0.19-3.8 lph (0.05-1.0 gph)
2.5PS	0.47-9.5 lph (0.125-2.5 ghp)
5.0PS	0.95-18.9 lph (0.25-5.0 gph)

Dual pump configurations available. *Stated polymer pump range may not be achieved at all viscosities.

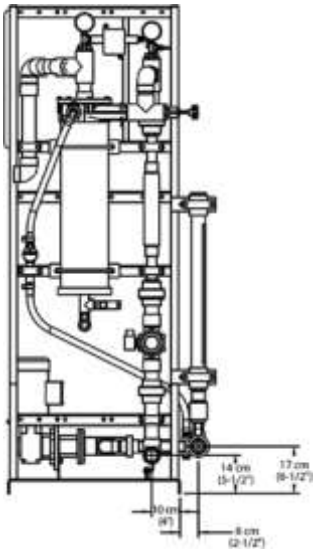
Technology: Systems L4-P/L6-P

The L4-P/L6-P Series dynaBLEND offers the same flow rates and features of the L4-PS/L6-PS Series with an upgrade to a progressing cavity pump. The progressing cavity pump provides increased life cycle.

dynaBLEND Model Example
L6-1800-6.0P fits applications with 681-6814 lph (180-1800 gph) dilution water and 2.3-22.7 lph (0.6-6.0 gph) polymer.



Side View



Back View

Water Supply Pressure:

Water supply must be able to provide the maximum flow rate at 2.41- 3.45 bar (35-50 psi) greater than the pressure at point of use.

Operating Pressure:

6.89 bar (100 psi)

PowerRequirements:
Single phase 115 VAC standard

Weight:

Series L4-P: 114 kg (250 lbs)
Series L6-P: 125 kg (275lbs)

Series	Dilution Water
L4-120-	45-454 lph (12-120 gph)
L4-300-	113-1136 lph (30-300 gph)
L4-600-	227-2271 lph (60-600 gph)
L4-1200-	151-1513 lph (120-1200 gph)
L4-1800-	681-6814 lph (180-1800 gph)
L4-2400-	909-9085 lph (210-2100 gph)
L4-3000-	1136-11356 (300-3000 gph)

Pump	Polymer Range*
1.2P	0.45-4.5 lph (0.12-1.2 gph)
3.0P	1.13-11.3 lph (0.3-3.0 gph)
6.0P	2.27-22.7 lph (0.6-6.0 gph)
10P	3.8-37.9 lph (1.0-10.0gph)
15P	5.68-56.8 lph (1.5-15.0 gph)
20P	7.57-75.7 lph (2.0-20.0gph)

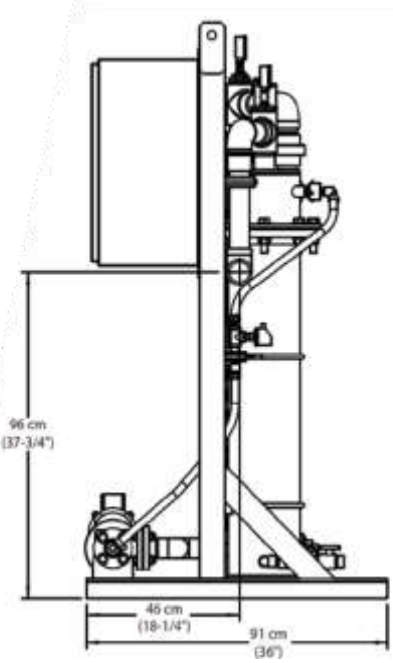
Dual pump configurations available.

Technology: Systems L8-P/L12-P

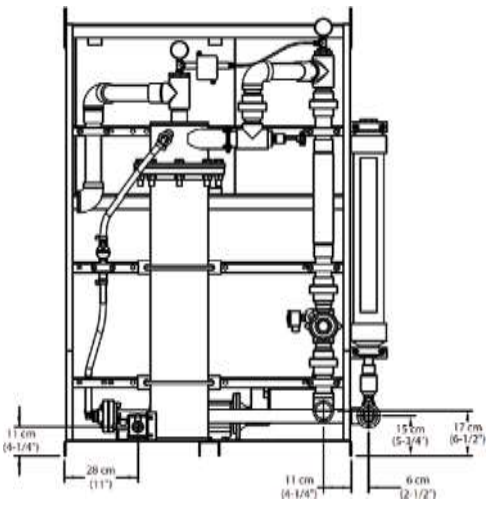
The L8-P/L12-P Series dynaBLEND include all features available throughout the line but in larger capacities.

L8-P/L12-P dynaBLENDs are designed to provide the highest standard water and polymer flow rates available on the market.

dynaBLEND Model Example
L8-6000-75P fits applications with 2271-22712 lph (600-6000 gph) dilution water and 28-284 lph (7.5-75 gph) polymer.



Side View



Back View

Water Supply Pressure:

Water supply must be able to provide the maximum flow rate at 2.41-3.45 bar (35-50 psi) greater than the pressure at point of use.

Operating Pressure:

6.89 bar (100 psi)

Power Requirements:

Single phase 115 VAC standard

Weight:

Series L8-P: 238 kg (525 lbs)
Series L12-P: 273 kg (600 lbs)

Series	Dilution Water
L8-3600--	1363-13627 lph (360-3600gph)
L8-4800-	1817-18170 lph (480-4800 gph)
L8-6000-	2271-22712 lph (600-6000 gph)
L12-9000-	3407-34069 lph (900-9000 gph)
L12-12000-	4543-45425 lph (1200-12000 gph)
L12-2100-	7949-79494 lph (2100-21000 gph)

Pump	Polymer Range*
15P	5.7-57.0 lph (1.5-15 gph)
20P	7.6-76.0 lph (2.0-20 gph)
25P	9.5-95.0 lph (2.5-25 gph)
35P	13.3-133.0 lph (3.5-35 gph)
50P	18.9-189.0 lph (5.0-50.0 gph)
75P	28.4-284.0 lph (7.5-75 gph)
110P	41.6-416.0 lph (7.5-75 gph)
150P	56.8-567.8 lph (15-150 gph)
300P	113.5-1135.0 lph (30-300 gph)

Dual pump configurations available.

Take Control

Because controls are an integral part of every dynaBLEND system, Fluid Dynamics has developed the widest range of standard control panels available. Beginning with a simple discrete controller, through microprocessor-based controllers, all the way up to versatile PLC-based systems with touch screen interfaces and a variety of communication options, there is likely to be a pre-engineered system to meet your needs. If additional features are required, Fluid Dynamics' electrical and software engineers, along with the UL panel shop will develop a custom solution for your application.

Control and Instrument Options

Control Panel Options are shown on pages 10 and 11. Some of the available features include or allow the selection of accessories or options. These options are described below

Pump Control

Peristaltic Pumps can be furnished with manual or automatic speed control. Automatic control models accept a 4-20 mADC pacing signal which varies the speed of the pump. Pacing feature is available on all control levels except Control Level 1.

Progressing Cavity Pumps are offered in manual or automatic models. Automatic models accept a 4-20 mADC pacing signal, which varies the speed of the pump. Pump speed is interpolated as an indication of polymer flow where budgetary constraints do not allow more sophisticated polymer flow measurement. Pacing feature is available on all control levels except Control Level 1.

Water Measurement

Differential Pressure Switch—A non-quantitative device used to sense the loss of water flow. Alarm and system shutdown are provided on loss of water flow. This feature is standard on Control Level 3 and optional on Control Levels 4, 5 and 6.

Rotameter—A quantitative device which allows water flow rate to be observed locally. Standard on all units unless a higher-level control is selected.

Turbine Flow Meter—A quantitative device which measures water flow and provides a signal to indicate the water flow rate. This signal is used to display the flow rate and/or as a part of the ratio control feature. This feature is standard for Control Levels 4, 5 and 6 and is optional on Control Level 3.

Magnetic Flow Meter—An alternative to the Turbine Flow Meter available to meet customer preferences. This feature is optional and available only on Control Levels 4, 5 and 6.

Polymer Measurement

Calibration Column—A pump draw-down cylinder is standard on all systems.

Thermal Flow Sensor—A non-quantitative device used to sense loss of polymer flow. Alarm and shutdown are provided when loss of polymer flow is sensed. This feature is optional on Control Levels 3, 4 and 5 and standard on Control Level 6.

Mass Flow Meter—A quantitative device which is a highly sensitive instrument used to measure the flow of non-conductive and viscous liquids such as polymer, accurately, even at very low flows. The device provides a signal proportional
to flow which may be used to display polymer flow rate and/or as the basis of the dynaBLEND ratio control feature with the highest accuracy. This option is available only on Control Levels 4, 5 and 6. When this option is selected, the thermal flow sensor is not required.

Auto Flush

Automatically initiated flush cycle. Cycle time is adjustable. Standard on Control Levels 4, 5 and 6; optional on Control Level 3.

Dry Polymer Preparation Units Available from Fluid Dynamics – request the dynaJET™ brochure

Your Choice of Pre-Engineered Control Configurations

Fluid Dynamics, Inc. offers dynaBLEND Liquid Polymer Blending Systems with a variety of pre-engineered control configurations, including local, remote, microprocessor and PLC. All control enclosures are rated NEMA 4X. Standard power is 115 VAC. UL certification is standard on all but Level 1 controls.

All units include manual polymer pump rate control. Control Levels 3 and higher are designed to accept a pacing signal for remote speed adjustment of the polymer feed pump. All progressing cavity pumps are provided with a variable speed drive with local rate indication. Peristaltic pumps feature speed control.

Control Levels 3, 4 and 5 are available with an optional alarm indicating loss of polymer flow, derived from aa thermal flow sensor. This option is not available with pumps operating below 0.76 lph (0.2 gph). This feature is included on Control Level 6.

Control Levels 1 and 3

Control Levels 1 and 3 are discrete control systems using relay logic and isolated contact I/O.

Level 1

- LOCAL-OFF-REMOTE Selector Switch
- RUN Indicating Light
- Manual Pump Flow Rate Adjustment
- Alarms: None
- Inputs: Remote ON-OFF (Discrete)
- Outputs: Running (Discrete)
  Remote Mode (Discrete)

Level 3

- LOCAL-OFF-REMOTE Selector Switch
- RUN Indicating Light
- Manual or Automatic Pump Flow Rate Adjustment
- Alarms: Low Water Differential Pressure
- Inputs: Remote ON-OFF (Discrete)
  Pacing of Metering Pump (4-20 mADC)
- Outputs: Running (Discrete)
  Remote Mode (Discrete)
  Low Water Diff. Press. Alarm (Discrete)
  Optional Low Polymer Flow Alarm (Discrete)

Option - AUTO FLUSH can be added to Level 3 controls.
Option - Low polymer Flow Alarm (TFS)

Control Level 4

Control Level 4 includes a microprocessor-based ratio control device capable of maintaining a precise solution concentration while following the manually adjusted dilution water flow rate.

- Microprocessor Control with Touchpad Input
- Ratio Control of Polymer to Dilution Water*
- LOCAL-OFF-REMOTE Selector Switch
- Running Indication
- Pump Rate Indication
- Water Rate Indication
- Solution Concentration Indication
- Auto Flush
- Alarm: Low Water Flow
  Optional Low Polymer Flow Alarm
- Inputs: Remote On-Off (Discrete)
  Pacing of Metering Pump (4-20 mADC)
- Outputs: Running (Discrete)
  Auto Flush Mode (Discrete)
  Low Water Flow Alarm (Discrete)
  Polymer Pump Rate (4-20 mADC)
  Optional Low Polymer Flow Alarm

* When the selector switch is in "LOCAL" the polymer feed follows the water flow to maintain a fixed concentration. A typical application is to fill a tank with a polymer solution, which is then delivered to multiple points of use. When the selector switch is in "REMOTE" the polymer pump follows a remote control (demand) signal. Dilution water is manually adjusted. A typical application for is direct injection of diluted polymer solution to a single feed point.

Control Level 5

Control Level 5 includes a microprocessor-based ratio control package to maintain a precise polymer solution concentration. The device is configurable, through a local touchpad, to allow either water or polymer to follow a 4-20 mADC pacing signal. The non-paced flow is controlled automatically to maintain the desired solution concentration. Polymer solution concentration may be adjusted locally or by a second remote 4-20 mADC signal. When operating in a fully automatic mode, water flow is controlled automatically using an integral linear actuated variable orifice (LAVO).

- Microprocessor Control with Touchpad Input
- Ratio Control of Polymer Solution Concentration
- Local Input Through Touchpad
- In Response to a Remote Signal
- LOCAL-OFF-REMOTE Selector Switch
- Running Indication
- Water Rate Indication
- Solution Concentration Indication
- Auto Flush
- Alarms: Low Water Flow
  Solution Concentration FAULT [2]
  Optional Low Polymer Flow Alarm
- Inputs: Pacing Signal (4-20 mADC) [1]
  Solution Concentration (4-20 mADC) [1, 3]
  Remote On-Off (Discrete)
- Outputs: Running (Discrete)
  Remote Mode (Discrete)
  Auto Flush Mode (Discrete)
  Common Alarm (Discrete)
  Polymer Pump Rate (4-20 mADC)

Control Level 6

Control Level 6 incorporates a PLC with a touch screen interface to maintain precise control of polymer solution concentration and flow rate. The system is configurable, through the integral touch screen, to select either water or polymer to follow a 4-20 mADC pacing signal. The non-paced flow is controlled automatically to maintain the desired solution concentration. Polymer solution concentration may be adjusted locally or by a second remote 4-20 mADC signal. When operating in a fully automatic mode, water flow is controlled automatically using an integral linear actuated variable orifice (LAVO).

- PLC Control with Touch Screen Interface
- Ratio Control of Polymer Solution Concentration
- Local Input Through Touch Screen
- In Response to a Remote Signal
- LOCAL-OFF-REMOTE Selection (Touch Screen)
- Running Indication
- Water Rate Indication
- Solution Concentration Indication
- Auto Flush
- Alarms: Low Water Flow (Adjustable Set Point)
  No Polymer Flow (Thermal Flow Sensor)
  Solution Concentration FAULT 2
  Optional Low Polymer Flow Alarm
- Inputs: Pacing Signal (4-20 mADC) [1]
  Solution Concentration (4-20 mADC) [1, 3]
  Remote On-Off (Discrete)
- Outputs: Running (Discrete)
  Remote Mode (Discrete)
  Auto Flush Mode (Discrete)
  Common Alarm (Discrete)
  Solution Flow Rate (4-20 mADC)
  Polymer Pump Rate (4-20 mADC)
  Dilution Water Flow Rate (4-20 mADC)

[1] The primary 4-20 mADC pacing signal can drive either water or polymer flow rate as master. A second 4-20 mADC signal is used to adjust the solution concentration.

[2] A solution concentration FAULT is an indication of insufficient dilution water to satisfy concentration requirement.

[3] This input is separate from the pacing signal.

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