Masterflex® Tubing Pumps–From Lab to Production

Masterflex® peristaltic pumps serve a variety of markets—from laboratory applications to process engineering to heavy-duty production and manufacturing. In all, you'll discover pumps that are accurate, durable, and easy to use. Each component is designed to strict standards and rigorously tested to ensure precise flow delivery.

The peristaltic design confines the fluid to the tubing, so the pump cannot contaminate the fluid and the fluid cannot contaminate your pump. When you want to pump a different fluid, simply change the tubing.

Compact/Low Flow

C/L® Compact/Low Flow Tubing Pumps

FLOW RANGE: 0.002 to 37 mL/min

C/L® tubing pumps combine low flow and a compact size into a single pump that sits on your benchtop or mounts to your equipment rack—ideal for analyzer applications and any contamination-free pumping.

For the all-new C/L® pump, see page 1.20 in our "Late-Breaking Additions" section in the front of this catalog.

Technical info

- C/L®—use for equipment racks and low-flow benchtop applications.
- L/S®—ideal for transferring fluid in the laboratory, in process areas, or in the field.
- I/P®—use in production scale-up or for quick fluid transfer in the lab.
- B/T®—select to quickly transfer large batches of fluid.

Laboratory/Standard

L/S® Laboratory/Standard Tubing Pumps

FLOW RANGE: 0.0006 to 3400 mL/min

This group includes fixed- and variable-speed contamination-free tubing pumps. It features high accuracy drives for precise flow control and dispensing. Durable and versatile L/S® pumps are designed for laboratory, process, or field use.

MASTERFLEX®

Masterflex® pumps are easy to use and most can be installed within minutes. With few moving parts, they are easy to operate and maintain. And, select drives offer maintenance-free brushless motors. Feature-for-feature, you will not find a better, more valued tubing pump on the market. Contact our Applications Specialists toll-free at 800-MASTERFLEX to order or for expert product and technical assistance. Or visit our Web site at **Masterflex.com** for the latest technical and ordering information.

Industrial/Process

I/P® Industrial/Process Tubing Pumps

FLOW RANGE: 0.012 to 26 LPM

I/P® pumps are characterized by more powerful motors and better protection from hazards like dust and water. These reliable, easy-to-use pumps are perfect in your manufacturing process or for quick fluid transfer in your lab.

Batch/Transfer

B/T® Batch/Transfer Tubing Pumps

FLOW RANGE: 0.3 to 45 LPM

With an all-new pump head design, new tubing sizes, and easy-to-use controls similar to our lower-flow models, rugged B/T® pumps have the highest flow rates of any pumps in the Masterflex® line. They are ideal for quickly transferring large batches of fluids or slurries. B/T® tubing pumps have reliable heavy-duty motors and excellent hazard protection.

Masterflex® Tubing Pumps from Cole-Parmer

Masterflex® tubing pump systems are made to exact specifications using a proven process developed over more than 50 years. This is key to Cole-Parmer's promise to deliver solutions you trust.

Customer Input

Before we create any Masterflex® tubing pump, we define the unique needs of our customers.

Concept

This is where we put our nearly 50 years of experience in developing more than 5,000 products to work. It's where we consider all the possibilities, including specific applications, product adaptability, and costs.

Engineering

Once a product is conceptualized, proven procedures are maintained to control and verify its design to ensure that specified requirements are met.

Testing

Before any Masterflex pump hits the market it is tested and scrutinized under actual application conditions to ensure that it meets specific requirements. The appearance of the following regulatory agency icons are your assurance that those products meet applicable standards for safety and reliability:

Production

Masterflex pumps are manufactured in a facility certified to ISO 9001:2000 standards.

Customer/Application Services

Our partnership with you doesn't end with the sale. We are available for follow-up, technical support, and service to ensure you are completely happy with your product. Our maintenance staff is available to quickly handle repairs and can help you identify replacement parts.

Finally, our expert Application Specialists can help you with product selection and maintenance, and offer you continuous support. Whether you are setting up a complicated system or just have a quick question, their advice is absolutely free.

Masterflex® Pump Configurator for selecting your perfect pump click here

Masterflex.com

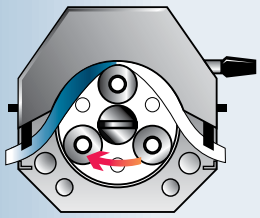
Cole-Parmer® Delivering Solutions You Trust

Markets Served

Biotechnology	Food & Beverage	Research & Development	Manufacturing	Education
Pharmaceutical	Cosmetics	Printing	Semiconductors	Environmental and more...
Chemical	Industrial	Water/Wastewater	Textiles	

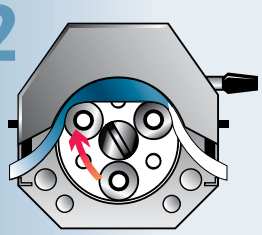
How Masterflex® Pump Heads Work

1



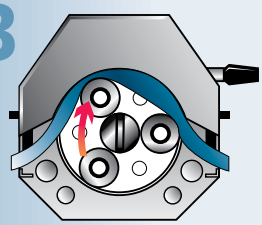
Pump head consists of only two parts: the rotor and the housing. The tubing is placed in the tubing bed—between the rotor and housing—where it is occluded (squeezed).

2



The rollers on the rotor move across the tubing, pushing the fluid. The tubing behind the rollers recovers its shape, creates a vacuum, and draws fluid in behind it.

3



A "pillow" of fluid is formed between the rollers. This is specific to the ID of the tubing and the geometry of the rotor. Flow rate is determined by multiplying speed by the size of the pillow. This pillow stays fairly constant except with very viscous fluids.

Technical info

For detailed technical information and the most complete listings of Masterflex® parts and accessories, please see our Masterflex Encyclopedia Vol. 3.

Click Here **to request your FREE copy!**

What's New!

C/L® Pump
More reliable and repeatable performance from an all-new ultra-compact pump head (page 1.20 in our "Late-Breaking Additions" section in the front of this catalog.)

L/S® Complete Pump Systems
Convenient, complete, single-number pump systems with the Easy-Load® 3 pump head (pages 1250–1276)

Chem-Durance™ Pump Tubing
An unprecedented combination of extended pumping life and chemical resistance from a continuous flexible pump tubing formulation (pages 1246–1247 and 1281)

B/T® Pumps
Improved tubing life and pressure performance from the new Rapid-Load® pump head—easier to load and ideal for high-flow transfer and batch dispensing applications (pages 1299–1305)

ATEX-approved Masterflex® Pump Heads
ATEX

Masterflex L/S Easy-Load® II and High-Performance and I/P® Easy-Load and High-Performance pump heads approved to ATEX Zone 2 (pages 1.21 to 1.24 in our "Late-Breaking Additions" section in the front of this catalog.)

Masterflex.com
For Online Selection & Solutions!*

Go to Masterflex.com today for solutions to all your fluid handling application needs

- Find full technical specs for Masterflex® pumps and tubing
- Search our comprehensive online catalog, updated daily
- Filter and compare product selections

"My CP" Time-Saving Features
- Quick List—save your favorite items
- Save and share shopping lists—for repeat orders
- "Remember Me" auto login

Order Status, Tracking, and More
- Search orders placed online, or via phone, fax, or e-mail
- Sort orders, reprint invoices in "My Orders"
- Real-time package tracking
- Reorder from past orders

"Hassle-Free" Site
- No registration required for pricing or ordering
- Free catalogs—fast, easy online literature requests

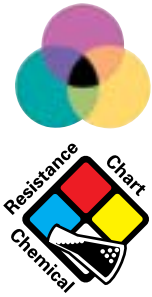
e-Newsletters! Tech Info Library! Industry Updates!
- Application-based resources—find the latest technical articles, operator manuals, application notes, and more
- Sign up for exclusive industry e-newsletters filled with informative articles, sales items, and special offerings!

Available Online Assistance

Go to Masterflex.com/tech_info_m
The Masterflex® Technical Library consists of tips, articles and technical info, application solutions, tubing information, our Masterflex® Connection Newsletter, plus much more!

Use the **Application Solutions** tool to scan a database of challenging fluid handling applications and the Masterflex® pump systems that meet those challenges.

Go to Masterflex.com/MasterflexTubing
The Masterflex® Tubing Parametric Search wizard provides a fast and easy way to determine the optimal tubing for your system configuration based on such parameters as material compatibility, required certification, fluid temperature range, and formulation.



Go to Masterflex.com/MflexChem
Don't take chances—search our interactive pump tubing chemical compatibility guide first!

*In Canada, find the same great online tools and product selection at www.coleparmer.ca

MASTERFLEX®

Selecting Your Masterflex® Tubing Pump System

Your complete system = Pump Head + Tubing + Drive

1 Define Your Application Requirements.

- **A** What flow rate do I need?
- **B** What chemical am I pumping?
- **C** Do conditions such as fluid viscosity or back pressure play an important role in my application?

Purchase your Masterflex® system by components

Pump Head + Tubing + Drive

WHAT TO CONSIDER:

Flow rate—Different pump heads have different flow rate capabilities.
Tubing change frequency—Some pump heads enable rapid tubing changes.
Desired number of channels—Pump heads are stackable in most cases.
Chemical compatibility—If chemicals spill, pump head materials become important.
Accuracy—Standard pump heads offer the most accurate, repeatable flow rates.

2 Select a Pump Series Based on Your Flow Rate.

- **A** C/L® 0.002 to 37 mL/min
- **B** L/S® 0.0006 to 3400 mL/min
- **C** I/P® 0.012 to 26 LPM
- **D** B/T® 0.3 to 45 LPM

Pump Head + **Tubing** + Drive

WHAT TO CONSIDER:

Flow rate—Tubing size directly affects flow rate.
Chemical compatibility—See tables on pages 1220–1221.
Tubing life—See page 1222.
Fluid viscosity, presence of solids, back pressure, or suction lift—High-performance tubing is best for these conditions. See pages 1222–1223.
Fluid temperature—Information concerning the temperature range for each tubing formulation can be found on pages 1216–1219.

3 Select a Pump Head, Tubing, and Drive.

- **A** Each pump series (except C/L® pumps) is divided into three component categories—pump head, tubing, and drive.
- **B** The icons at right appear throughout the Masterflex® section to show you which pump series and what components are listed on those pages.

Pump Head + Tubing + **Drive**

WHAT TO CONSIDER:

Flow rate—The rpm of the drive directly correlates to flow rate.
Fixed- or variable-speed—Variable-speed drives enable flow rate adjustment.
Accuracy of flow rate or dispense volume—Many drives have digital speed control circuitry for highly accurate and repeatable flow rates.
Remote control or computer interface—Some drives can connect to your process controller or can be operated by a footswitch.
Environmental protection against hazards—Many drives are sealed against dust and water exposure.

or purchase a complete Masterflex tubing pump system:

Pump Head + Tubing + Drive

TO FIND COMPLETE MASTERFLEX® TUBING PUMP SYSTEMS, look for the symbol above with all three components highlighted. This symbol indicates that you may purchase a complete Masterflex® system with a single catalog number.

MASTERFLEX® Application Solutions

Scan this database of challenging fluid handling applications and the Masterflex® tubing pump systems that are meeting those challenges.

Help in selecting your Masterflex® pump system is available at Masterflex.com

Enter your specific application parameters into our interactive Pump Configurator and in seconds it will select a pump system that will meet your needs.

MASTERFLEX®

Why MASTERFLEX® Pump Tubing?

Accept no substitutes—use only Masterflex® tubing in your tubing pumps!

- Precision extruded to meet tight tolerances
- Factory tested and optically inspected
- Engineered to comply with numerous standards and classifications

To ensure accurate flow rates and long tubing life, use only Masterflex® tubing in your pump tubing applications. Our tubing is your best choice because, unlike general-purpose commodity tubing, it is specifically designed and manufactured for use in demanding peristaltic pump applications.

Masterflex® tubing will help you achieve top performance from your fluid transfer system. We offer 20 different tubing formulations in a variety of sizes for every application. Select Precision tubing or High-performance precision tubing, which improves pressure generation, suction lift, ability to pump viscous fluids, and tubing life.

Pump Tubing for a Wide Range of Applications

Masterflex® pump tubing is ideal for a wide range of applications in a number of markets, including:

- Chemical processing
- Food and beverage
- Medical research
- Education
- Water treatment
- Pharmaceutical
- Environmental
- Industrial
- Laboratory
- Printing
- Biotech
- Semiconductors

Need help to determine the right tubing for your application?

Call our Application Specialists at **847-549-7600** for a recommendation; or go to **www.coleparmer.com/MasterflexTubing**

Special Tubing for Challenging Applications

Chem-Durance™ Tubing New

Chem-Durance tubing provides excellent chemical resistance and pumping life. A plasticizer-free liner helps to reduce spallation. The thermoplastic outer jacket provides more durability—especially under higher pressures. For more information, see page 1219.

Chemical Resistant

PTFE Tubing

A peristaltic pump head that uses PTFE tubing is available. PTFE tubing is chemically inert, will not absorb or leach into fluid, and can withstand pressure up to 100 psi (6.8 bar). For additional technical information and specifications, see page 1234.

STA-PURE® and CHEM-SURE® Pump Tubing

STA-PURE pump tubing produces no detectable particulates to prevent fluid contamination, and lasts over 6000 hours at 100 rpm. Its unique design and material also provides unparalleled flow stability. CHEM-SURE pump tubing offers the same benefits as our STA-PURE tubing, with enhanced chemical resistance for greater fluid compatibility. CHEM-SURE pump tubing is fluoroelastomer-based to withstand aggressive chemicals, including organic solvents—even xylene and toluene. For more information, see page 1217.

High-Pressure Tubing

Need to pump under pressure? Masterflex® High-Pressure PharMed® BPT and Norprene® tubing (page 1261) can withstand up to 100 psi continuously. PTFE pump tubing can also operate up to 100 psi, while STA-PURE and CHEM-SURE pump tubing exhibit long life at up to 60 psi (see above).

FDA Viton®

For the chemical resistance of Viton combined with FDA approval for food and beverage applications, see FDA Viton on page 1219.

Quick-Coupling Sanitary Pump Tubing Sets

This tubing features smooth, pre-molded sanitary mini-connections that provide enhanced, bacteria-free fluid transfer and allow quick connection to an adapter or to another length of sanitary tubing with similar pre-molded ends. See page 1249 for L/S® and page 1283 for I/P® sanitary tubing.

Double-Y Pump Tubing Sets

Molded double-Y pump tubing sets are made from platinum-cured silicone (96410-series) and are available in five-foot lengths. Combine two channels to double pump output and reduce pulsation by up to 90%. For more information, see page 1248.

Bulk Pump Tubing and Custom Orders

Spooled and bulk-packed tubing save you money, time and waste, while giving you the added convenience of having enough tubing on hand at all times (see pages 1245, 1282, and 1304–1305). Need a large volume of tubing? Contact us and we'll custom package Masterflex® tubing to meet your needs.

Choose Masterflex® Tubing

The right pump tubing is crucial when building your Masterflex pump system. Before you choose, consider all aspects of your application: chemical compatibility, operating temperature, pressure, necessary regulatory approvals, gas permeability of the tubing, and cleaning/sterilization requirements.

Reference information:

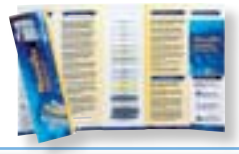
For specific information on chemical compatibility with Masterflex tubing, go to pages 1220–1221
For our interactive chemical compatibility charts for pump tubing, go to ColeParmer.com/MflexChem
For information on material life, gas permeability, pressure/vacuum/suction generation, and viscosity handling characteristics, go to Masterflex.com

More info

Need Compliance Documentation? If you need documentation to prove that your specific Masterflex® pump tubing complies with certain regulations or agency requirements, **simply request a FREE Certificate of Tubing Compliance with your order.**

Technical info

Our FREE Tubing Test Kit is a simple way to test your chemicals against different tubing formulations. Kit contains samples of 17 different pump tubing formulations, formulation descriptions, a selection guide, instructions on how to test your tubing, and complete ordering information. Call today!



Masterflex® Pump Tubing Formulations Descriptions

Silicone Tubing

While our silicone tubing formulations share many characteristics, there are some basic differences.

Platinum-Cured Silicone Tubing

- Slightly greater clarity
- Smooth surface; lower protein binding levels
- Fewer potential leachables
- Ideal for pharmaceutical and biotechnology use

Peroxide-Cured Silicone Tubing

- Greater physical compression capability
- Economical, longer tubing life
- Potential outgassing of peroxide products

BioPharm Silicone Tubing (platinum-cured)

- Ultra-smooth inner surface minimizes particle entrapment
- Very low extractables, with documented biocompatibility for sensitive applications
- Ideal for lab, biotech, and pharmaceutical applications

BioPharm Plus Silicone Tubing (platinum-cured)

- All of the benefits of BioPharm silicone tubing (at left), plus:
- Longest tubing life of any silicone pump tubing
- Lower spallation than regular silicone
- Enhanced pressure capability

C-FLEX® Tubing

- Combines biocompatibility of silicone with chemical resistance similar to Tygon®
- Very low protein binding
- Heat sealable, weldable, economical

To sterilize all silicone tubing:

High-speed instrument (flash) autoclave: Place tubing on nonlinting cloth or sterilizing paper in a clean, open tray for 10 minutes at 270°F (132°C) at 2 kg/cm² (30 psi).

Standard gravity autoclave: Wrap tubing in nonlinting cloth or sterilizing paper and place in a clean, open tray for 30 minutes at 250°F (121°C) at 1 kg/cm² (15 psi).

Pre-vacuum high-temperature autoclave: Wrap tubing in nonlinting cloth or sterilizing paper and place in a clean, open tray for normal cycle of 30 to 35 minutes at 250°F (121°C).

Gamma radiation: 2.5 Mrad.

Pump tubing formulation	Silicone (platinum-cured)	Silicone (peroxide-cured)	BioPharm Silicone (platinum-cured)	BioPharm® Plus Silicone (platinum-cured)	C-FLEX® (50 A)
Series number	**96410**	**96400**	**96420**	**96440**	**06424**
					
Advantages	Excellent biocompatibility. No leachable additives, DOP, or plasticizers; phthalate and latex-free; odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Extremely good over a wide temperature range. Weather, ozone, corona, and radiation resistant. Minimal tendency to take a set.	Excellent biocompatibility. No additives, plasticizers or DOP; odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Extremely good at low temperatures. Weather, ozone, corona, and radiation resistant. Minimal tendency to take a set.	Ultra-smooth inner surface minimizes particle entrapment. Lower absorption; excellent biocompatibility; no leachable additive, DOP, or plasticizers. Very low extractables. Odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Weather, ozone, corona, and radiation resistant.	Similar to BioPharm Silicone, plus: Longest life of any silicone pump tubing. Lower spallation than regular silicone. Enhanced pressure capability. Fungus-resistant. Nontoxic, no leachable plasticizers. Lower gas permeability than other silicones. Use with many acids and alkalies.	Physical properties similar to silicone with chemical compatibility of Tygon®. Very low protein binding. Inexpensive. Biocompatible. Heat sealable and weldable.
Limitations	Do not use with concentrated acids and bases, organic solvents, or oils. Relatively high gas permeability.	Do not use with concentrated solvents, oils, acids. Relatively high gas permeability.	Do not use with concentrated solvents, oils, or acids. Relatively high gas permeability.	Do not use with concentrated solvents, oils, or acids. Relatively high gas permeability.	Not recommended for use with oils. Moderate pumping life.
Application suitability:					
Acids	Not recommended	Not recommended	Not recommended	Not recommended	Good
Alkalies	Not recommended	Not recommended	Not recommended	Not recommended	Good
Organic solvents	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended
Pressure	Fair	Fair	Fair	Fair	Fair
Vacuum	Good	Good	Good	Good	Good
Viscous fluids	Fair	Fair	Fair	Fair	Fair
Sterile fluids	Excellent	Excellent	Excellent	Excellent	Excellent
Physical characteristics and composition	Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material; flexible. Translucent, clear to light amber.	Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material. Translucent, clear to light amber.	Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material. Translucent, clear to light amber.	Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material. Translucent, clear to light amber.	Thermoplastic elastomer. Styrene-ethylene-butylene modified block copolymer with silicone oil. Excellent tensile and tear strength Soft material. Opaque, white.
Temperature range	–58 to 446°F (–50 to 230°C)	–58 to 446°F (–50 to 230°C)	–75 to 450°F (–60 to 232°C)	–75 to 450°F (–60 to 232°C)	–100 to 275°F (–73 to 135°C)
Meets classifications	USP Class V Extractables; exceeds Class VI Implant; FDA 21 CFR 177.2600; Exceeds 3A Sanitary cGMPs (FDA 21 CFR 210 and 211). European Pharmacopoeia (EP)	USP Class VI FDA 21 CFR 177.2600 criteria European Pharmacopoeia (EP)	USP Class VI FDA 21 CFR 177.2600 Exceeds 3A sanitary standards European Pharmacopoeia (EP)	USP Class VI FDA 21 CFR 177.2600 Exceeds 3A sanitary standards European Pharmacopoeia (EP)	USP Class VI FDA 21 CFR 177.1810
Gas permeability $\frac{cc \times mm}{(cm^2 \times sec \times cm\ Hg) \times 10^{-10}}$	CO_2: 20,132 H_2: 6579 O_2: 7961 N_2: 2763	CO_2 20,132 H_2: 6579 O_2: 7961 N_2: 2763	CO_2: 25,147 H_2: — O_2: 4715 N_2: 2284	CO_2: 25,147 H_2: — O_2: 4715 N_2: 2284	CO_2: — H_2: — O_2: 150 N_2: —
Cleaning/sterilization	Clean with hot water/soap solution; use a non-oily soap such as Ivory®, not synthetic detergent or oil-based soap as they may be absorbed by the tubing and into the fluid. Rinse well with distilled water. Ethylene oxide (ETO) sterilization is not recommended—sufficient data is not available about complete outgassing of residual ETO and other ETO products.	Clean with isopropyl alcohol or hot water/soap solution; use a non-oily soap such as Ivory®, not synthetic detergent or oil-based soap as they may be absorbed by the tubing and into the fluid. Rinse thoroughly with distilled water. May use ETO. Autoclavable.	Sterilize by ETO, autoclave, or gamma radiation up to 2.5 Mrad. To autoclave: coil loosely in nonlinting cloth or paper; autoclave at 250°F (121°C), 1 bar (15 psi) for 30 minutes.	Sterilize by ETO, autoclave, or gamma irradiation up to 2.5 Mrad. To autoclave: coil loosely in nonlinting cloth or paper; autoclave at 250°F (121°C), 1 bar (15 psi) for 30 minutes.	Sterilize by ETO, autoclave, or gamma radiation.

MASTERFLEX®

Continuous pressures up to 100 psi!
See page 1261 for details and to order our High-pressure tubing.

Other Biopharmaceutical Tubing

In addition to silicone, we also carry other pump tubing formulations that are biocompatible and well-suited to biotech and pharmaceutical laboratory or production applications.

PharMed® BPT Tubing
- Over 10,000 hours of tubing life
- Resists ozone and UV radiation
- Noncytotoxic and nonhemolytic
- Ideal for tissue and cell culture work
- Heat sealable and bondable

PharmaPure® Tubing
- Biocompatibility similar to PharMed® BPT
- Long life under continuous pressure up to 40 psi (2.7 bar)
- Very low spallation
- Low extractables

STA-PURE® Tubing
- Long life at continuous pressure up to 60 psi (4 bar)
- Excellent flow stability
- Spallation-free
- Low gas permeability

CHEM-SURE® Tubing
- Very similar to STA-PURE (left), plus:
- Excellent chemical resistance
- Compatible with many inorganic and organic chemicals

PTFE Tubing
- Chemically inert; best chemical resistance of any pump tubing
- Sold in molded pump tubing elements
- Use with PTFE tubing pump head

Pump tubing formulation	PharMed® BPT	PharmaPure®	Gore™ STA-PURE®	Gore™ CHEM-SURE®	PTFE
Series number	**06508**	**06435**	**96200**	**96210**	**77390**
					
Advantages	Great for tissue and cell work—nontoxic and nonhemolytic. Long service life minimizes risk of fluid exposure; reduces tubing costs and pump downtime. Opaque to UV and visible light to protect light-sensitive fluids. Low gas permeability. High-pressure (100 psi) version available.	Nontoxic and nonhemolytic (similar to PharMed® BPT); biocompatible. Long life even under pressure; up to 1000 hours at 40 psi (2.7 bar). Very low spallation—protects fluid purity. Low extractables. Low gas permeability.	Long life, even under pressures up to 60 psi (4 bar). Excellent flow stability; <1% change in flow rate as tubing wears, no break-in period required. Spallation-free. Excellent biocompatibility. Very low extractables.	Similar to STA-PURE® tubing but with enhanced chemical resistance. Resistant to many organic and inorganic fluids. Long life at pressure up to 60 psi (4 bar). Spallation-free. Excellent biocompatibility. Low gas permeability.	Chemically inert. Excellent chemical resistance. Will not leach into or absorb out of fluid being pumped. Extremely low gas permeability. Nontoxic. Virtually nonporous. Low coefficient of friction.
Limitations	Potential leaching of USP mineral oil or blend material.	Potential leaching of USP mineral oil or blend material.	Sold as tube elements only; no continuous lengths available.	Sold as tube elements only; no continuous lengths available.	Limited pumping life.
Application suitability:					
Acids	Good	Good	Not recommended	Excellent	Excellent
Alkalies	Good	Good	Not recommended	Good	Excellent
Organic solvents	Not recommended	Not recommended	Not recommended	Excellent	Excellent
Pressure	Good	Good	Excellent	Excellent	Good
Vacuum	Good	Good	Good	Good	Good
Viscous fluids	Excellent	Excellent	Good	Good	Excellent
Sterile fluids	Excellent	Good	Excellent	Excellent	Good
Physical characteristics and composition	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, beige.	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, off-white.	ePTFE (expanded PTFE) and platinum-cured silicone. Excellent tensile strength. Firm (stiff) material. Opaque, white.	ePTFE (expanded PTFE) and fluoroelastomer. Excellent tensile strength. Firm (stiff) material. Opaque, white.	Polytetrafluoroethylene. Rigid material. Translucent, white.
Temperature range	–60 to 270°F (–51 to 132°C)	–89 to 275°F (–67 to 135°C)	–40 to 302°F (–40 to 150°C)	–112 to 392°F (–80 to 200°C)	–400 to 500°F (–240 to 260°C)
Meets classifications	USP Class VI FDA 21 CFR 177.2600 NSF-listed (Standard 51). European Pharmacopoeia (EP)	USP Class VI FDA 21 CFR 177.2600 European Pharmacopoeia (EP)	USP Class VI FDA 21 CFR 177.2600 European Pharmacopoeia (EP)	USP Class VI FDA 21 CFR 177.1550	USP Class VI FDA 21 CFR 177.1500
Gas permeability $\frac{cc \times mm}{(cm^2 \times sec \times cm\ Hg) \times 10^{-10}}$	CO_2: 1200 H_2: — O_2: 200 N_2: 80	CO_2: 1200 H_2: — O_2: 200 N_2: 80	CO_2: 20,132 H_2: 6579 O_2: 7961 N_2: 2763	CO_2: 76 to 79 H_2: — O_2: — N_2: 4.3	CO_2: 6.8 H_2: — O_2: — N_2: 1.0
Cleaning/sterilization	Sterilize by ETO, autoclave, or gamma radiation up to 2.5 Mrad. Repeated autoclaving will not affect overall life.	Sterilize by ETO, autoclave or gamma radiation up to 2.5 Mrad. Repeated autoclaving will not affect overall life.	Sterilize by ETO, autoclave or SIP (steam in place). Repeated autoclaving will not affect overall life.	Sterilize by ETO, autoclave or SIP (steam in place). Repeated autoclaving will not affect overall life.	Sterilize by ETO, autoclave or dry heat.

Masterflex® Pump Tubing Formulations Descriptions

Tygon® Tubing

Our Tygon tubing comes in five separate formulations that share common characteristics but differ in tubing life and other specifications. See descriptions below for details about each formulation.

Tygon® Lab Tubing

- Ideal for general transfer applications
- Economical
- Nontoxic, nonaging, and non-oxidizing

Tygon® LFL Tubing

- Longest tubing life of all Tygon tubing formulations
- Broad chemical compatibility
- Low gas permeability

Tygon® Food Tubing

- Meets various food and sanitary regulations
- Unaffected by all commercial sanitizers
- Nonwetting properties allow flush-cleaning and complete drainage
- Smooth inner surface

Tygon® Fuel & Lubricant Tubing

- Ideal for transferring hydrocarbons, gasoline, kerosene, heating oils, cutting compounds, and glycol-based coolants
- Not for use with concentrated strong acids or alkalies

Tygon® Chemical Tubing

- Best chemical resistance of Tygon® formulations
- Compatible with some organics
- Plasticizer-free

Sterilization

Ethylene oxide (ETO): Coil tubing loosely in nonlinting cloth or sterilization paper. Follow the sterilization equipment manufacturer's directions as to gas type, concentration, times, and temperatures; maintain humidity within the prescribed limits, generally between 30 to 65%.

Standard gravity autoclave: Coil tubing loosely in nonlinting cloth or sterilizing paper, and place in a clean, open tray for 30 minutes at 250°F (121°C) at 1 kg/cm² (15 psi); air dry at max 150°F (66°C) for 2 to 2½ hours until clear.

Gamma radiation: Cap ends of tubing if required. Radiation should be product specific and according to GMP guidelines.

Pump tubing formulation	Tygon® Lab (R-3603)	Tygon® LFL	Tygon® Food (B-44-4X)	Tygon® Fuel & Lubricant (F-4040-A)	Tygon® Chemical (2001)
Series number	06409	06429	06419	06401	06475
					
Advantages	Inexpensive tubing for general laboratory applications. Clear for easy flow monitoring. Handles virtually all inorganic chemicals. Nonaging, nonoxidizing. Low gas permeability. Good for viscous fluids. High dielectric constant.	Longest life of all Tygon® peristaltic tubing (up to 1000 hrs). Clear for easy flow monitoring. Broad chemical resistance. Nonaging, nonoxidizing. Low gas permeability. Smooth bore. Good for viscous fluids. High dielectric constant.	Designed especially for handling food products. Bore is extremely smooth (better than most stainless steels) Nontoxic, will not affect taste or odor, and clear for CIP and flow verification. Excellent nonwetting properties permit flush cleaning and complete drainage. High dielectric constant.	Specially formulated to transport hydrocarbons, petroleum products, and distillates. Suitable for gasoline, kerosene, heating oils, cutting fluids, and glycol-based coolants. Minimum extractability. Low gas permeability. High dielectric constant.	Best chemical resistance of any Tygon® formulation. Compatible with many polar solvents. Plasticizer-free. Clear for easy flow monitoring. Low extractability. Low gas permeability. High dielectric constant.
Limitations	Limited pumping life. Potential leaching of plasticizer.	Potential leaching of plasticizer.	Limited pumping life.	Don't use with strong acids and alkalies.	Limited pumping life. Some external spallation during use (does not affect tubing ID). Recommended for use with Easy-Load®, Easy-Load® II, and Easy-Load®3 pump heads only.
Application suitability:					
Acids	Good	Good	Good	Good	Excellent
Alkalies	Good	Good	Good	Good	Excellent
Organic solvents	Not recommended	Not recommended	Not recommended	Not recommended	Good
Pressure	Good	Good	Good	Good	Good
Vacuum	Good	Good	Good	Good	Good
Viscous fluids	Excellent	Excellent	Excellent	Excellent	Excellent
Sterile fluids	Poor	Good	Good	Poor	Good
Physical characteristics and composition	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, clear.	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, clear.	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, clear.	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, yellow.	Thermoplastic elastomer. PVC- and plasticizer-free material. Firm (stiff) material. Transparent, clear.
Temperature range	–58 to 165°F (–50 to 74°C)	–58 to 165°F (–50 to 74°C)	–47 to 165°F (–44 to 74°C)	–35 to 165°F (–37 to 74°C)	–108 to 135°F (–77 to 57°C)
Meets classifications	FDA 21 CFR 175.300	USP Class VI FDA 21 CFR 175.300	FDA 21 CFR 175.300 NSF-listed (Standard 51)	None	FDA 21 CFR 177.2600
Gas permeability $\frac{cc \times mm}{(cm^2 \times sec \times cm\ Hg) \times 10^{-10}}$	CO_2: 360 H_2: 97 O_2: 80 N_2: 40	CO_2: 563 H_2: — O_2: 124 N_2: 67	CO_2: 270 H_2: 97 O_2: 60 N_2: 30	CO_2: 100 H_2: 97 O_2: 22 N_2: 12	CO_2: 114 H_2: — O_2: 19 N_2: 9
Cleaning/sterilization	Sterilize with ETO or autoclave. To autoclave: Coil tubing loosely in nonlinting cloth or paper, autoclave at 250°F (121°C), 1 kg/cm² (15 psi) for 30 minutes (tubing will appear milky); air dry at max 150°F (66°C) for 2 to 2½ hours until clear.	Sterilize with ETO or autoclave. To autoclave: Coil tubing loosely in nonlinting cloth or paper, autoclave at 250°F (121°C), 1 kg/cm² (15 psi) for 30 minutes (tubing will appear milky); air dry at max 150°F (66°C) for 2 to 2½ hours until clear.	Unaffected by commercial sanitizers (with recommended procedures). Sterilize by ETO or autoclave. To autoclave: Coil tubing loosely in nonlinting cloth or paper; autoclave at 250°F (121°C), 1 kg/cm² (15 psi) for 30 minutes (tubing will appear milky); air dry at max 150°F (66°C) for 2 to 2½ hours until clear.	Sterilization is not recommended.	Sterilize by ETO, autoclave, or gamma radiation. To autoclave: Coil tubing loosely in nonlinting cloth or paper; autoclave at 250°F (121°C), 1 kg/cm² (15 psi) for 30 minutes (tubing will appear milky); air dry at max 150°F (66°C) for 2 to 2½ hours until clear.

MASTERFLEX®

Other Industrial and Food-Grade Tubing

Norprene® Tubing

- Up to 10,000 hours of tubing life
- Best choice for pressure/vacuum applications
- Resists heat, ozone, acids, and alkalies
- Heat sealable and bondable
- Nonaging, nonoxidizing

Norprene® Food Tubing

- Ideal for high-temperature food and beverage applications
- Similar characteristics as Norprene® tubing
- Meets FDA and NSF standards

Chem-Durance™ Tubing

- Excellent chemical resistance
- Excellent pumping life
- Low spallation

Viton® Tubing

- Excellent chemical resistance
- Resists corrosives, solvents, and oils at elevated temperatures

FDA Viton® Tubing

- Similar to Viton® (above), but with FDA approval
- Excellent chemical resistance

Where to Order Tubing

Continuous pressures up to 100 psi!

L/S® High-Pressure Pump System

See page 1261 for details and to order our High-pressure Norprene® and PharMed® BPT tubing.

Pump tubing formulation	Norprene® (A 60 G)	Norprene® Food (A 60 F)	Chem-Durance™	Viton®	FDA Viton®
Series number	**06404**	**06402**	**06432**	**06412**	**96412**
					
Advantages	Best choice for vacuum/pressure applications. Offers longest pump tubing life. Heat, ambient ozone resistant. Good resistance to acids/alkalies. Black color hides dirt and dust. Heat sealable, nonaging, and nonoxidizing. High dielectric constant. High-pressure version available.	Similar to Norprene® (06404) but with FDA approval. Excellent for food/dairy applications. Longest life, good flow consistency. Heat and ozone resistant. Good resistance to acids/alkalies. Heat sealable, nonaging, and nonoxidizing. High dielectric constant.	Excellent chemical resistance. Excellent life and durability under pressure. Low spallation. Plasticizer-free inner liner. High dielectric constant.	Excellent chemical resistance. Resistant to corrosives, solvents, and oils at elevated temperatures. Low gas permeability.	Similar to Viton® (06412) but with FDA approval. Perfect for food and lab applications where FDA compliance is required. Excellent chemical resistance. Resistant to corrosives, solvents, and oils at elevated temperatures. Low gas permeability.
Limitations	Potential leaching of USP mineral oil or blend material.	Potential leaching of USP mineral oil or blend material.	Requires high starting torque.	Limited pumping life.	Limited pumping life.
Application suitability:					
Acids	Good	Good	Excellent	Excellent	Excellent
Alkalies	Good	Good	Excellent	Excellent	Excellent
Organic solvents	Not recommended	Not recommended	Good	Variable—test before using	Variable—test before using
Pressure	Excellent	Excellent	Excellent	Good	Good
Vacuum	Excellent	Excellent	Excellent	Good	Good
Viscous fluids	Excellent	Excellent	Excellent	Good	Good
Sterile fluids	Not recommended	Good	Excellent	Fair	Fair
Physical characteristics and composition	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, black.	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, beige.	Thermoplastic elastomer (for outer jacket). Plasticizer-free inner liner. Firm (stiff) material. Opaque, beige.	Thermal set rubber. Viton B (67% fluorine). Firm (stiff) material. Opaque, black.	Thermal set rubber. Viton B (67% fluorine). Firm (stiff) material. Opaque, black.
Temperature range	–60 to 270°F (–59 to 135°C)	–60 to 270°F (–59 to 135°C)	–71 to 165°F (–60 to 74°C)	–25 to 400°F (–32 to 205°C)	–25 to 400°F (–32 to 205°C)
Meets classifications	None	FDA 21 CFR 177.2600 NSF-listed (Standard 51)	FDA 21 CFR 177.2600	None	FDA 21 CFR 177.2600
Gas permeability $\frac{cc \times mm}{(cm^2 \times sec \times cm\ Hg) \times 10^{-10}}$	CO_2: 1200 H_2: — O_2: 200 N_2: 80	CO_2: 1200 H_2: — O_2: 200 N_2: 80	CO_2: 745 H_2: — O_2: 135 N_2: 45	CO_2: 76 to 79 H_2: — O_2: 13 to 15 N_2: 4.3	CO_2: 76 to 79 H_2: — O_2: 13 to 15 N_2: 4.3
Cleaning/sterilization	Sterilize by autoclave. Repeated sterilization will not affect overall life.	Sterilize by autoclave. Repeated autoclaving will not affect overall life.	Sterilize with ethylene oxide (ETO) radiation or autoclave. To autoclave: Coil loosely in nonlinting cloth or paper, autoclave at 250°F (121°C) 1 kg/cm² (15 psi) for 30 minutes; air dry at 150°F (66°C) for 2 to 2½ hours. Radiation: 25 kGy (2.5 Mrads).	Sterilization is not recommended.	Sterilize by using a circulating hot air oven at 480°F (249°C) for 16 hours.

MASTERFLEX®

Masterflex® Pump Tubing Compatibility Charts

Determine the right tubing formulation for your application using the chemical compatibility tables at right. These tables are for use with all Masterflex® tubing sizes. All ratings in the tables indicate tubing condition after exposure to the chemical at 70°F (21°C).

Ratings & Materials Legend

Ratings

- **A:** No effect; little noticeable change
- **B:** Minor effect; slight corrosion or discoloration
- **C:** Moderate effect; not recommended for continuous use; softening, loss of strength, swelling and/or shrinkage
- **D:** Severe effect; not recommended for use; severe softening, swelling and/or shrinkage
- **—:** No data available

Tubing formulations

- **PN:** PharMed® BPT, High-Pressure PharMed® BPT, PharmaPure®, Norprene®, Norprene® Food
- **CF:** C-FLEX®
- **S:** Silicone (peroxide/platinum-cured), BioPharm, BioPharm Plus, STA-PURE®
- **T:** Tygon® Lab, Tygon® LFL, Tygon® Food
- **TU:** Tygon® Fuel & Lubricant
- **TC:** Tygon® Chemical
- **CD:** Chem-Durance™
- **CS:** CHEM-SURE®
- **V:** Viton®, FDA Viton®
- **PT:** Polytetrafluoroethylene (PTFE)

Pump head materials

- **PSF:** Polysulfone
- **PC:** Polycarbonate
- **PPS:** Polyphenylene sulfide
- **SS:** Stainless steel
- **PP:** Polypropylene

Where to Order Tubing

C/L® Tubing.....1227
L/S® Tubing.....1245–1249
I/P® Tubing.....1281–1283
B/T® Tubing.....1304–1305

⚠ DANGER

Even if tubing passes the immersion test, variations in temperature, pressure, or concentration may cause tubing failure. SERIOUS INJURY MAY RESULT. Use suitable guards and/or personal protection when pumping chemicals.

⚠ WARNING

The information in these tables has been supplied to Cole-Parmer by the tubing manufacturers and is to be used ONLY as a guide to select your tubing. Test fluids and tubing using the tubing test procedure below. Cole-Parmer does not warrant (neither express or implied) that the information in these tables is accurate or complete or that any material is suitable for any purpose.

Fluid	Tubing formulation										Pump head material				
	PN	CF	S	T	TU	TC	CD	CS	V	PT	PSF	PC	PPS	SS	PP
Acetaldehyde	D	A	B	D	D	D	C	A	D	A	D	—	A	A	A
Acetate LMW	A	A	—	D	D	C	D	—	—	A	D	—	A	A	D
Acetic acid <5%	A	A	A	A	A	B	A	A	—	A	A	A	A	B	B
Acetic acid >5%	A	A	A	B	A	B	A	A	B	A	A	C	A	B	A
Acetic anhydride	A	B	C	D	D	A	A	A	D	A	D	D	A	B	C
Acetone	D	C	C	D	D	C	B	A	D	A	D	D	A	A	A
Acetonitrile	B	A	—	D	D	B	B	—	D	A	D	D	A	A	—
Acetyl bromide	C	A	—	D	D	C	D	—	—	A	—	—	—	—	—
Acetyl chloride	C	A	C	D	D	C	D	A	A	A	D	D	A	A	D
Air	A	A	A	A	A	A	A	A	A	A*	A	A	A	A	A
Aliphatic hydrocarbons	D	D	—	D	B	D	D	—	—	—	—	—	—	B	—
Aluminum chloride	A	A	B	A	A	A	A	—	A	A	A	A	A	D	A
Aluminum sulfate	A	A	A	A	A	A	A	—	A	A	A	A	A	B	A
Alums	A	A	A	A	A	A	A	—	A	A	—	—	—	—	A
Ammonia, gas / liquid	A	A	C	B	B	B	B	—	D	A	A	D	A	B	A
Ammonium acetate	A	A	—	A	A	A	A	A	D	A	—	A	—	B	A
Ammonium carbonate	A	A	C	A	A	A	A	A	A	A	A	—	A	B	A
Ammonium chloride	A	A	C	A	A	A	A	A	A	A	A	—	A	C	A
Ammonium hydroxide	A	A	A	B	C	A	A	A	B	A	A	D	A	A	A
Ammonium nitrate	A	A	C	A	A	A	A	A	A	A	A	—	A	A	A
Ammonium phosphate	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Ammonium sulfate	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Amyl acetate	B	D	D	D	D	D	D	B	D	A	D	D	A	A	D
Amyl alcohol	D	D	D	D	A	A	A	A	A	A	A	—	A	A	A
Amyl chloride	C	D	D	D	D	D	D	—	A	A	D	D	D	A	D
Aniline	C	B	D	D	D	D	D	A	B	A	D	D	A	A	A
Aniline hydrochloride	C	B	D	D	D	D	D	A	B	A	—	D	—	D	D
Aqua regia (80% HCl, 20% H)	D	—	D	D	D	A	A	—	B	A	D	D	D	D	B
Aromatic hydrocarbons	D	D	—	D	D	D	D	—	A	—	—	—	—	B	—
Arsenic salts	A	—	—	A	A	A	A	—	D	—	—	—	—	—	—
Barium salts	A	A	A	A	A	A	A	A	A	A	A	—	A	B	B
Benzaldehyde	D	D	B	D	D	C	C	A	D	A	C	C	A	B	C
Benzenesulfonic acid	D	A	D	D	D	D	D	A	A	A	D	D	A	B	D
Bleaching liquors	A	B	B	A	A	A	A	—	A	A	—	—	—	—	B
Boric acid	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Bromine	D	A	D	D	D	D	D	—	A	A	—	D	D	D	C
Butane	A	D	D	A	A	B	B	B	A	A	—	—	A	A	B
Butanol (butyl alcohol)	D	B	B	D	A	A	A	A	A	A	A	C	A	A	B
Butyl acetate	B	D	D	D	D	D	D	B	D	A	D	D	A	B	D
Butyric acid	B	A	D	D	C	D	D	A	B	A	—	—	A	B	C
Calcium oxide	A	—	A	A	A	A	A	—	A	A	—	—	—	A	A
Calcium salts	A	A	B	A	A	A	A	A	A	A	A	—	A	B	A
Carbon bisulfide	D	D	D	D	D	D	D	—	—	A	—	—	—	A	C
Carbon dioxide	A	A	B	A	A	A	A	A	A	A*	—	A	A	A	A
Carbon tetrachloride	D	B	D	D	D	D	D	B	A	A	A	D	A	B	D
Chlorine, dry	C	A	D	A	A	C	C	—	A	A*	D	—	D	A	D
Chlorine, wet	D	A	D	B	A	C	C	—	B	A	D	—	D	C	D
Chloroacetic acid	B	A	—	A	D	A	A	B	D	A	D	D	A	B	D
Chlorobenzene	D	D	D	D	D	D	D	A	A	B	D	D	A	A	D
Chlorobromomethane	B	D	D	D	D	—	D	—	A	A	D	—	—	—	A
Chloroform	C	D	D	D	D	D	D	B	A	A	D	D	A	A	D
Chlorosulfonic acid	D	A	D	D	D	D	D	A	D	A	D	—	—	D	D
Chromic acid, 30%	A	A	C	B	C	B	B	—	A	A	D	D	A	B	A
Chromium salts	A	A	—	A	A	A	A	—	—	—	—	—	—	—	—
Copper salts	A	A	A	A	A	A	A	—	A	A	—	—	A	B	A
Cresol	D	D	D	D	C	A	A	A	A	A	D	D	A	A	C
Cyclohexane	D	D	D	D	C	D	D	B	A	A	A	B	A	A	D
Cyclohexanone	D	D	D	D	D	C	C	—	D	A	D	D	A	A	D
Diacetone alcohol	A	A	B	D	D	A	A	A	D	A	—	D	—	B	C
Dimethyl formamide	B	B	B	D	D	A	A	A	D	A	D	D	A	A	A
Essential oils	D	B	C	D	C	D	D	—	—	—	—	—	—	—	—
Ethanol (ethyl alcohol)	C	B	A	D	B	A	A	A	A	A	B	B	A	A	A
Ether	C	D	D	D	C	D	D	B	D	A	D	D	A	A	B
Ethyl acetate	B	D	B	D	D	D	D	A	D	A	A	D	A	B	A
Ethyl bromide	D	A	D	D	D	C	D	—	A	A	—	—	—	—	D
Ethyl chloride	C	A	D	D	D	D	D	—	A	A	D	D	—	A	D
Ethylamine	D	A	C	D	D	B	B	B	D	—	—	—	—	—	—
Ethylene chlorohydrin	A	A	C	D	B	A	A	—	A	A	D	D	A	B	D
Ethylene dichloride	C	A	D	D	D	D	D	B	A	A	D	D	A	B	A
Ethylene glycol	A	B	A	A	A	A	A	A	A	A	A	C	A	B	A
Ethylene oxide	A	A	D	A	A	A	A	B	D	A	A	D	D	B	D
Fatty acids	C	B	C	B	B	C	C	A	A	A	—	C	—	B	A
Ferric chloride	A	A	B	A	A	A	A	—	A	A	A	—	A	D	A
Ferric sulfate	A	A	B	A	A	A	A	A	A	A	A	—	A	B	A
Ferrous chloride	A	A	C	A	A	A	A	—	A	A	A	D	A	D	A
Ferrous sulfate	A	A	C	A	A	A	A	A	A	A	A	A	A	B	A
Fluoboric acid	D	A	A	A	D	A	A	—	—	A	A	—	A	B	A
Fluoroborate salts	A	A	—	A	A	A	A	—	—	—	—	—	—	—	—
Fluosilicic acid	C	A	D	A	A	A	A	—	A	A	A	—	A	C	A
Formaldehyde	D	A	B	D	D	C	C	A	D	A	A	A	A	C	A
Formic acid, 25%	A	A	B	A	C	A	A	A	D	A	C	D	A	B	A
Freon® TMS	D	C	—	D	D	A	A	D	—	A	—	D	A	—	—
Gasoline, high-aromatic	D	D	D	D	B	D	D	B	A	B	A	C	A	A	D
Gasoline, nonaromatic	D	D	D	D	B	D	D	B	A	A	A	A	A	—	C
Glucose	A	A	A	A	A	A	A	A	A	A	—	A	—	A	A
Glue, P.V.A.	A	A	A	A	A	—	A	—	A	A	—	—	—	A	C
Glycerin	A	B	A	A	A	A	A	—	A	A	A	A	A	A	A
Hydriodic acid	D	A	—	A	A	A	A	—	A	—	—	—	—	—	—
Hydrobromic acid, 30%	D	A	D	A	A	A	A	—	A	A	B	D	A	D	A
Hydrochloric acid (dil)	A	A	D	A	A	A	A	A	A	A	A	A	D	D	A
Hydrochloric acid (med)	B	A	D	A	D	A	A	A	A	A	A	D	D	D	A
Hydrochloric acid (conc)	—	B	D	A	D	A	A	A	A	A	A	B	D	D	A
Hydrocyanic acid	A	A	C	A	A	A	A	A	A	A	—	—	—	B	A
Hydrocyanic acid, gas, 10%	A	A	C	A	A	A	A	—	A	A	—	—	—	—	A
Hydrofluoric acid, 50%	D	A	D	C	D	A	A	D	D	A	—	D	A	D	C
Hydrofluoric acid, 75%	—	A	D	D	D	—	C	D	D	A	—	D	A	D	C

*Do not use the L/S® PTFE-tubing pump head with gases due to excessive heat buildup.

MASTERFLEX®

Fluid	Tubing formulation										Pump head material				
	PN	CF	S	T	TU	TC	CD	CS	V	PT	PSF	PC	PPS	SS	PP
Hydrogen peroxide (dil)	A	A	A	A	A	A	A	A	A	A	A	A	—	B	A
Hydrogen peroxide, 90%	B	D	B	D	D	B	B	A	A	A	A	A	—	B	A
Hypochlorous acid	A	A	D	A	A	A	A	A	A	A	—	—	—	—	—
Iodine solutions	A	C	C	A	A	A	A	—	A	A	—	D	D	D	A
Iodoform	—	—	—	—	—	—	D	—	C	—	—	—	—	A	—
Kerosene	D	D	D	D	B	D	D	A	A	A	A	A	A	A	A
Ketones	D	B	—	D	D	C	C	—	—	A	D	D	A	A	A
Lacquer solvents	B	D	D	D	D	D	D	A	D	A	—	D	—	A	D
Lactic acid, 3–10%	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Lead acetate	A	A	D	A	A	A	A	—	D	A	A	—	A	B	A
Linseed oil	C	D	A	D	A	B	B	A	A	A	A	A	A	A	A
Lithium hydroxide	B	A	D	A	A	—	B	—	C	A	—	D	A	B	—
Magnesium chloride	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Magnesium sulfate	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Malic acid	A	A	B	A	A	A	A	A	A	A	—	—	—	A	B
Manganese salts	A	A	B	A	A	A	A	—	A	A	—	—	—	D	—
Mercury salts	A	A	—	A	A	A	A	—	A	A	—	—	—	B	A
Methane	A	D	D	A	A	A	A	B	A	A*	—	—	—	A	B
Methanol (methyl alcohol)	D	—	A	C	C	A	A	A	B	A	D	B	A	A	A
Methyl chloride	C	A	D	D	D	D	D	B	B	A	D	—	A	A	D
Methyl ethyl ketone (MEK)	D	—	D	D	D	C	C	B	D	A	D	D	A	A	A
Mixed acid (40% H_2SO_4, 15% HNO_3)	B	—	—	B	D	—	A	—	—	A	D	—	—	B	A
Molybdenum disulfide	—	A	—	—	—	—	A	—	A	—	—	—	—	—	—
Monoethanolamine	C	B	B	D	D	D	D	—	D	A	A	—	A	A	B
Naphtha	D	D	D	D	B	D	D	B	A	B	B	—	A	A	A
Natural gas	A	D	A	A	A	A	A	B	A	A*	—	—	—	A	B
Nickel salts	A	A	A	A	A	A	A	A	A	A	A	—	A	B	A
Nitric acid (dil)	A	A	B	A	D	A	A	A	B	A	A	B	A	A	A
Nitric acid (med)	A	—	C	A	D	A	A	A	A	A	C	C	—	A	B
Nitric acid (conc)	D	—	D	D	D	A	A	A	A	A	C	D	D	A	C
Nitrobenzene	D	D	D	D	D	D	D	A	B	A	D	D	A	B	B
Nitrogen oxides	A	A	D	A	A	A	A	—	D	A	—	—	—	—	—
Nitrous acid	A	A	—	A	C	A	A	—	—	A	—	—	—	B	A
Oils, animal	C	B	B	D	B	B	B	—	A	A	—	—	—	A	—
Oils, mineral	D	B	B	C	A	D	D	—	A	A	B	A	A	A	A
Oils, vegetable	C	B	B	D	A	B	B	A	A	A	A	—	A	A	A
Oleic acid	C	A	D	D	B	D	C	A	B	A	A	A	A	B	A
Oxalic acid, cold	B	A	B	B	D	A	A	A	A	A	—	B	A	B	A
Oxygen, gas	A	A	B	A	A	A	A	A	B	A*	A	A	—	A	—
Palmitic acid, 100% in ether	C	—	D	D	B	C	C	A	A	A	—	—	—	B	C
Perchloric acid	A	A	D	C	D	A	A	A	A	A	D	D	A	C	C
Perchloroethylene	C	B	D	D	D	D	D	B	A	A	D	D	A	B	D
Phenol (carbolic acid)	A	D	D	B	C	A	A	A	A	A	—	D	—	B	A
Phosphoric acid, 50%	A	A	C	A	A	A	A	A	A	A	A	B	—	A	A
Phthalic acid	A	D	B	D	A	A	A	—	B	A	—	—	—	B	A
Plating solutions	A	A	D	A	D	A	A	—	A	A	—	—	—	—	A
Polyglycol	B	B	A	A	A	—	B	—	A	—	—	—	—	—	—
Potassium carbonate	A	A	—	A	A	A	A	A	A	—	A	—	A	B	A
Potassium chlorate	B	A	B	A	A	—	A	A	A	A	A	—	A	B	A
Potassium hydroxide (med)	A	A	B	A	D	—	A	B	D	A	A	D	A	B	A
Potassium hydroxide (conc)	A	A	C	D	D	—	A	B	D	A	A	D	—	B	B
Potassium iodide	A	A	—	A	A	A	A	—	A	A	—	—	—	A	B
Propanol (propyl alcohol)	C	—	A	D	A	A	A	A	A	A	B	A	A	A	A
Pyridine	C	A	D	D	D	C	C	A	D	A	D	D	A	A	B
Silicone fluids	A	B	C	B	A	B	A	—	A	A	—	—	A	A	A
Silicone oils	C	B	C	B	A	B	A	—	A	A	—	A	A	A	A
Silver nitrate	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Soap solutions	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sodium bicarbonate	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Sodium bisulfate	A	A	—	A	A	A	A	A	A	A	A	A	A	D	A
Sodium bisulfite	A	A	A	A	A	—	A	A	A	A	—	A	—	B	A
Sodium borate	A	A	A	A	A	—	A	—	A	A	A	A	A	B	B
Sodium carbonate	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sodium chlorate	A	A	C	A	A	A	A	—	A	A	A	A	A	B	A
Sodium chloride	A	A	A	A	A	A	A	A	A	A	A	A	A	C	A
Sodium ferrocyanide	A	A	—	B	B	—	A	—	A	A	—	—	—	B	A
Sodium hydrosulfite	B	A	—	A	A	—	A	—	—	A	—	—	—	—	—
Sodium hydroxide (dil)	A	A	A	A	D	A	A	A	A	A	A	D	A	A	A
Sodium hydroxide, 25%	A	B	B	C	D	A	A	—	A	A	A	D	A	B	A
Sodium hydroxide (conc)	—	C	—	C	D	A	A	—	A	A	—	D	A	C	B
Sodium hypochlorite, <5%	A	A	B	A	A	A	A	A	A	A	A	B	A	A	A
Sodium hypochlorite, >5%	A	A	B	A	A	A	A	A	A	A	A	—	A	C	B
Sodium nitrate	A	A	D	A	A	A	A	A	A	A	—	—	A	B	A
Sodium silicate	A	A	A	A	A	—	A	A	A	A	A	—	A	B	A
Sodium sulfide	A	A	A	A	A	A	A	A	A	A	A	—	A	C	A
Sodium sulfite	A	A	A	A	A	A	A	A	A	A	—	D	—	A	B
Steam, up to 40 psi	C	—	A	D	D	—	D	A	B	A*	A	A	A	A	—
Stearic acid	C	A	B	A	B	C	C	A	A	A	C	A	—	B	C
Styrene	D	D	D	D	D	D	D	A	A	A	—	D	—	A	—
Sulfuric acid (dil)	A	A	D	A	A	A	A	A	A	A	A	A	A	D	A
Sulfuric acid (med)	A	A	D	A	B	A	A	—	A	A	B	C	A	D	A
Sulfuric acid (conc)	D	A	D	D	D	D	A	C	A	A	D	D	A	C	B
Sulfurous acid	A	A	D	A	A	A	A	—	B	A	A	—	A	B	A
Tannic acid	B	A	B	B	D	A	A	—	A	A	A	—	A	B	A
Tanning liquors	A	B	—	A	A	A	A	—	—	A	—	—	—	A	B
Tartaric acid	A	A	A	A	A	A	A	A	A	A	A	B	A	C	A
Tin salts	A	A	B	A	A	A	A	—	—	A	—	—	—	—	A
Toluene (toluol)	D	D	D	D	D	D	D	A	A	A	D	D	A	A	B
Trichloroacetic acid	B	A	D	A	D	A	A	—	C	A	—	D	A	D	A
Trichloroethylene	D	D	D	D	D	D	D	B	A	A	C	D	A	B	D
Trisodium phosphate	A	A	—	A	A	A	A	—	A	A	—	—	A	B	A
Turpentine	D	D	D	D	B	D	D	A	A	A	—	—	A	A	B
Urea	A	A	B	A	A	A	A	A	—	A	C	D	A	A	A
Uric acid	A	A	—	A	C	A	A	—	—	A	—	—	—	B	—
Water, fresh	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A
Water, salt	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A
Xylene	D	D	D	D	D	D	D	A	A	A	D	D	A	A	C
Zinc chloride	A	A	A	A	A	A	A	A	A	A	A	A	A	D	A

*Do not use the L/S® PTFE-tubing pump head with gases due to excessive heat buildup.

Tubing Test Procedure

1. Measure and weigh a sample of tubing.
2. Immerse the sample in the fluid for 72 hours in a closed vessel.
3. Dry sample, then measure and weigh it. Inspect carefully for signs of deterioration such as swelling, embrittlement, cracking, softness, or change of size or weight.
4. If there is no sign of deterioration, test a sample in pump under the conditions of your application.

Tubing for Food Products

Liquified food products	Norprene® food	Silicone	Tygon® food
Alcohol	B	—	—
Beer	B	A	—
Brandy	B	—	—
Butter	A	B	A
Carrot	A	—	A
Chocolate syrup	A	—	A
Citric acid	A	A	A
Coffee	A	A	—
Corn oil	—	A	—
Corn syrup	—	—	A
Fish	—	A	A
Fruit juices	A	—	A
Liqueurs	B	B	—
Mayonnaise	A	—	A
Milk	A	A	A
Milk of magnesia	A	—	B
Molasses	A	—	B
Orange syrup	A	B	—
Sauerkraut	A	—	B
Shortening (liquid)	C	B	—
Soft drink concentrate	B	C	—
Sugar	A	A	A
Tomatoes	A	—	A
Vegetable oil	B	B	B
Vinegar	A	A	A
Whiskey	B	A	B
Wines	B	A	B

Masterflex® Tubing Compatibility Tables

- Tubing Life
- Pressure Guidelines
- Vacuum/Suction Lift
- Gas Permeability

Ensure top performance with your Masterflex® pump head by using precision-extruded Masterflex® tubing to deliver accurate flow rates. We offer twenty different material formulations.

To order the correct tubing:

1. Consider all the aspects of your application: flow rate, pressure, etc.
2. Review the chemical compatibility data on pages 1220–1221, as well as specific information about individual tubing materials on pages 1216–1219.
3. Use the "Tubing Material Life Comparison" graph and table at right to select the tubing with the longest life.

If your specific application requires the generation of high pressure or a strong vacuum/suction lift, refer to the "Pressure Guidelines" and "Vacuum/Suction Lift" graphs at right. These graphs help you determine which tubing will pressurize the most rapidly or develop the strongest vacuum/suction lift in your particular application.

If your application requires pumping air-sensitive gases or liquids, refer to the "Gas Permeability" graph below right to choose the tubing with the lowest permeability.

If you are pumping a viscous fluid, refer to the "Tubing Selection Guide for Pumping Viscous Fluids" graph on page 1223 to select the best tubing size.

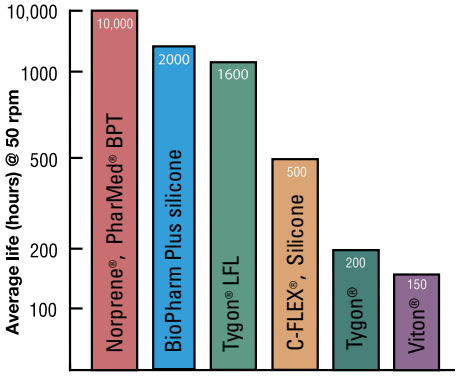
Technical info

Our FREE Tubing Test Kit is a simple way to test your chemicals against different tubing formulations. Kit contains samples of 17 different pump tubing formulations, formulation descriptions, a selection guide, instructions on how to test your tubing, and complete ordering information. Call today!

More info

Use only Masterflex® tubing with Masterflex® pumps to ensure optimal performance. Use of other tubing may void applicable warranties.

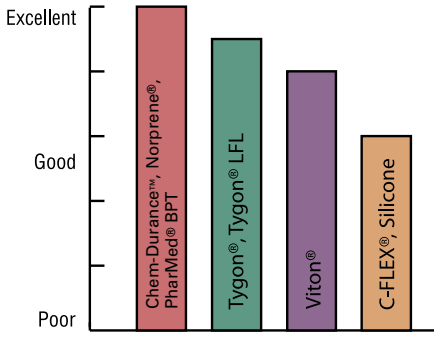
Tubing Material Life Comparison



The graph above displays the average tubing life in hours of Masterflex tubing. This tubing was tested in a Masterflex Standard pump head continuously pumping water at 70°F (21°C) and 0 psig (0 bar). Tubing life is calculated to time of failure or of 50% reduction in flow rate, whichever comes first. Reduce drive speeds to extend tubing life. Average tubing life for L/S® 16, I/P® 73, and B/T® 90 tubing at various rpm are listed in the table below.

Tubing class	L/S® 16		I/P® 73		B/T® 90	
Drive rpm	50	600	50	600	50	350
Norprene®, PharMed® BPT	10,000	1000	4000	800	2000	400
Tygon® LFL	1600	700	800	400	500	130
C-FLEX®, Silicone	500	100	400	80	250	100
Tygon®	200	50	180	35	100	30
Viton®	150	30	120	25	—	—

Vacuum/Suction Lift



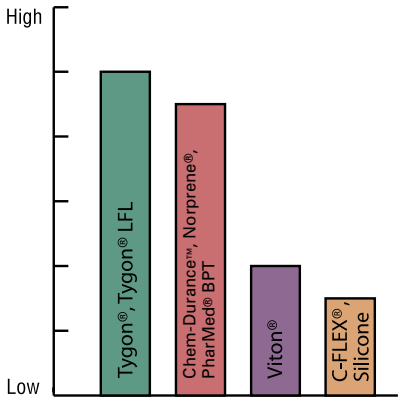
Vacuum/suction lift capability depends greatly on the tubing's ability to maintain its shape. Thus, a firmer tubing type in the smallest possible bore size will generate a stronger vacuum for your application. Higher drive speeds are required to generate the strongest possible vacuum with some tubing sizes.

Where to Order Tubing

- C/L® Tubing.....1227
- L/S® Tubing..... 1245–1249
- I/P® Tubing..... 1281–1283
- B/T® Tubing 1304–1305

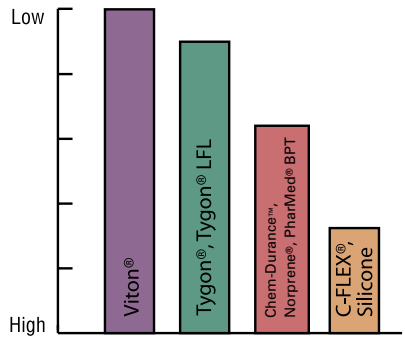
GO to page(s) 1261
For our high-pressure PharMed® BPT and Norprene® tubing.

Pressure Guidelines



All tubing types accept pressure, but the firmer formulations accept more pressure than the softer types of tubing.

Gas Permeability



To minimize permeation of gases through the tubing wall, use firm tubing. Masterflex® L/S® and I/P® High-performance precision tubing (L/S® 15, L/S® 24, L/S® 35, L/S® 36, I/P® 70, I/P® 88, and I/P® 89) is less permeable than Precision tubing sizes. See pages 1216–1219 for tubing permeability to various gases.

MASTERFLEX®

Masterflex® Peristaltic Pumps

Ideal for pumping viscous fluids

To maximize the pumping efficiency of viscous fluid, follow these steps:

1. Slow down the speed of your pump. Increasing the speed beyond a certain point will not have any effect on flow rate. The maximum efficient speed of the pump decreases as viscosity increases and tubing size decreases.

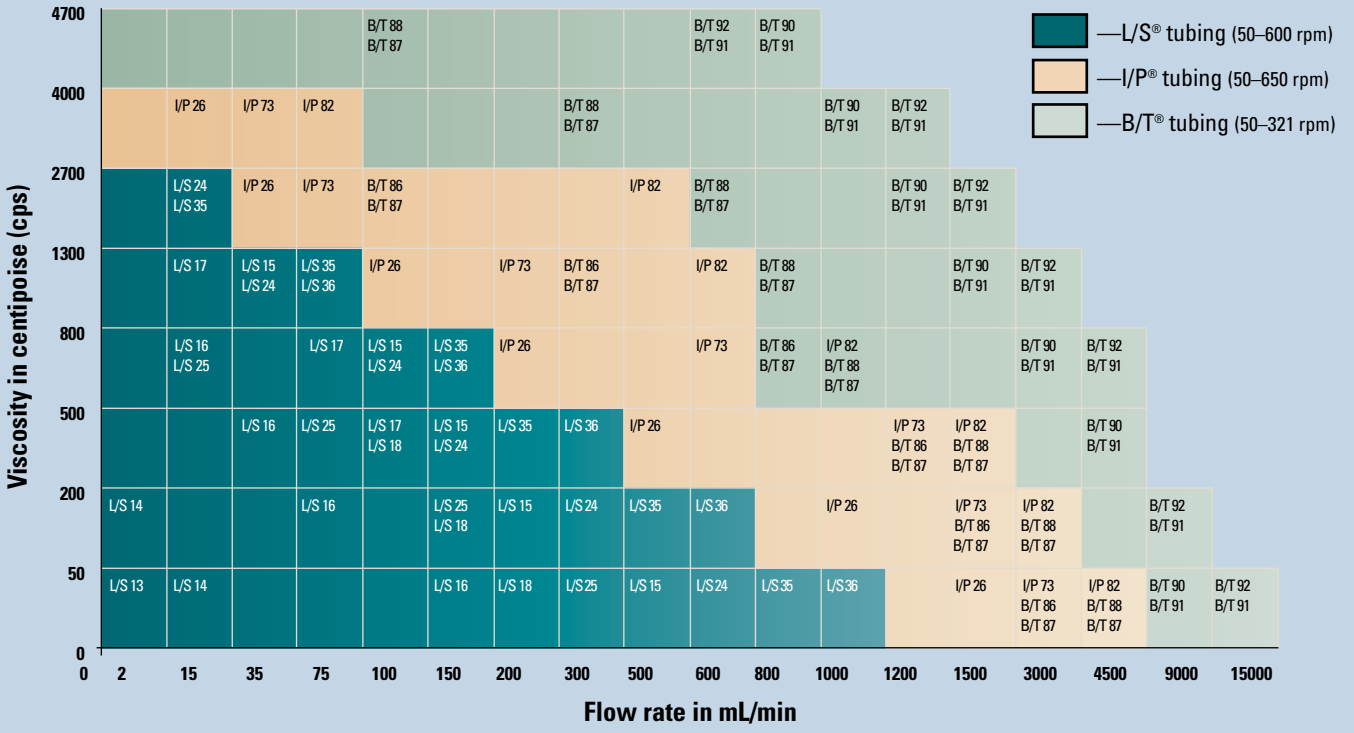
2. Choose a larger size tubing than required to pump water. The table below will help you choose the best size.

3. Choose a firm tubing such as Norprene®, PharMed® BPT, CHEM-SURE®, STA-PURE®, Chem-Durance™, or Tygon® LFL. Performance will be better because the tubing returns to its original shape quickly after pump head occlusion. For L/S®, I/P® and B/T® sizes, choose high-performance precision tubing—the thicker wall also returns more quickly to its original shape than precision tubing. The quicker return allows liquid to be pulled into the tubing with greater force.

4. Select a tubing with a smooth bore. A smooth bore will decrease frictional forces. BioPharm, BioPharm Plus, Tygon®, Tygon® LFL, silicone, or Tygon® silicone formulations are good choices.

5. Decrease the viscosity of your fluid. Heat your fluid if possible; viscosity usually decreases with temperature.

Tubing Selection Guide for Pumping Viscous Fluids



How to use this graph:

Example: You have an 800 centipoise fluid that you wish to pump at 150 mL/min. Find 150 mL/min on the "flow rate" axis of the graph above and find 800 centipoise on the "viscosity" axis. Follow the two points to where they meet. The graph shows that L/S® 35 and L/S® 36 tubing will obtain the desired flow rate. These tubing sizes will also work for all lower viscosities and lower flow rates.

Considerations: All viscosity test data were obtained using firm tubing materials such as Norprene®, PharMed® BPT, Viton®, and Tygon® because these formulations perform the best in viscosity applications. Tests were performed with fluids at 70°F (21°C) and 0 bar (0 psig) of back pressure. The graph is best used as a general guideline only, and is not a guarantee that you will achieve the results shown.

Pulse Dampener

Virtually eliminates pulsation in your output flow. Features a polyethylene body. Includes five pairs of fittings and PTFE-pipe thread tape.

Accepted tubing:
All L/S® sizes and I/P® 26

Fittings included (tubing ID x NPT(M) thread): 1/16" x 1/8", 1/8" x 1/8" PP fittings; 3/16" x 1/8", 1/4" x 1/8" and 3/8" x 1/8" HDPE fittings

Dampener connections: 1/8" NPT(F) **Dead volume:** 190 mL

Max. pressure: 4.3 bar (60 psi) at 70°F (21°C)

Catalog number	Description	Price
EK-07596-20	Pulse dampener	

MASTERFLEX®
Chem-Durance™ Pump Tubing

Specially formulated to provide excellent chemical resistance and long life in peristaltic pumps

New

COLE-PARMER EXCLUSIVE

Inner liner provides excellent chemical resistance.

Flexible outer layer ensures excellent pumping capabilities in Masterflex® peristaltic pumps.

Chem-Durance tubing has been developed with a plasticizer-free bore (inner layer) specially bonded to a thermoplastic elastomer jacket (outer layer) to create a synergistic combination of chemical resistance and pumping life. With excellent resistance to acids, bases, salts, ketones and alcohols, this product will perform in a wide range of chemical applications—limiting the number of tubing formulations you need to keep on hand.

The plasticizer-free, smooth bore liner is hydrophobic and will resist the absorption/adsorption of aqueous fluids. This property minimizes the risk of fluid alteration in single or repeat-use applications. Additionally, the inner liner reduces the amount of particulate spallation, ensuring a cleaner process.

Test results to date have shown pump life up to 5000 hours at 100 rpm and 0 psi; up to 1000 hours at 600 rpm and 0 psi. Chem-Durance tubing has been tested at pressures up to 40 psi, with a life of 200 hours at 100 rpm.

This unique tubing uses the latest in polymer technology to provide a tubing choice for sensitive-fluid transfer applications with peristaltic pumps.

Features & Benefits

- Long flex life in peristaltic pumps
- Temperature range of –75 to 165°F (–59 to 74°C)
- Superior chemical resistance
- Meets FDA criteria for food contact
- Resists absorption/adsorption of aqueous fluids
- Virtually unaffected by chemical sanitizers and cleaners

Applications

- Ink and solvent production
- Battery acid filling
- Specialty chemical production/processing
- Diagnostic testing
- Sensitive-fluid transfer

More info

For Chem-Durance tubing, see pages 1246–1247 and 1281.

MASTERFLEX®

MASTERFLEX® PharmaPure® Low-Spallation Pump Tubing

Features & Benefits

- Ultra-low particulate spallation
- Outlasts silicone tubing in peristaltic pumps up to 30 times
- Provides an excellent barrier with low permeability
- Withstands autoclaving and sterilization
- Meets all USP Class VI and FDA criteria

Masterflex PharmaPure tubing is a premium peristaltic pump tubing that combines unsurpassed pump life with ultra-low particle spallation. Developed especially for pharmaceutical, biotechnology, and laboratory applications, this tubing provides superior flex life, excellent wear properties, low permeability, and superior adsorption characteristics as compared to silicone and other alternate materials. Recommended for use in all Masterflex L/S®, I/P®, and B/T® pump heads, except for L/S and I/P High-Performance pump heads.

Applications

- Cell harvest and media process systems
- Vaccine manufacturing
- Bioreactor process lines
- Sterile filling
- Diagnostic test products
- Production filtration and fermentation

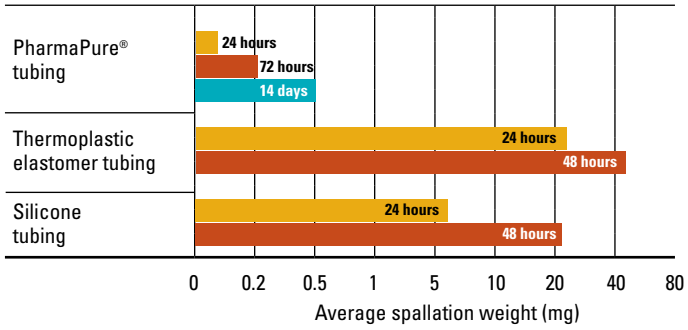
More info

For PharmaPure® tubing, see pages 1246–1247, 1281, and 1304–1305.
For PharMed® BPT tubing, see pages 1245–1247, 1281–1282, and 1304–1305.

With its superior flex life and low spallation rate, PharmaPure® tubing is an ideal option in biotechnology and laboratory applications. The inner layer protects sensitive cell cultures. The tubing is shown at right on Masterflex® I/P® drive 77420-00 and I/P® Easy-Load® pump head 77601-60.

Spallation Rate Tubing Comparison

The following test data summarizes the spallation results of select tubing used in a peristaltic pump. In each case ¼" ID tubing was used in a three-roller pump head operating at 600 rpm under room temperature 73°F (23°C). Results from a minimum of five samples were averaged to obtain values.



MASTERFLEX® PharMed® BPT Biocompatible Pump Tubing

Features & Benefits

- Provides an excellent barrier with low permeability
- Outlasts silicone tubing in peristaltic pumps up to 30 times
- Withstands autoclaving and sterilization
- Temperature resistant from –60 to 275°F (–51 to 135°C)
- Withstands repeated CIP and SIP cleaning and sterilization
- Meets all USP Class VI and FDA criteria

Masterflex PharMed BPT biocompatible tubing is less permeable to gases and vapors than silicone tubing and is ideal for protecting sensitive cell cultures, fermentation, synthesis, separation, purification, and process monitoring and control systems. PharMed BPT tubing has been formulated to withstand the rigors of peristaltic pumping action while providing the biocompatible fluid surface required in sensitive applications. Recommended for use in all Masterflex L/S®, I/P®, and B/T® pump heads.

Applications

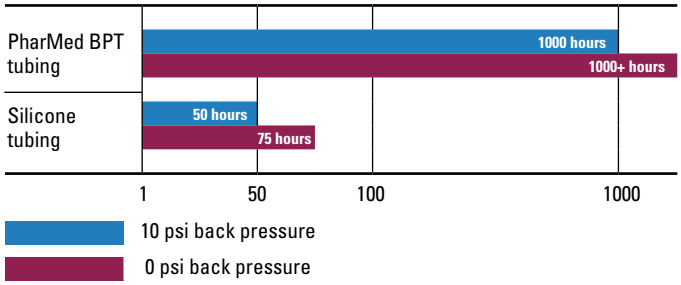
- Diagnostic test product manufacturing
- Cell harvest and media process systems
- Vaccine manufacturing
- Bioreactor process lines
- Production filtration and fermentation
- Sterile filling
- Shear-sensitive fluid transfer

The performance of tubing in peristaltic pumping applications is affected by the conditions of use and equipment utilized, along with size and wall thickness of the tubing tested. The data at right is presented for information only and should not be utilized for specification purposes.

Formulated to last in tough peristaltic pumping conditions, PharMed® BPT tubing is an excellent choice for pharmaceutical and biotechnology applications. The tubing is shown at right on Masterflex® L/S® drive 07523-60 and Easy-Load® 3 pump head 77800-60.

Comparative Peristaltic Pump Tubing Life

The table below depicts hours until failure of ¼" ID x ⅜" OD tubing. In each case, a three-roller pump head was utilized operating at 600 rpm under room temperature 73°F (23°C). Tubing life is measured in hours of use prior to failure.



C/L® Variable-Speed Tubing Pumps

Contamination-free dual- or single-channel pumping

- Stackable, compact ¼-DIN housing—mount in your equipment rack or place on your lab bench. (To mount, order optional brackets 77120-03 on facing page).
- Separate single-turn speed control and cw/off/ccw switch with green LED power indicator—maintain speed setting when you turn pump on/off or reverse direction
- Reversible permanent magnet DC motor enables fluid purge before or after pumping, and pumping fluid in either direction
- Remote control connections on back of pump; start/stop pump with a contact closure
- Built-in tubing retainers firmly grip the tubing—change tubing quickly and easily

C/L® pumps are compact (¼ DIN) and perfect for low-flow OEM use or analyzer applications. These easy-to-use, economical pumps feature reversible pumping, remote control capabilities, and rapid tubing changes. Ideal for consistent fluid delivery in chromatography, spectroscopy, and dispensing applications.

Pump head is constructed from polyphenylene sulfide (PPS), stainless steel (SS), and features acetyl copolymer rollers. PPS and SS promote longer life and the six-roller construction provides a low-pulsation flow. Average fixed occlusion for tubing means there is no need to adjust after tubing changes.

Maximum suction lift of 5 ft (1.5 m); max discharge head of 20 ft (6.1 m); max pressure 15 psi (1.0 bar). Self-priming pumps withstand minor back pressure, and accept all sizes of microbore tubing listed on facing page.

Perfect for Compact Spaces!

For the all-new C/L® pump, see page 1.20 in our "Late-Breaking Additions" section in the front of this catalog.

A C/L dual-channel pump 77120-32 shown with PharMed® BPT tubing 95809-42

B C/L single-channel pump 77120-80 shown with Tygon® Lab tubing 95609-10

A Dual-Channel Compact Pumps

- Flow range: 0.002 to 12.3 mL/min per channel depending on drive rpm and tubing size
- One- or two-channel, reversible pumping
- Max button runs pump at 100% of maximum rpm—use to prime or to rapidly flush tubing

What's included: 5-ft (1.5-m) of 0.89-mm ID Tygon® LFL tubing and dual-voltage (115/230 VAC) power supply with 6-ft (1.8-m) power cord. Pumps are shipped with cord/plug assembly appropriate to destination country. Order additional microbore tubing based on chemical compatibility (pages 1215–1223) and flow rate (page 1227).

B Single-Channel Compact Pumps

- Highest flow rate: 0.07 to 37.0 mL/min depending on drive rpm and tubing size
- Reversible, one-channel pumping
- Max button runs pump at 100% of maximum rpm—use to prime or to rapidly flush tubing

What's included: 5-ft (1.5-m) of 0.89-mm ID Tygon LFL tubing and dual-voltage (115/230 VAC) power supply with 6-ft (1.8-m) power cord. Pumps are shipped with cord/plug assembly appropriate to destination country. Order additional microbore tubing based on chemical compatibility (pages 1215–1223) and flow rate (page 1227).

Typical applications

- Chlorine analyzer feed
- Refractometer flow cell feed
- Flow injection analysis
- Low flow infusion/perfusion

GO to page(s) 487–546

For stainless steel microconnector fittings for microbore tubing, please see pages 487–546.

34000-24

The ideal pump system for flow-through analyzer applications

Flow Rates in mL/min

rpm	Microbore pump tubing size (ID)							
	0.19 mm	0.25 mm	0.51 mm	0.89 mm	1.14 mm	1.42 mm	2.06 mm	2.79 mm
A Dual-channel compact pumps (flow rate per channel)								
1 to 6	0.002 to 0.013	0.0028 to 0.017	0.012 to 0.07	0.036 to 0.20	0.057 to 0.34	0.08 to 0.49	0.15 to 0.88	0.22 to 1.3
10 to 60	0.02 to 0.13	0.03 to 0.18	0.12 to 0.7	0.36 to 2.13	0.55 to 3.3	0.8 to 4.9	1.5 to 8.9	2.1 to 12.3
B Single-channel compact pumps								
35 to 200	0.07 to 0.41	0.11 to 0.61	0.4 to 2.3	1.3 to 7.2	1.9 to 11.0	2.9 to 16.8	4.9 to 28.1	6.5 to 37.0

Power supplies are: UL, CSA, GS

ISO 9001:2000 CERTIFIED SUPPLIER | CE | 1 year warranty

Specifications & Ordering Information for C/L® Pumps

Catalog number	rpm	Speed control (repeatability)	Number of channels	Reversible motor	IP rating	Dimensions—¼ DIN (L x W x H)	Power		Price
							VAC, Hz	Amps	
A Dual-channel compact pumps									
KH-77120-32	1 to 6	±5% (±5%)	2	Yes	IP22	5½" x 3¾" x 3¾" (14 cm x 9.5 cm x 9.5 cm)	90 to 260, 50/60	150 mA at 115 VAC	
KH-77120-52†							12 VDC†	—	
KH-77120-42	10 to 60						90 to 260, 50/60	150 mA at 115 VAC	
KH-77120-62†							12 VDC†	—	
B Single-channel compact pumps									
KH-77120-70†	35 to 200	±5% (±5%)	1	Yes	IP22	5½" x 3¾" x 3¾" (14 cm x 9.5 cm x 9.5 cm)	12 VDC†	—	
KH-77120-80							90 to 260, 50/60	120 mA at 115 VAC	

†Power supply not included.

Accessories

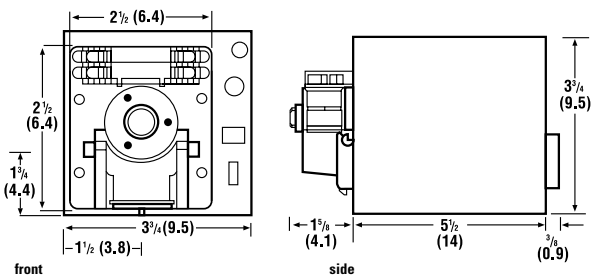
KH-77120-03 Brackets for panel mounting. Set of 2
KH-77120-11 Replacement power supply, 115/230 VAC, for pumps 77120-32 and -42
KH-77200-07 Replacement power supply, 115/230 VAC, for pump 77120-80
KH-06473-00 Straight connector, for connecting microbore tubing of 1- to 4-mm OD (sizes -10 through -42). Pack of 3

Order brackets 77120-03 to mount your C/L® pump to an equipment rack.

Microbore Pump Tubing Ordering Information

Tube ID (mm)	Tygon® Lab	Silicone, platinum-cured	Silicone, peroxide-cured	PharMed® BPT	Tygon® LFL (long flex life)	Viton®	C-FLEX®	Solvent/ hydrocarbon
0.19	KH-95609-10	—	—	—	—	—	KH-95718-10	KH-95712-10
0.25	KH-95609-12	—	—	KH-95809-12	—	—	KH-95718-12	KH-95712-12
0.51	KH-95609-18	—	—	KH-95809-18	KH-96429-18	—	KH-95718-18	KH-95712-18
0.89	KH-95609-26	KH-95612-26	KH-07625-26	KH-95809-26	KH-96429-26	KH-07632-26	KH-95718-26	KH-95712-26
1.14	KH-95609-30	KH-95612-30	KH-07625-30	KH-95809-30	KH-96429-30	KH-07632-30	KH-95718-30	KH-95712-30
1.42	KH-95609-34	KH-95612-34	KH-07625-34	KH-95809-34	KH-96429-34	KH-07632-34	KH-95718-34	KH-95712-34
2.06	KH-95609-42	KH-95612-42	KH-07625-42	KH-95809-42	KH-96429-42	KH-07632-42	KH-95718-42	KH-95712-42
2.79	KH-95609-48	KH-95612-48	KH-07625-48	KH-95809-48	KH-96429-48	KH-07632-48	KH-95718-48	KH-95712-48
Qty/pk	100 ft (30.4 m)	50 ft (15.2 m)	50 ft (15.2 m)	100 ft (30.4 m)	100 ft (30.4 m)	50 ft (15.2 m)	50 ft (15.2 m)	50 ft (15.2 m)
Price/pk								

C/L® Pump Dimensions—dimensions in inches (cm)

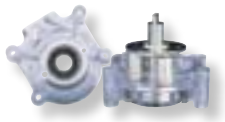


Built-in Tubing Retainers

Lower occlusion bed. Wrap tubing around rollers and secure in tubing retainers.

Snap occlusion bed shut.

Selection Guide for L/S® Pump Heads

Pump Head	Flow rates	No. of rollers	Multi-channel or stackable	Housing/roller materials*	Special features	Page number
Standard 	0.06 to 2900 mL/min	3	Yes, stack up to 4 heads.	PC/CRS, PC/SS or PPS/SS	Highest precision, accurate, and economical. Accurate repeatable fluid transfer.	**1229**
Easy-Load® 3 	0.06 to 2900 mL/min	3	Yes, stack up to 4 heads.	PP and nylon/ CRS or SS	Easy tubing changes with automatic retention, same side tubing entry/exit. New mounting system—install and stack heads without tools or hardware.	**1230–1231**
Easy-Load® II 	0.06 to 2900 mL/min	4	Yes, stack up to 4 heads. Dual-channel models available.	PPS/CRS or PPS/SS	Easy tubing changes, automatic tubing retention, adjustable occlusion. Choice of one or two channels.	**1232–1233**
PTFE-Tubing 	0.06 to 65 mL/min	6	No.	Aluminum, acetal/SS	A technological breakthrough—uses rigid PTFE-tubing. Up to 100 psi. Transfers aggressive solvents. High purity. High pressures.	**1234**
High-Performance 	0.9 to 3400 mL/min	3	No.	Polyester, SS, PPS	Highest flow rate of any L/S® pump head. Up to 100 psi with L/S® HP (High-Pressure) pump tubing.	**1235**
Multichannel 	0.0026 to 2300 mL/min (per channel)	3 or 6	Yes, stack for up to 32 channels.	Aluminum/ SS	Synchronous flow from up to-32 channels without cartridges. Two-stop tubing sets are easy to load with no adjustment.	**1236–1237**
Multichannel Cartridge 	0.0006 to 1700 mL/min (per channel)	3, 4, 6, or 8	Yes, 1 to 12 channels.	PSF/SS or PSF/ Rulon®/SS	Synchronous flow rates. Run up to 12 channels on a single pump head. Easy tubing changes. Holds tubing securely in place.	**1238–1241**
PTFE-Diaphragm 	10.0 to 800 mL/min	—	No.	—	PTFE and borosilicate glass are the only wetted parts. Up to 100 psi. Accurate metering. Handles aggressive fluids	**1242**
Easy-Load® 	0.06 to 2300 mL/min	3	Yes, stack up to 4 heads.	PSF/CRS, PSF/SS, or PPS/SS	Load or change multiple tubing sizes quickly and easily. Low maintenance.	**1243**
Masterflex® Partners 	See page 1244 to order from two different pump heads: mini-cartridge or piston pump. Each style mounts directly on to a Masterflex® drive. Call our Application Specialists at 800-MASTERFLEX to select the right pump head for your application.					**1244**

*PC = Polycarbonate PPS = Polyphenylene sulfide PP = Polypropylene PSF = Polysulfone CRS = Cold-rolled steel SS = Stainless steel

L/S® Standard Pump Heads

Ideal for accurate and repeatable fluid transfer applications

- Available with PC housing with CRS or SS rotor, or PPS housing with SS rotor. PC housing and CRS rotors are more economical; PPS housing and SS rotors have excellent chemical resistance.
- Heads are fixed occlusion—models with clear PC housing let you see the pump in operation
- Mount up to four pump heads, depending on drive
- Patented pump head is compact and simple in design—easy to install into your OEM applications

What's included: tubing loading key, a 15" (38-cm) length of silicone tubing, and single channel mounting hardware.

A Standard Pump Heads for Precision Tubing

- Perfect for common fluid transfer applications
- Flow rates: 0.06 to 2300 mL/min
- Tubing: Select a pump head for one of the following high-performance precision tubing sizes: L/S 13, L/S 14, L/S 16, L/S 17, or L/S 18,

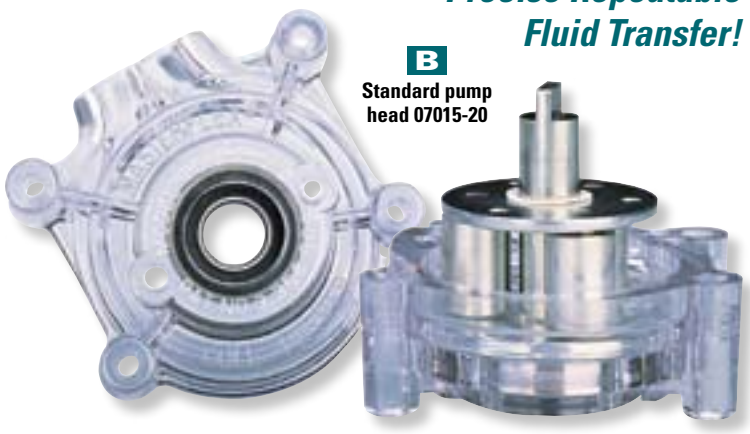
B Standard Pump Heads for High-Performance Precision Tubing

- Accepts our high-performance precision tubing—choose these pump heads for better pressure generation, suction lift, viscous fluid transfer, and longer tubing life
- Flow rates: 1.7 to 2900 mL/min
- Tubing: Select a pump head for one of the following high-performance precision tubing sizes: L/S 15, L/S 24, L/S 35, or L/S 36.

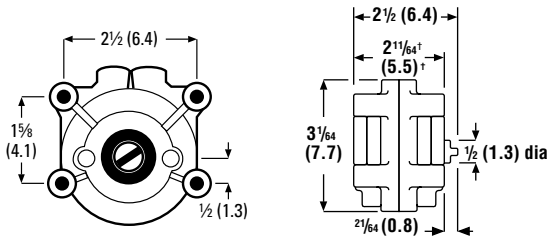
Technical info

Use only Masterflex® precision pump tubing with Masterflex® pumps to ensure optimal performance. Use of other tubing brands may void applicable warranties. Order tubing on pages 1245–1249.

Precise Repeatable Fluid Transfer!



L/S® Standard Pump Head—
dimensions in inches (cm)



†2 27/64" (6.1 cm) for L/S® 36 standard pump head.

Specifications & Ordering Information—Standard Pump Heads

ISO9001:2000 SUPPLIER CERTIFIED — 2 year warranty

Pump tubing size	mL per rev	Flow rates in mL/min		Maximum system pressure psi (bar)		Pump heads*		
						PC housing		PPS housing
		1 to 100 rpm	6 to 600 rpm	Continuous	Intermittent	CRS rotor	SS rotor	SS rotor
A Standard pump heads for precision pump tubing								
L/S 13	0.06	0.06 to 6	0.36 to 36	25 (1.7)	40 (2.7)	KH-07013-20	KH-07013-21	KH-07013-52
L/S 14	0.21	0.21 to 21	1.3 to 130	25 (1.7)	40 (2.7)	KH-07014-20	KH-07014-21	KH-07014-52
L/S 16	0.8	0.8 to 80	4.8 to 480	25 (1.7)	40 (2.7)	KH-07016-20	KH-07016-21	KH-07016-52
L/S 17	2.8	2.8 to 280	17 to 1700	15 (1.0)	20 (1.4)	KH-07017-20	KH-07017-21	KH-07017-52
L/S 18	3.8	3.8 to 380	23 to 2300	10 (0.7)	15 (1.0)	KH-07018-20	KH-07018-21	KH-07018-52
Price								
B Standard pump heads for high-performance precision pump tubing								
L/S 15	1.7	1.7 to 170	10 to 1000	25 (1.7)	40 (2.7)	KH-07015-20	KH-07015-21	KH-07015-52
L/S 24	2.8	2.8 to 280	17 to 1700	25 (1.7)	40 (2.7)	KH-07024-20	KH-07024-21	KH-07024-52
L/S 35	3.8	3.8 to 380	23 to 2300	20 (1.4)	35 (2.4)	KH-07035-20	KH-07035-21	—
Price								
L/S 36	4.8	4.8 to 480	29 to 2900	15 (1.0)	20 (1.4)	KH-07036-30	KH-07036-31	—
Price								—

*PC = polycarbonate PPS = polyphenylene sulfide CRS = cold-rolled steel SS = stainless steel

Mounting Hardware

Stack up to four L/S Standard pump heads on one drive (see drive specifications for recommended number of heads). Order hardware based on number of mounted pump heads. Hardware is stainless steel.

Hardware for Standard heads L/S 13 to 35

Heads to be mounted	Catalog number	Price/st
One	KH-07013-04	
Two	KH-07013-05	
Three	KH-07013-08	
Four	KH-07013-09	

Hardware for Standard heads L/S 36

Heads to be mounted	Catalog number	Price/st
One	KH-07036-01	
Two	KH-07036-02	

L/S® Easy-Load® 3 Pump Heads

Mount and stack heads without tools or hardware—automatic tubing retention speeds setup and changeover

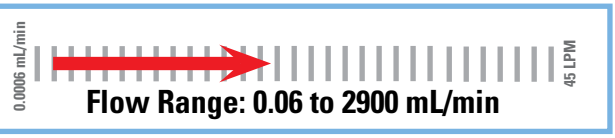
- Twist-lock mounting feature lets you mount and stack heads in seconds
- Included mounting plate adapts Easy-Load 3 to L/S drives—locking tab secures pump head during operation in either direction
- Polypropylene (PP) housing with CRS or SS rotor—CRS rotor is more economical while SS offers greater durability and chemical resistance
- Same side tubing entry/exit permits easy integration into space-limited applications—mount and operate pump head in any of four positions (depending on drive)
- Stack heads to increase flow capacity and for multiple-channel applications; see individual drive specifications for maximum number of heads to be mounted

The all-new design of the Easy-Load 3 features an automatic retention mechanism that makes loading and unloading tubing easier than ever. The activator lever opens the occlusion bed and simultaneously retracts the tubing retainers so that tubing slips right in. Close the lever and start the pump—the retainers automatically grip and hold the tubing securely in place.

The occlusion bed applies optimal occlusion force and the wide occlusion angle prevents fluid backflow up to the rated pressure of the tubing (see specifications on facing page).

Rotor is designed with 30˚ roller/shaft offset—unify channels from stacked heads for greatly reduced pulsation.

What's included: mounting plate/adapter kit for L/S pump drives and a 17" (43 cm) length of silicone pump tubing. Pump head comes ready to mount to drive.



Fast & Easy Changeover of Tubing and Fluid!

A
Easy-Load® 3 pump head 77800-60 shown with PharMed® BPT tubing 06508-17

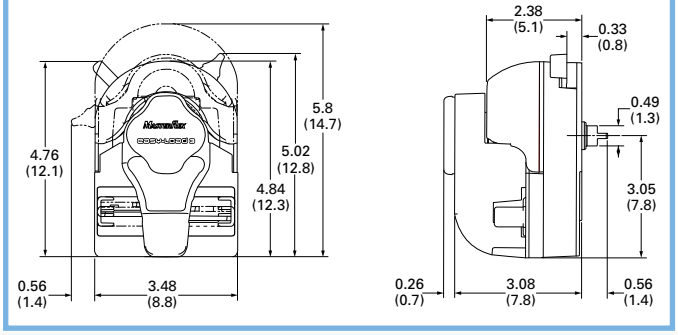
Special Features

Rotate heads to meet your space or application requirements.

Tubing retainers automatically grip tubing.

Stack pump heads to increase flow capacity.

L/S® Easy-Load® 3 Pump Head—
dimensions in inches (cm)



A Easy-Load® 3 Pump Heads for Precision Pump Tubing

- Flow range: 0.06 to 2300 mL/min depending on drive rpm and tubing size
- Each pump head for precision pump tubing accepts all six precision tubing sizes—L/S 13, L/S 14, L/S 16, L/S 25, L/S 17, and L/S 18

B Easy-Load® 3 Pump Heads for High-Performance Precision Pump Tubing

- Flow range: 1.7 to 2900 mL/min depending on drive rpm and tubing size
- Each pump head for high-performance precision pump tubing accepts all four high-performance precision tubing sizes—L/S 15, L/S 24, L/S 35, and L/S 36

A
Easy Load 3 pump head 77800-60 shown with occlusion bed open and tubing retainers retracted

Mounting and Stacking the Easy-Load® 3 Pump Head

Attach mounting plate to your L/S drive.

Twist and lock Easy-Load 3 pump head onto mounting plate.

For multiple-channel applications, simply remove the front cover and . . .

. . . stack pump heads up to the limits of your drive.

Specifications & Ordering Information—Easy-Load® 3 Pump Heads

ISO 9001:2000 SUPPLIER CERTIFIED — 2 year warranty

Pump tubing size	mL per rev	Flow rates in mL/min		Maximum system pressure* psi (bar)		Easy-Load® 3 pump heads	
		1 to 100 rpm	6 to 600 rpm	Continuous	Intermittent	CRS rotor	SS rotor
A Easy-Load 3 pump heads for precision pump tubing							
L/S 13	0.06	0.06 to 6	0.36 to 36	25 (1.7)	40 (2.7)	KH-77800-50	KH-77800-60
L/S 14	0.22	0.22 to 22	1.3 to 130	25 (1.7)	40 (2.7)		
L/S 16	0.8	0.8 to 80	4.8 to 480	25 (1.7)	40 (2.7)		
L/S 25	1.7	1.7 to 170	10 to 1000	20 (1.4)	35 (2.4)		
L/S 17	2.8	2.8 to 280	17 to 1700	15 (1.0)	20 (1.4)		
L/S 18	3.8	3.8 to 380	23 to 2300	10 (0.7)	15 (1.0)		
B Easy-Load 3 pump heads for high-performance precision pump tubing							
L/S 15	1.7	1.7 to 170	10 to 1000	25 (1.7)	30 (2.0)	KH-77800-52	KH-77800-62
L/S 24	2.8	2.8 to 280	17 to 1700	25 (1.7)	30 (2.0)		
L/S 35	3.8	3.8 to 380	23 to 2300	20 (1.4)	25 (1.7)		
L/S 36	4.8	4.8 to 480	29 to 2900	15 (1.0)	20 (1.4)		
Price							

*Actual performance varies depending on pump tubing formulation—values shown are for firm pump tubing.
CRS = cold-rolled steel SS = stainless steel

Accessories

KH-77800-00 **Replacement mounting kit,** for mounting Easy-Load 3 pump head to Masterflex L/S pump drives. Includes mounting plate and four screws

Technical info

Use only Masterflex® precision pump tubing with Masterflex pumps to ensure optimal performance. Use of other tubing brands may void applicable warranties. Order tubing on pages 1245–1249.

Pump selection made easy!

Masterflex.com

Masterflex® Pump Configurator for selecting your perfect pump click here

Enter your specific application parameters into our **Interactive Pump Configurator** and in seconds it will select a pump system that will meet your needs.

L/S®

MASTERFLEX®

L/S® Easy-Load® II Pump Heads

Automatic tubing retention system holds pump tubing securely in place—no need to make manual adjustments

- Four-roller rotor improves pressure performance and mechanical stability, and reduces flow pulsation
- Improved occlusion bed geometry reduces tubing wear and lengthens tubing life
- PPS housing with SS or CRS rotor available—choose economical CRS rotors, or SS rotors for greater durability and chemical resistance
- Models with adjustable occlusion available—tighten occlusion for higher pressure, loosen for longer tubing life
- Two-channel models C give you synchronous flow from two separate channels

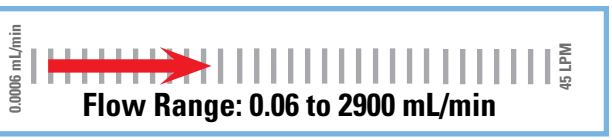
The Easy-Load II features automatic tubing retainers that positively grip the tubing to ensure flow performance and tubing life. Retainers also allow each head to accept multiple tubing sizes for a wider flow range and increased versatility.

Fixed-occlusion pump heads offer high flow rates at economical prices; adjustable occlusion models are ideal for greater pressure and suction lift. Select precision pump tubing for standard applications or high-performance precision pump tubing for applications requiring better pressure generation, suction lift, ability to pump viscous fluids, and longer tubing life.

Mount up to four pump heads on a single drive; see individual drive specifications for maximum number of heads to be mounted. When two Easy-Load II heads are stacked, rotors are offset by 45°—combine the outlets of the two pump heads for a 95% reduction in flow pulsation.

What's included: single-channel mounting hardware and a 15" (38-cm) length of silicone pump tubing. Pump head comes ready to mount to drive.

Two-, three-, and four-channel mounting hardware available (order separately on bottom of facing page).



Reduced Pulsation and Quick Tubing Changes!

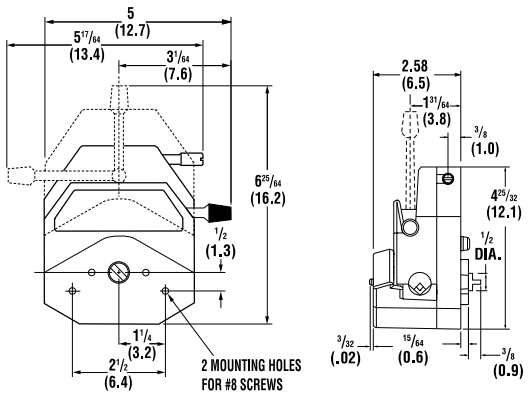
B

Easy-Load II fixed occlusion pump head 77200-62

Technical info

Use only Masterflex® precision pump tubing with Masterflex pumps to ensure optimal performance. Use of other tubing brands may void applicable warranties. Order tubing on pages 1245–1249.

L/S® Easy-Load® II Pump Head—
dimensions in inches (cm)



Special Features

Adjustable occlusion available on models 77201-60 and 77201-62 only.

Automatic tubing retention available on all models.

Simple and quick tubing changes.

A Easy-Load® II Pump Heads for Precision Pump Tubing

- Each pump head for precision pump tubing accepts all six precision tubing sizes—L/S 13, L/S 14, L/S 16, L/S 25, L/S 17, and L/S 18. Pump a wide range of flow rates from a single pump head.
- Flow rates: 0.06 to 2300 mL/min
- Select fixed or adjustable occlusion models

B Easy-Load® II Pump Heads for High-Performance Precision Pump tubing

- Accept all four High-performance precision tubing sizes—L/S 15, L/S 24, L/S 35, and L/S 36. High-performance precision pump tubing has a thicker wall than precision pump tubing; this enables better pressure generation, suction lift, ability to pump viscous fluids, and promotes longer pump tubing life.
- Flow rates: 1.7 to 2900 mL/min
- Select fixed or adjustable occlusion models

C Two-Channel Easy-Load® II Pump Heads for Precision tubing

- Pump two channels simultaneously from one head eliminating the need for stacking pump heads.*
- Each pump head accepts L/S 13, L/S 14, L/S 16, and L/S 25 pump tubing sizes in any formulation.
- Flow rates: 0.06 to 1000 mL/min per channel

*Using the same size pump tubing in each channel.

Two-channel L/S Easy-Load II pump head 77202-50 (side view)

Technical info

Adjustable or fixed occlusion?

Adjustable occlusion pump head

- Increase occlusion to maximize pressure performance and obtain better suction lift
- Reduce occlusion to extend pump tubing life

Fixed occlusion pump head

- High flow rates at an economical price
- Factory calibrated for average occlusion
- No settings required—just load pump tubing and pump

Stack two-channel heads for up to eight flow channels—depending on drive capability and tubing formulation.

Specifications & Ordering Information—Easy-Load® II Pump Heads

ISO9001:2000 SUPPLIER CERTIFIED — 2 year warranty

Pump tubing size	mL per rev	Flow rates in mL/min		Maximum system pressure‡ psi (bar)		Easy-Load II pump heads†		
						Fixed occlusion		Adjustable occlusion
		1 to 100 rpm	6 to 600 rpm	Continuous	Intermittent	CRS rotor	SS rotor	SS rotor
A Easy-Load II pump heads for precision pump tubing								
L/S 13	0.06	0.06 to 6	0.36 to 36	25 (1.7)	40 (2.7)	KH-77200-50	KH-77200-60	KH-77201-60
L/S 14	0.21	0.21 to 21	1.3 to 130	25 (1.7)	40 (2.7)			
L/S 16	0.8	0.8 to 80	4.8 to 480	25 (1.7)	40 (2.7)			
L/S 25	1.7	1.7 to 170	10 to 1000	20 (1.4)	35 (2.4)			
L/S 17	2.8	2.8 to 280	17 to 1700	15 (1.4)	20 (1.4)			
L/S 18	3.8	3.8 to 380	23 to 2300	10 (0.7)	15 (1.0)			
B Easy-Load II pump heads for high-performance precision pump tubing								
L/S 15	1.7	1.7 to 170	10 to 1000	25 (1.7)	40 (2.7)	KH-77200-52	KH-77200-62	KH-77201-62
L/S 24	2.8	2.8 to 280	17 to 1700	25 (1.7)	40 (2.7)			
L/S 35	3.8	3.8 to 380	23 to 2300	20 (1.4)	35 (2.4)			
L/S 36	4.8	4.8 to 480	29 to 2900	15 (1.0)	20 (1.4)			
Price								
C Two-Channel Easy-Load II pump heads								
L/S 13	0.06	0.06 to 6	0.36 to 36	25 (1.7)	40 (2.7)	KH-77202-50	KH-77202-60	—
L/S 14	0.21	0.21 to 21	1.3 to 130	25 (1.7)	40 (2.7)			
L/S 16	0.8	0.8 to 80	4.8 to 480	25 (1.7)	40 (2.7)			
L/S 25	1.7	1.7 to 170	10 to 1000	20 (1.4)	35 (2.4)			
Price								—

†CRS = cold-rolled steel SS = stainless steel ‡Actual performance varies depending on pump tubing formulation—values shown are for firm pump tubing.

Mounting Hardware for Easy-Load II Heads

Mount up to four L/S Easy-Load II pump heads on a single drive; see individual drive specifications for maximum number of heads to be mounted. Mounting hardware is stainless steel.

Heads to be mounted	Catalog number	Price/st
One	KH-77200-01	
Two	KH-77200-02	
Three	KH-77200-03	
Four	KH-77200-04	

More info ATEX

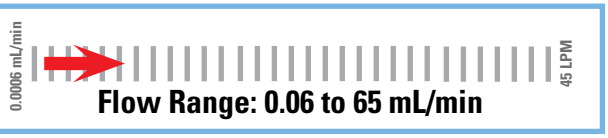
For L/S® and I/P® pump heads approved to ATEX Zone 2, see pages 1.21–1.24 in our "Late-Breaking Additions" section in the front of this catalog.

L/S® PTFE-Tubing Pump Head

Ideal for high-purity fluids and aggressive organic solvents

- Rigid PTFE pump tubing allows you to pump fluids at higher pressures than conventional tubing—up to 100 psi (6.9 bar)
- Use for applications including filtration, chemical injection, and high-purity sampling
- PTFE tubing is the only wetted part in the PTFE-tubing pump head, so chemical exposure is limited
- Adjustable occlusion six-roller pump head—tighten occlusion for higher pressure, loosen for longer tubing life
- Compatible with L/S drives that accept two or more pump heads (1/10 hp min). For best results, run at 1 to 300 rpm.

Note: PTFE tubing pump accepts Masterflex L/S PTFE tubing sets only. Order tubing sets 77390-50 and -60 separately below.

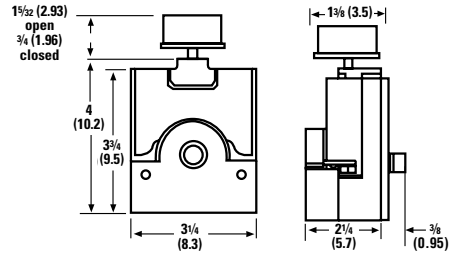


Technological Breakthrough!

77390-00

ISO 9001:2000 SUPPLIER CERTIFIED — 1 year warranty

L/S® PTFE-Tubing Pump Head—dimensions in inches (cm)



Specifications & Ordering Information—PTFE-Tubing Pump Head

Materials: anodized aluminum and acetal body; stainless steel rotor assembly **Dimensions:** 3 1/4"W x 5 1/8"H x 2 1/4"D (8.3 cm W x 13 cm H x 5.7 cm D)

Catalog number	Flow rates (mL/min at 1 to 300 rpm)		Maximum continuous pressure	Max suction lift	Avg tubing life (100 rpm, 0 psi)	Number of rollers	Price
	4-mm OD tubing	6-mm OD tubing					
KH-77390-00	0.06 to 17	0.25 to 65	100 psi (6.9 bar)	8 ft (2.4 m)	500 hours	Six	

PTFE-Tubing Sets

PTFE-tubing sets include two 15" (38 cm) lengths and cannot be substituted with ordinary PTFE tubing.

KH-77390-50 **PTFE-tubing set.**
2-mm ID, 4-mm OD. Set of 2

KH-77390-60 **PTFE-tubing set.**
4-mm ID, 6-mm OD. Set of 2

Accessories for Tubing Sets

The compression fittings listed below adapt tubing sets to your system; also see our "Fittings" section on pages 487–546.

For 4-mm OD PTFE-Tubing Sets

KH-31321-61 **Straight connector,**
40 psi (2.8 bar) max

KH-31321-63 **Male pipe adapter**
with 1/4" NPT(M) connection

KH-06407-15 **PTFE extension tubing,**
4-mm OD. Pack of 12 ft (3.7 m)

For 6-mm OD PTFE-Tubing Sets

KH-31321-64 **Straight connector,**
135 psi (9.2 bar) max

KH-31321-43 **Male pipe adapter**
with 1/4" NPT(M) connection

KH-06407-20 **PTFE extension tubing,**
6-mm OD. Pack of 12 ft (3.7 m)

KH-31321-49 **Tubing grooving tool.**
Use when connections must withstand 40 psi (2.8 bar) or greater

Complete L/S® PTFE-Tubing Pump System

Complete system includes:

Pump Head + **Tubing** + **Drive**

PTFE-tubing pump head 77390-00 (above)

PTFE-tubing set , 6-mm OD 77390-60 (above)

Variable-speed drive 07520-60 or -67 6 to 300 rpm (pages 1258–1259)

Flow Range: 0.25 to 65 mL/min

Ordering Information—Complete Pump System

Catalog number	Description	Power	Price
KH-77912-00	L/S PTFE-tubing pump system	115 VAC, 50/60 Hz	
KH-77912-07		230 VAC, 50/60 Hz	

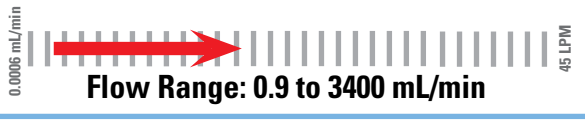
Note: Systems also include two 1/4" NPT(M) pipe adapters and tubing grooving tool.

L/S® High-Performance Pump Head

The highest flow rate and the highest pressure generation of any L/S pump head

- Offers better suction lift, viscous fluid transfer, and long tubing life—at pressures up to 125 psi
- Mount pump head upright or on its side—design allows tubing to enter/exit the same side of the pump head
- Rollers, bearings, rotor plates, and rotor shaft are made of stainless steel (SS); occlusion bed is made from polyphenylene sulfide (PPS)—SS and PPS have excellent chemical resistance
- Compatible with all L/S drives listed in this catalog that accept two or more pump heads (High-Performance heads are not stackable)
- Accepts all four high-performance precision pump tubing sizes: L/S 15, L/S 24, L/S 35, L/S 36, and our high-pressure pump tubing: L/S 15HP and L/S 16HP

What's included: mounting hardware and a 15" (38-cm) length of L/S 35 Tygon® LFL pump tubing (see pages 1245–1249 for additional L/S® pump tubing).



Highest L/S® Pump Head Flow Rate!

Tubing enters/exits the same side of High-Performance pump head 77250-62 for easy connection to tubing inlet and outlet.

More info ATEX

For L/S® and I/P® pump heads approved to ATEX Zone 2, see pages 1.21–1.24 in our "Late-Breaking Additions" section in the front of this catalog.

Specifications & Ordering Information—High-Performance Pump Head

ISO 9001:2000 SUPPLIER CERTIFIED — 2 year warranty

Dimensions: 3 3/4"W x 3 1/2"H x 3 7/8"D (9.5 cm W x 8.9 cm H x 9.8 cm D)

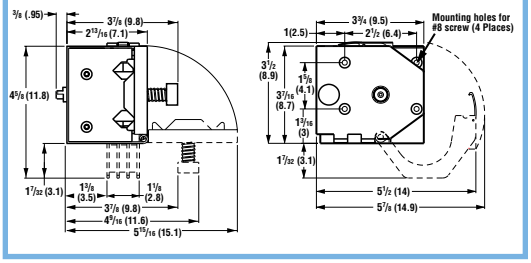
Pump tubing size	mL per rev	Flow rates in mL/min		Maximum system pressure		Catalog number
		1 to 100 rpm	6 to 600 rpm	Continuous	Intermittent	
L/S 16HP†	0.9	0.9 to 90	Not recommended	100 psi (6.8 bar)	125 psi (8.5 bar)	KH-77250-62
L/S 15HP†	1.7	1.7 to 170	Not recommended	80 psi (5.5 bar)	100 psi (6.8 bar)	
L/S 15	1.8	1.8 to 180	11 to 1100	25 psi (1.7 bar)	40 psi (2.7 bar)	
L/S 24	3.0	3.0 to 300	18 to 1800	25 psi (1.7 bar)	40 psi (2.7 bar)	
L/S 35	4.3	4.3 to 430	26 to 2600	20 psi (1.4 bar)	35 psi (2.4 bar)	
L/S 36	5.8	5.8 to 580	34 to 3400	15 psi (1.0 bar)	20 psi (1.4 bar)	
Price						

†L/S 15HP and L/S 16HP pump tubing is for use only with the L/S High-Performance pump head mounted on any L/S 1 to 100 rpm drive capable of running two or more pump heads.
Note: High-Performance pump heads are not stackable.

L/S High-Pressure Pump Tubing Ordering Information

Masterflex tubing size	Catalog number	Tubing ID	Flow range	Maximum pressure (continuous)	Length/pk	Price/pk
PharMed® BPT						
L/S 16HP	KH-95664-16	1/8"	0.9 to 90 mL/min	100 psig (6.8 bar)	25 ft (7.6 m)	
L/S 15HP	KH-95664-15	3/16"	1.7 to 170 mL/min	80 psig (5.5 bar)	25 ft (7.6 m)	
Norprene®						
L/S 16HP	KH-06504-16	1/8"	0.9 to 90 mL/min	100 psig (6.8 bar)	25 ft (7.6 m)	
L/S 15HP	KH-06504-15	3/16"	1.7 to 170 mL/min	80 psig (5.5 bar)	25 ft (7.6 m)	

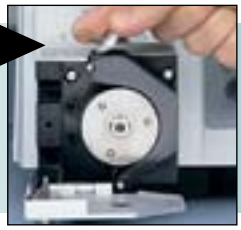
L/S® High-Performance Pump Head— dimensions in inches (cm)



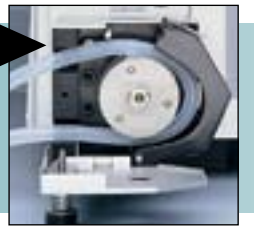
Special Features

Quick tubing loading:

Rotate tubing retainer knob counterclockwise to release retainer, then lift latch to open.



Insert tubing into occlusion bed so that the tubing ends extend out of the tubing entrance as shown.



Snap the latch closed. Pull the tubing snug around the rotor, close the cover, and rotate the tubing retainer knob clockwise to secure tubing.

Mounted Upright

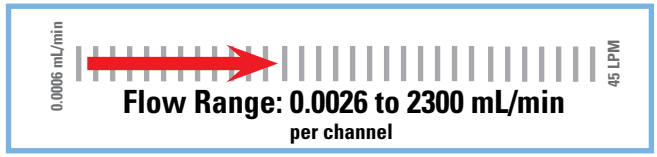
L/S® MASTERFLEX®

L/S® Multichannel Pump Heads

Low-pulsation synchronous flow from multiple channels with no cartridges

- Machined stainless steel (SS) and anodized aluminum with SS rotor, bearings, and rollers for reliable, continuous-duty operation
- Six roller heads deliver low-pulsation flow; three-roller heads offer higher flow rates
- Stackable heads let you expand the number of flow channels
- Compatible with L/S drives that accept two or more pump heads; 1/10 hp min
- Load the tubing, latch the occlusion bed, and run the pump—two-stop tubing gives you optimum tension with no adjustment

What's included: mounting hardware and hex key tool.



Flow Range: 0.0026 to 2300 mL/min
per channel

Low Pulsation Fluid Transfer!

Stack multichannel heads for up to 32 synchronous flow channels.

A **Multichannel head for microbore tubing 07534-04**

B **Multichannel head for L/S precision pump tubing 07535-08**

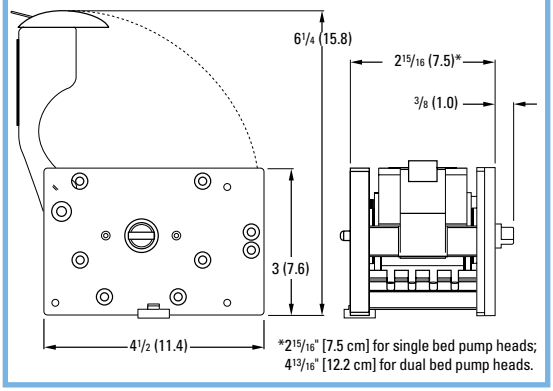
A Multichannel Heads for Microbore Tubing

- Flow range: 0.0026 to 200 mL/min per channel depending on drive rpm and tubing size
- Accept two-stop microbore tubing sets—0.19 to 2.79 mm ID
- Four- or eight-channel heads are stackable for up to 32 channels

B-C Multichannel Heads for L/S Precision and High-Performance Precision Pump Tubing

- Flow range: 0.045 to 2300 mL/min per channel depending on drive rpm and tubing size
- Heads for L/S precision pump tubing accept two-stop tubing set sizes L/S 13, L/S 14, and L/S 16; heads for L/S high-performance precision pump tubing accept two-stop tubing set sizes L/S 15, L/S 24, and L/S 35
- Two-, four-, or eight-channel heads are stackable for up to 24 channels

L/S® Multichannel Pump Head—
dimensions in inches (cm)



*2 15/16" [7.5 cm] for single bed pump heads; 4 13/16" [12.2 cm] for dual bed pump heads.

Specifications & Ordering Information—Multichannel Pump Heads

ISO 9001:2000 SUPPLIER CERTIFIED — 2 year warranty

Key letter	Catalog number	Number of channels	Number of rollers	Max channels with stacked heads†		Price
				100 rpm drive	600 rpm drive	
L/S Multichannel pump heads for microbore pump tubing						
A	KH-07534-04	4	6	32	28	
	KH-07534-08	8				
L/S Multichannel pump heads for precision pump tubing, sizes L/S 13, L/S 14, L/S 16						
B	KH-07535-04	4	6	24	12	
	KH-07535-08	8				
L/S Multichannel pump heads for high-performance precision pump tubing, sizes L/S 15, L/S 24, L/S 35						
C	KH-07536-02	2	3	12	6	
	KH-07536-04	4				

†Maximum channel capacity depends on drive torque capability and tubing formulation used.

KH-07534-01 **Replacement mounting hardware set,** includes mounting screws and hex key tool

Flow Rates per Channel in mL/min with Microbore Two-Stop Pump Tube Sets below

Drive rpm	Microbore pump tubing					
	0.19 mm ID	0.25 mm ID	0.89 mm ID	1.42 mm ID	2.06 mm ID	2.79 mm ID
1 to 100	0.0026 to 0.26	0.0053 to 0.53	0.054 to 5.4	0.12 to 12	0.23 to 23	0.35 to 35
6 to 600	Not recommended‡	Not recommended‡	0.30 to 30	0.67 to 67	1.3 to 130	2.0 to 200

‡Maximum recommended speed for these sizes is 300 rpm

Microbore Two-Stop Pump Tube Sets Ordering Information

Tubing ID (mm)	Platinum-cured silicone	Santoprene	PVC	Viton®
0.19	—	—	KH-06416-10	—
0.25	—	KH-06431-12	KH-06416-12	—
0.89	KH-06421-26	KH-06431-26	KH-06416-26	KH-06428-26
1.42	KH-06421-34	KH-06431-34	KH-06416-34	KH-06428-34
2.06	KH-06421-42	KH-06431-42	KH-06416-42	KH-06428-42
2.79	KH-06421-48	KH-06431-48	KH-06416-48	KH-06428-48
Qty/pk	6	12	12	12
Price				

GO to page(s) 1227, 1245–1249

For microbore extension tubing, see page 1227; for L/S extension tubing, see pages 1245 to 1249.

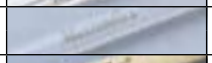
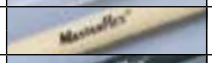
Technical info

Use only Masterflex precision pump tubing with Masterflex pumps to ensure optimal performance. Use of other tubing brands may void applicable warranties.

Flow Rates per Channel in mL/min with Masterflex® L/S® Two-Stop Precision Pump Tubing Sets below

Drive rpm	Precision pump tubing			High-performance precision pump tubing		
	L/S 13	L/S 14	L/S 16	L/S 15	L/S 24	L/S 35
1 to 100	0.045 to 4.5	0.16 to 16	0.47 to 47	1.6 to 160	2.8 to 280	3.8 to 380
6 to 600	0.27 to 27	0.96 to 96	2.8 to 280	10 to 1000	17 to 1700	23 to 2300

Masterflex® L/S® Two-Stop Precision Pump Tubing Sets Ordering Information

Pump tubing formulation		L/S® Precision pump tubing			L/S® High-performance precision pump tubing		
		L/S 13 (pk of 8)	L/S 14 (pk of 8)	L/S 16 (pk of 8)	L/S 15 (pk of 4)	L/S 24 (pk of 4)	L/S 35 (pk of 4)
Tygon® Lab		KH-06416-13	KH-06416-14	KH-06416-16	KH-06416-15	KH-06416-24	KH-06416-35
Silicone (platinum-cured)		KH-06421-13	KH-06421-14	KH-06421-16	KH-06421-15	KH-06421-24	KH-06421-35
PharMed® BPT		KH-96114-13	KH-96114-14	KH-96114-16	KH-96114-15	KH-96114-24	KH-96114-35
Viton®		KH-06428-13	KH-06428-14	KH-06428-16	KH-06428-15	KH-06428-24	KH-06428-35

Complete L/S® Multichannel Pump Systems

Complete systems include:

Pump Head + **Tubing** + **Drive**

System 1: L/S multichannel pump head 07534-04

System 2: L/S multichannel pump head 07535-04

System 3: L/S multichannel pump head 07536-04

PVC two-stop tube set, 2.79 mm ID, 06416-48

Tygon® Lab two-stop tube set, L/S 16, 06416-16

Tygon Lab two-stop tube set, L/S 24, 06416-24

All systems use:

Precision standard drive 77521-50 or 77521-57
1 to 100 rpm
(pages 1258–1259)

System 1 Flow Range: 0.35 to 35 mL/min per channel

77925-00

System 2 Flow Range: 0.47 to 47 mL/min per channel

77926-00

System 3 Flow Range: 2.8 to 280 mL/min per channel

77927-00

Ordering Information—System 1

Catalog number	Description	Power	Price
KH-77925-00	L/S multichannel pump system for microbore tubing	115 VAC, 50/60 Hz	
KH-77925-07		230 VAC, 50/60 Hz	

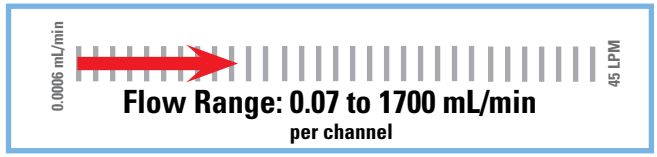
Ordering Information—System 2

Catalog number	Description	Power	Price
KH-77926-00	L/S multichannel pump system for L/S precision pump tubing	115 VAC, 50/60 Hz	
KH-77926-07		230 VAC, 50/60 Hz	

Ordering Information—System 3

Catalog number	Description	Power	Price
KH-77927-00	L/S multichannel pump system for L/S high-performance precision pump tubing	115 VAC, 50/60 Hz	
KH-77927-07		230 VAC, 50/60 Hz	

A L/S® three-roller cartridge pump head 07519-05 shown with small cartridge 07519-80



L/S® Multichannel Cartridge Pump Heads

Multichannel cartridge heads provide synchronous flow rates

- Multichannel pump heads accept our improved cartridges for optimal performance, tubing retention, and ease of use
- Cartridges snap in and out for fast tubing changes—no need to remove pump head from the drive
- O-ring stoppers ensure positive retention, even when head is not fully loaded with cartridges
- Load pump heads with 1 to 8 cartridges (up to 12 with pump heads on pages 1240–1241)
- Mix large and small cartridges—one large cartridge occupies the same space as two small ones

For large cartridges, set tubing retainers to your tube size and you are ready to pump. On small cartridges, retention is preset—simply load tubing and start pumping. The improved retainer design holds the tubing securely in place, while the redesigned occlusion bed geometry promotes long tubing life even in the most challenging applications (pressure, high speed, etc.).

Cartridge heads are available with three or four rollers. The greater the number of rollers, the lower the pulsation in the flow. The pump heads, constructed of SS rotor/bearings with polysulfone ends, feature tangential, adjustable occlusion. They require drives with a minimum of 1/10 hp, and a maximum of 600 rpm.

A 8-Channel, 3-Roller Pump Head 07519-05

- Flow rates: 0.050 to 1700 mL/min
- Number of cartridges: 1 to 8 small, 1 to 4 large
- Drive requirements: 1/10 hp min, 600 rpm max

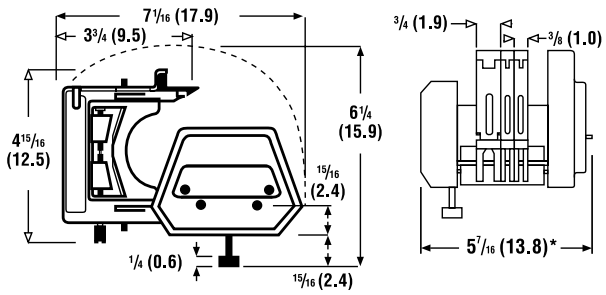
B 8-Channel, 4-Roller Pump Head 07519-06

- Flow rates: 0.047 to 1400 mL/min
- Number of cartridges: 1 to 8 small, 1 to 4 large
- Drive requirements: 1/10 hp min, 600 rpm max

Synchronous flow rates!

B L/S four-roller cartridge pump head 07519-06

L/S® Cartridge Pump Heads—dimensions in inches (cm)



*3 13/16" (9.7) for 4-channel pump heads and 8 1/16" (20.5 cm) for 12-channel pump heads on pages 1240–1241.

Cartridges

Masterflex® cartridges are constructed from polycarbonate and glass-filled nylon.

- Cartridges are available in small or large sizes.
- Cartridges accept microbore tube sets or L/S precision tubing.
- Adjustable occlusion maintains a bidirectional flow variation of ±5%.
- Tighten occlusion for higher pressures, loosen for longer tubing life.

Tubing size settings allow you to select your tubing size for exact retention every time!

Cartridge compatibility with tubing and pump heads

Cartridge model no.	Masterflex two-stop microbore tube sets	L/S precision pump tubing					Pump head compatibility
		L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	
07519-80 (small)	■	■	■				07519-05 or 07519-06
07519-70 (large)			■	■	■	■	

Flow Rates per Channel in mL/min with L/S® Precision Pump Tubing—order L/S® pump tubing on pages 1245–1249

Key letter	Pump head model no.	Number of rollers	Pump head gear ratio	Drive rpm	L/S® precision pump tubing (flow rate per channel)				
					L/S 13	L/S 14	L/S 16	L/S 25	L/S 17†
A	07519-05	3	1:1	6 to 600	0.30 to 30	1.3 to 130	4.6 to 460	10 to 1000	17 to 1700
				1 to 100	0.050 to 5	0.21 to 21	0.76 to 76	1.7 to 170	2.8 to 280
B	07519-06	4	1:1	6 to 600	0.28 to 28	1.2 to 120	3.8 to 380	8.3 to 830	14 to 1400
				1 to 100	0.047 to 4.7	0.20 to 20	0.63 to 63	1.4 to 140	2.3 to 230

†Only silicone and C-FLEX® tubing formulations are recommended for L/S 17.

Flow Rates per Channel in mL/min with Two-Stop Microbore Pump Tube Sets—order below; order microbore extension tubing on page 1227

Key letter	Pump head model no.	Number of rollers	Pump head gear ratio	Drive rpm	Two-stop microbore tube sets (flow rate per channel)			
					0.89 mm ID	1.42 mm ID	2.06 mm ID	2.79 mm ID
A	07519-05	3	1:1	6 to 600	0.44 to 44	1.0 to 100	2.2 to 220	3.8 to 380
				1 to 100	0.074 to 7.4	0.17 to 17	0.37 to 37	0.63 to 63
B	07519-06	4	1:1	6 to 600	0.44 to 44	1.0 to 100	2.2 to 220	3.8 to 380
				1 to 100	0.074 to 7.4	0.17 to 18	0.37 to 37	0.63 to 63

Recommended Pump Tubing for Multichannel Cartridge Pumps

Use any of the microbore two-stop tubing sets listed below—or any of the following tubing formulations in sizes L/S 13, L/S 14, L/S 16, L/S 25, and L/S 17†

- Platinum-cured silicone 96410-series
- Peroxide-cured silicone 96400-series
- Biopharm platinum-cured silicone 96420-series
- Tygon® LFL 06429-series
- C-FLEX® 06424-series
- Tygon® lab 06409-series
- Tygon® fuel & lubricant 06401-series
- PharMed® BPT 06508-series
- Norprene® 06404-series
- Norprene food 06402-series

†Only silicone and C-FLEX tubing formulations are recommended for L/S 17.

Specifications & Ordering Information—Pump Heads and Cartridges

Pump heads							Cartridges		
Key letter	Catalog number	Number of rollers	Pump head gear ratio	Max no. of cartridges‡ Small	Max no. of cartridges‡ Large	Price	Small	Large	Price
A	KH-07519-05	3	1:1	8	4		KH-07519-80 (fits microbore two-stop tube sets >0.44 mm ID & L/S 13, L/S 14)	KH-07519-70 (fits L/S 14, L/S 16, L/S 25, L/S 17†)	
B	KH-07519-06	4	1:1	8	4				

†Only silicone and C-FLEX® tubing formulations are recommended for L/S® 17.
‡For pump heads that accept both sizes, small and large cartridges can be mixed; 2 small = 1 large.

Masterflex® Microbore Two-Stop Pump Tube Sets Ordering Information (for 07519-80 small cartridge)

Tubing ID (mm)	Platinum-cured silicone	Santoprene	PVC	Viton®
0.89	KH-06421-26	KH-06431-26	KH-06416-26	KH-06428-26
1.42	KH-06421-34	KH-06431-34	KH-06416-34	KH-06428-34
2.06	KH-06421-42	KH-06431-42	KH-06416-42	KH-06428-42
2.79	KH-06421-48	KH-06431-48	KH-06416-48	KH-06428-48
Qty/pk	6	12	12	12
Price				

Complete L/S® Eight-Channel, Four-Roller Cartridge Pump System

Complete system includes:

Pump Head + **Tubing** + **Drive**

L/S Cartridge pump head 07519-06 and eight small cartridges 07519-80

PVC two-stop tube sets 06416-34
1.42-mm ID
Pack of 12

Brushless digital drive 07523-70
1 to 100 rpm
(pages 1262–1263)

New

Flow Range: 0.17 to 18 mL/min per channel

Ordering Information—Complete Pump System

Catalog number	Description	rpm	Power (50/60 Hz)	Price
KH-77919-00	L/S Eight-channel, four-roller cartridge pump system	1 to 100	115/230 VAC	

Reduced Pulsation L/S® Multichannel Cartridge Pump Heads

Six- and eight-roller heads offer synchronous, low-pulsation flow from up to 12 channels

- Load pump heads with 1 to 12 cartridges—with synchronous flow rates from each channel
- The improved retainer design holds tubing securely in place
- Cartridges snap in and out of the pump head for fast tubing changes—no need to remove pump head from the drive

These pump heads are available with six or eight rollers. The greater the number of rollers, the lower the pulsation. They feature stainless steel rotors, Rulon® rollers, and PSF ends. Occlusion is offset, tangential, and adjustable. Use large and small cartridges—one large cartridge occupies the same space as two small ones. For large cartridges, set tubing retainers to your tube size and you are ready to pump. On small cartridges, optimum retention is preset—simply load tubing and start pumping.

Flow Range: 0.0006 to 350 mL/min
per channel

Reduced pulsation fluid transfer!

For L/S Precision Pump Tubing:

A 2-Channel, 6-Roller Pump Head 07519-10

- Flow rates: 0.16 to 350 mL/min
- Number of cartridges: 1 or 2 large
- Drive requirements: 1/10 hp min, 250 rpm max

B 6-Channel, 6-Roller Pump Head 07519-15

- Flow rates: 0.033 to 170 mL/min
- Number of cartridges: 1 to 6 large
- Drive requirements: 1/10 hp min, 600 rpm max

B
L/S reduced-pulsation six-roller cartridge pump head 07519-15

For Two-Stop Microbore Tube Sets:

C 4-Channel, 8-Roller Pump Head 07519-20

- Flow rates: 0.0028 to 85 mL/min
- Number of cartridges: 1 to 4 small
- Drive requirements: 1/10 hp min, 250 rpm max

D 12-Channel, 8-Roller Pump Head 07519-25

- Flow rates: 0.0006 to 41 mL/min
- Number of cartridges: 1 to 12 small
- Drive requirements: 1/10 hp min, 600 rpm max

D
L/S reduced-pulsation eight-roller cartridge pump head 07519-25 shown with twelve small cartridges 07519-85

Cartridges

Tubing size settings on our newly designed cartridges allow you to simply select your tubing size for exact tubing retention every time! Cartridges are constructed from polycarbonate and glass-filled nylon.

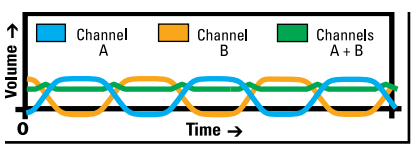
- Available in small or large sizes
- Accept microbore tube sets or L/S precision tubing
- Adjustable occlusion maintains a bidirectional flow variation of ±5%
- Combine the input/output of two cartridges to reduce pulsation

Cartridge compatibility with tubing and pump heads

Cartridge model no.	Masterflex two-stop microbore tube sets	L/S precision pump tubing					Pump head compatibility
		L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	
07519-85 (small)	■	■	■				07519-20 or -25
07519-75 (large)			■	■	■	■	07519-10 or -15

Reduced Pulsation

Mount two cartridges (07519-75 or -85) in opposite directions. Connect the inlets/outlets of each channel with Y-connectors (or use Double-Y tubing; see page 1249). This will "balance" the offset occlusion of each cartridge and reduce pulsation (measured at outlet and shown in the graph at right).



Flow Rates per Channel in mL/min with L/S Precision Pump Tubing—order L/S pump tubing on pages 1245–1249

Key letter	Pump head model no.	Number of rollers	Pump head gear ratio	Drive rpm	L/S precision pump tubing (flow rate per channel)				
					L/S 13	L/S 14	L/S 16	L/S 25	L/S 17†
A	07519-10	6	1:1	6 to 250	0.24 to 10	0.94 to 39	3.1 to 130	5.8 to 240	8.4 to 350
				1 to 100	0.040 to 4.0	0.16 to 16	0.52 to 52	0.96 to 96	1.4 to 140
B	07519-15	6	5:1	6 to 600	0.052 to 5.2	0.20 to 20	0.65 to 65	1.2 to 120	1.7 to 170
				1 to 100	0.0087 to 0.87	0.033 to 3.3	0.11 to 11	0.20 to 20	0.28 to 28

†Only silicone and C-FLEX® tubing formulations are recommended for L/S 17.

Flow Rates per Channel in mL/min with Two-Stop Microbore Pump Tube Sets—order below; order microbore extension tubing on page 1227

Key letter	Pump head model no.	Number of rollers	Pump head gear ratio	Drive rpm	Two-stop microbore tube sets (flow rate per channel)					
					0.19 mm ID	0.25 mm ID	0.89 mm ID	1.42 mm ID	2.06 mm ID	2.79 mm ID
C	07519-20	8	1:1	6 to 250	0.017 to 0.70	0.031 to 1.3	0.31 to 13	0.70 to 29	1.3 to 54	2.0 to 85
				1 to 100	0.0028 to 0.28	0.0052 to 0.52	0.052 to 5.2	0.12 to 12	0.22 to 22	0.34 to 34
D	07519-25	8	5:1	6 to 600	0.0030 to 0.30	0.0060 to 0.60	0.062 to 6.2	0.14 to 14	0.26 to 26	0.41 to 41
				1 to 100	0.00060 to 0.050	0.0010 to 0.10	0.010 to 1.0	0.023 to 2.3	0.043 to 4.3	0.068 to 6.8

Recommended Pump Tubing for Multichannel Cartridge Pumps

Use any of the microbore two-stop tubing sets listed below—or any of the following tubing formulations in sizes L/S 13, L/S 14, L/S 16, L/S 25, and L/S 17†

- Platinum-cured silicone 96410-series
- Peroxide-cured silicone 96400-series
- Biopharm platinum-cured silicone 96420-series
- Tygon® LFL 06429-series
- C-FLEX® 06424-series
- Tygon® lab 06409-series
- Tygon® fuel & lubricant 06401-series
- PharMed® BPT 06508-series
- Norprene® 06404-series
- Norprene food 06402-series

†Only silicone and C-FLEX tubing formulations are recommended for L/S 17.

Specifications & Ordering Information—Pump Heads and Cartridges

Pump heads							Cartridges		
Key letter	Catalog number	Number of rollers	Pump head gear ratio	Max no. of cartridges		Price	Small	Large	Price
				Small	Large				
A	KH-07519-10	6	1:1	—	2		KH-07519-85 (fits all microbore two-stop tubing sizes & L/S 13, L/S 14)	KH-07519-75 (fits L/S 14, L/S 16, L/S 25, L/S 17†)	
B	KH-07519-15	6	5:1	—	6				
C	KH-07519-20	8	1:1	4	—				
D	KH-07519-25	8	5:1	12	—				

†Only silicone and C-FLEX® tubing formulations are recommended for L/S 17.

Masterflex® Microbore Two-Stop Pump Tube Sets Ordering Information (for 07519-85 small cartridge)

Tubing ID (mm)	Platinum-cured silicone	Santoprene	PVC	Viton®
0.19	—	—	KH-06416-10	—
0.25	—	KH-06431-12	KH-06416-12	—
0.89	KH-06421-26	KH-06431-26	KH-06416-26	KH-06428-26
1.42	KH-06421-34	KH-06431-34	KH-06416-34	KH-06428-34
2.06	KH-06421-42	KH-06431-42	KH-06416-42	KH-06428-42
2.79	KH-06421-48	KH-06431-48	KH-06416-48	KH-06428-48
Qty/pk	6	12	12	12
Price				

Complete L/S® Four-Channel, Eight-Roller Cartridge Pump System

Complete system includes:

Pump Head + **Tubing** + **Drive**

L/S Cartridge pump head 07519-20 and four small cartridges 07519-85

PVC two-stop tube sets 06416-34
1.42-mm ID
Pack of 12

Brushless digital drive 07523-70
1 to 100 rpm
(pages 1262–1263)

New

Flow Range: 0.12 to 12 mL/min per channel

Ordering Information—Complete Pump System

Catalog number	Description	rpm	Power (50/60 Hz)	Price
KH-77919-10	L/S Four-channel, eight-roller cartridge pump system	1 to 100	115/230 VAC	

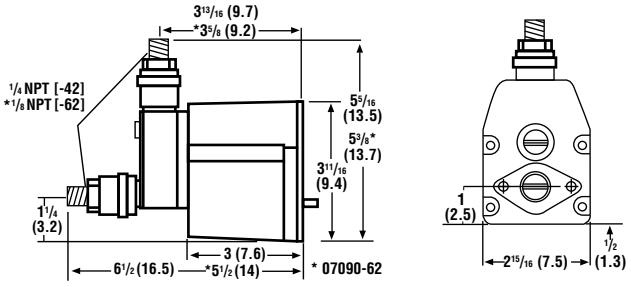
L/S® PTFE-Diaphragm Pump Heads

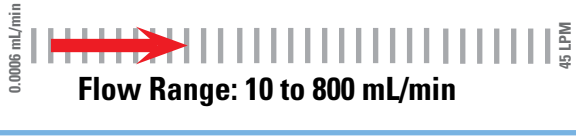
Ideal for accurate chemical feed/metering and applications requiring high-purity, high-pressure, or both

- Turns a Masterflex® L/S drive into a chemically inert diaphragm pump—the wetted parts of these PTFE-diaphragm pump heads resist even the most aggressive chemicals
- Unique geometry minimizes fluid churning and dead volume for high metering accuracy—maintain ±2% repeatability
- Self-priming—wet or dry
- Intermittent pressure capabilities: maintains consistent flow performance up to 100 psi (6.9 bar)

Note: compatible with L/S® drives that accept two or more pump heads, recommended operating speed range is 40 to 400 rpm

L/S® PTFE-Diaphragm Pump Head—dimensions in inches (cm)





Accurate Metering of Aggressive Fluids!

Pump head maintains consistent flow performance even with varying system pressures and liquid viscosities.

Specifications & Ordering Information—PTFE Diaphragm Pump Heads

ISO 9001:2000 SUPPLIER CERTIFIED — 1 year warranty

Repeatability: ±2%
Max fluid temperature: 149°F (65°C)
Drive requirements: minimum 1/10 hp
Cracking pressure: <1 psi (68 mbar)
Wetted parts: PTFE diaphragm, body, valve seat, and spring; PTFE ball check in 07090-42, borosilicate glass ball check in 07090-62
Dimensions: 3"W x 6"H x 6 1/2"D (7.6 cm W x 15.2 cm H x 16.5 cm D)

Catalog number	Flow rate at 40 to 400 rpm		Max pressure, psi (bar)		Metering pressure range	Max suction lift		Max dead volume	Intake/discharge ports	Price
	mL/min	GPH	Continuous	Intermittent		Dry	Wet			
KH-07090-42	80 to 800	1.3 to 12.7	50 (3.4)	75 (5.0)	3 to 50 psi (0.2 to 3.4 bar)	24" (61 cm)	16 ft (4.9 m)	16 mL	1/4" NPT(M)	
KH-07090-62	10 to 100	0.16 to 1.6	75 (5.0)	100 (6.9)		10" (25.4 cm)	10 ft (3 m)	2 mL	1/8" NPT(M)	

Accessories

KH-07090-43 **Service kit** for 07090-42; includes diaphragm, check valves, installation tool and instructions
KH-07090-45 **Check valve** for 07090-42
KH-07090-63 **Service kit** for 07090-62; includes diaphragm, check valves, installation tool and instructions
KH-07090-65 **Check valve** for 07090-62

Complete L/S® PTFE-Diaphragm Pump System

Complete system includes:

Pump Head + **Tubing** + **Drive**

PTFE-diaphragm pump head 07090-42 (above)

PTFE-extension tubing 06605-15, 12 ft (page 1868)

Variable-speed drive 77521-40 or -47 6 to 600 rpm (pages 1258–1259)

Flow Range: 80 to 800 mL/min

Ordering Information—Complete Pump System

Catalog number	Description	Power	Price
KH-77915-00	L/S PTFE-diaphragm pump system	115 VAC, 50/60 Hz	
KH-77915-07		230 VAC, 50/60 Hz	

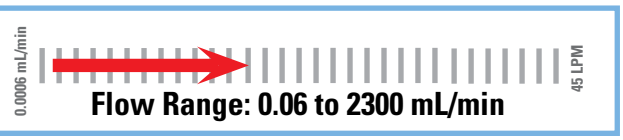
Note: System also includes two 1/4" NPT(M) pipe adapters and check valve.

L/S® Easy-Load® Pump Heads

Ideal for fast tubing changes and reduced maintenance

- Perfect for any application that requires frequent tubing changes
- Patented design and adjustable tubing retention feature allow for multiple tubing sizes
- Easily change the tubing without removing head from the drive
- Choose precision tubing for basic applications. For better pressure generation, suction lift, longer tubing life, and viscous fluids, choose high-performance precision tubing.
- PSF housing with CRS or SS rotor, or PPS housing with SS rotor available—choose PPS housing for improved chemical resistance; SS rotor offers increased durability and chemical resistance

What's included: single-channel mounting hardware and a 15" (38-cm) length of silicone tubing. Two-, three-, and four-channel mounting hardware available (order separately below). Mount up to four pump heads on a single drive depending on drive specifications.



Easy Tubing Changes

A Easy-Load pump head 07518-00 for precision pump tubing.

A Easy-Load Pump Head for Precision Tubing

- Each pump head for precision pump tubing accepts all six precision tubing sizes—L/S 13, L/S 14, L/S 16, L/S 25, L/S 17, and L/S 18. Pump a wide range of flow rates from a single pump head.
- Flow rates: 0.06 to 2300 mL/min

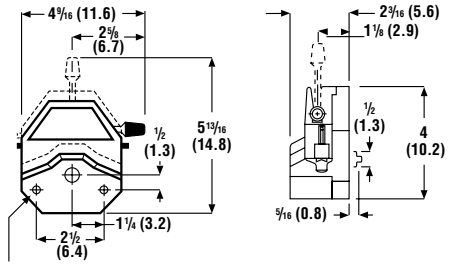
B Easy-Load Pump Head for High-Performance Precision Tubing

- Each pump head for high-performance precision pump tubing accepts two high-performance precision tubing sizes—L/S 15 and L/S 24. Pump a range of flow rates from a single pump head.
- Flow rates: 1.7 to 1700 mL/min
- Ideal for viscous fluids and applications requiring greater suction lift

Technical info

Use only Masterflex® precision pump tubing with Masterflex pumps to ensure optimal performance. Use of other tubing brands may void applicable warranties. Order tubing on pages 1245–1249.

L/S® Easy-Load® Pump Head—dimensions in inches (cm)



Mounting holes for #8 screws

Specifications & Ordering Information—Easy-Load Pump Heads

ISO 9001:2000 SUPPLIER CERTIFIED — 2 year warranty

Pump tubing size	mL per rev	Flow rates in mL/min		Maximum system pressure psi (bar)		Pump heads*		
						PSF housing		PPS housing
		1 to 100 rpm	6 to 600 rpm	Continuous	Intermittent	CRS rotor	SS rotor	SS rotor
A Easy-Load pump heads for precision pump tubing								
L/S 13	0.06	0.06 to 6	0.36 to 36	25 (1.7)	40 (2.7)	KH-07518-00	KH-07518-10	KH-07518-60
L/S 14	0.21	0.21 to 21	1.3 to 130	25 (1.7)	40 (2.7)			
L/S 16	0.8	0.8 to 80	4.8 to 480	25 (1.7)	40 (2.7)			
L/S 25	1.7	1.7 to 170	10 to 1000	20 (1.4)	35 (2.4)			
L/S 17	2.8	2.8 to 280	17 to 1700	15 (1.0)	20 (1.4)			
L/S 18	3.8	3.8 to 380	23 to 2300	10 (0.7)	15 (1.0)			
B Easy-Load pump heads for high-performance precision pump tubing								
L/S 15	1.7	1.7 to 170	10 to 1000	25 (1.7)	40 (2.7)	KH-07518-02	KH-07518-12	KH-07518-62
L/S 24	2.8	2.8 to 280	17 to 1700	25 (1.7)	40 (2.7)			
Price								

*PSF = polysulfone PPS = polyphenylene sulfide CRS = cold-rolled steel SS = stainless steel

Mounting Hardware for Easy-Load Heads

Stack up to four L/S Easy-Load pump heads on one drive (see individual drive specifications for recommended number of heads). Order mounting hardware based on number of mounted pump heads. Hardware is stainless steel.

Mounting Hardware Ordering Information

Heads to be mounted	Catalog number	Price/st
One	KH-07013-04	
Two	KH-07013-05	
Three	KH-07013-08	
Four	KH-07013-09	

Masterflex® L/S® "Partner" Pump Heads

Use these pump heads with Masterflex drives for special applications

- Ismatec® minicartridge pump heads offer variable flow from multiple channels—each head accepts up to eight cartridges (included)
- Valveless piston pump heads give you options to handle a wide range of fluids at pressures up to 100 psi
- All pump heads listed below can be used with Masterflex drives found on pages 1250–1276

Masterflex tubing pumps offer a large selection of L/S pump heads: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, High-Performance, multichannel cartridge, PTFE-diaphragm, or PTFE-tubing.

And, while Masterflex tubing pump heads are designed to meet many of your demands, you may need something different on occasion.

Ismatec® minicartridge pump head 07623-00 with L/S drive 77521-40 (order tubing on pages 1326–1327)

Valveless piston pump head 07104-56 with L/S drive 07554-80 and adapter 07104-48

Specifications & Ordering Information—Ismatec® Minicartridge Pump Heads

Catalog number	Pump head type	Advantages	Maximum flow rate (100 rpm)	Maximum pressure	Channels	Rollers	Price
EK-07623-00	Peristaltic minicartridge pump head	Multichannel pumping and variable occlusion	32.5 mL/min	25 psi	8	6	
EK-07623-10			28.5 mL/min		8	8	

Specifications & Ordering Information—Valveless Piston Pump Heads

Catalog number	Max flow rate (mL/min) at various rpm (vary flow rate by adjusting rpm or stroke length)		Max psi	Piston dia of body	Max temp of liner	Materials of construction			Price
	1 to 100 rpm	6 to 600 rpm				Piston	Cylinder body	Cylinder liner	
Standard high-flow pump heads									
EK-07104-50 EK-07104-52	0.08 to 8	0.48 to 48	100 60	⅛"	140°F (60°C)	316 SS 316 SS	316 SS Kynar®	Carbon Carbon	
EK-07117-26 EK-07104-62	0.32 to 32	1.92 to 192	60 100	¼"	140°F (60°C)	316 SS 316 SS	Kynar 316 SS	Carbon Carbon	
EK-07104-54 EK-07104-58	0.32 to 32	1.92 to 192	60 60	¼"	212°F (100°C)	Ceramic Ceramic	Kynar Kynar	Ceramic Carbon	
EK-07104-56 EK-07104-60	0.32 to 32	1.92 to 192	100 100	¼"	350°F (177°C)	Ceramic Ceramic	316 SS 316 SS	Ceramic Carbon	
EK-07117-28 EK-07104-72	0.72 to 72	4.32 to 432	60 100	⅜"	140°F (60°C)	316 SS 316 SS	Kynar 316 SS	Carbon Carbon	
EK-07104-64 EK-07104-68	0.72 to 72	4.32 to 432	60 60	⅜"	212°F (100°C)	Ceramic Ceramic	Kynar Kynar	Ceramic Carbon	
EK-07104-66 EK-07104-70	0.72 to 72	4.32 to 432	100 100	⅜"	350°F (177°C)	Ceramic Ceramic	316 SS 316 SS	Ceramic Carbon	
Sanitary high-flow pump heads (3A-approved for use with foods)									
EK-07117-20	0.32 to 32	1.92 to 192	100	¼"	350°F (177°C)	Ceramic	316 SS	Ceramic	
EK-07117-22	0.72 to 72	4.32 to 432		⅜"					

Adapter Ordering Information

The Masterflex adapter kit listed below is required to convert your L/S drive for use with the valveless piston pump heads. (Order pump heads separately above.) The adapter allows you to select from these valveless piston pump heads, which are ideal for dispensing and metering. Valveless piston metering pump heads have adjustable stroke length to adjust flow rate, allowing you to convert your fixed-speed drive into a variable flow pump.

EK-07104-48 **Masterflex adapter kit** for use with valveless piston pump heads. Includes all necessary hardware and fittings

GO to page(s) 1314–1328

See pages 1314–1328 for additional technical information on Ismatec® pump heads, and page 1390 for additional details on valveless piston pump heads.

MASTERFLEX® L/S® Spooled Pump Tubing

Cut to any length to fit your application

- Save money by buying in bulk—costs less to ship, too
- Reduce scrap—cut only as much as you need
- Ensure that you always have enough tubing on hand

Spooled pump tubing provides continuous lengths of pump tubing on convenient, manageable spools that are easy to transport and require less storage space than the equivalent amount of individual tubing coils. They are a good choice for applications requiring long, continuous runs of tubing, or which use odd-size lengths that generate leftover scrap when using standard 25- or 50-ft coils.

Save money by buying in bulk, and take advantage of lower shipping charges compared to shipping several individual coils. Spooled pump tubing also requires less packaging, reducing waste disposal costs.

Nearly any Masterflex pump tubing formulation can be spooled. If the formulation you need is not listed below, call our Application Specialists for a quote or to place a special order.

Save Money and Reduce Downtime!

96403-15

Specifications & Ordering Information

Pump tubing size	Peroxide-cured silicone (96400-series)			Platinum-cured silicone (96410-series)			PharMed® BPT (06508-series)			BioPharm Silicone (96420-series)			C-FLEX® (06424-series)			Norprene® Food (06402-series)		
	Ft	Catalog number	Price	Ft	Catalog number	Price	Ft	Catalog number	Price	Ft	Catalog number	Price	Ft	Catalog number	Price	Ft	Catalog number	Price
L/S 13	500	KH-96402-13		500	KH-96403-13		500	KH-95687-13		400	KH-96423-13		400	KH-06427-13		500	KH-06415-13	
L/S 14	500	KH-96402-14		500	KH-96403-14		500	KH-95687-14		400	KH-96423-14		400	KH-06427-14		500	KH-06415-14	
L/S 16	500	KH-96402-16		500	KH-96403-16		500	KH-95687-16		400	KH-96423-16		400	KH-06427-16		500	KH-06415-16	
L/S 25	500	KH-96402-25		500	KH-96403-25		500	KH-95687-25		400	KH-96423-25		400	KH-06427-25		—	—	—
L/S 17	500	KH-96402-17		500	KH-96403-17		500	KH-95687-17		400	KH-96423-17		400	KH-06427-17		500	KH-06415-17	
L/S 18	400	KH-96402-18		400	KH-96403-18		400	KH-95687-18		400	KH-96423-18		400	KH-06427-18		400	KH-06415-18	
L/S 15	500	KH-96402-15		400	KH-96403-15		400	KH-95687-15		400	KH-96423-15		400	KH-06427-15		—	—	—
L/S 24	400	KH-96402-24		300	KH-96403-24		300	KH-95687-24		400	KH-96423-24		400	KH-06427-24		—	—	—
L/S 35	—	—	—	300	KH-96403-35		300	KH-95687-35		400	KH-96423-35		400	KH-06427-35		—	—	—
L/S 36	—	—	—	100	KH-96403-36		100	KH-95687-36		400	KH-96423-36		400	KH-06427-36		—	—	—

MASTERFLEX® L/S® Bulk-Packed Pump Tubing

Individually bagged and sealed to prevent contamination

- Keep tubing sealed until ready to use
- Reduce storage space requirements
- Save money and shipping fees by buying in bulk

Ideal for large-volume pump tubing users, bulk packs contain ten individually bagged, sealed 25-ft coils of tubing, all from a single manufacturing lot. Because bulk packs use less packaging, they require less storage space for the same amount of tubing, and are the best choice for storerooms or other areas where space is at a premium.

Most Masterflex pump tubing formulations can be bulk-packed. If the formulation you need is not listed below, call our Application Specialists for a quote or to place a special order.

96404-16

Specifications & Ordering Information

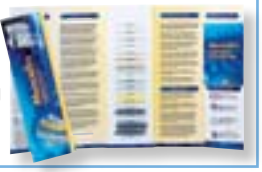
Pump tubing size	Number of 25-ft bags per box	Platinum-cured silicone (96410-series)		PharMed® BPT (06508-series)		C-FLEX® (06424-series)	
		Cat. no.	Price/bx	Cat. no.	Price/bx	Cat. no.	Price/bx
L/S 13	20	KH-96404-13		KH-95691-13		KH-06436-13	
L/S 14	20	KH-96404-14		KH-95691-14		KH-06436-14	
L/S 16	20	KH-96404-16		KH-95691-16		KH-06436-16	
L/S 25	20	KH-96404-25		KH-95691-25		KH-06436-25	
L/S 17	20	KH-96404-17		KH-95691-17		KH-06436-17	
L/S 18	10	KH-96404-18		KH-95691-18		KH-06436-18	
L/S 15	20	KH-96404-15		KH-95691-15		KH-06436-15	
L/S 24	20	KH-96404-24		KH-95691-24		KH-06436-24	
L/S 35	10	KH-96404-35		KH-95691-35		KH-06436-35	
L/S 36	10	KH-96404-36		KH-95691-36		KH-06436-36	

More info ***FREE TUBING TEST KIT!***

Find out which tubing formulations work best with chemicals you are using

Includes 17 FREE pump tubing samples, formulation descriptions, testing and ordering instructions.

Call 847-549-7600 to request a tubing test kit today!



L/S®

MASTERFLEX®

MASTERFLEX® L/S® Precision and High-Performance Precision Pump Tubing

Ensure optimal performance from your Masterflex® pump

- Custom extruded to fit Masterflex pumps
- Engineered for long life in peristaltic pump applications
- Lot-to-lot consistency provides superior accuracy and repeatability

Masterflex L/S pump tubing is manufactured to extremely close tolerances that match our L/S pump heads, ensuring accurate, repeatable flow and long tubing life. Our pump tubing is factory-tested and optically inspected to provide the best performance from your peristaltic pump. With 19 different materials available, there is an L/S pump tubing formulation suitable for nearly any fluid handling application.

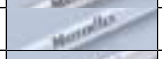
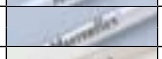
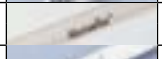
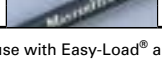
Our High-performance precision pump tubing features a thicker wall compared to our Precision pump tubing, making it the best choice for applications involving pressure, suction lift, viscous fluids, or long tubing life.

L/S® Precision Pump Tubing Specifications

	Precision pump tubing					
Pump tubing cross sections						
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18
Inside diameter (nominal), in. (mm)	0.03 (0.8)	0.06 (1.6)	0.12 (3.1)	0.19 (4.8)	0.25 (6.4)	0.31 (7.9)
Hose barb size, in. (mm)	1/16 (1.6)	1/16 (1.6)	1/8 (3.2)	3/16 (4.8)	1/4 (6.4)	3/8 (9.5)
Flow range (approximate)* with 1 to 600 rpm drive, mL/min	0.06 to 36	0.21 to 130	0.8 to 480	1.7 to 1000	2.8 to 1700	3.8 to 2300
Maximum pressure, continuous†	25 psig (1.7 bar)			20 psig (1.4 bar)	15 psig (1.0 bar)	10 psig (0.7 bar)
Maximum pressure, intermittent†	40 psig (2.7 bar)			35 psig (2.4 bar)	20 psig (1.4 bar)	15 psig (1.0 bar)
Maximum vacuum†	26" Hg (660 mm Hg)				20" Hg (510 mm Hg)	
Suction lift†	29 ft H_2O (8.8 m H_2O)				22 ft H_2O (6.7 m H_2O)	

*Determined under the following conditions: 0 psi at inlet, 0.5 psi at outlet; water temperature at 72°F (22°C). †Actual performance varies depending on tubing formulation—values shown are for firm tubing. Values for STA-PURE®/CHEM-SURE® pump tubing are 60 psi (4.1 bar) continuous, 100 psi (6.9 bar) intermittent.

L/S® Precision Pump Tubing Ordering Information

Pump tubing formulation / size			L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18
Silicone (platinum-cured)	25 ft (7.6 m) per pack		KH-96410-13	KH-96410-14	KH-96410-16	KH-96410-25	KH-96410-17	KH-96410-18
Silicone (peroxide-cured)	25 ft (7.6 m) per pack		KH-96400-13	KH-96400-14	KH-96400-16	KH-96400-25	KH-96400-17	KH-96400-18
BioPharm silicone (platinum-cured)	25 ft (7.6 m) per pack		KH-96420-13	KH-96420-14	KH-96420-16	KH-96420-25	KH-96420-17	KH-96420-18
BioPharm Plus silicone (platinum-cured)	25 ft (7.6 m) per pack		KH-96440-13	KH-96440-14	KH-96440-16	KH-96440-25	KH-96440-17	KH-96440-18
C-FLEX® (50 A)	25 ft (7.6 m) per pack		KH-06424-13	KH-06424-14	KH-06424-16	KH-06424-25	KH-06424-17	KH-06424-18
PharMed® BPT	25 ft (7.6 m) per pack		KH-06508-13	KH-06508-14	KH-06508-16	KH-06508-25	KH-06508-17	KH-06508-18
PharmaPure®‡	25 ft (7.6 m) per pack		KH-06435-13	KH-06435-14	KH-06435-16	KH-06435-25	KH-06435-17	KH-06435-18
STA-PURE®	12" (30.5 cm) per pack		—	KH-96200-14	KH-96200-16	KH-96200-25	KH-96200-17	KH-96200-18
CHEM-SURE®	12" (30.5 cm) per pack		—	KH-96210-14	KH-96210-16	KH-96210-25	KH-96210-17	KH-96210-18
Tygon® LFL	25 ft (7.6 m) per pack		KH-06429-13	KH-06429-14	KH-06429-16	KH-06429-25	KH-06429-17	KH-06429-18
Tygon® Food (B-44-4X)	50 ft (15.2 m) per pack		KH-06419-13	KH-06419-14	KH-06419-16	KH-06419-25	KH-06419-17	KH-06419-18
Tygon® lab (R-3603)	50 ft (15.2 m) per pack		KH-06409-13	KH-06409-14	KH-06409-16	KH-06409-25	KH-06409-17	KH-06409-18
Tygon® fuel & lubricant (F-4040-A)	50 ft (15.2 m) per pack		KH-06401-13	KH-06401-14	KH-06401-16	KH-06401-25	KH-06401-17	KH-06401-18
Tygon® chemical (2001)‡	50 ft (15.2 m) per pack		KH-06475-13	KH-06475-14	KH-06475-16	KH-06475-25	KH-06475-17	KH-06475-18
Norprene® (A 60 G)	50 ft (15.2 m) per pack		KH-06404-13	KH-06404-14	KH-06404-16	KH-06404-25	KH-06404-17	KH-06404-18
Norprene® Food (A 60 F)	50 ft (15.2 m) per pack		KH-06402-13	KH-06402-14	KH-06402-16	KH-06402-25	KH-06402-17	KH-06402-18
Chem-Durance™	50 ft (15.2 m) per pack	 New	KH-06432-13	KH-06432-14	KH-06432-16	KH-06432-25	KH-06432-17	KH-06432-18
Viton®	25 ft (7.6 m) per pack		KH-06412-13	KH-06412-14	KH-06412-16	KH-06412-25	KH-06412-17	KH-06412-18
FDA Viton®	25 ft (7.6 m) per pack		KH-96412-13	KH-96412-14	KH-96412-16	KH-96412-25	KH-96412-17	KH-96412-18

‡These formulations are recommended for use with Easy-Load® and Easy-Load® II pump heads only.

GO to ColeParmer.com

ColeParmer.com/MasterflexTubing

For help selecting the right Masterflex® pump tubing formulation for your application, visit our Web site at www.coleparmer.com/MasterflexTubing

Pulse Dampener

Virtually eliminate pulsation in your output flow. Pulse dampener features a polyethylene body. It includes five pairs of fittings and PTFE-pipe thread tape. Pulse dampener accepts all L/S® tubing sizes and I/P® 26 size tubing.

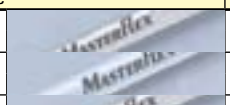
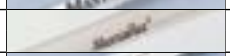
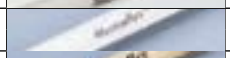
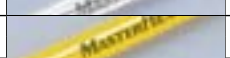
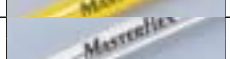
EK-07596-20 **Pulse dampener**

L/S® High-Performance Precision Pump Tubing Specifications

	High-performance precision pump tubing			
Pump tubing cross sections				
	L/S 15	**L/S 24**	**L/S 35**	**L/S 36**
Inside diameter (nominal), in. (mm)	0.19 (4.8)	0.25 (6.4)	0.31 (7.9)	0.38 (9.7)
Hose barb size, in. (mm)	3⁄16 (4.8)	1⁄4 (6.4)	3⁄8 (9.5)	3⁄8 (9.5)
Flow range (approximate)* with 1 to 600 rpm drive, mL/min Value in ( ) obtained with High-Performance pump head	1.7 to 1000 (1.8 to 1100)	2.8 to 1700 (3.0 to 1800)	3.8 to 2300 (4.3 to 2600)	4.8 to 2900 (5.8 to 3400)
Maximum pressure, continuous† Maximum pressure, intermittent†	25 psig (1.7 bar) 40 psig (2.7 bar)		20 psig (1.4 bar) 35 psig (2.4 bar)	15 psig (1.0 bar) 20 psig (1.4 bar)
Maximum vacuum† Suction lift†	26" Hg (660 mm Hg) 29 ft H_2O (8.8 m H_2O)			24" Hg (610 mm Hg) 27 ft H_2O (8.3 m H_2O)

*Determined under the following conditions: 0 psi at inlet, 0.5 psi at outlet; water temperature at 72°F (22°C). †Actual performance varies depending on tubing formulation—values shown are for firm tubing. Values for STA-PURE®/CHEM-SURE® pump tubing are 60 psi (4.1 bar) continuous, 100 psi (6.9 bar) intermittent.

L/S® High-Performance Precision Pump Tubing Ordering Information

Pump tubing formulation / size			L/S 15	L/S 24	L/S 35	L/S 36
Silicone (platinum-cured)	25 ft (7.6 m) per pack		KH-96410-15	KH-96410-24	KH-96410-35	KH-96410-36
Silicone (peroxide-cured)	25 ft (7.6 m) per pack		KH-96400-15	KH-96400-24	KH-96400-35	KH-96400-36
BioPharm silicone (platinum-cured)	25 ft (7.6 m) per pack		KH-96420-15	KH-96420-24	KH-96420-35	KH-96420-36
BioPharm Plus silicone (platinum-cured)	25 ft (7.6 m) per pack		KH-96440-15	KH-96440-24	KH-96440-35	KH-96440-36
C-FLEX® (50 A)	25 ft (7.6 m) per pack		KH-06424-15	KH-06424-24	KH-06424-35	KH-06424-36
PharMed® BPT	25 ft (7.6 m) per pack		KH-06508-15	KH-06508-24	KH-06508-35	KH-06508-36
PharmaPure®‡	25 ft (7.6 m) per pack		KH-06435-15	KH-06435-24	—	—
STA-PURE®	14" (35.6 cm) per pack		KH-96200-15	KH-96200-24	KH-96200-35	—
CHEM-SURE®	14" (35.6 cm) per pack		KH-96210-15	KH-96210-24	KH-96210-35	—
Tygon® LFL	25 ft (7.6 m) per pack		KH-06429-15	KH-06429-24	KH-06429-35	KH-06429-36
Tygon® Food (B-44-4X)	50 ft (15.2 m) per pack		KH-06419-15	KH-06419-24	KH-06419-35	KH-06419-36
Tygon® lab (R-3603)	50 ft (15.2 m) per pack		KH-06409-15	KH-06409-24	KH-06409-35	KH-06409-36
Tygon® fuel & lubricant (F-4040-A)	50 ft (15.2 m) per pack		KH-06401-15	KH-06401-24	KH-06401-35	KH-06401-36
Tygon® chemical (2001)‡	50 ft (15.2 m) per pack		KH-06475-15	KH-06475-24	—	—
Norprene® (A 60 G)	50 ft (15.2 m) per pack		KH-06404-15	KH-06404-24	KH-06404-35	KH-06404-36
Norprene® Food (A 60 F)	50 ft (15.2 m) per pack		KH-06402-15	KH-06402-24	KH-06402-35	KH-06402-36
Chem-Durance™	50 ft (15.2 m) per pack	 New	KH-06432-15	KH-06432-24	KH-06432-35††	—
Viton®	25 ft (7.6 m) per pack		KH-06412-15	KH-06412-24	KH-06412-35	KH-06412-36
FDA Viton®	25 ft (7.6 m) per pack		KH-96412-15	KH-96412-24	KH-96412-35	KH-96412-36

‡These formulations are recommended for use with Easy-Load® and Easy-Load® II pump heads only.
††This size is recommended for use with Easy-Load®, Easy-Load® II, and High-Performance pump heads only.

L/S®

MASTERFLEX®

MASTERFLEX® L/S® Double-Y Pump Tubing Sets

Reduce pulsation and maintain sterility

- Enhances dispensing accuracy
- Prevents fluid contamination
- Tubing meets USP Class V, exceeds Class VI standards

Double-Y sanitary tubing set shown above on our Digi-Staltic® dispensing system 77340-00

The "Y" design eliminates fittings and provides a contamination-free pathway for fluid transfer.

Reduce pulsation and enhance accuracy in peristaltic dispensing by combining the split-channel tubing configuration with the offset rollers of two stacked Easy-Load® II pump heads. Double-Y tube sets double flow rates while reducing pulsation by 90%, resulting in increased accuracy. Ideal for any application sensitive to pulsation, including dispensing, pumping viscous or foaming liquids, or where fluid pulses interfere with instrument readings.

Masterflex double-Y tubing sets consist of a single molded fluid pathway, preventing particle entrapment that can lead to microbial contamination. These convenient one-piece tube assemblies are ready to use straight from the package, eliminating the time and expense of making your own tube sets.

Made from our popular Masterflex platinum-cured silicone pump tubing (96410-series), these tubing sets exceed FDA and USP Class VI requirements and meet USP Class V (extractables) standards; tubing is manufactured to bulk pharmaceutical cGMPs. Use with any Masterflex drive featuring two stacked Easy-Load® II pump heads.

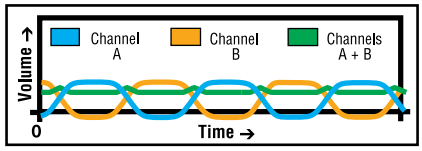
Overall tubing length is approximately 5 feet (12" between double Ys). Autoclavable. Temperature range: –75 to 450°F (–60 to 232°C). Life expectancy: up to 375 hours.

Specifications & Ordering Information

Pump tubing size	L/S® Precision pump tubing						L/S® High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
Inside diameter, in. (mm)	0.03 (0.8)	0.06 (1.6)	0.12 (3.1)	0.19 (4.8)	0.25 (6.4)	0.31 (7.9)	0.19 (4.8)	0.25 (6.4)	0.31 (7.9)	0.38 (9.7)
Hose barb size, in. (mm)	1/16 (1.6)	1/16 (1.6)	1/8 (3.2)	3/16 (4.8)	1/4 (6.4)	3/8 (9.5)	3/16 (4.8)	1/4 (6.4)	3/8 (9.5)	3/8 (9.5)
Flow range, 6 to 600 rpm drive, mL/min	0.72 to 72	2.6 to 260	9.6 to 960	20 to 2000	34 to 3400	46 to 4600	20 to 2000	34 to 3400	46 to 4600	58 to 5800
Masterflex L/S double-Y pump tubing sets, 5 ft (1.5 m) ea	KH-96501-13	KH-96501-14	KH-96501-16	KH-96501-25	KH-96501-17	KH-96501-18	KH-96501-15	KH-96501-24	KH-96501-35	KH-96501-36

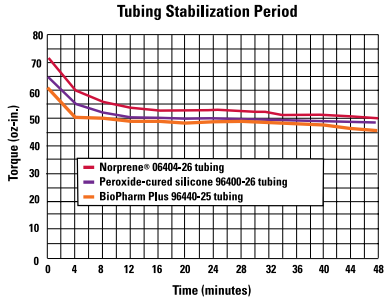
Reduced Pulsation

Minimal pulsation is essential to ensuring accuracy in peristaltic dispensing. Pulsation causes variations in flow rate and splashing and frothing in the receiving vessel. Combining the split-channel tubing configuration with the offset rollers of two stacked Easy-Load® II pump heads merges a pulse from one channel with a trough from the other. The reduced pulsation is measured at the outlet and shown in the graph above.



Tubing Break-In Period

Peristaltic pump tubing shows a distinct increase in flow stability after the first few minutes of pumping. During this break-in period the tubing adapts to the repeated compression of the rollers. For tubing in the L/S® sizes the break-in period is 10 to 15 minutes; for I/P® tubing sizes 15 to 20 minutes.

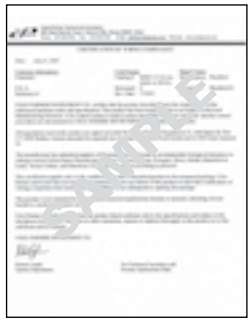


TECHNICAL INFO

Our FREE Tubing Test Kit is a simple way to test your chemicals against different tubing formulations. Kit contains samples of 17 different tubing formulations, formulation descriptions, a selection guide, instructions on how to test your tubing, and complete ordering information. Call today!

MORE INFO

If you need documentation to prove that your specific Masterflex® pump tubing complies with certain regulations or agency requirements, we can help. Simply request a FREE Certificate of Tubing Compliance with your order.



MASTERFLEX® L/S® Sanitary Pump Tubing Assemblies

Crevice-free connections protect fluid sterility

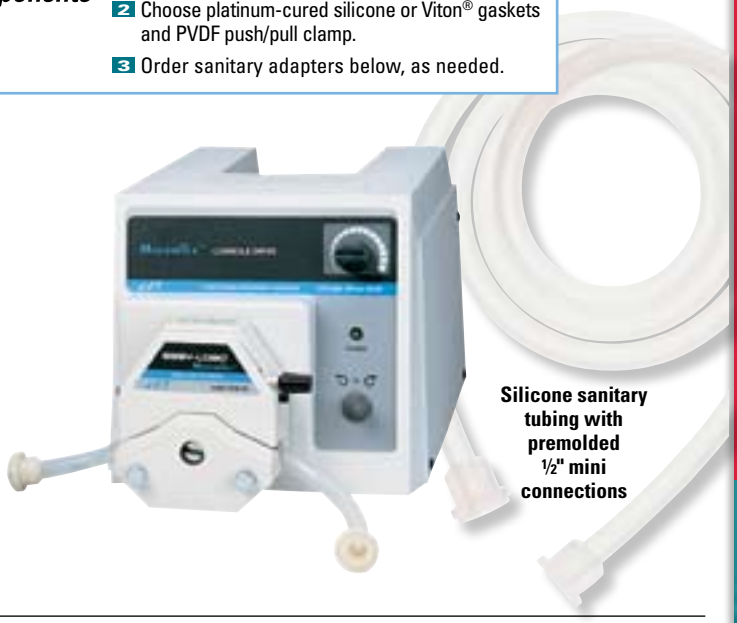
- Molded ends promote a smooth fluid pathway and prevent particulate entrapment
- Eliminate crevices and dead zones that promote microbial growth
- Made from Masterflex pump tubing to provide optimal pump performance

Molded pump tubing assemblies are ideal for sanitary fluid handling applications, including pharmaceutical, biotech, food, beverage, and dairy processing. Smooth molded components ensure a smooth flow pathway, preventing crevices that could trap particles and promote bacterial and fungal growth. Less thermally conductive than metallic tubing or pipe, molded pump tubing assemblies are not subject to galvanic action, RFI, or EMI.

Pump tubing with sanitary ends is available in five- or ten-foot lengths of platinum-cured silicone (96410-series) or PharMed® BPT (06508-series), or in two-foot lengths of STA-PURE® tubing; all with premolded ½" mini connections. Order gaskets, push/pull clamps, and the adapters of your choice below.

Required System Components

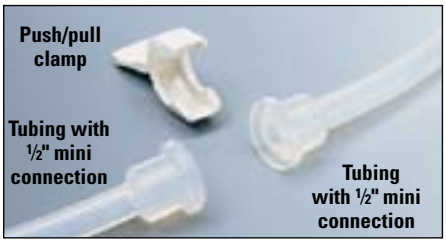
1. Select a molded pump tubing assembly in your choice of pump tubing formulation and length.
2. Choose platinum-cured silicone or Viton® gaskets and PVDF push/pull clamp.
3. Order sanitary adapters below, as needed.



Specifications & Ordering Information

Pump tubing size	Platinum-cured silicone (96410-series) 5-ft (1.5-m) length		Platinum-cured silicone (96410-series) 10-ft (3-m) length		PharMed® BPT (06508-series) 5-ft (1.5-m) length		PharMed® BPT (06508-series) 10-ft (3-m) length		Gore™ STA-PURE® (96200-series) 1-ft (0.3-m) length	
	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price	Cat. no.	Price
L/S® Precision pump tubing										
L/S 13	KH-96100-13		KH-96101-13		KH-96112-13		KH-96113-13		—	—
L/S 14	KH-96100-14		KH-96101-14		KH-96112-14		KH-96113-14		—	—
L/S 16	KH-96100-16		KH-96101-16		KH-96112-16		KH-96113-16		KH-96202-16	
L/S 25	KH-96100-25		KH-96101-25		KH-96112-25		KH-96113-25		—	—
L/S 17	KH-96100-17		KH-96101-17		KH-96112-17		KH-96113-17		KH-96202-17	
L/S 18	KH-96100-18		KH-96101-18		KH-96112-18		KH-96113-18		KH-96202-18	
L/S® High-performance precision pump tubing										
L/S 15	KH-96100-15		KH-96101-15		KH-96112-15		KH-96113-15		KH-96202-15	
L/S 24	KH-96100-24		KH-96101-24		KH-96112-24		KH-96113-24		KH-96202-24	
L/S 35	—	—	—	—	KH-96112-35		KH-96113-35		KH-96202-35	
L/S 36	—	—	—	—	KH-96112-36		KH-96113-36		—	—

Accessories for ½" Mini Connections



KH-31201-88 Push/pull clamp, PVDF. For quick joining of two ½" mini connections

Gaskets. Order gaskets to join ½" mini connection without molded-in gasket to another ½" mini connection without molded-in gasket or to an adapter from table at right.

KH-31807-00 **Silicone gasket;** for use with sanitary silicone (platinum-cured) tubing

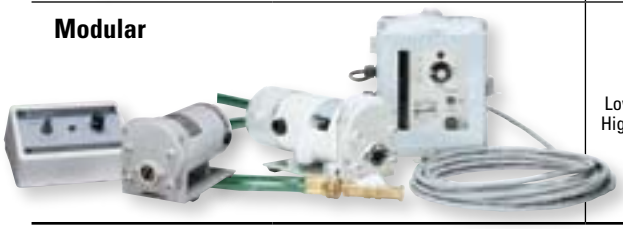
KH-31807-08 **Viton® gasket;** for use with sanitary PharMed® BPT tubing

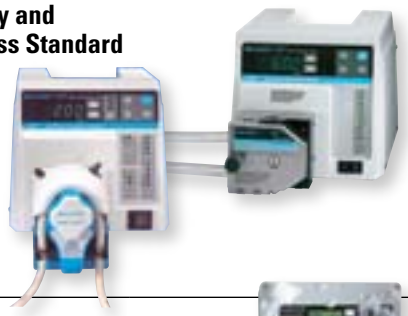
GO to page(s) 538–546
For our complete selection of sanitary fittings.

Sanitary Adapter Ordering Information

Adapter connections	Polypropylene		Kynar®	
	Catalog number	Price	Catalog number	Price
½" mini to ⅛" NPT(M)	KH-31200-00		KH-31201-00	
½" mini to ⅛" NPT(F)	KH-31200-10		KH-31201-10	
½" mini to ¼" NPT(M)	KH-31200-01		KH-31201-01	
½" mini to ¼" NPT(F)	KH-31200-11		KH-31201-11	
½" mini to ¼" hose barb	KH-31805-25		KH-31201-21	
½" mini to ⅜" NPT(M)	KH-31200-02		KH-31201-02	
½" mini to ⅜" NPT(F)	KH-31200-12		KH-31201-12	
½" mini to ⅜" hose barb	KH-31805-26		KH-31201-22	
½" mini to ½" NPT(M)	KH-31200-03		KH-31201-03	
½" mini to ½" NPT(F)	KH-31200-13		KH-31201-13	
½" mini to ½" hose barb	KH-31805-27		—	—
½" mini to 1" maxi	KH-31200-30		—	—
½" mini to 1" ladish	KH-31805-05		KH-31201-40	
½" mini to female luer lock	KH-31200-50		KH-31201-50	

Selection Guide for L/S® Drives

Description	Flow rates (mL/min)	Fixed speed	Variable speed	Reversible	Remote control capabilities	Special features	Page number
Analog							
Fixed-Speed 	Lowest: 0.06 Highest: 290	✓				Consistent repeatable flow rates. Economical and compact. Stackable. UL, cUL, and CE listed models.	1252
Compact 	Lowest: 0.8 Highest: 560		✓	✓	✓	Economical and compact. Stackable. UL, cUL, and CE listed models. Compact pump with integral pump head and quick-loading tube sets—single or dual channels.	1253–1254
Console 	Lowest: 0.06 Highest: 3400		✓	✓	✓	Economical variable flow; 10-turn potentiometer for speed control. UL, cUL, and CE listed models. Drives accept stacked pump heads for multiple channels. Drives are stackable.	1255; 1258–1259
Modular 	Lowest: 0.06 Highest: 3400		✓	✓	✓	Separate motor and controller up to 31 feet. Models available with IP56-rated wall-mount controllers. Pump heads can be stacked.	1256–1257
Specialty							
Complete Pump Systems 	Lowest: 0.36 Highest: 1700		✓	✓	✓	Complete tubing pump systems. Technological breakthrough uses rigid PTFE tubing in a peristaltic tubing pump. High-pressure system enables continuous pressure up to 100 psi.	1260-1261
Samplers 	Lowest: 0.06 Highest: 1650		✓	✓		Samplers float up to 30 minutes if inadvertantly dropped in water. Rechargeable internal batteries for field use. Ideal for sampling in the field or in the plant as portable pump. Programmable digital composite samplers available.	1273
DC-Powered 	Lowest: 1.2 Highest: 2700	✓	✓	✓		Operate from 12 VDC supply. Versatile, portable and easy to use.	1274

Description	Flow rates (mL/min)	Fixed speed	Variable speed	Reversible	Remote control capabilities	Special features	Page number
Digital							
Economy and Brushless Standard 	Lowest: 0.1 Highest: 3400		✓	✓	✓	Maintenance-free brushless motor. Precise PWM speed control. Quiet operation. Tachometer feedback for ±0.25% speed control. Housings are stackable. Calibration capability. Programmable for all L/S® tubing sizes. Pump heads can be stacked.	1262–1263
Brushless Dispensers 	Lowest: 0.6 Highest: 3400		✓	✓	✓	Maintenance-free brushless motor. Special features for precise repetitive dispensing. Precise PWM speed control. Quiet operation. Tachometer feedback for ±0.25% speed control. Stackable. Pump heads can be stacked. Calibration capability. Programmable for all L/S® tubing sizes.	1266–1267
Stainless Steel Process 	Lowest: 0.1 Highest: 3400		✓	✓	✓	IP66 and NEMA 4X rated for washdown. Sealed 316 stainless steel housing. Maintenance-free brushless motor with PWM speed control. Dispensing features include delay interval and cumulative volume. Full remote control capability.	1268–1269
Specialty							
Computer Compatible/ Digi-Staltic Dispenser 	Lowest: 0.1 Highest: 5800		✓	✓	✓	Control brushless computerized drive with Windows®-based software. Digital dispenser stores up to 30 user programs. Calibration capability. Use as stand-alone or programmable drives. Control multiple Digi-Staltic drives from a single controller. Ideal for automated process applications. Stack pump heads.	1264–1265 1270–1272
Air-Powered and Hazardous Duty 	Lowest: 3.6 Highest: 3400	✓	✓			Use air-powered drives in locations where electricity is unsafe or impractical. Stack pump heads. Hazardous-duty drives with fixed-speed motors are agency-certified for hazardous locations.	1275

L/S®

MASTERFLEX®

L/S® Fixed-Speed Drives

Economical drives deliver consistent, repeatable flow rates

- Pump head flow rate: 0.06 to 290 mL/min; cartridge flow rate: 0.0006 to 84 mL/min. Flow rate depends on drive rpm and tubing size.
- Economy fixed-speed drives are stackable and ideal for field or lab use. Select from seven speeds—choose your drive based on flow rate; see table below.
- Lighted power switch on front of drive lets you know that pump is running. Drives are UL-listed and comply with CE regulations.
- Drives accept five different pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, and Cartridge.

What's included: 6-ft (1.8-m) line cord. 115 VAC models: U.S. standard plug; 230 VAC models: European plug.

Consistent, Repeatable Flow Rates!

07540-01

Drive 07540-01 shown with Easy-Load II pump head 77200-62 (see pages 1232–1233)

Technical info

Fixed-speed drives accept five different pump head types: Standard, Easy-Load®, Easy-Load II, Easy-Load 3, and Cartridge. Drives that accept only one pump head are not for use with cartridge pump heads.

Flow Rates in mL/min†

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Standard, Easy-Load II, Easy-Load 3			
	Cartridge**						Easy-Load			
1	0.06	0.21	0.8	1.7	2.8	3.8	1.7	2.8	3.8	4.8
2	0.12	0.42	1.6	3.4	5.6	7.6	3.4	5.6	7.6	9.6
6	0.36	1.3	4.8	10	17	23	10	17	23	29
12	0.72	2.5	9.6	20	34	46	20	34	46	58
20	1.2	4.2	16	34	56	76	34	56	76	96
30	1.8	6.3	24	50	84	110	50	84	110	140
60	3.6	13	48	100	170	230	100	170	230	290

*The Standard pump head is not available for L/S® 25.
**Cartridge heads are available for microbore tubing.
†Motor rpm and flow rates for the 230 VAC, 50 Hz economy drives are approximately ⅚ of the values shown.

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Specifications & Ordering Information for Fixed-Speed Drives

rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	115 VAC/60 Hz models		230 VAC/50 Hz models	
						Catalog number	Price	Catalog number	Price
1	None‡	2	Subfractional (< 1/25 hp)**	IP22	6" x 4⅞" x 4½" (15.2 cm x 12.5 cm x 11.5 cm)	KH-07540-01		KH-07542-01	
2						KH-07540-02		KH-07542-02	
6						KH-07540-06		KH-07542-06	
12	None‡	2	Subfractional (< 1/25 hp)**	IP22	6" x 4⅞" x 4½" (15.2 cm x 12.5 cm x 11.5 cm)	KH-07540-12		KH-07542-12	
20						KH-07540-20		KH-07542-20	
30						KH-07540-30		KH-07542-30	
60		1				KH-07540-60		KH-07542-60	

‡Drive speed may vary ±15%, subject to fluctuations in line voltage and frequency. **Maximum power required is 70 W or less.

Technical info

For detailed technical information and the most complete listings of Masterflex® parts and accessories, please see our Masterflex® Encyclopedia, Vol. 3.

Request your free copy at Masterflex.com

Technical info

Our FREE Tubing Test Kit is a simple way to test your chemicals against different tubing formulations. Kit contains samples of 17 different pump tubing formulations, formulation descriptions, a selection guide, test instructions, and complete ordering information. Call today!

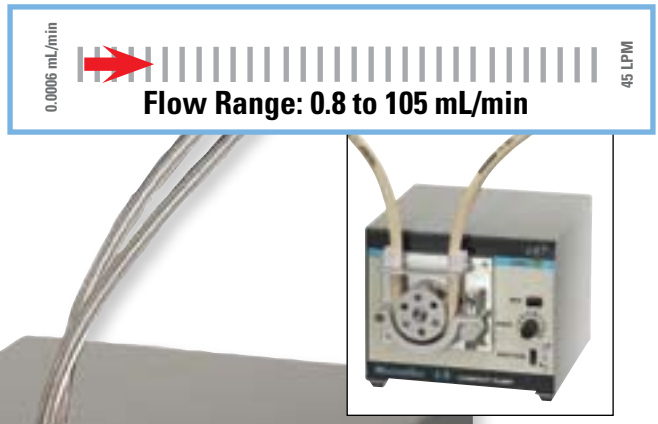
L/S® Compact, Variable-Speed Pumps

Pump with integral head delivers repeatable low flow rates with quick set up

- Flow rate of 0.8 to 105 mL/min—depending on drive rpm and tubing size.
- Two-stop tube sets are easy to load with no occlusion or tension adjustment
- Separate single-turn speed control and forward/off/reverse switch—maintain speed setting when turning pump on/off
- Remote start/stop via contact closure on back of pump
- Dual-channel model delivers synchronous flow from two separate channels

This compact, stackable pump features a durable steel housing with chip resistant epoxy-based paint. The anodized aluminum occlusion bed swings open for quick loading of the two-stop tube sets. Wide occlusion angle prevents fluid backflow up to the rated pressure of the tubing. MAX button runs motor at full rpm to rapidly prime or flush tubing. Self-lubricating thermoplastic polyester (Ertalyte® TX) rollers are low-friction and long wearing for smooth operation and long life.

What's included: dual-voltage (115/230 VAC) benchtop power supply with IEC320/CEE22 socket. Pump is shipped with cord/plug assembly specific to country of destination.



77240-00

Dual-channel pump
77240-10

Easy to Load, Single- or Dual-Channel

Masterflex L/S® Two-Stop Precision Pump Tubing Sets Ordering Information (Pack of 8)

Tubing size	Tygon® Lab (pk of 8)	Platinum-cured silicone (pk of 8)	PharMed® BPT (pk of 8)	Viton® (pk of 8)
L/S® 13	KH-06416-13	KH-06421-13	KH-96114-13	KH-06428-13
L/S® 14	KH-06416-14	KH-06421-14	KH-96114-14	KH-06428-14
L/S® 16	KH-06416-16	KH-06421-16	KH-96114-16	KH-06428-16
L/S® 25	KH-06416-25	KH-06421-25	KH-96114-25	KH-06428-25

Flow Rates in mL/min

rpm	Precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25
Single-channel pump 77240-00				
20 to 100 rpm	0.8 to 4.0	2.8 to 14	11 to 54	21 to 105
Dual-channel pump 77240-10				
20 to 100 rpm	0.8 to 4.0	2.8 to 14	—	—

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Specifications & Ordering Information for L/S® Compact, Variable-Speed Pump

Catalog number	Number of channels	rpm	Speed control (repeatability)	Reversible motor	IP rating	Dimensions (L x W x H)	Power (50/60 Hz)	Price
KH-77240-00	1	20 to 100	±5%	Yes	IP22	6½" x 5¼" x 4½" (16.5 cm x 13.4 cm x 11.4 cm)	Dual voltage: 90 to 130 VAC, 0.4 A and 190 to 260 VAC, 0.2 A	
KH-77240-10	2							

KH-77200-07 **Replacement power supply,** dual-voltage 115/230 VAC

GO to page(s) 1308

For a selection of Masterflex® barbed fittings to connect two-stop tubing sets to extension tubing.

GO to page(s) 1245–1249

For Masterflex® L/S® precision pump tubing.

L/S®

MASTERFLEX®

L/S® Compact, Low-Flow, Variable-Speed Drive

Stackable, compact pump delivers versatile performance in limited space

- Flow rate: 2.1 to 560 mL/min depending on drive rpm and tubing size.
- Compact size: 5⅜"L x 5³⁄₁₆"W x 4½"H.
- Separate single-turn speed control and forward/off/reverse switch maintain speed setting while turning pump on/off.
- Reversible motor—purge before or after pumping; pump in either direction.
- Remote control options on the back of pump. Start/stop pump via contact closure.

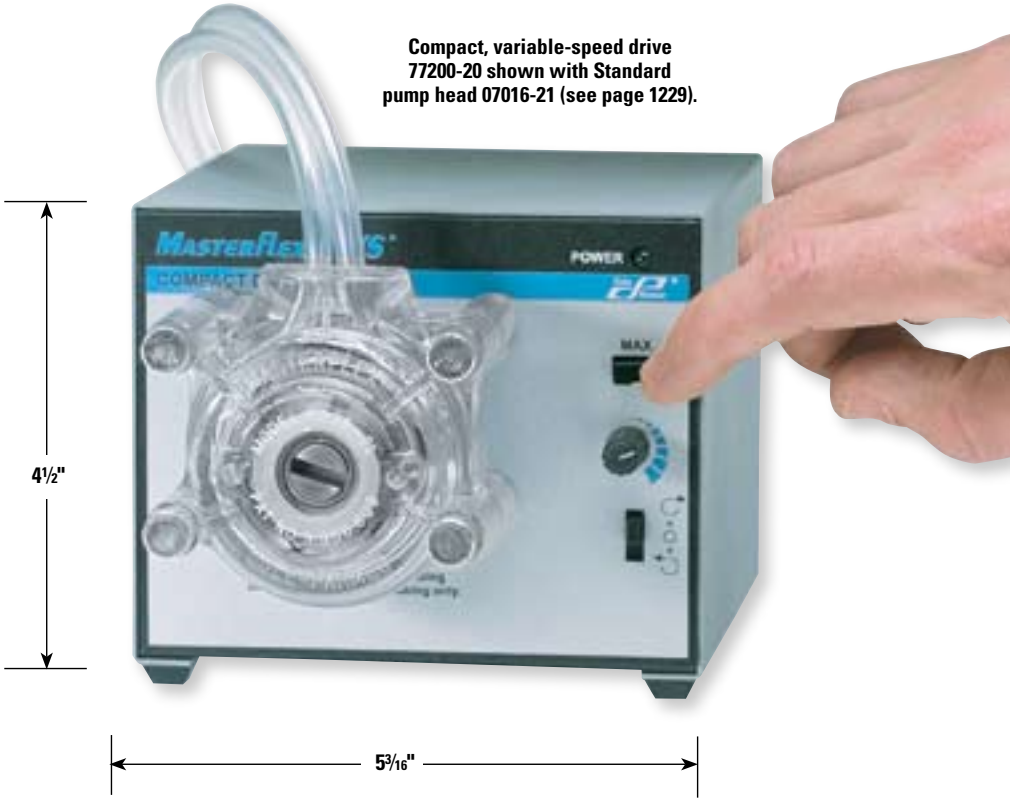
This compact L/S® variable-speed drive is the perfect upgrade from Masterflex® C/L® variable speed tubing pumps. Lightweight and reversible, this drive offers higher flow rates and remote control capabilities—all at an economical price. The drive is also stackable, which is ideal when you need to pump fluid at a higher rate, but when space is limited in your lab. MAX button runs pump at maximum rpm to prime or rapidly flush tubing.

What's included: model 77200-20 includes dual voltage (115/230 VAC) benchtop power supply with IEC320/CEE22 socket. Pump is shipped with cord/plug assembly specific to country of destination.

Drives are stackable—ideal where space is limited.

Lightweight, Compact and Economical

Compact, variable-speed drive 77200-20 shown with Standard pump head 07016-21 (see page 1229).



Technical info

Compact variable-speed drives accept a single pump head—either Standard or Easy-Load®.

Flow Rates in mL/min

Use these drives with Masterflex® L/S® precision pump tubing in-the sizes below. Only silicone and C-FLEX® pump tubing formulations are recommended for L/S® 17 and L/S® 25 size tubing.

	Precision pump tubing				
35 to 200 rpm	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17
	2.1 to 12	7.4 to 42	28 to 160	60 to 340	98 to 560

Power supplies are:

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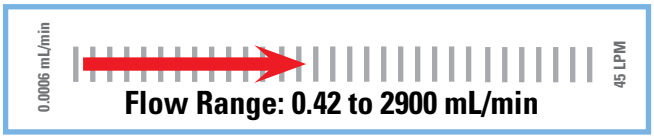
Specifications & Ordering Information (order pump tubing separately on pages 1245-1249)

Catalog number	rpm	Speed control (repeatability)	Pump heads accepted	Reversible motor	IP rating	Dimensions (L x W x H)	Power (50/60 Hz)	Price
KH-77200-12	35 to 200	±5% (2% of max)	1	Yes	IP22	5⅜" x 5³⁄₁₆" x 4½" (13.6 cm x 13.2 cm x 11.4 cm)	12 VDC	
KH-77200-20							90 to 260 VAC, 120 mA	

KH-77200-07 **Replacement power supply,** dual voltage 115/230 VAC



L/S® Variable-Speed Economy Console Drives

An economical and versatile variable-speed drive with a wide flow range

- Pump head flow rate: 0.42 to 2900 mL/min; cartridge head flow rate: 0.0035 to 1700 mL/min. Flow rate depends on rpm and pump tubing size.
- Separate single-turn speed control and on/off switch with green power indicator. Maintain speed setting while turning on/off.
- The 1/20-hp unidirectional motor has soft start and back EMF for ±5% speed control. Smooth operation and long service life.
- 115 VAC models: UL and cUL listed; 230 VAC models: CE compliant

A perfect upgrade from a fixed-speed drive, these variable-speed drives include a wider rpm range and ±5% speed regulation. For added versatility, these drives accept nine different pump head types.

What's included: 6-ft (1.8-m) line cord—115 VAC: U.S. standard plug; 230 VAC: IEC 320/CEE22 socket. Please specify country of destination when ordering.

Variable-speed console drive 07554-80

Flow Rates in mL/min (flow rates in parentheses can only be obtained with the High-Performance pump head)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load®, Easy-Load® II, Easy-Load® 3						Multichannel**, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
20 to 600	1.2 to 36	4.2 to 130	16 to 480	34 to 1000	56 to 1700	76 to 2300	34 to 1000	56 to 1700	76 to 2300	96 to 2900
7 to 200	0.42 to 12	1.4 to 43	5.6 to 160	12 to 330	20 to 570	27 to 770	12 to 330 (13 to 370)	20 to 570 (21 to 600)	27 to 770 (30 to 870)	34 to 970 (41 to 1130)

*The Standard pump head is not available for L/S 25. **Multichannel head is not available for L/S 36. Multichannel and Cartridge heads are available for microbore tubing.

Specifications & Ordering Information

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Catalog number	rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power (50/60 Hz) VAC	Power (50/60 Hz) Amps	Price
KH-07554-90	20 to 600	±5%	1	1/20 hp (37 W)	IP22	9" x 7" x 5¼" (22.9 cm x 18.1 cm x 13.3 cm)	90 to 130	1.5	
KH-07554-95							180 to 260	0.8	
KH-07554-80	7 to 200		2				90 to 130	1.5	
KH-07554-85							180 to 260	0.8	

Technical info

Drives accept nine different pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, and PTFE-Diaphragm. Drives 07554-90 and -95 are not recommended for use with the PTFE-tubing and PTFE-diaphragm pump heads. These drives can be used with High-Performance, Multichannel, and Cartridge pump heads only when loaded with silicone or C-FLEX® tubing.

Complete L/S® Variable-Speed Economy Pump Systems

Complete Systems 1 and 2 include:

Pump Head + Tubing + Drive

1 L/S Easy-Load 3 pump head 77800-60 (pages 1230–1231)
Tygon® LFL L/S 16 tubing 06429-16 10 ft (3 m) (pages 1245–1249)
Console drive 07554-90 or 07554-95 20 to 600 rpm (above)

2 L/S Easy-Load II pump head 77200-62 (pages 1232–1233)
Tygon LFL L/S 24 tubing 06429-24 10 ft (3 m) (pages 1245–1249)
Console drive 07554-90 or 07554-95 20 to 600 rpm (above)

Flow Range: 56 to 1700 mL/min

2 77910-20

New

Flow Range: 16 to 480 mL/min

1 77910-30

Ordering Information—Complete Pump Systems 1 and 2

Key	Catalog number	Description	Power	Price
1	KH-77910-30	L/S economy pump with Easy-Load 3 pump head	115 VAC, 50/60 Hz	
	KH-77910-35		230 VAC, 50/60 Hz	
2	KH-77910-20	L/S economy pump with Easy-Load II pump head	115 VAC, 50/60 Hz	
	KH-77910-25		230 VAC, 50/60 Hz	

L/S®

MASTERFLEX®

L/S® Variable-Speed Modular Drives

Modular drives let you place drive and controller where most convenient

- Reversible motor—pump in either direction.
- Separate single-turn potentiometer and forward/off/reverse switch with inertia center. Maintain speed while turning drive on/off/reverse.

L/S® modular drives feature reversible pumping and allow you to separate the motor up to 31-ft from the controller (115 VAC models). For hostile environments, use model "B" that features an IP56 rated wall-mount controller.

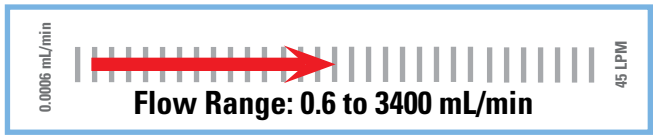
A Modular drive 07553-70

Separate Motor and Controller up to 31 feet!

B Modular drive with IP56-rated wall-mount controller 07552-70

Technical info

Variable-speed modular drives accept nine pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, and PTFE-Diaphragm.



A Modular Drives

- Pump head flow rate: 0.06 to 3400 mL/min; cartridge head flow rate: 0.0006 to 1700 mL/min. Flow rate depends on drive rpm and tubing size.
- 6-ft (1.8-m) cable connects motor and controller; additional 25-ft (7.6 m) cable for 115 VAC units available; see "Accessories" on facing page.
- 115 VAC models are UL- and cUL-listed; 230 VAC models 07553-77 and -87 comply with CE regulations.
- ABS plastic controller housing; epoxy finished steel drive housing. Controller is splash resistant; motor is chemical resistant.
- Soft-start motor with back EMF for ±2% speed control; transfer fluids with great precision.

What's included: 6-ft (1.8-m) line cord—115 VAC: U.S. standard plug; 230 VAC: IEC 320/CEE22 socket. Specify destination country to receive correct plug/cord set.

B Modular Drives with Wall-Mount Controller

- Pump head flow rate: 0.36 to 3400 mL/min; cartridge pump head flow rate: 0.0036 to 1700 mL/min. Flow rate depends on drive rpm and pump tubing size.
- Motor/controller connected by 24-ft (7.3-m) cable.
- 4 to 20 mA remote control input for speed control. Connections on front panel terminal strip (<4 mA signal stops drive).

What's included: 6-ft (1.8-m) line cord—115 VAC: U.S. standard plug; 230 VAC: European plug.

Typical Application: L/S® modular drive 07553-70 shown above with Easy-Load® II pump head 77201-62 and Tygon® Lab L/S® 24 tubing 06409-24. This system is ideal for recirculating chilled water from a refrigerated bath to a separate cooling chamber in gel electrophoresis applications.

Flow Rates in mL/min (flow rates in parentheses can only be obtained with the High-Performance pump head-see page 1235)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel**, Standard*, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
6 to 600	0.36 to 36	1.3 to 130	4.8 to 480	10 to 1000	17 to 1700	23 to 2300	10 to 1000 (11 to 1100)	17 to 1700 (18 to 1800)	23 to 2300 (26 to 2600)	29 to 2900 (34 to 3400)
1 to 100	0.06 to 6	0.21 to 21	0.8 to 80	1.7 to 170	2.8 to 280	3.8 to 380	1.7 to 170 (1.8 to 180)	2.8 to 280 (3.0 to 300)	3.8 to 380 (4.3 to 430)	4.8 to 480 (5.8 to 580)

*The Standard pump head is not available for L/S® 25.
**Multichannel head is not available for L/S® 36. Multichannel and Cartridge heads are available for microbore tubing.

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Specifications & Ordering Information (for all drives on these two pages)

Catalog number	CE	rpm	Speed control	No. of pump heads accepted	Motor size	IP rating	Dimensions† (L x W x H)	Power (50/60 Hz) VAC	Power (50/60 Hz) Amps	Price
A Modular drives										
KH-07553-70		6 to 600	±2%	2	1/10 hp (75 W)	Controller: IP23 Drive: IP21	Controller: 4 15/16" x 7 1/16" x 4 1/16" (12.5 cm x 17.9 cm x 10.3 cm) Drive: 7 7/8" x 3 13/16" x 4 5/8" (20 cm x 9.7 cm x 11.7 cm)	90 to 130	3.0	
KH-07553-75								190 to 260	1.6	
KH-07553-77	✓							190 to 260	1.2	
KH-07553-80		1 to 100		4				90 to 130	3.0	
KH-07553-85								190 to 260	1.6	
KH-07553-87	✓							190 to 260	1.2	
B Modular drives with wall-mount controller										
KH-07552-70		6 to 600	±10%	2	1/10 hp (75 W)	Controller: IP56 Drive: IP34	Controller: 5 7/16" x 6 1/2" x 8" Drive: 10 1/2" x 3 13/16" x 4 5/8"	100 to 130	1.5	
KH-07552-75								200 to 260	0.8	

†The dimensions of the controller for 07553-77, -87 are 6½"W x 7⅝"L x 3½"H (16.5 cm x 19.4 cm x 8.9 cm)—complies with CE inspection.

Accessories for "A" Modular Drives

KH-07553-72 **Extension cable, 25 ft (7.6 m)** for 115 VAC drives 07553-70, -80, and pump 77913-20 to extend the distance between motor and controller by 25 ft (7.6 m). For 115 VAC models only

Complete L/S® Variable-Speed Economy Pump Systems

Complete Systems 1 and 2 include:

Pump Head + **Tubing** + **Drive**

1 L/S Easy-Load 3 pump head 77800-60 (pages 1230–1231)
Tygon LFL L/S 16 tubing 06429-16 10 ft (3 m) (pages 1245–1249)
Modular drive 07553-70 or 07553-77 6 to 600 rpm (above)

2 L/S Easy-Load II pump head 77200-62 (pages 1232–1233)
Tygon LFL L/S 24 tubing 06429-24 10 ft (3 m) (pages 1245–1249)
Modular drive 07553-70 or 07553-77 6 to 600 rpm (above)

Ordering Information—Complete Pump Systems 1 and 2

Key	Catalog number	Description	Power	Price
1	KH-77913-40	L/S modular pump with Easy-Load 3 pump head	115 VAC, 50/60 Hz	
	KH-77913-45		230 VAC, 50/60 Hz	
2	KH-77913-20	L/S modular pump with Easy-Load II pump head	115 VAC, 50/60 Hz	
	KH-77913-25		230 VAC, 50/60 Hz	

Complete System 3 includes:

Pump Head + **Tubing** + **Drive**

Easy-Load® II pump head 77200-62 (pages 1232–1233)
Tygon® LFL L/S® 24 tubing 06429-24 10-ft (3-m) (pages 1245–1249)
Modular drive 07552-70 or 07552-75 6 to 600 rpm (above)

Ordering Information—Complete Pump System 3

Catalog number	Description	Power	Price
KH-77913-30	L/S modular pump with wall-mount controller	115 VAC, 50/60 Hz	
KH-77913-35		230 VAC, 50/60 Hz	

L/S®

MASTERFLEX®

A Precision standard drive 07520-40 with single-turn speed control.

Most Versatile Console Drives!

L/S® Variable-Speed Console Drives

Easy-to-use analog drives offer precise speed control—ideal for metering applications

- Pump head flow rate: 0.06 to 3400 mL/min; Cartridge head flow rate: 0.0006 to 1700 mL/min. Flow rate depends on drive rpm and tubing size.
- Reversible motor—purge tubing before or after pumping; pump fluid in either direction.
- Separate single-turn speed control and on/off/reverse switch with inertia center and green LED power indicator. Maintain speed setting while turning pump on/off.
- The 1/10-hp motor has soft start and back EMF for ±2% speed control. Promotes smooth operation and long service life.
- Stackable, splash-resistant ABS plastic housing, IP23 rated.

These accurate analog console drives have ±2% speed control for precise flow regulation—ideal for metering applications. A convenient carrying handle is molded into the housing. Choose our basic "A" drives, or our full-featured "B" drives which come with the same features, plus a locking 10-turn speed control with index marks and remote control capabilities. Drives meet or exceed selected limits for safety and noise immunity in the laboratory: (UL 508C and CSA C22.2 No. 14 for 115 VAC units; EN 61010-1 and EN 63126 for 230 VAC units).

What's included: 6-ft (1.8-m) line cord—115 VAC: U.S. standard plug; 230 VAC: IEC 320/CEE22 socket. Specify ultimate destination country to receive correct plug/cord set.

B Precision standard drive 77521-40 with 10-turn potentiometer speed control and remote capabilities via footswitch 77595-35 shown below (order separately).

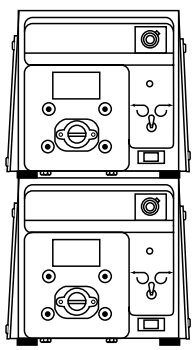
A Precision Standard Drives

- Three different rpm range models—select the speed range best suited to your application.

B Precision Standard Drives with 10-Turn Speed Control and Remote Capabilities

- 10-turn potentiometer for precision speed control. Locking lever enables you to lock in your exact speed setting.
- Remote control capabilities via DB9 female connector on back of drive.
  - Speed control input: 4 to 20 mA or 2 to 10 VDC
  - Start/stop via open collector or contact closure
- Local/remote speed loop control via contact closure or open connector.

Remote speed control (3% FS linear resolution) requires DB9 male connector 07595-45. Use connector 07595-45 for remote control of start/stop via contact closure or open collector (5 V TTL); or control start/stop via footswitch 77595-35. Order connector and footswitch under "Remote Control Accessories" on facing page.



These stackable console drives save benchtop space.

Technical info

Variable-speed console drives accept nine different pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, and PTFE-Diaphragm.

www.masterflex.com

Flow rates in mL/min (flow rates in parentheses can only be obtained with the High-Performance pump head—see page 1235)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel**, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
A-B Precision standard drives and precision standard drives with 10-turn speed control and remote control capabilities										
6 to 600	0.36 to 36	1.3 to 130	4.8 to 480	10 to 1000	17 to 1700	23 to 2300	10 to 1000 (11 to 1100)	17 to 1700 (18 to 1800)	23 to 2300 (26 to 2600)	29 to 2900 (34 to 3400)
6 to 300	0.36 to 18	1.3 to 65	4.8 to 240	10 to 500	17 to 850	23 to 1150	10 to 500 (11 to 550)	17 to 850 (18 to 900)	23 to 1150 (26 to 1300)	29 to 1450 (34 to 1700)
1 to 100	0.06 to 6	0.21 to 21	0.8 to 80	1.7 to 170	2.8 to 280	3.8 to 380	1.7 to 170 (1.8 to 180)	2.8 to 280 (3.0 to 300)	3.8 to 380 (4.3 to 430)	4.8 to 480 (5.8 to 580)

*The Standard pump head is not available for L/S® 25. **Multichannel head is not available for L/S 36. Multichannel and Cartridge heads are available for microbore tubing.

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Specifications & Ordering Information (for all drives on these two pages)

Catalog number	rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power (50/60 Hz) VAC	Power (50/60 Hz) Amps	Price
A Precision standard drives									
KH-07520-40	6 to 600	±2% (1-turn speed control)	2	1/10 hp (75 W)	IP23	11½" x 7" x 7" (29.2 cm x 17.8 cm x 17.8 cm)	90 to 130	2.3	
KH-07520-47							190 to 260	1.2	
KH-07520-60	6 to 300		2				90 to 130	2.3	
KH-07520-67							190 to 260	1.2	
KH-07520-50	1 to 100		4				90 to 130	2.3	
KH-07520-57							190 to 260	1.2	
B Precision standard drives with 10-turn speed control and remote control capabilities									
KH-77521-40	6 to 600	±1% (10-turn speed control)	2	1/10 hp (75 W)	IP23	11½" x 7" x 7" (29.2 cm x 17.8 cm x 17.8 cm)	90 to 130	2.3	
KH-77521-47							190 to 260	1.2	
KH-77521-50	1 to 100		4				90 to 130	2.3	
KH-77521-57							190 to 260	1.2	

Remote Control Accessories for 77521-series drives

KH-07595-45 **Connector,** DB9 male. Use for 4 to 20 mA remote control

KH-77595-35 **Footswitch,** DB9 male. For use with 77521-40, -47, -50, and -57 drives only

More info

Use only Masterflex® pump tubing with Masterflex® tubing pumps to ensure accuracy and optimum performance. Use of other tubing may void applicable warranties.

Complete L/S® Variable-Speed Pump Systems

Complete Systems 1 and 2 include:

Pump Head + Tubing + Drive

1 L/S® Easy-Load® II pump head 77200-62 (pages 1232–1233)
Tygon® LFL L/S® 24 tubing 06429-24 10 ft (3 m) (pages 1245–1249)
Precision standard drive (1 turn) 07520-40 or -47 6 to 600 rpm (above)

2 L/S Easy-Load II pump head 77200-62 (pages 1232–1233)
Tygon LFL L/S 24 tubing 06429-24 10 ft (3 m) (pages 1245–1249)
Precision standard drive (10 turn) 77521-40 or -47 6 to 600 rpm (above)

Ordering Information—Complete Pump Systems 1 and 2

Key	Catalog number	Description	Remote control	Power VAC (Hz)	Price
1	KH-77916-00	L/S Precision standard pump with 1-turn speed control	No	115 (50/60)	
	KH-77916-07			230 (50/60)	
2	KH-77911-20	L/S Precision standard pump with 10-turn speed control	Yes	115 (50/60)	
	KH-77911-27			230 (50/60)	

L/S®

MASTERFLEX®

L/S® PTFE-Tubing Pump System

Technological breakthrough—peristaltic pump that uses inert PTFE tubing

Transfer aggressive organic solvents and maintain high purity of your fluid. Since PTFE tubing is the only wetted part, chemical exposure is limited. Rigid pump tubing allows you to pump fluids at pressures up to 100 psi (6.9 bar). Ideal for filtration, chemical injection, and other high-pressure applications.

- Flow range: 0.36 to 65 mL/min. Max flow rate of 65 mL/min is possible with the 6-mm OD tubing set 77390-60, which is included with system.
- Accepts either 4- or 6-mm OD rigid PTFE-tubing sets. **Note:** Use Masterflex® PTFE-tubing sets only.
- Adjustable occlusion six-roller pump head. Tighten occlusion for higher pressure, loosen for longer tubing life.
- Transfers liquids containing small particulates.

Complete system includes: L/S® PTFE-tubing pump head 77390-00, PTFE-tubing set 77390-60, and L/S® variable-speed drive 07520-60 or 07520-67 (6 to 300 rpm). System also includes two ¼" NPT(M) pipe adapters.

L/S® PTFE-tubing pump system 77912-00

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Specifications & Ordering Information

Maximum continuous pressure: 100 psi (6.9 bar)
Maximum suction lift: 8 ft (2.4 m)
Drive requirements: minimum 1/10 hp
Avg tubing life (100 rpm, 0 psi): 500 hours
Body material: anodized aluminum, acetal
Roller material: stainless steel

Catalog number	Flow range at 6 to 300 rpm		rpm	Rollers	Drive dimensions (L x W x H)	Power VAC (Hz)	Price
	4-mm OD tubing	6-mm OD tubing					
KH-77912-00	0.36 to 17 mL/min	1.50 to 65 mL/min	6 to 300	6	11½" x 7" x 7" (29.2 cm x 17.8 cm x 17.8 cm)	115 (50/60)	
KH-77912-07						230 (50/60)	

Tubing Sets

PTFE-Tubing Sets include two 15" (38-cm) lengths and cannot be substituted with ordinary PTFE tubing.

KH-77390-50 **PTFE-tubing.**
2-mm ID, 4-mm OD. Set of two

KH-77390-60 **PTFE-tubing.**
4-mm ID, 6-mm OD. Set of two

Tubing Set Accessories

For 4-mm OD PTFE-tubing sets:

KH-31321-61 **Straight connector,**
40 psi (9.2 bar) max

KH-06407-15 **PTFE extension tubing,**
4-mm OD. Pack of 12 ft (3.7 m)

For 6-mm OD PTFE-tubing sets:

KH-31321-64 **Straight connector,**
135 psi (9.2 bar) max

KH-06407-20 **PTFE extension tubing,**
6-mm OD. pack of 12 ft (3.7 m)

Masterflex® L/S® Pump System with CHEM-SURE® Pump Tubing

Transfer aggressive and high-purity fluids in pharmaceutical and specialty chemical applications

- CHEM-SURE® is the most chemically resistant flexible peristaltic pump tubing—offers long pumping life even with organic solvents
- Flow range of 28 to 1700 mL/min (with 10 to 600 rpm drive)
- Included PFA fittings and PTFE extension tubing maintain fluid purity throughout system

Complete system 77918-10 includes: L/S® 24 High-performance CHEM-SURE tubing 96210-24, L/S® Easy-Load® II pump head with SS rotor 77200-62, L/S® brushless digital console drive 07523-60 (10 to 600 rpm), 12 feet of ¼" ID PTFE extension tubing, and adapter fittings.

Masterflex® L/S® pump system 77918-10

GO to page(s) 1215–1225
Go to pages 1215–1225 for a complete description and specifications for CHEM-SURE® pump tubing.

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Specifications & Ordering Information

Catalog number	Description	Power (50/60 Hz)	Price
KH-77918-10	L/S CHEM-SURE/Easy-Load II pump system with variable-speed digital drive	115/230 VAC	

Accessories

KH-06605-15 **PTFE extension tubing,**
¼" ID x ⅜" OD x 12 ft L

L/S® High-Pressure Pump System

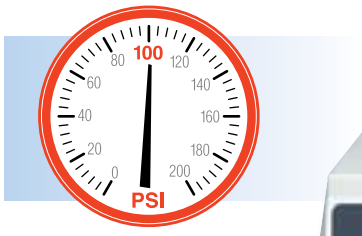
Ideal for chemical injection, metering, and filtration

- Flow rate: 0.9 to 170 mL/min depending on drive rpm and tubing size
- Reversible motor—pump fluid in either direction
- Separate single-turn speed control and on/off/reverse switch with inertia center and LED power indicator. Maintain speed setting while turning pump on/off.
- The 1/10-hp reversible motor has soft start and back EMF for ±1% speed control—promotes smooth operation and long service life.
- Stackable ABS plastic housing; IP23 rated. Pump is splash- and fire-resistant.
- IEC 320/CEE22 socket; 6-ft (1.8 m) line cord. **Note:** Please specify country to receive correct plug/cord set.

The Masterflex® L/S® High-Pressure Pump System enables peristaltic fluid transfer using flexible tubing—at higher pressures. This innovative pump system transfers fluids at continuous pressure up to 100 psi (6.9 bar). Unlike ordinary high-pressure pumps, there are no gears, valves, seals, or diaphragms to disassemble for cleaning, which saves you time, money, and downtime. This pump is ideal for chemical injection or sterile filtration because the fluid remains in the tubing at all times, with absolutely no contact with the pump's moving parts.

Complete system includes: L/S® High-Performance pump head 77250-62, eight feet of high-pressure PharMed® BPT 95664-16 (L/S® 16HP) tubing, and L/S® drive 07520-50 or -57 (1 to 100 rpm).

Continuous pressure up to 6.9 bar (100 psi)



L/S® high-pressure pump system 77914-00 handles continuous pressure up to 100 psi (6.9 bar)!

Specifications & Ordering Information (order replacement tubing separately below)

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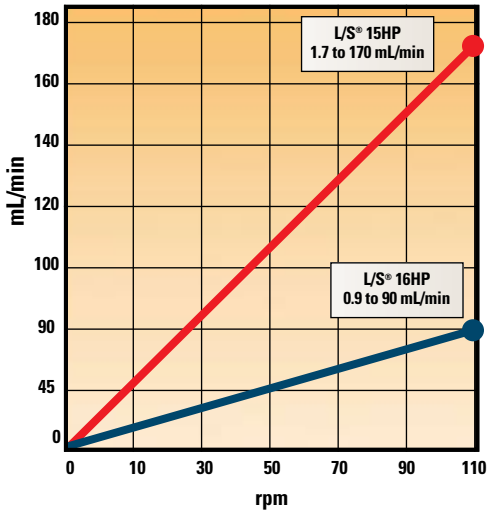
Catalog number	rpm	Speed control (repeatability)	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power (50/60 Hz)	Price
Complete high-pressure pump systems (includes drive, High-Performance pump head and L/S 16HP tubing)								
KH-77914-00	1 to 100	±1% (±1 rpm)	1	1/10 hp (75 W)	IP23	Drive: 11¾" x 8" x 7¼" (29.8 cm x 20.3 cm x 18.4 cm) Pump head: 3¾" x 4" x 3½" (9.5 cm x 9.8 cm x 8.9 cm)	90 to 130 VAC, 2.3 A	
KH-77914-07							190 to 260 VAC, 1.2 A	

Masterflex® L/S® High-Pressure Pump Tubing Ordering Information

Masterflex tubing size	Catalog number	Tubing ID	Flow range	Max pressure (continuous)	Length/pk	Price/pk
PharMed® BPT high pressure tubing						
L/S 16HP†	KH-95664-16	1/8"	0.9 to 90 mL/min	100 psig (6.9 bar)	25 ft (7.6 m)	
L/S 15HP†	KH-95664-15	3/16"	1.7 to 170 mL/min	80 psig (5.5 bar)	25 ft (7.6 m)	
Norprene® high pressure tubing						
L/S 16HP†	KH-06504-16	1/8"	0.9 to 90 mL/min	100 psig (6.9 bar)	25 ft (7.6 m)	
L/S 15HP†	KH-06504-15	3/16"	1.7 to 170 mL/min	80 psig (5.5 bar)	25 ft (7.6 m)	

†Use only with the L/S® HP pump head mounted on any L/S® 1 to 100 rpm drive capable of running two or more pump heads (min. 1/10 hp).

Flow Rates for Masterflex® L/S® High-Pressure Pump System



NOTE: Flow rates achieved are independent of pressure.

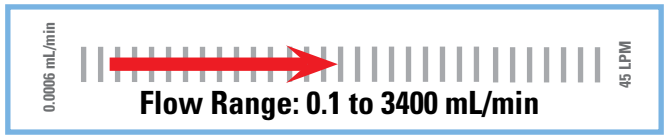
Accessories

KH-30703-02 **Fitting, straight barb/barb;** 1/8" tubing ID. Kynar®. Pack of 10
KH-30703-04 **Fitting, straight barb/barb;** 3/16" tubing ID. Kynar®. Pack of 10
KH-31208-76 **Fitting, straight barb/NPT(M);** 1/8" tubing ID x 1/4" NPT. Stainless steel
KH-31208-78 **Fitting, straight barb/NPT(M);** 3/16" tubing ID x 1/4" NPT. Stainless steel
KH-06832-02 **Tubing clamp;** secures tubing to barbed fitting. Pack of 100

L/S® Variable-Speed Digital Drives

Digital display and programmed calibration deliver high accuracy for critical metering and dispensing applications

- Flow rate: 0.1 to 3400 mL/min; cartridge flow rate: 0.001 to 1700 mL/min. Flow rate depends on drive rpm and tubing size.
- Membrane keypad for easy programming. Select tubing size and enter desired flow rate—drive automatically locks in required rpm.
- Keypad lock/unlock feature prevents accidents or tampering.
- Tachometer feedback for ±0.25% speed control; dispense or meter with accuracy and precision.
- Drive stores one user-specified calibration value per tubing size even when power is turned off—calibrate system to improve display accuracy.



Our L/S® digital drives offer wide flow ranges, powerful motors, and an easy-to-read digital display. Choose version "A" for its economical price, or if you need more versatility, select our "B" digital drives, which offer all of the features of our economy drive plus a maintenance-free brushless reversible motor, precision PWM speed control, dual voltage, copy/dispense features, and full-featured remote control capabilities. Drives feature a stackable ABS plastic housing, IP23 rated for splash resistance.

What's included: 6-ft (1.8-m) line cord with IEC 320/CEE22 socket. Please specify destination country; product shipped with country specific plug/cord set.

Easy-to-Read Digital Display!

A Economy Digital Drives

- Display shows motor rpm or flow rate; view feedback of pump performance. 10 to 600 rpm model resolution: 1 rpm (flow rate: 0.1 to 10 autoranging); 1.6 to 100 rpm model resolution: 0.1 rpm (flow rate: 0.01 to 1 autoranging)
- Select from two speed ranges—both accept multiple pump heads. Order a drive based on flow rate or number of heads needed.

Technical info

Variable-speed digital drives accept nine different pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, PTFE-Diaphragm.

GO to ColeParmer.com

For technical information on Masterflex® pump tubing, including chemical compatibility, visit our Web site at www.coleparmer.com/MasterflexTubing

B Standard Brushless Digital Drives

- Four-digit LED display shows four different parameters: motor rpm, flow rate, dispense volume, and copy number. View pump performance continually. 10 to 600 rpm model resolution: 1 rpm (flow rate: 0.1 to 10 autoranging); 1.6 to 100 rpm model resolution: 0.1 rpm (flow rate: 0.01 to 1 autoranging).
- Dispense by: mL—vol in mL of each dispense; 0.001 to 9999 mL; copy—1 to 9,999 dispense cycles; or SEC—time between each dispense:1 to 9,999 secs.
- Remote control capabilities via DB15 female connector on back of drive:
  - Speed control input: 0 to 20 mA, 4 to 20 mA, or 0 to 10 V;
  - Pumping direction: requires open collector or contact closure;
  - Start/stop/purge: requires open collector or contact closure.
  - Tachometer output: 0 to 20 mA, 4 to 20 mA, 0 to 10 V, or TTL pulse;

These advanced digital drives now feature a dispense interval mode that lets you set a delay between dispense cycles. You get the ease and convenience of hands-off automatic dispensing. Reversible motor allows you to purge tubing and pump in either direction.

Flow rates in mL/min (flow rates in parentheses can only be obtained with the High-Performance pump head—see page 1235)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel**, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
A-B Economy digital and brushless digital drives										
10 to 600	0.6 to 36	2.1 to 130	8 to 480	17 to 1000	28 to 1700	38 to 2300	17 to 1000 (18 to 1100)	28 to 1700 (30 to 1800)	38 to 2300 (43 to 2600)	48 to 2900 (58 to 3400)
1.6 to 100	0.1 to 6	0.4 to 21	1.4 to 80	3 to 170	5 to 280	6 to 380	3 to 170 (3 to 180)	5 to 280 (5 to 300)	6 to 380 (7 to 430)	8 to 480 (9 to 580)

*The Standard pump head is not available for L/S® 25.
**Multichannel head is not available for L/S 36. Multichannel and Cartridge heads are available for microbore tubing.

Specifications & Ordering Information for all drives on these two pages

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Catalog number	rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power (50/60 Hz)	Price
A Economy digital drives								
KH-07524-40	10 to 600	±0.25% (1 rpm at 600 rpm; 0.1 rpm at 100 rpm)	2	1/10 hp (75 W)	IP23	11½" x 7" x 7" (29.2 cm x 17.8 cm x 17.8 cm)	90 to 130 VAC, 2.3 A	
KH-07524-45							190 to 260 VAC, 1.2 A	
KH-07524-50	1.6 to 100		4				90 to 130 VAC, 2.3 A	
KH-07524-55							190 to 260 VAC, 1.2 A	
B Standard brushless digital drives								
KH-07523-60	10 to 600	±0.25% (1 rpm at 600 rpm; 0.1 rpm at 100 rpm)	2	1/10 hp (75 W)	IP23	11½" x 7" x 7" (29.2 cm x 17.8 cm x 17.8 cm)	Dual voltage: 90 to 130 VAC, 2.2 A and 190 to 260 VAC, 1.1 A	
KH-07523-70	1.6 to 100		4				Dual voltage: 90 to 130 VAC, 2.2 A and 190 to 260 VAC, 1.1 A	

Accessories for 07523-series Brushless Digital Drives

KH-07595-42 **Footswitch,** momentary start/stop; 6-ft (1.8-m) cable
KH-07595-52 **DB15 male connector.** Use to create your own cable
KH-07595-60 **Handheld dispensing wand**

GO to page(s) 1245–1249
For Masterflex® L/S® precision pump tubing.

Complete L/S® Variable-Speed Economy Pump Systems

Complete System 1 includes:

Pump Head + **Tubing** + **Drive**

1 Easy-Load® II pump head 77200-62 (pages 1232–1233)

Tygon® LFL L/S® 24 tubing 06429-24 10-ft (3-m) (pages 1245–1249)

Economy digital drive 07524-40 or 07524-45 10 to 600 rpm (above)

1
77920-30
Flow Range: 28 to 1700 mL/min

Ordering Information—Complete Pump System 1

Catalog number	Description	Power	Price
KH-77920-30	L/S economy digital pump	115 VAC, 50/60 Hz	
KH-77920-37		230 VAC, 50/60 Hz	

Complete Systems 2 and 3 include:

Pump Head + **Tubing** + **Drive**

2 L/S Easy-Load 3 pump head 77800-60 (pages 1230–1231)

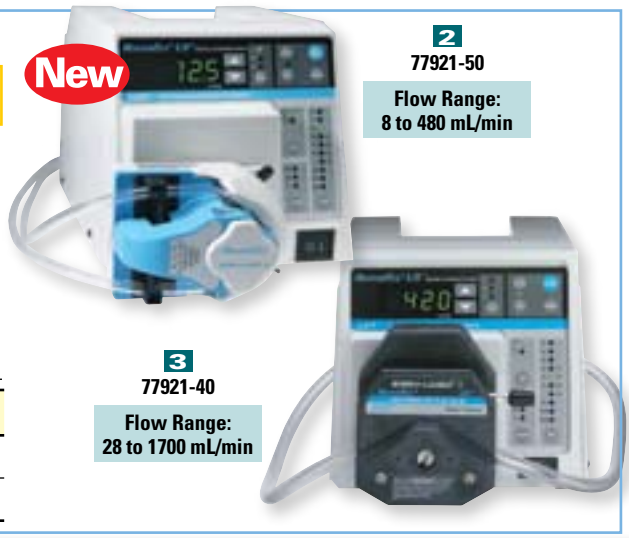
Tygon LFL L/S 16 tubing 06429-16 10 ft (3 m) (pages 1245–1249)

Standard digital drive 07523-60 10 to 600 rpm (above)

3 L/S Easy-Load II pump head 77200-62 (pages 1232–1233)

Tygon LFL L/S 24 tubing 06429-24 10 ft (3 m) (pages 1245–1249)

Standard digital drive 07523-60 10 to 600 rpm (above)



2
77921-50
Flow Range: 8 to 480 mL/min

3
77921-40
Flow Range: 28 to 1700 mL/min

Ordering Information—Complete Pump Systems 2 and 3

Key	Catalog number	Description	Power	Price
2	KH-77921-50	L/S standard brushless digital pump with Easy-Load 3 pump head	115/230 VAC, 50/60 Hz	
3	KH-77921-40	L/S standard brushless digital pump with Easy-Load II pump head	115/230 VAC, 50/60 Hz	

Computer Controlled!

Computer-compatible brushless drive 07550-30

Technical info

Drives accept nine pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, and PTFE-Diaphragm.

L/S® Computer-Compatible/ Programmable Brushless Drives

Interface these brushless digital drives to a computer for automated lab and process applications

- Flow rate: 0.1 to 3400 mL/min; cartridge flow rate: 0.001 to 1700 mL/min. Flow rate depends on drive rpm and tubing size.
- Four-digit LED display shows four different parameters: motor rpm, flow rate, dispense volume, and copy number. View pump performance continually.
- Dispense by: mL—volume in mL of each dispense, 0.001 to 9999 mL; Copy—1 to 9,999 dispense cycles; or SEC—time interval between each dispense cycle: 1 to 9,999 secs
- Remote control capabilities via DB15 female connector on drive.
  –Speed control input: 0 to 20 mA, 4 to 20 mA, or 0 to 10 V
  –Pumping direction: requires open collector or contact closure
  –Start/stop/purge: requires open collector or contact closure
  –Tachometer output: 0 to 20 mA, 4 to 20 mA, 0 to 10 V, TTL pulse
- Full RS-232 input/output via DB9 connector; valve control via auxiliary output contact.

Use these computer-compatible drives as stand-alone digital drives or full-featured programmable drives when interfaced with a computer and software. They offer analog remote control options and simple programming—ideal for automated process applications. Drives feature a programmable dispense interval that lets you set the delay between dispense cycles for convenient, automatic dispensing.

Precise PWM speed control (±0.25%) maximizes accuracy and efficiency while the brushless motor gives you quiet, maintenance-free reliability. Programmed calibration ensures dispense and display accuracy—drive stores one calibration value per tubing size. Program the drive via the simple membrane keypad; keypad lock/unlock feature protects settings. Motor is reversible so you can purge tubing before or after pumping and pump fluid in either direction.

Drives are stackable to save space when multiple drives are in use. The ABS plastic housing is IP23 rated for splash resistance.

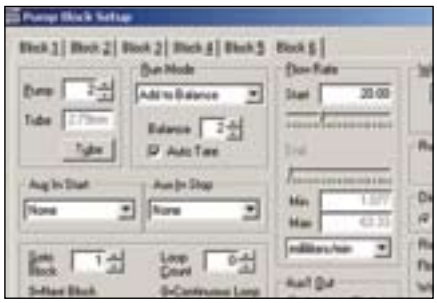
What's included: 6-ft (1.8-m) line cord with IEC 320/CEE22 socket. These models are shipped with country specific plug/cord set; please specify ultimate destination when ordering.

MASTERFLEX® Linkable Instrument Control Software

Enhanced balance interface capability and 21 CFR Part 11 compliance

- Control up to 25 Masterflex drives or Servodyne mixers directly from your computer.
- Customize the software to meet your application needs: dispensing, mixing/diluting, flow proportioning, and single/multiple slope gradients; program each pump to automate up to 50 steps.
- Improved balance interface allows you to dispense off of a balance and now features weight-ratio dispensing; use of multiple balances is enabled with multiple COM ports on your PC.
- Log at specific intervals, at the end of each block, or at the end of each run.
- Complies with 21 CFR Part 11: password protection and authorized user list, audit trail documents all operations, file encryption permits authorized user access only.

Control all functions of the Masterflex L/S® 07550-series computer-compatible drives with your personal computer by adding software 07550-74 and RS-232 interface cable 22050-54. Windows®-based software has familiar pull-down menus and mouse-selectable icons.



Quick updates provide up-to-the minute pump information, and you don't need to leave your desk!

Design your own program using the simple-to-use software.

Specifications & Ordering Information

Catalog number	Description	Price
KH-07550-74	Masterflex linkable instrument control software, Windows® 3.1 or later, CD-ROM	

KH-22050-54 **RS-232 interface cable,** DB9 (M) to DB9 (F), 8-ft (2.4-m) long. Connects pump drive to drive and drive to IBM® personal computer or 100% compatible

New

KH-22050-58 **USB to RS-232 serial adapter cable,** connect Masterflex 07550-series drives to a PC with USB port

Technical info

Flow rates in parentheses can only be obtained with the High-Performance pump head (order on page 1235).

Flow rates in mL/min (flow rates in parentheses can only be obtained with the High-Performance pump head)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel†, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
Computer-compatible/programmable brushless drives										
10 to 600	0.6 to 36	2.1 to 130	8 to 480	17 to 1000	28 to 1700	38 to 2300	17 to 1000 (18 to 1100)	28 to 1700 (30 to 1800)	38 to 2300 (43 to 2600)	48 to 2900 (58 to 3400)
1.6 to 100	0.1 to 6	0.4 to 21	1.4 to 80	3 to 170	5 to 280	6 to 380	3 to 170 (3 to 180)	5 to 280 (5 to 300)	6 to 380 (7 to 430)	8 to 480 (9 to 580)

*The Standard pump head is not available for L/S® 25.
†Multichannel head is not available for L/S 36. Multichannel and Cartridge heads are available for microbore tubing.

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Specifications & Ordering Information

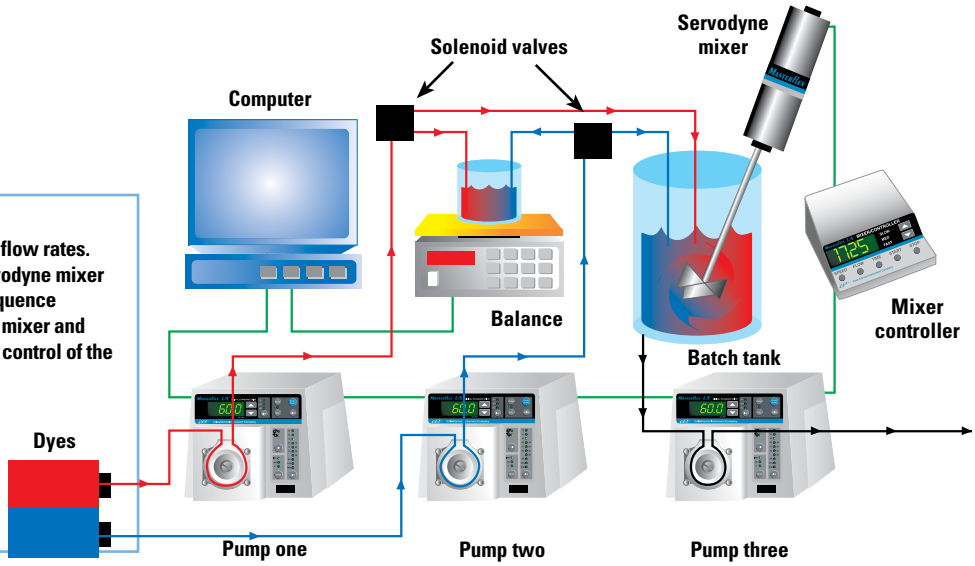
Catalog number	rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power (50/60 Hz)	Price
Computer-compatible/programmable brushless drives								
KH-07550-30	10 to 600	±0.25% (1 rpm at 600 rpm; 0.1 rpm at 100 rpm)	2	1/10 hp (75 W)	IP23	11½" x 7" x 7" (29.2 x 17.8 x 17.8 cm)	90 to 130 VAC, 2.2 A and 190 to 260 VAC, 1.1 A	
KH-07550-50	1.6 to 100		4					

Accessories

KH-07595-42 Footswitch,
momentary start/stop; 6-ft cable
KH-07595-52 DB15 male connector
KH-07595-60 Dispensing handle
for momentary start/stop

SAMPLE APPLICATION
Pumps one and two deliver two dyes at different flow rates. These dyes are mixed in the batch tank by a Servodyne mixer (see page 979). When mixing is complete, the sequence controller turns off pump one, pump two, and the mixer and turns pump three on. Pumps and mixer are under control of the computer, connected in one daisy-chain.

Legend
Red.....Fluid path #1
Blue.....Fluid path #2
Green.....Computer signal path



Complete Systems 1 and 2 include:

Pump Head + Tubing + Drive

1 L/S Easy-Load 3 pump head 77800-60
(pages 1230–1231)
Tygon LFL L/S 16 tubing 06429-16
10 ft (3 m)
(pages 1245–1249)
Computer-compatible drive 07550-30
600 rpm
(above)

2 L/S Easy-Load II pump head 77200-62
(pages 1232–1233)
Tygon LFL L/S 24 tubing 06429-24
10 ft (3 m)
(pages 1245–1249)
Computer-compatible drive 07550-30
10 to 600 rpm
(above)

New

1
77924-40
Flow range: 8 to 480 mL/min

2
77924-30
Flow range: 28 to 1700 mL/min

Ordering Information—Complete Pump Systems 1 and 2

Key	Catalog number	Description	Power	Price
1	KH-77924-40	L/S computer-compatible pump system with Easy-Load 3 pump head 77800-60	115/230 VAC, 50/60 Hz	
2	KH-77924-30	L/S computer-compatible pump system with Easy-Load II pump head 77200-62	115/230 VAC, 50/60 Hz	

L/S® MASTERFLEX®

L/S® Variable-Speed Brushless Digital Dispensing Drives

High-accuracy and remote control capability in a modular format—place components where most convenient

A
Modular digital dispensing drive 77301-20

B
Modular digital dispensing drive with wall-mount controller 77301-30

Optional hand-held remote controller 07592-83

- Flow rate: 0.6 to 3400 mL/min; cartridge flow rate: 0.006 to 1700 mL/min. Flow rate depends on drive rpm and tubing size.
- Four-digit LED display shows four different parameters:
  - Flow rate: 0.1 or 1 mL; autoranging
  - Dispense volume: 1 mL to 999 L (in 1 mL increments)
  - Copy: 1 to 99 repetitions, 20 µL to 999 L each
  - Motor rpm: 10 to 600 rpm; 1 rpm resolution
- Dispense by: mL—volume in mL of each dispense, 0.001 to 9999 mL; copy—1 to 9,999 dispense cycles; or SEC—time between each dispense: 1 to 9,999 secs.
- Programmable dispense interval lets you set delay time between dispense cycles for automatic, repetitive dispensing
- Reversible 1/10-hp motor. Pump in either direction; purge before or after pumping.

Designed for accurate dispensing and low maintenance, these drives feature precise PWM speed control (±0.3%) and an efficient, maintenance-free brushless motor. The modular digital drives with wall-mount controller (B) give you an IP56-rated controller with full remote control features.

Programmed calibration ensures dispense and display accuracy—drive stores one calibration value per tubing size. Program the drive via the simple membrane keypad; keypad lock/unlock feature protects settings. For standard applications select tubing size and desired flow rate—drive automatically locks in required rpm.

What's included: 6-ft (1.8-m) line cord with IEC 320/CEE22 socket. Must specify destination country; product shipped with country specific plug/cord set.

A Modular Brushless Digital Dispensing Drive

- Benchtop controller is tough ABS plastic—IP22-rated for easy wipe-down
- 25-ft (7.6-m) cable connects motor and controller—place where convenient.
- Remote control capabilities via DB15 female connector on back of drive:
  - Speed control input: 0 to 20 mA, 4 to 20 mA, or 0 to 10 V signals.
  - Pumping direction: requires open collector or contact closure
  - Start/stop/purge: requires open collector or contact closure
  - Tachometer output: 0 to 20 mA, 4 to 20 mA, 0 to 10 V, or TTL pulse
  - Pump speed: 10 to 600 rpm; 1 rpm resolution

B Modular Brushless Digital Dispensing Drive with Wall-Mount Controller

- IP56 controller and motor—protected against dust and strong jets of water
- 25-ft (7.6-m) weather resistant cable connects motor and controller.
- Remote control capabilities via weather-resistant connection on controller:
  - Remote control cable (77300-32) sold separately on facing page.
  - Speed control input: 0 to 20 mA, 4 to 20 mA, or 0 to 10 V
  - Pumping direction: requires open collector or contact closure
  - Start/stop/purge: requires open collector or contact closure
  - Tachometer output: 0 to 20 mA, 4 to 20 mA, 0 to 10 V, or TTL pulse
  - Pump speed: 10 to 600 rpm; 1 rpm resolution

Dispensing Precision
for all drives on these two pages

Standard pump head	Minimum dose (for ±0.5% precision)	Precision (±)
7013	4 mL	20 µL
7014	14 mL	70 µL
7016	55 mL	270 µL
7015	110 mL	550 µL
7017, 7024	200 mL	1 mL
7018, 7035	300 mL	1.5 mL

Technical info

Digital dispensing drives accept nine different L/S® pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, PTFE-Diaphragm

GO to page(s) 1245–1249
For L/S® precision pump tubing.

Flow rates in mL/min (flow rates in parentheses can only be obtained with the High-Performance pump head—see page 1235)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel†, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
A-B Variable-speed brushless digital dispensing drives										
10 to 600	0.6 to 36	2.1 to 130	8 to 480	17 to 1000	28 to 1700	38 to 2300	17 to 1000 (18 to 1100)	28 to 1700 (30 to 1800)	38 to 2300 (43 to 2600)	48 to 2900 (58 to 3400)

*The Standard pump head is not available for L/S® 25.
†Multichannel head is not available for L/S 36. Multichannel and Cartridge heads are available for microbore tubing.

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Specifications & Ordering Information (for all drives on these two pages)

Catalog number	rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power (50/60 Hz) VAC	Power (50/60 Hz) Amps	Price
A Modular brushless digital dispensing drive									
KH-77301-20	10 to 600	±0.3%	2	1/10 hp (75 W)	Controller: IP22 Motor: IP56	Controller: 9¾" x 9 3/16" x 5 1/16" (24.8 x 23.3 x 12.9 cm) Motor: 10½" x 3 13/16" x 4⅝" (26.7 x 9.7 x 11.7 cm)	Dual voltage: 90 to 130 190 to 260	2.2 1.1	
B Modular brushless digital dispensing drive with wall-mount controller									
KH-77301-30	10 to 600	±0.3%	2	1/10 hp (75 W)	Controller: IP56 Motor: IP56	Controller: 9" x 11¾" x 4½" (23 x 30 x 11.4 cm) Motor: 10½" x 3 13/16" x 4⅝" (26.7 x 9.7 x 11.7 cm)	Dual voltage: 90 to 130 190 to 260	2.2 1.1	

KH-07595-42 **Footswitch,** momentary start/stop; 6-ft (2-m) cable (for 77301-20 only)
KH-07595-52 **DB15 male connector.** Use to create your own cable (for 77301-20 only)
KH-07595-60 **Handheld dispensing wand** for momentary start/stop (for 77301-20 only)
KH-07592-83 **Handheld remote controller** with 6-ft (1.8-m) cable (for 77301-30 only)
KH-77300-32 **Remote control cable,** 25 ft (8.3 m) (for 77301-30 only). Use for remote control capabilities
KH-07595-43 **Washdown foot switch,** momentary start/stop, 6-ft (1.8-m) cable (for 77301-30 only)

Complete L/S® Modular Dispensing Pump Systems

Complete System 1 includes:

Pump Head + **Tubing** + **Drive**

L/S® Easy-Load® II pump head 77200-62 (pages 1232–1233)

Tygon® LFL L/S® 24 tubing 06429-24 10-ft (3-m) (pages 1245–1249)

Modular digital drive 77301-20 10 to 600 rpm (above)

1
77923-60
Flow Range: 28 to 1700 mL/min

Ordering Information—Complete Pump System 1

Catalog number	Description	Power (50/60 Hz)	Price
KH-77923-60	L/S Modular dispensing pump	115/230 VAC	

Complete System 2 includes:

Pump Head + **Tubing** + **Drive**

L/S® Easy-Load® II pump head 77200-62 (pages 1232–1233)

Tygon® LFL L/S® 24 tubing 06429-24 10-ft (3-m) (pages 1245–1249)

Modular digital drive 77301-30 10 to 600 rpm (above)

2
77923-70
Flow Range: 28 to 1700 mL/min

Ordering Information—Complete Pump System 2

Catalog number	Description	Power (50/60 Hz)	Price
KH-77923-70	L/S Modular dispensing pump with wall-mount controller, IP56	115/230 VAC	

Masterflex® L/S® Digital Console Process Drive

WASHDOWN

Maintenance-Free and Easy to Clean

Continuous 24 HOURS Duty

L/S® digital console drive 07575-00 shown with L/S® High-Performance pump head 77250-62 and L/S® 36 PharMed® BPT tubing 06508-36.

Pump heads can be stacked on the Masterflex® L/S® digital console drive to increase flow rates. Shown are stacked L/S® Standard pump heads 07015-20 (above, left) and L/S® Easy-Load® II pump heads 77200-62 (above, right).

Transfer, dispense, and meter in lab, process and washdown environments

- IP66 and NEMA 4X rated. Sealed 316 stainless steel housing and sealed keypad are protected from dust, water, and chemicals in the washdown environment—simply hose down to clean.
- Flow rate: 0.1 to 3400 mL/min (0.001 to 54 GPH) with L/S® tubing. Flow rate depends on drive rpm and tubing size.
- Five-digit LED display shows six different parameters: motor rpm, flow rate, dispense volume, cumulative volume, dispense interval time, and copy number.
- Dispense by: volume—in milliliters (0.001 to 99,999), liters, and gallons; copy—1 to 99,999 dispense cycles. Set time interval (SEC) between dispense cycles from 1 to 99,999 seconds.
- Remote control capabilities via fluid-resistant input/output connector on back of drive:
  - Speed control input: scalable 0 to 20 mA, 4 to 20 mA, 0 to 10 V;
  - Pumping direction: requires open collector or contact closure;
  - Start/stop/purge: requires open collector or contact closure;
  - Tachometer output: scalable 0 to 20 mA, 4 to 20 mA, 0 to 10 V, or TTL pulse.

This full-featured drive gives you rugged performance and precise digital control. Ideal for fluid transfer, dispensing, and metering applications in laboratory, process and washdown environments including pharmaceutical, food & beverage, chemical, and water treatment.

The 316 stainless steel housing is completely sealed, easy-to-clean, and resistant to commonly used cleaning and sanitizing solutions. The reversible, maintenance-free brushless motor offers a full complement of remote control capabilities allowing easy integration into your automated processes.

Drive features a membrane keypad for easy programming. Select tubing size and enter desired flow rate—drive locks in required rpm. Keypad lock/unlock feature prevents accidents or tampering.

Tachometer feedback provides 0.25% speed control; dispense or meter with accuracy and precision. Drive stores one user-specified calibration value per tubing size even when power is turned off. Calibrate system to improve display accuracy.

What's included: six-foot (1.8-meter) line cord—features IEC 320/CEE 22 connector coupler; watertight cord connection. Please specify destination country when ordering; drive is shipped with country-specific plug/cord set.

Technical info

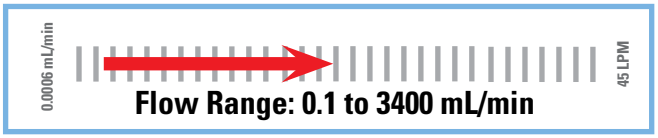
Accepts nine different L/S® pump heads: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, High-Performance, Cartridge, Multichannel, PTFE-Tubing, and PTFE Diaphragm.

More info

Use only Masterflex® pump tubing with Masterflex® tubing pumps to ensure accuracy and optimum performance. Use of other tubing may void applicable warranties.

Add *these options*

- L/S® Pump heads.....1228–1244
- L/S® Pump tubing.....1245–1249



More info

Flow rates in parentheses can only be reached with High-Performance pump head 77250-62 (see page 1235).

Flow rates in mL/min for L/S digital console process drive

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel†, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
10 to 600	0.1 to 36	0.2 to 130	1 to 480	2 to 1000	3 to 1700	4 to 2300	2 to 1000 (2 to 1100)	3 to 1700 (3 to 1800)	4 to 2300 (4 to 2600)	5 to 2900 (6 to 3400)

*The Standard pump head is not available for L/S® 25.
†Multichannel head is not available for L/S 36. Multichannel and Cartridge heads are available for microbore tubing.

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Specifications & Ordering Information

Catalog number	rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power (50/60 Hz) VAC	Power (50/60 Hz) Amps	Price
KH-07575-00	1 to 600	±0.25%	2	1/10 hp (75 W)	IP66	12" x 9" x 9¼" (26.7 x 9.7 x 11.7 cm)	90 to 130 190 to 260	2.2 1.1	

Accessories

KH-07592-83 **Handheld remote controller,** 6-ft (1.8 m) cable
KH-07595-43 **Washdown footswitch,** momentary start/stop; 6-ft (1.8 m) cable
KH-77300-32 **Remote control cable;** 25-ft (8.3 m)
KH-07575-01 **Replacement seal kit;** includes shaft seal, hardware, and gasket


07592-83


07595-43

Complete L/S® Digital Process Pump Systems

Complete System 1 includes:

Pump Head + **Tubing** + **Drive**

L/S® Easy-Load® II pump head 77200-62 (pages 1232–1233)

Tygon® LFL L/S® 24 tubing 06429-24 10-ft (3-m) (pages 1245–1249)

Digital console process drive 07575-00 1 to 600 rpm (above)

1
77975-00
Flow Range: 3.0 to 1700 mL/min

Ordering Information—Complete Pump System 1

Catalog number	Description	Power (50/60 Hz)	Price
KH-77975-00	L/S digital process pump with Easy-Load II pump head	115/230 VAC	

Complete System 2 includes:

Pump Head + **Tubing** + **Drive**

L/S® High-Performance pump head 77250-62 (page 1235)

Tygon® LFL L/S® 24 tubing 06429-24 10-ft (3-m) (pages 1245–1249)

Digital console process drive 07575-00 1 to 600 rpm (above)

2
77975-10
Flow Range: 3.0 to 1800 mL/min

Ordering Information—Complete Pump System 2

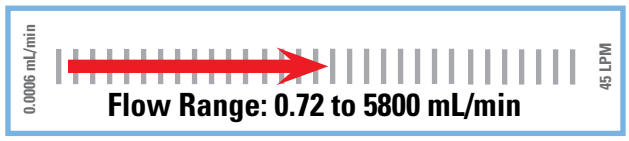
Catalog number	Description	Power (50/60 Hz)	Price
KH-77975-10	L/S digital process pump with High-Performance pump head	115/230 VAC	

L/S® MASTERFLEX®

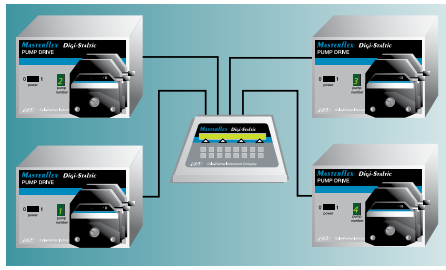
L/S® Digi-Staltic® Modular Dispensing Pump Systems

Accurately dispense, dilute, or transfer—operate up to four drives from one controller

- Flow rate range: 0.72 to 5800 mL/min depending on tubing size
- Controller simultaneously controls up to four Digi-Staltic® pump drives. Transfer four fluids at the same flow rate, or vary each independently
- Control all functions of the Digi-Staltic pump through your PC or operate as a stand-alone dispenser. Included CD-ROM software is compatible with Windows® 95/98/NT®/2000/XP
- User-friendly, menu-driven keypad facilitates direct data entry. Eighty character (2 x 40), backlit LCD is easy to read
- Controller stores up to 30 programs in memory—no need to reprogram once you have your application set up



Use as a Stand-Alone Programmable Dispenser...



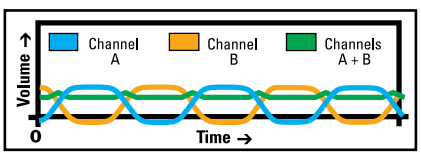
...or Connect up to Four Drives to a Single Controller!

Digi-Staltic® system 77310-00 includes controller, pump drive, dispensing handle, CD-ROM software and two Easy-Load II pump heads 77200-62. Also shown is the Masterflex® double-Y tubing system 96501-24 (order separately on page 1271).

Use the Digi-Staltic dispensing pump as a dispenser, diluter, or as a general-purpose transfer pump. Ideal for contamination-free pumping for pharmaceutical, research lab, biotech, and food pilot plant applications. The modular format allows you to operate up to four drives from a single controller. Easily programmable options enable you to operate each drive independently. To deliver the high accuracy essential to dispensing applications, each drive includes two stacked pump heads in tandem with offset rollers that produce constant flow rates with virtually no pulsation.

Drives feature a reversible 1/10-hp motor that lets you purge tubing before and after pumping and pump fluid in either direction. Speed control accuracy of ±0.3% ensures precision in all applications. Two sets of NO and NC contacts provide "pump running" and "cycle running" signaling at each pump drive. Remote control capabilities via one contact closure on each drive offers on/off control with dispensing handle (included) or optional footswitch (see Accessories" on facing page). Both drive and controller are enclosed in an IP22-rated gray housing for protection against splashing water.

Reduced Pulsation



Minimal pulsation is essential to ensuring accuracy in peristaltic dispensing. Pulsation causes variations in flow rate and splashing and frothing in the receiving vessel. Combining the split-channel tubing configuration with the offset rollers of two stacked Easy-Load® II pump heads merges a pulse from one channel with a trough from the other. The reduced pulsation is measured at the outlet and shown in the graph above.

Standard Fluid Transfer Features

- Directly input volumes, flow rates, and speed range using the 20-key, tactile-feedback keypad. Flow range is determined by tubing selection.
- Pump drive features a seven-segment LED on front panel. Drive tells you exactly which pump is in use when plugged into the controller.
- Two stacked Easy-Load® II pump heads with offset rollers virtually eliminate pulsation and ensure accuracy.

Dispensing and Diluting Features

- Program dispensing parameters via controller
  Dispense volume: 0.5 mL to 8000 L (based on tubing size)
  Cycles: 1 to 999 (completed cycles confirmed by audible prompt)
  Interval delay time: 0.1 sec to 167 min in 0.1 sec increments
- Programmable anti-drip feature reverses drive after each dispense cycle. No excess fluid spills into your container—ensures accuracy and minimizes waste.
- Built-in direct connection and control to Ohaus®, Sartorius®, A&D®, and Mettler-Toledo® balances. No need to program your controller to read compatible balances; DB9, RS-232 connector. For compatible balances see page 1272; order balance interface cables on page 1271–1272.

A Digi-Staltic® Dispensing System for Precision Tubing

- Flow range: 0.72 to 4600 mL/min
- Tubing sizes L/S® 13, L/S® 14, L/S® 16, L/S® 25, L/S® 17, L/S® 18

Choose the Digi-Staltic dispensing system for precision tubing if you require flow rates up to 1000 mL/min. Precision pump tubing offers a higher wall thickness to inside diameter (ID) ratio for greatest accuracy and longer tubing life. Purchase one system 77340-00 and up to three add-on Digi-Staltic dispensing drives 77340-50. You will also require the appropriate Double-Y tubing sets (order separately below right).

What's included: controller, pump drive, two Easy-Load® II pump heads (77200-60), dispensing handle for remote on/off control, CD-ROM software, a 3½-ft RJ-12 drive-to-controller cable, and a 6-ft (1.8-m) line cord with IEC 320/CEE22 socket connector. Pump is shipped with cord/plug set specific to country of destination.

B Digi-Staltic® Dispensing System for High-Performance Precision Tubing

- Flow range: 20 to 5800 mL/min
- Tubing sizes: L/S® 15, L/S® 24, and L/S® 35, L/S® 36

High-performance precision tubing offers better pressure generation and suction lift and better performance with viscous fluids. Purchase one system 77310-00 and up to three add-on Digi-Staltic dispensing drives 77310-50. You will also require the appropriate Double-Y tubing sets (order separately below right).

What's included: controller, pump drive, two Easy-Load® II pump heads (77200-62), dispensing handle for remote on/off control, CD-ROM software, a 3½-ft RJ-12 drive-to-controller cable, and a 6-ft (1.8-m) line cord with IEC 320/CEE22 socket connector. Pump is shipped with cord/plug set specific to country of destination.

Flow rates in mL/min (based on two Easy-Load® II pump heads)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
6 to 600	0.72 to 72	2.6 to 260	9.6 to 960	20 to 2000	34 to 3400	46 to 4600	20 to 2000	34 to 3400	46 to 4600	58 to 5800

Dispensing Precision (for all Easy-Load® II pump heads)

Dispensing mode	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
Minimum dose*	3 mL	11 mL	40 mL	84 mL	140 mL	200 mL	84 mL	140 mL	200 mL	240 mL
Precision	±15 µl	±55 µl	±200 µl	±420 µl	±0.7 mL	±1 mL	±420 µl	±0.7 mL	±1 mL	±1.2 mL

*For ±0.5% precision

Specifications & Ordering Information

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Catalog number	Motor size hp (W)	Motor speed (rpm)	Speed control	IP rating	Dimensions (W x H x D)	Power (50/60 Hz), switch-selectable	Price
A Digi-Staltic® dispensing system for precision tubing							
KH-77340-00	1/10 (75)	6 to 600	±0.3%	IP22	Controller: 9" x 8⅓" x 8" (22.9 x 20.6 x 20.3 cm) Drive: 9" x 5" x 10" (22.9 x 12.7 x 25.4 cm)	90 to 130 VAC, 1.7 A; 180 to 260 VAC, 0.8 A	
B Digi-Staltic dispensing system for high-performance precision tubing							
KH-77310-00	1/10 (75)	6 to 600	±0.3%	IP22	Controller: 9" x 8⅓" x 8" (22.9 x 20.6 x 20.3 cm) Drive: 9" x 5" x 10" (22.9 x 12.7 x 25.4 cm)	90 to 130 VAC, 1.7 A; 180 to 260 VAC, 0.8 A	

Accessories

KH-77340-50 Add-on Digi-Staltic® dispensing drive for precision tubing. Includes two Easy-Load® II pump heads (77200-60)

KH-77310-50 Add-on Digi-Staltic® dispensing drive for high-performance precision tubing. Includes two Easy-Load® II pump heads (77200-62)

KH-77095-03 RJ-12 cord/cable, 10-ft (3-m); for connecting drive to controller (3½-ft cord included with each drive)

KH-77095-04 RJ-12 cord/cable, 15-ft (4.6-m); for connecting drive to controller (3½-ft cord included with each drive)

KH-77310-06 Balance interface cable, for connecting Digi-Staltic® controller to Ohaus® and Sartorius® balances

KH-77310-07 Balance interface cable, for connecting Digi-Staltic® controller to A&D® balances

KH-77310-08 Balance interface cable, for connecting Digi-Staltic® controller to Mettler-Toledo® balances

KH-07595-40 Footswitch for momentary start/stop; 6-ft (1.8-m) cable

KH-77310-01 Repl. Digi-Staltic® drive (drive only)

KH-77310-02 Repl. Digi-Staltic® controller (controller only)

KH-77310-05 Repl. dispensing handle

KH-77310-03 Tubing weights of PTFE, flow-through type. Keep pump tubing in place during dispense cycle. Set of two: one for L/S® 16, 15, and 25 size pump tubing; one for L/S® 17, 18, 24, 35, and L/S® 36 size pump tubing

KH-77310-04 Glass dispensing tip, with Luer lock; for L/S® 25, L/S® 17, L/S® 15, and L/S® 24 size pump tubing

Masterflex® Double-Y Tubing Systems

The double-Y tubing systems allow you to create a split channel tubing configuration. Based on our popular platinum-cured silicone tubing (96410-series), which complies with FDA and USP Class VI and exceeds 3A sanitary standards. Use one system per pump drive. For a full listing of L/S® tubing, see pages 1245–1249.

Catalog number	Masterflex® pump tubing size	Length	Price
For A Digi-Staltic® dispensing system for precision tubing			
KH-96501-13	L/S 13	10 ft	
KH-96501-14	L/S 14	10 ft	
KH-96501-16	L/S 16	10 ft	
KH-96501-25	L/S 25	10 ft	
KH-96501-17	L/S 17	10 ft	
KH-96501-18	L/S 18	10 ft	
For B Digi-Staltic® dispensing system for high-performance precision tubing			
KH-96501-15	L/S 15	10 ft	
KH-96501-24	L/S 24	10 ft	
KH-96501-35	L/S 35	10 ft	
KH-96501-36	L/S 36	10 ft	

L/S® MASTERFLEX®

L/S® Digi-Staltic® Software and Balance Capabilities

Program and control your Digi-Staltic® pump system from your PC

- Dispense
- Dilute
- Transfer

Masterflex® CD-ROM software is included with each Digi-Staltic® dispensing pump system. The software, compatible with Windows® 95/98/NT/2000/XP, enables you to save up to 30 fluid handling programs—any combination of dispense, dilute, or general transfer. Also, it allows you to download new programs to the controller created on your computer; download existing programs on the computer to the controller; upload programs from the controller to make revisions; calibrate pumps from the computer; and review feedback of pump activity on the computer screen.

This CD-ROM software is included with the Digi-Staltic dispensing systems (77310- and 77340-series). Order on pages 1270–1271.

Type of Programs

Dispensing

This program dispenses a specific volume at a programmed rate with a delay between cycles. The cycle can be automatic or manual. To program for dispensing, determine:

- Number of pump heads
- Tubing size
- Flow rate
- Volume
- Pump direction

Optional parameters include acceleration and deceleration times, anti-drip system, cycle, auto/manual, delay, beep, units of measure, as-well as balance and PC interface.

Diluting

As a diluter, the pump is first primed. Then, a dilute cycle consists of two separate actions— sample and delivery. For diluting, select the following:

- Number of pump heads
- Tubing size
- Flow rate
- Sample delivery
- Pump direction

Optional parameters: anti-drip system, hold, acceleration and deceleration times, cycle, auto/manual, delay, beep, and PC interface.

General Transfer

A pump program runs continuously at a programmed rate until the CANCEL/STOP or-STOP ALL keys are pressed. For general transfer, choose the following parameters:

- Number of pump heads
- Tubing size
- Flow rate

Optional parameters: anti-drip system, acceleration and deceleration times, pump direction, and PC interface.

Program Parameters

Program Type: Pump, dispense, dilute

Tubing Size: Size depends on application.

Flow Rate: Software calculates flow range for tubing size selected.

Flow Unit: Choose from mL/min or LPM

Flow Direction: Default direction is CW; in dilute program, sample phase direction is opposite of dilute phase direction.

Acceleration Time: Amount of time to reach programmed speed (0 to 9.9 sec)

Deceleration Time: Amount of time for pump to reach zero from programmed speed (0 to 9.9 sec)

Anti-Drip: Reverse pump direction before stopping to prevent dripping (0 to 10; 10=1 revolution).

Beep Length: End of cycle alert can be programmed from 0 to 60 seconds.

Use Balance: Enables balance use in dispense mode

Continuous Cycling: Program continues until the programmed number of cycles is completed.

Dispense Amount: Volume to be dispensed (0.5 mL to 8000 L)

Dispense Unit: Select units; if balance is selected, unit is set to grams.

Number of Cycles: Number of cycles (single dispense or sample and delivery sequence) to be dispensed (1 to 999)

Program Cycles: Automatic or manual

Delay Between Cycles: Enter delay between cycles in Automatic program (0 to 999.9 sec)

Delivery Amount: Equals sample volume and diluent volume

Delivery Unit: mL, L; g and kg for dispense

Sample Amount: Enter sample volume

Sample Delay: Enter delay time between end of-the sampling phase and the beginning of the diluent delivery phase.

Compatibility with Balances

For dispensing applications, the Digi-Staltic® pump controller features a connection to an electronic balance RS-232 cable. A built-in connection and control to Ohaus®, Sartorius®, A&D®, and Mettler-Toledo® balances eliminates the need to program the controller to read these balances. The Digi-Staltic® pump provides communication through a nine-pin male RS-232 DTE port, and communicates at 9600 baud, 7 databits, 2 stop bits, odd parity.

Balance/Dispensing System Connection

- Designed to work with Ohaus® Voyager® model V1D120 (11014-10); Ohaus® Adventurer® model AV3100 (01010-50); Sartorius® Masterpro model LP4200 (11212-20); A&D® model GF-2000 (11133-08); and Mettler-Toledo® model PG5002-S DeltaRange®. Controller has a DB-9 connector labeled BALANCE.

Balance Interface Cables are 1.8 m (6 ft) in length; use for connecting Digi-Staltic® controller to noted balances.

Catalog number	Description	Price
KH-77310-06	Cable for Ohaus and Sartorius balances	
KH-77310-07	Cable for A&D® balances	
KH-77310-08	Cable for Mettler-Toledo® balances	

KH-07550-74 Replacement Digi-Staltic software, CD-ROM, for controlling the Digi-Staltic system from your PC. For Windows 95/98/NT/2000/XP

E/S™ Portable Sampling Pumps

A Portable sampling drive 07571-00 shown with Easy-Load® pump head 07518-00 (sold separately on page 1243).

B Composite sampler 07580-00

Portable & Versatile

0.0006 mL/min — 45 LPM

Flow Range: 4.2 to 1650 mL/min

A E/S™ Portable Sampling Drive

- Flow rate: 4.2 to 1100 mL/min; depends on tubing size.
- Sample depths down to 26 ft (7.9 m)*. Simple to use in wells, sewers, or lakes. Reversible flow and prime/purge function.
- Variable-speed portable sampling drive operates on internal battery, your 12 V car battery, or from an AC outlet.

The IP54-rated control panel protects against inclement weather and water splash. Accepts three pump head types: Standard, Easy-Load®, and PTFE-tubing.

*Maximum sampling depth can be achieved with a size L/S® 15 or L/S® 24 Standard pump head.

B E/S™ Composite Sampler

- Program to meet EPA requirements. Program sample size, sampling time, delayed start, remote contact closure, momentary and maintained sampling—five customizable programs.
- Flow rate is 435 to 1650 mL/min depending on tubing size and lift height. Sample depths down to 26 ft (7.9 m).
- This complete pump includes: Masterflex Easy-Load pump head 07518-12, 9-liter HDPE carboy, 12 VDC rechargeable battery, 115/230 VAC power converter and 25 ft of L/S® 24 peroxide-cured silicone tubing.
- Controls can wait up to 90 days for a remote signal.
- Rechargeable battery makes it ideal for field applications. Operates on internal batteries, 12 V car battery (order automotive power adapter below), or AC outlet.

The IP56-rated control panel protects against bad weather and water splash. Case fits through standard 18-inch diameter manhole. Adjustable back-lit LCD and glow-in-the-dark keypad help you to read the control panel in low-light environments.

Flow rates in mL/min for L/S digital console process drive

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard†, Easy-Load						Standard			
							Easy-Load			
A E/S™ portable sampling drive										
70 to 400	4.2 to 24	15 to 84	56 to 320	120 to 680	Not recommended		120 to 680	200 to 1100	Not recommended	
B E/S™ composite sampler										
600	Not recommended						1110	1650	Not recommended	

†The Standard pump head is not available for L/S® 25.

Power supplies are: cULus CE

ISO 9001:2000 SUPPLIER CERTIFIED — 2 year warranty

Specifications & Ordering Information

Catalog number	rpm	Nominal voltage	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power‡ VAC (50/60 Hz)	Price
A E/S™ portable sampling drive									
KH-07571-00	70 to 400	12 VDC or AC line	±10%	1	1/20 hp (37 W)	IP54	11" x 10" x 16" (28 x 25.4 x 40.6 cm)	115	
KH-07571-05								230	
B E/S™ composite sampler									
KH-07580-00	600	12 VDC or AC line	±0.5%	1	1/20 hp (37 W)	IP56	11" x 13½" x 17½" (28 x 34 x 44 cm)	115/230	

‡Drives run from 12 VDC internal rechargeable batteries, external 12 VDC source (order automotive adapter separately below), or from VAC line source.

Accessories

KH-07580-50 **Carrying strap** for sampler 07580-00

KH-07571-50 **Automotive power adapter,** 25-ft cable

L/S®

MASTERFLEX®

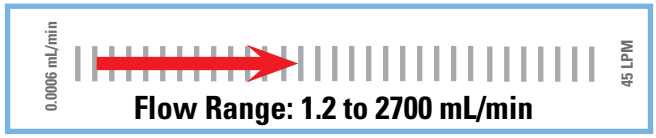
L/S® DC-Powered Drives

Versatile drives are ideal for sampling and fluid transfer in the field, and for OEM applications

- All models comply with CE regulations
- Drives accept 8 different pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, High-Performance, Cartridge, PTFE Tubing, PTFE-Diaphragm

Cabinet-Style Drives offer variable-speed and operate on 12 VDC power. The reversible 1/20-hp motor lets you pump in either direction and purge before or after pumping. Separate single-turn speed control and on/off/reverse switch let you maintain speed setting when turning drive on/off. The painted steel housing is IP21 rated for protection from gentle water spray. Order optional power adapters (sold separately below) to connect drive to an automotive power source or directly to a car/boat battery.

Compact 12- and 24-VDC Drives feature rugged, continuous-duty motors ideal for applications requiring full-time duty cycle. Steel motor housing is chemical resistant and IP52 rated for protection from dust and gentle water spray. These drives are ideal for OEM applications. The epoxy-coated motor, power leads, and mounting bracket enable easy installation into your equipment.



A Cabinet-style drive 07533-20

B Compact 12-VDC drive 07533-50

A Cabinet-Style Drives

- Flow range: 1.2 to 2400 mL/min depending on drive rpm and tubing size
- Sample depths down to 26 ft (7.9 m); use for field applications in wells, sewers, or lakes.
- Color-coded banana plug/screw terminals for power connections—circuit breaker protected. Attach your 12 VDC source directly or order adapters below for easy connection.

B Compact 12- and 24-VDC Drives

- Flow range: 6 to 2700 mL/min depending on drive rpm and tubing size
- Vary input voltage to change drive speed; reverse input voltage polarity to reverse direction. Control drive completely using power source.
- Three-wire, 16-gauge, 12-inch (30-cm) long stripped-end leads for power connection. Wire power from your 12 or 24 VDC source.

Flow Rates in mL/min

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel†, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
A Cabinet-style drives										
20 to 90	1.2 to 5.4	4.2 to 19	16 to 72	34 to 150	56 to 250	76 to 340	34 to 150 (36 to 160)	56 to 250 (60 to 270)	76 to 340 (86 to 390)	96 to 430 (116 to 520)
100 to 500	6 to 30	21 to 105	80 to 400	170 to 850	280 to 1400	380 to 1900	170 to 850	280 to 1400	380 to 1900	480 to 2400
B Compact 12- and 24-VDC drives										
100	6	21	80	170	280	380	170 (180)	280 (300)	380 (430)	480 (580)
540	32	113	430	920	1500	2050	920	1500	2050	2600
570	34	120	450	970	1600	2170	970	1600	2170	2700

*Standard head is not available for L/S® 25
†Multichannel head is not available for L/S® 36. Multichannel and Cartridge heads are available for microbore tubing.

ISO9001:2000 SUPPLIER CERTIFIED CE 2 year warranty

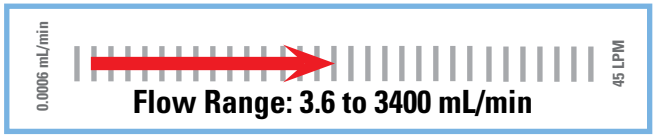
Specifications & Ordering Information

Catalog number	rpm	Nominal voltage	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power	Price
A Cabinet-style drives									
KH-07533-20	20 to 90	12 VDC	±5%	2	1/20 hp (37 W)	IP21	11" x 6½" x 8¾" (27.9 cm x 16.5 cm x 22.2 cm)	10.8 to 13.2 VDC, 3 A	
KH-07533-40	100 to 500			1					
B Compact 12- and 24-VDC drives									
KH-07533-50	100	12 VDC	±5%	2	1/20 hp (37 W)	IP52	8 9/16" x 3 13/16" x 4 5/8" (21.6 cm x 9.7 cm x 11.7 cm)	1.0 to 15 VDC, 3.2 A	
KH-07533-60	540			1				1.5 to 15 VDC, 5.7 A	
KH-07533-70	100	24 VDC	±5%	2	1/20 hp (37 W)	IP52	8 9/16" x 3 13/16" x 4 5/8" (21.6 cm x 9.7 cm x 11.7 cm)	1.0 to 30 VDC, 1.5 A	
KH-07533-80	570			1				1.7 to 30 VDC, 2.6 A	

Accessories for Cabinet-Style Drives

KH-07573-02 **Automotive power adapter cable,** 25 ft (7.6 m). Use with 07533-20, -40
KH-07573-04 **Car/boat battery adapter cable,** 8 ft (2.4 m). Use with 07533-20, -40

L/S® Air-Powered and Hazardous-Duty Drives



A Variable-speed air-powered drive 07569-00

Ideal for hazardous locations

Technical info

Drives accept nine different pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, and PTFE-Diaphragm.

B Fixed-speed hazardous-duty drive 07571-30

A Variable-Speed Air-Powered Drive

- Flow: 3.6 to 3400 mL/min. Flow rate depends on tubing size.
- The ⅓-hp air motor requires little maintenance. Air motor generates less heat than electric motor.
- Painted steel housing; IP44 rated. Protects from gentle spray.

Use this variable-speed air-powered drive whenever electricity is unsafe or impractical. Note: Careful grounding to protect from static electricity is vital for safe operation. Drive meets EU machine directive requirements for CE compliance.

What's included: air/speed regulator with 5-µm air filter, automatic lubricator, 0 to 30 psi pressure gauge, and muffler.

B Fixed-Speed Hazardous-Duty Drives

- 115 VAC flow rate: 30 to 2700 mL/min; 230 VAC flow rate: 23 to 2200 mL/min. Flow rate depends on tubing size.
- Motor is UL-listed for Class 1, Group D; Class 2, Groups F/G; and Division 1 hazardous locations.
- Painted steel/aluminum housing; IP55 rated. Protects against dust/low-pressure water jets.

Fixed-speed hazardous-duty drives feature ½-hp motors, making them ideal for multiple head applications. Drives accept up to two pump heads for multichannel applications.

What's included: drive only. Power switch/line cord are not included. Safely connect power with your own protected connections.

Flow Rates in mL/min (flow rates in parentheses can only be obtained with the High-Performance pump head—see page 1235)

rpm	Precision pump tubing						High-performance precision pump tubing			
	L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
	Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Multichannel†, Standard, Easy-Load II, Easy-Load 3, High-Performance			
	Cartridge, Multichannel			Cartridge			Easy-Load			
A Variable-speed air-powered drive										
60 to 600	3.6 to 36	13 to 130	48 to 480	100 to 1000	170 to 1700	230 to 2300	100 to 1000 (110 to 1100)	170 to 1700 (180 to 1800)	230 to 2300 (260 to 2600)	290 to 2900 (340 to 3400)
B Fixed-speed hazardous-duty drives										
385	23	81	310	660	1100	1500	660 (700)	1100 (1200)	1500 (1700)	1900 (2200)
470	30	100	380	800	1300	1800	800 (850)	1300 (1400)	1800 (2000)	2300 (2700)

*The Standard pump head is not available for L/S® 25. †Multichannel head is not available for L/S® 36. Multichannel and Cartridge heads are available for microbore tubing.

Specifications & Ordering Information for Air-Powered and Hazardous-Duty Drives

ISO 9001:2000 SUPPLIER CERTIFIED CE 2 year warranty

Catalog number	rpm	Speed control	Pump heads accepted	Motor size	IP rating	Dimensions (L x W x H)	Power	Price
A Variable-speed air-powered drive								
KH-07569-00	60 to 600	±10%	2	⅓ hp (250 W)	IP44	9⅞" x 4¹³⁄₁₆" x 8¹³⁄₁₆" (25.1 cm x 12.2 cm x 22.4 cm)	3 to 25 cfm (0.08-0.7 m³/min) at 20 to 100 psi (1.4 to 6.9 bar)	
B Fixed-speed hazardous-duty drives								
KH-07571-30	470	±1%	2	½ hp (370 W)	IP55	16" x 8½" x 9⅛" (40.6 cm x 21.6 cm x 23.2 cm)	115 VAC, 60 Hz	
KH-07571-35	385						220 VAC, 50 Hz	

Complete L/S® Variable-Speed Air-Powered Pump System

Complete System includes:

Pump Head + **Tubing** + **Drive**

Flow Range: 170 to 1700 mL/min

L/S® Easy-Load® II pump head 77200-62
(pages 1232–1233)

Tygon® LFL L/S® 24 tubing 06429-24
10-ft (3-m)
(pages 1245–1249)

Air-powered drive 07569-00
60 to 600 rpm (above)

Ordering Information—Complete Pump System

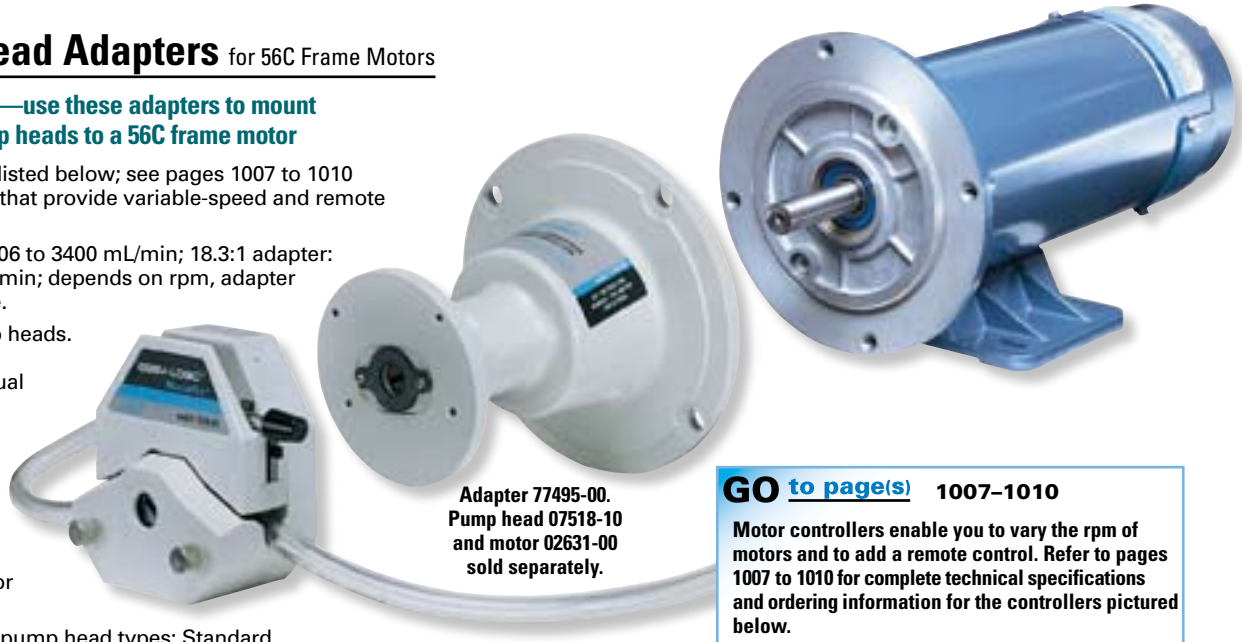
Catalog number	Description	Price
KH-77931-10	L/S Air-powered pump system	

77931-10

L/S® Pump Head Adapters for 56C Frame Motors

Customize your motor—use these adapters to mount Masterflex® L/S® pump heads to a 56C frame motor

- Specialty motors are listed below; see pages 1007 to 1010 for motor controllers that provide variable-speed and remote control operation.
- 3.7:1 adapter: flow: 0.06 to 3400 mL/min; 18.3:1 adapter: flow 0.06 to 1100 mL/min; depends on rpm, adapter gear ratio, tubing size.
- Use 1 or 2 L/S® pump heads. Pump two fluids simultaneously at equal or different flow rates.
- IP56-rated cast-aluminum adapters feature built-in gear box—mounting hardware included. Adapters maintain integrity of your motor rating up to IP56.
- Adapters accept nine pump head types: Standard, Easy-Load®, Easy-Load® II, Easy-Load® 3, Multichannel, High-Performance, Cartridge, PTFE-Tubing, PTFE-Diaphragm.



Adapter 77495-00. Pump head 07518-10 and motor 02631-00 sold separately.

Adapters include hardware!

GO to page(s) 1007–1010

Motor controllers enable you to vary the rpm of motors and to add a remote control. Refer to pages 1007 to 1010 for complete technical specifications and ordering information for the controllers pictured below.

70100-10

70100-00

Technical info

Use the following formula to calculate flow rate—do not exceed 600 rpm pump head speed:

Flow rate = (Motor rpm/adapter gear ratio) x flow per revolution

More info

ATEX

Masterflex® L/S® and I/P® pump heads and adapters approved to ATEX Zone 2 are now available. Please see pages 1.21 to 1.24 in the "Late-Breaking Additions" section in the front of this catalog.

Flow rates in mL/min (flow rate in parentheses can only be reached with the High-Performance pump head—see page 1235)

Adapter gear ratio	Recommended motor rpm limits	Pump head rpm	Precision pump tubing						High-performance precision pump tubing			
			L/S 13	L/S 14	L/S 16	L/S 25	L/S 17	L/S 18	L/S 15	L/S 24	L/S 35	L/S 36
			Standard*, Easy-Load, Easy-Load II, Easy-Load 3						Standard*, Multichannel†, Easy-Load II, Easy-Load 3, High-Performance pump heads			
			Cartridge, Multichannel			Cartridge			Easy-Load			
Flow per revolution		1	0.06	0.21	0.8	1.7	2.8	3.8	1.7 (1.8)	2.8 (3.0)	3.8 (4.3)	4.8 (5.8)
3.7 : 1	3.7 to 2220	1 to 600	0.06 to 36	0.21 to 130	0.8 to 480	1.7 to 1000	2.8 to 1700	3.8 to 2300	1.7 to 1000 (1.8 to 1100)	2.8 to 1700 (3.0 to 1800)	3.8 to 2300 (4.3 to 2600)	4.8 to 2900 (5.8 to 3400)
18.3 : 1	18.3 to 3450	1 to 190	0.06 to 12	0.21 to 40	0.8 to 150	1.7 to 320	2.8 to 540	3.8 to 720	1.7 to 320 (1.8 to 340)	2.8 to 540 (3.0 to 580)	3.8 to 720 (4.3 to 800)	4.8 to 900 (5.8 to 1100)

*The Standard pump head is not available for L/S® 25. †Multichannel head is not available for L/S® 36. Multichannel and Cartridge heads are available for microbore tubing.

Specifications & Ordering Information—Pump Heads

Catalog number	Motor type	Adapter gear ratio	Motor size required	Maximum motor rpm	Mounting type	Dimensions L x W x H	Power	Price
KH-77495-00	NEMA Type 56C	3.7:1	¼-hp min; 600 rpm pump head speed max	2220	Direct coupled	5¾" x 6½" x 6½" (14.6 cm x 16.5 cm x 16.5 cm)	Power specifications only apply to the motor selected.	
KH-77495-20		18.3:1		3450				

Specifications & Ordering Information—56C Frame Motors

Cat. no.	hp	rpm	Type**	Voltage	Frequency‡	Phase	Wattage	IP rating	Overall dimensions (L x W x H)	Price
DC motors										
KH-02631-00	¼	1800	TENV	90 VDC	—	—	225	IP44	9⅛" x 6½" x 6¾" (23.2 cm x 16.5 cm x 17.1 cm)	
KH-02631-30	¼	3450	TENV	180 VDC	—	—	270	IP44	10" x 6½" x 6¾" (25.4 cm x 16.5 cm x 17.1 cm)	
KH-02631-05	¼	1800	XPRF	90 VDC	—	—	225	IP55	10$^{13}/_{32}$" x 6½" x 6¾" (26.5 cm x 16.5 cm x 17.1 cm)	
KH-02631-50	¼	1750	WDN	90 VDC	—	—	225	IP56	11¼" x 6½" x 6⅞" (28.6 cm x 16.5 cm x 17.5 cm)	
AC motors										
KH-07129-05	¼	1725	TEFC	115/208-230 VAC	60 Hz	1	600	IP44	11⅜" x 8½" x 9⅛" (29 cm x 21.7 cm x 23.2 cm)	
KH-07129-16	⅓	3450	TEFC	115/230 VAC	60 Hz	1	600	IP44	11⅜" x 8½" x 9⅛" (29 cm x 21.7 cm x 23.2 cm)	
KH-07129-15	⅓	1725	XPRF	115/230 VAC	60 Hz	1	700	IP55	13¼" x 8½" x 6⅞" (33.7 cm x 21.7 cm x 17.5 cm)	
KH-07129-26	½	3450	XPRF	115/230 VAC	60 Hz	1	850	IP55	13¼" x 8½" x 6⅞" (33.7 cm x 21.7 cm x 17.5 cm)	
KH-07129-80	½	1725	WDN	115/208-230 VAC	60 Hz	1	900	IP56	12¼" x 8½" x 6⅞" (31.2 cm x 21.7 cm x 17.5 cm)	

‡Refer to pages 1007–1010 for 50 Hz AC motors **TENV—Totally enclosed, non-ventilating TEFC—Totally enclosed, fan-cooled WDN—Wash down XPRF—Explosion proof