









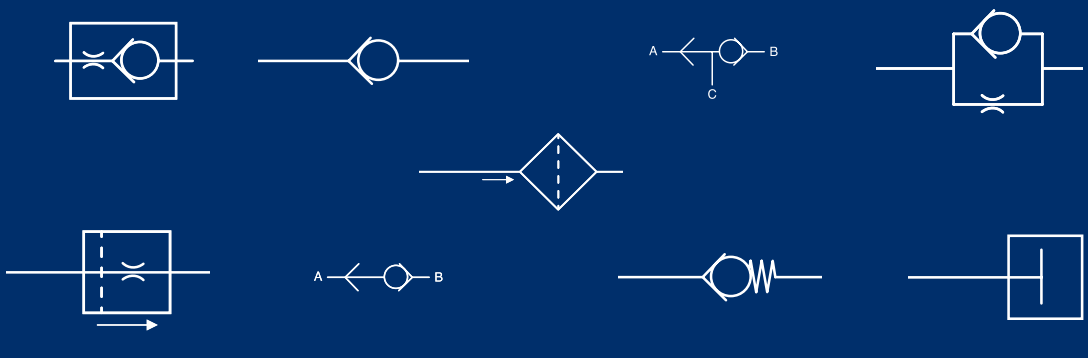




THE LEE COMPANY

TECHNICAL FLUID CONTROL HANDBOOK FOR AUTOMOTIVE & INDUSTRIAL





THE LEE COMPANY

TECHNICAL FLUID CONTROL HANDBOOK FOR AUTOMOTIVE & INDUSTRIAL

9TH EDITION

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theleeco.com

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THE LEE COMPANY'S HISTORY

1948 — THE LEE COMPANY IS FOUNDED

Leighton Lee II founded The Lee Company at his home in Rocky Hill, CT.



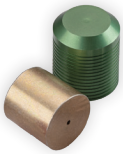
1950s — LANDING IN WESTBROOK

The Lee Company moved to a machine shop in Hartford, CT before purchasing an additional 88 acres of land in Westbrook, CT that would serve as the future company headquarters.



1958 — THE LEE PLUG® IS PATENTED

The patent for the original Lee Plug was issued. The success of this product line became the foundation for today's extensive line of product offerings.



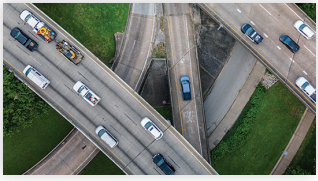
1960s -1970 — THE SPACE RACE

Several Lee products were used on the historic Apollo 11 mission that enabled Neil Armstrong and Buzz Aldrin to take their first steps on the moon.



1990s — SAFER ROADS AHEAD

Lee check valves are used to support the development of anti-lock brake systems (ABS) as they become a common safety feature in vehicles.



THE LEE COMPANY

LOOKING TO THE FUTURE

The Lee Company continues to be a world leader in miniature precision fluid control, providing engineered solutions for some of the world's largest and most innovative organizations. The Lee Company remains a family-owned and operated company. On July 10th, 2023 – the 75th anniversary of the Lee Company – Marietta S. Lee, the granddaughter of the company's founder, became President and CEO.

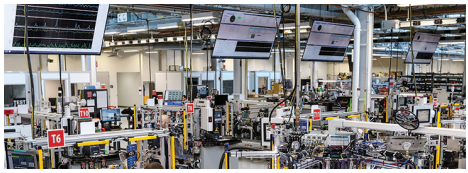
INDUSTRIAL MICROHYDRAULICS (IMH) DIVISION ESTABLISHED

Check valves and Lee Betaplug® expansion plugs served as foundational products in the company's efforts to address the high volume production rates, cost requirements, and unique performance demands of automotive, industrial, and medical applications.



INCREASED AUTOMATION

Driven by ongoing product development and advanced manufacturing automation, the IMH division expanded its offerings to include poppet pressure relief valves, zero leak check valves, and the DL Series Expansion Plug.



1991 2000s 2010s 2020s

ROOM TO GROW

The Lee Company experienced steady growth through partnerships with major automakers, expanding its IMH product line by adding additional sizes to check valve offerings, along with pressure relief valves, flow restrictors, and safety screen filters. To support increased production and new product development, the division relocated to a larger facility in Pequot Park, Westbrook, CT.



NEW INNOVATIONS

IMH expanded its product portfolio, with major growth led by applications in diesel emissions, gasoline direct injection, and automatic transmissions.

Strong demand led to the creation of a 90,000 sq ft energy-efficient facility on the Pequot Park campus, featuring expansive automation to boost productivity. An additional 100,000 sq ft of space was added in 2019.



INNOVATION IN MINIATURE

The Lee Company is a global leader in miniature precision fluid control technology. Our products are used in multiple industries to help control fluid in everything from cars and planes to rockets and medical devices. Our mission is to design and build state-of-the-art products that exceed expectations for utility, performance, and quality. Founded in 1948, we are the original inventor of dozens of miniature fluid control products and technologies that became – and remain – industry standards. We trace our unwavering commitment to superior quality and high performance to our origins in the aerospace industry and our first-ever product: the Lee Plug®, created to solve a specific customer problem. Our unique capabilities in miniaturization and engineering expertise enable our customers to improve their designs, increase profitability, and advance their industries.

CORE MARKETS & APPLICATIONS

The Lee Company offers thousands of precision fluid control components that enable customers to develop products advancing technology across aerospace and defense, automotive, diagnostics, industrial and off-highway, medical equipment, scientific instruments, data centers, motorsports, oil and gas, and power generation. Built on an aerospace heritage defined by rigorous engineering standards and meticulous attention to detail, our design expertise has been extended to support high volume production environments with demanding cost, performance, and reliability requirements.

To meet these needs, the Industrial Microhydraulics (IMH) Division was established in 1991 to expand The Lee Company's aerospace-driven design capabilities into high volume automotive, industrial, and medical markets. By adapting proven aerospace design concepts, we deliver fluid control solutions that maintain the same reliability, precision, and consistency expected in mission-critical aerospace systems — produced efficiently in large quantities.



At The Lee Company, we provide solutions that give you the freedom to innovate without compromise. And when timelines tighten, our work across fast-moving industries means we keep pace with even the most demanding program schedules.

Today, these capabilities enable us to support the **automotive, industrial & off-highway, data centers, diagnostics, scientific instruments, and medical equipment** markets with products engineered for demanding, high volume environments. Typical applications include:






- **Transmissions**
- **Engines**
- **Fuel Systems**
- **Diesel Emissions Systems**
- **EV Thermal Management**
- **Data Center Liquid Cooling**
- **Single-Use Medical Devices**

These applications are served by our check valves, pressure relief valves, flow restrictors, flow metering valves, vent valves, shuttle valves, safety screen filters, expansion plugs, and other fluid control components — all designed to deliver consistent, reliable performance.

You'll learn more about these products, among others, in this technical handbook.

CUSTOMER SATISFACTION BACKED BY ENGINEERING AND MANUFACTURING EXPERTISE

For over 75 years, our customers have trusted us to solve their most demanding fluid control challenges — and every product we offer is built with that responsibility in mind. Lee Sales Engineers work directly with customers to understand their needs and develop the right solution, no matter how complex the challenge.

Innovation & Automation

Nearly 80% of our projects require a custom-engineered approach, and our continuous investment in innovation is what makes that possible at scale. We invest significantly in the technology used to fabricate, assemble, and test our parts, including the in-house design and development of automation equipment that allows us to meet the evolving demands of our customers. Because we build and manage this infrastructure ourselves, we can identify and resolve issues quickly, reducing the risk of downtime

or delivery delays for customers who depend on our products in mission-critical applications. We also perform rapid prototyping in-house to keep pace with customer project schedules, delivering testable components quickly so your teams can stay focused on system-level challenges rather than component-level problems.

Manufacturing Precision

Our manufacturing capabilities are equally focused on precision and reliability. We maintain an unmatched ability to hold tight tolerances and produce miniature parts, utilizing controlled manufacturing practices and computerized production control systems to ensure high quality and consistent long-term performance. A substantial inventory of standard parts further helps ensure quick, on-time delivery.



Our manufacturing floor brings together experienced operators and advanced production technology to ensure every component meets the exact specifications our customers require.

Quality & Certifications

Quality is built into every product we make. All Lee components in this handbook are manufactured in the U.S. and 100% functionally tested to guarantee performance throughout the life of the systems they are installed in. We are IATF 16949, PPAP ready, and compliant with RoHS and REACH — and our quality management system, including full manufacturing lot control and traceability, is recognized as a benchmark by independent auditors. Each product undergoes rigorous qualification testing and must pass an extensive acceptance test procedure prior to shipment, ensuring every unit you receive will exceed its performance specification.

GLOBAL PRESENCE & LOCAL SUPPORT

The Lee Company is a close-knit organization that balances best-in-class local support with an expanding global presence to meet the evolving needs of our customers. We employ over 1,100 people and occupy over 1 million square feet of manufacturing space on several campuses in Westbrook, Connecticut, U.S.A. Our technical sales offices are located in the United States, Europe, Asia, South America, and Australia. When you contact any of these offices, you'll talk with a degreed engineer who is ready to help find the right solution for your unique fluid control needs. Thanks to our global network, we can provide local technical support wherever you are in the world, engineer-to-engineer.



Automotive and industrial products are manufactured at our Pequot Park campus in Westbrook, Connecticut, U.S.A.

THE LEE COMPANY

Local Engineering Support

We provide local engineering support globally through our international network of Sales Engineers. If you have a fluid control problem and would like to talk to an engineer, please contact your local technical sales office.

For the most current contact information, please scan the QR code or visit theleeco.com/locations.

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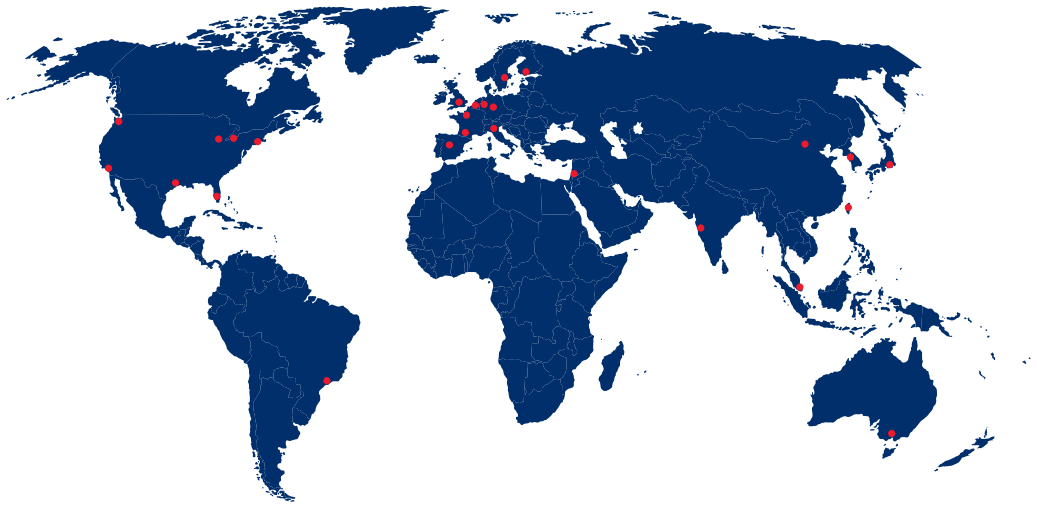
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LEE DESIGN TERMINOLOGY AND RETENTION METHODS

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This section provides engineers and designers with a practical overview of retention methods, design terminology, manufacturing efficiency practices, and technical definitions used across Lee components.

METHODS OF RETENTION

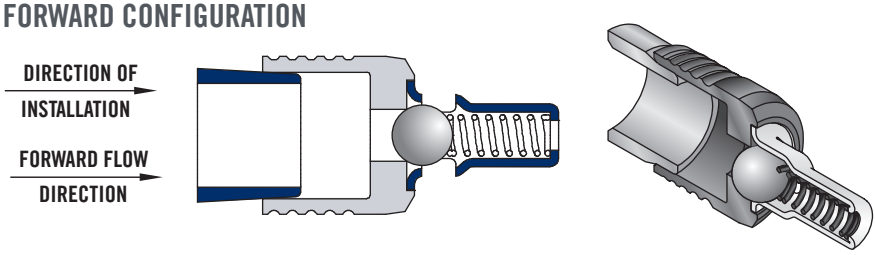
The retention method for each application is determined by specific requirements including housing material, installation direction, flow direction, pressure conditions, and assembly processes. Using the proper retention method is essential to ensure secure installation, reliable sealing performance, and long-term system integrity.

INSERT RETENTION

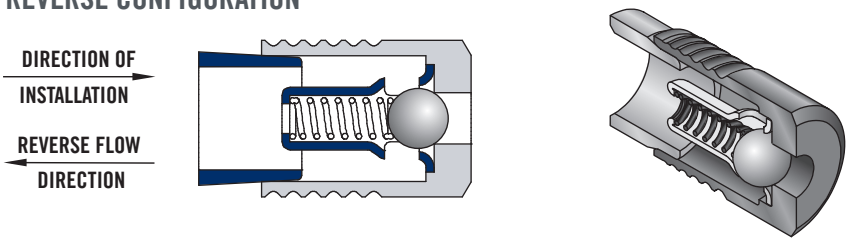
Insert retention utilizes the field-proven **Lee Principle of Controlled Expansion**, a specialized method for sealing fluid passageways that enables significant improvements in the design and manufacture of all fluid devices. It is the foundation of the Lee Plug® and Lee Betaplug®, offering a permanent, leak-tight seal without the need for O-rings, threads, or sealants.

Insert retention is ideal for simple installation directly into metal housings. After placing the part into the installation hole, an expansion pin is pressed into the body which expands locking grooves, creating a leak-tight seal without threads, sealants, or O-rings. This installation method is commonly used for check valves, pressure relief valves, and flow restrictors in high pressure or tightly controlled flow applications. Since inserts can only be installed in one direction, most come in forward and reverse flow versions to provide design flexibility.

FORWARD CONFIGURATION



REVERSE CONFIGURATION

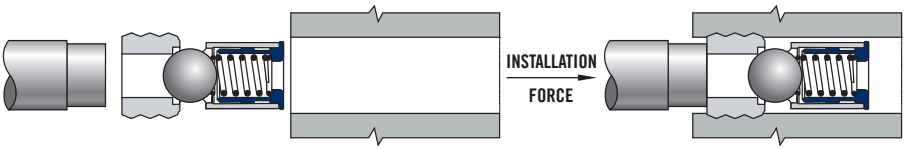


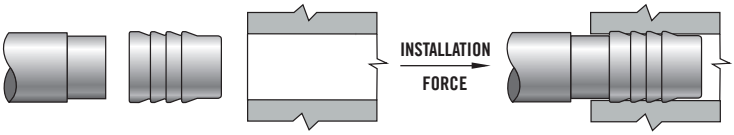
PRESS-IN RETENTION

Press-in retention utilizes engineered retention grooves for simple, direct installation into plastic housings or soft tubing. This technique provides reliable retention without bypass leakage. With this method, the component forms an interference fit with the plastic housing to create a secure seal. During insertion, the component's contoured retention profile allows it to press easily into the hole while the surrounding plastic flows into the adjacent grooves, creating a secure mechanical hold and a leak-tight seal without threads, sealants, or O-rings.

Plastics with higher elongation, including polypropylene, nylon, acetal, polyethylene, and PEEK, can undergo controlled cold flow during press-in installation. Under interference load, these materials plastically deform to conform to the groove geometry, improving retention and sealing over time. More rigid plastics such as acrylic and polycarbonate are generally less suitable for press-in retention. Please contact a Lee Sales Engineer to discuss your material selection and application needs.

Many press-in valves can be installed in either direction to allow for forward or reverse flow performance.





BARB RETENTION

Barb retention is a threadless, mechanical retention method in which small, engineered barbs on the exterior of a safety screen filter are expanded into the walls of a metal housing as the screen is installed. This allows for quick, secure installation without the need for threads, sealants, or O-rings. It is relevant to our BR Series Safety Screen Filters.

CARTRIDGE RETENTION

Unlike insert and press-in designs that incorporate an integral locking end, cartridge retention relies on an external or secondary retention feature — such as threaded retainers, C-clips, or existing components — to hold the component in place within a drilled flat bottom hole. In this handbook, the only product offered in this style are safety screen filters, but other products can be customized to incorporate this style of retention to meet specific requirements. Please contact your local Lee Sales Engineer for more information.

BETAPLUG RETENTION

Betaplug retention uses a unique tapered method derived from the Lee Principle of Controlled Expansion. The Lee Betaplug® is a cylindrical, tapered plug. When installed, the plug slips into a reamed counterbore. A tapered pin is then driven into the plug until the ends of the pin and the plug are below flush with each other. The controlled expansion causes the lands and grooves of the plug to “bite” into the surrounding material, forming multiple seals. This creates a positive seal for both liquids and gases. For more information on the Betaplug, please see pages H3-H11.

DRIVE LOCKING® TECHNOLOGY

Drive Locking® technology (also known as DL retention) is used to create a leak-tight seal in aluminum or soft metal housings without the use of threads, adhesives, or O-rings. It is primarily used with our DL Series Expansion Plugs, though this retention method can often be applied to other products such as valves or flow restrictors for low pressure, soft-metal applications.

The locking end includes an Installation Indicator feature that allows customers to visually verify when the installation process is complete. When fully installed, the Installation Indicator feature will be in contact with the housing wall 360° around the part with no visible gaps. Please refer to pages H12-H13 for more information on DL Series Plug installation.

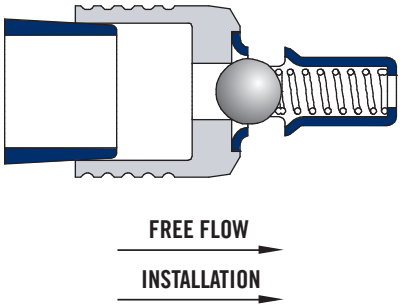
CUSTOM RETENTION

If the retention method for the product you’re looking for is not listed in this handbook, please contact a Lee Sales Engineer for more information on custom solutions.

DESIGN TERMINOLOGY

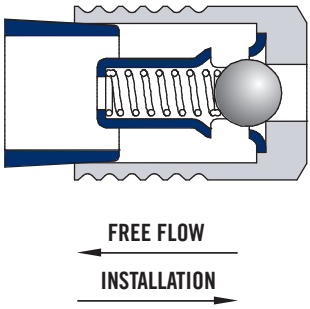
FORWARD CONFIGURATION

A forward flow valve configuration means that the direction of flow and the direction of installation is the same. This term is relevant to our check valves, pressure relief valves, flow restrictors, flow metering valves, and vent valves.



REVERSE CONFIGURATION

A reverse flow valve configuration means that the direction of flow and the direction of installation are opposite. This term is relevant to our check valves, pressure relief valves, flow restrictors, flow metering valves, and vent valves.



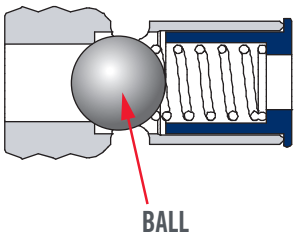
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BALL VS. POPPET VALVES

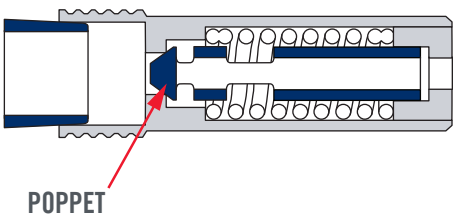
While most of our valves use a ball as a mechanism for preventing back flow, we also offer valves that utilize a poppet sealing element. The fundamental distinction lies in the geometry of the sealing element itself. Ball-type valves use a ball bearing that interfaces with a seat to prevent flow in the checked direction. Poppet-type valves use a shaped sealing element that moves axially against its seat and can support improved opening characteristics over ball-type designs while still providing effective sealing when closed.

These terms are relevant to our mechanical valves, including check valves, pressure relief valves, flow metering valves, and shuttle valves.

BALL-TYPE DESIGN



POPPET-TYPE DESIGN

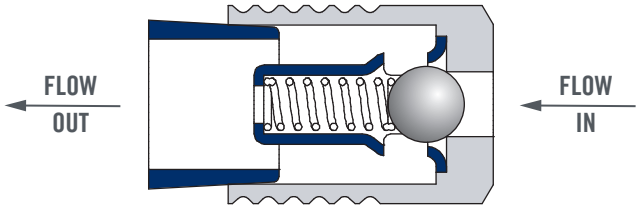


AXIAL VS SIDE-EXIT CONFIGURATIONS

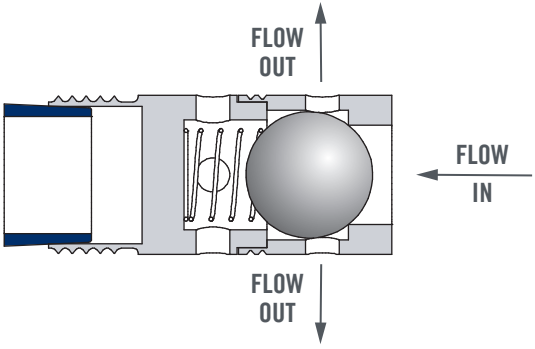
In an axial flow design, fluid enters and exits following the length of the valve. This allows the fluid to flow freely in one direction. In a side-exit flow design, fluid enters the valve body axially and exits through a port positioned at a 90-degree angle to the inlet. Because the inlet and outlet ports are not aligned on the same axis, the flow path changes direction.

These terms are relevant to our axial and side-exit check valves.

AXIAL FLOW



SIDE-EXIT FLOW



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MANUFACTURING EFFICIENCY PRACTICES

100% TESTING

A rigorous, part-by-part qualification process that establishes a repeatable standard of quality that eliminates the variability inherent in sample-based inspection. By ensuring that every component performs exactly as intended, 100% testing provides designers and manufacturers with a reliable foundation on which to build high performance fluid systems across diverse industries and applications.

This disciplined approach forms a core pillar of The Lee Company's quality philosophy, guaranteeing that each part is delivered only after demonstrating full compliance with its specified functional requirements. As a result, customers can be confident that every component they receive meets their specific performance requirements and can be immediately integrated into their systems without concern. Unlike statistical sampling, 100% testing subjects every unit to complete performance, flow, or functional evaluation, confirming leak-tight operation, consistent flow characteristics, and reliable behavior.

CLEANLINESS

The Lee Company uses controlled cleaning and cleanliness verification practices designed to support reliable performance in demanding applications. Where applicable, many products in this handbook are manufactured using methods and equipment as specified per ISO 16232 (Road vehicles – Cleanliness of components and systems).

Products are cleaned in batch processes using automated cleaning equipment that incorporates ultrasonic agitation, temperature control, and basket rotation. Medical grade alcohol is used as a cleaning fluid. Analysis is performed daily on products and cleaning fluids to ensure overall system and process cleanliness.

See pages J55-J59 of the Engineering Tools section for more information on system cleanliness.

TECHNICAL DEFINITIONS

BURST PRESSURE

The retention rating of a plug, defined as the pressure at which the installed plug can no longer be securely retained before bursting. This rating is not the intended operating pressure, but rather the ultimate strength limit of the plug.

CHECKED DIRECTION

The direction in which flow is prevented in a check valve. It is the opposite of free flow.

CHECKED DIRECTION LEAKAGE

The maximum allowable leakage in the checked direction of a valve. Many of our check valves are measured on air at 172 kPa or 25 psid. This value is included within our 100% testing process.

CRACKING PRESSURE

The uprun pressure at which the valve begins to open. This value is defined at a specified amount of air flow for our check valves and pressure relief valves. It is included within our 100% testing process.

FLOW POINT

The minimum amount of flow at a specified pressure. This value is defined on hydraulic oil for our poppet pressure relief valves and air for our vent valves. It is included within our 100% testing process.

FREE FLOW

The direction in which the valve opens to allow flow. It is the opposite of checked direction.

LOHM RATE

A way of defining and measuring resistance to fluid flow. Often listed as a reference for understanding general valve flow capacity. For more information, please reference page J1 of the Engineering Tools section.

MAXIMUM WORKING PRESSURE DIFFERENTIAL

- **Checked Direction:** Maximum permissible outlet-to-inlet pressure difference.
- **Flow Direction:** Maximum permissible inlet-to-outlet instantaneous pressure difference.

METERED FLOW

A defined Lohm rate that is used to measure the amount of fluid that passes through a component. It is included within our 100% testing process.

TECHNICAL DEFINITIONS

LEE DESIGN TERMINOLOGY AND RETENTION METHODS

MICRON RATING

The particle size a safety screen filter is designed to capture, expressed in micrometers (µm). A low micron rating corresponds to finer filtering performance.

MINIMUM BURST PRESSURE

The minimum differential pressure rating, assuming a fully clogged safety screen filter.

MINIMUM PILOT RATIO

The minimum ratio between checked pressure (Port A) and pilot pressure (Port B) required for the piloting piston to open the valve.

RATED PRESSURE

The maximum continuous operating pressure at which a product is intended to function while meeting all specified performance requirements under defined operating conditions.

RESEAT PRESSURE

The minimum pressure on the downrun curve of a pressure relief valve at which the valve poppet returns to a closed position. This value is defined as a pressure at which flow drops below a defined limit. It is included within our 100% testing process.

ROB NUMBER

A unitless number used to rate the relative resistance to blockage of safety screen filters. A higher ROB number indicated a greater resistance to blockage. For more information, please reference pages J52-J54 of the Engineering Tools section.

SHUTOFF PRESSURE

The pressure range at which a vent valve seats in the closed position. It is measured as a part of our 100% testing process.

SHUTTLING PRESSURE

The pressure required to transition flow from the primary inlet to the secondary inlet, both of which feed a common outlet. It is included within our 100% testing process.

UPRUN LEAKAGE

While pressure is increasing, the maximum allowable leakage measured at a specified pressure below the cracking pressure. This characteristic is verified as part of our 100% testing process.

CHECK VALVES



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PRESS-IN: FOR INSTALLATION INTO PLASTIC

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- 6.5 mm Check Valves
- 8 mm Check Valves
- 8 mm LC Check Valves

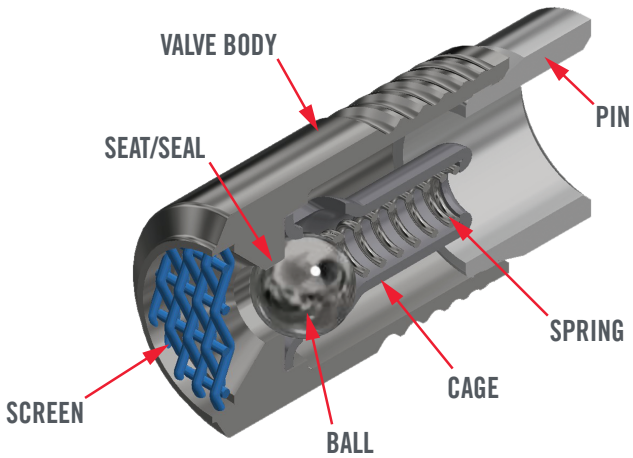
Axial Elastomeric Seat Check Valves A46-A47
- 6 mm Zero Leak Check Valves

WHAT IS A CHECK VALVE?

A check valve, also known as a non-return or one-way valve, is a mechanical device that allows a gas or liquid to flow freely in one direction while preventing reverse flow in the other direction.

ENGINEERED FOR SUPERIOR PERFORMANCE

The Lee Company has developed a wide range of miniature check valves designed to prevent backflow in hydraulic or pneumatic systems. Engineered for both performance and value, these valves consistently meet the demanding requirements of applications across a wide range of industries.



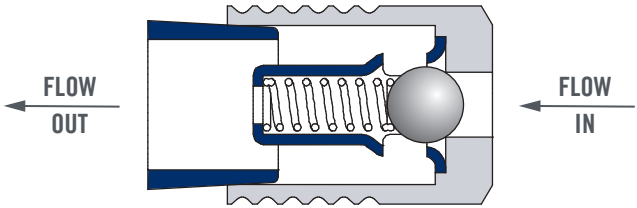
Designed to integrate seamlessly into both automated and manual assembly workflows, Lee check valves feature a simple, **one-piece assembly** that installs without threads, O-rings, or adhesive. Integral retention features ensure the valve stays securely in place, eliminating the need for complex installation. Their high quality seats ensure **leak-tight operation**, resulting in superior system performance, extended durability, and a more reliable finished product. Our guided ball designs provide **fast response times and low hysteresis** for precise flow control. The **positive ball stop** ensures infinite spring life and stable performance over time.

The following section provides information on available check valve configurations. These versatile options offer engineers **design flexibility** to meet diverse system requirements.

AXIAL FLOW

In an axial flow design, fluid enters and exits following the length of the valve. This allows the fluid to flow freely in one direction. Axial flow check valves offer the advantage of simplified installation hole geometry, as both the inlet and outlet are aligned along the same axis.

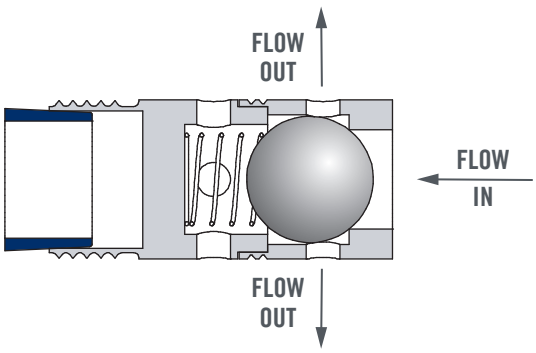
AXIAL FLOW



SIDE-EXIT FLOW

In a side-exit flow design, fluid enters the valve body and exits through a port positioned at a 90-degree angle to the inlet. Because the inlet and outlet ports are not aligned on the same axis, the flow path changes direction. Side-exit check valves with specialized porting allow the ball to move out of the flow path, increasing flow capacity while maintaining the same envelope diameter.

SIDE-EXIT FLOW



METAL SEAT

A high quality metal-to-metal seat provides low leakage, highly repeatable cracking pressure, and long life. When the check valve is closed, the closure element (like a ball), presses against the metal seat, creating a tight seal that stops fluid from flowing in the checked direction.

ELASTOMERIC SEAT

An elastomeric seat creates a tight, leak-proof seal in a check valve by compressing when the ball presses against the seat to prevent backflow. Elastomeric materials are softer and more flexible than metal, which helps create a better seal – especially in low pressure conditions. Elastomeric seats are commonly used in applications where a tighter seal is needed or in pneumatic systems operated with gas flow.

PILOT OPERATED

A pilot-operated check valve typically uses three ports: an inlet, outlet, and a pilot port connected to an internal piston. When pressure is applied to the pilot port, the piston presses against the ball to allow flow in the checked direction. When pressure is removed from the pilot port, the check valve will reseat to prevent flow in the checked direction.

CUSTOMIZATION OPTIONS

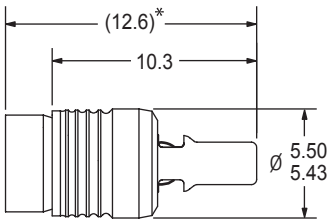
Lee check valves are engineered for high performance and long service life. Additional customizations are available, allowing engineers to optimize valve performance based on criteria such as material, flow rate, packaging constraints, pressure differentials, and allowable leakage. Because these modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. Select models support bidirectional installation for forward or reverse flow and are available with an **integral safety screen** for added protection against contamination. Ceramic ball versions are also available to provide **enhanced chemical compatibility** with aggressive fluids while maintaining the same reliable operation. For more information or design support, please contact a Lee Sales Engineer.

5.5 mm CHECK VALVE - FORWARD FLOW

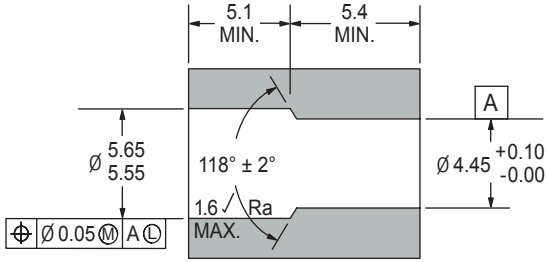
INSERT: FOR INSTALLATION INTO METAL

A

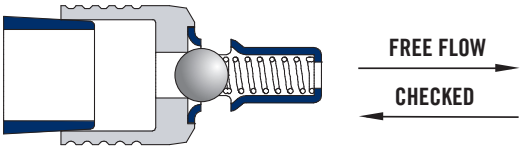
DIMENSIONAL VIEW



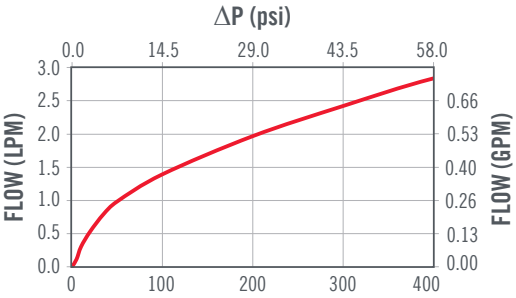
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCFM2550200S	0 kPa (no spring)
CCFM2550204S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCFM2550207S	7 ± 5 kPa (1 ± 0.7 psid)
CCFM2550214S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2550225S	25 ± 10 kPa (3.6 ± 1.5 psid)
CCFM2550240S	40 ± 15 kPa (6 ± 2.2 psid)
CCFM2550269S	69 ± 17 kPa (10 ± 2.5 psid)

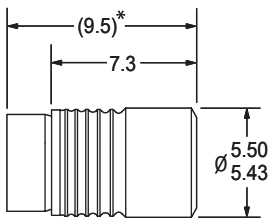
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.7 grams

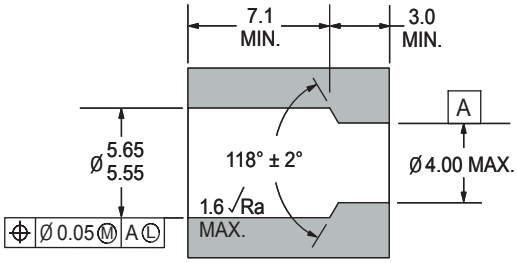
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

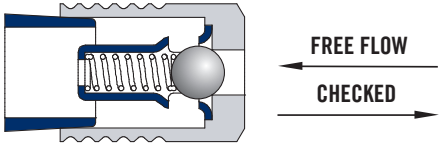
DIMENSIONAL VIEW



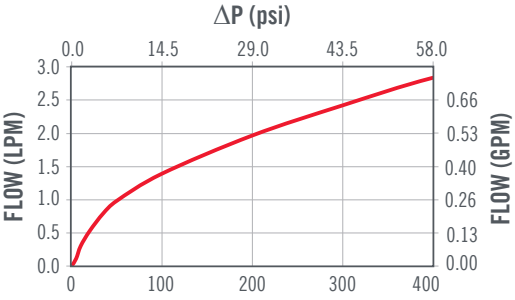
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCRM2550200S	0 kPa (no spring)
CCRM2550204S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCRM2550207S	7 ± 5 kPa (1 ± 0.7 psid)
CCRM2550214S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2550225S	25 ± 10 kPa (3.6 ± 1.5 psid)
CCRM2550240S	40 ± 15 kPa (6 ± 2.2 psid)
CCRM2550269S	69 ± 17 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.85 grams

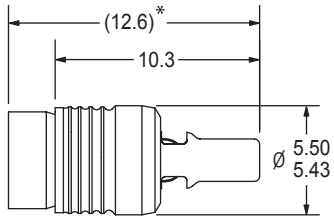
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert-Unscreened (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

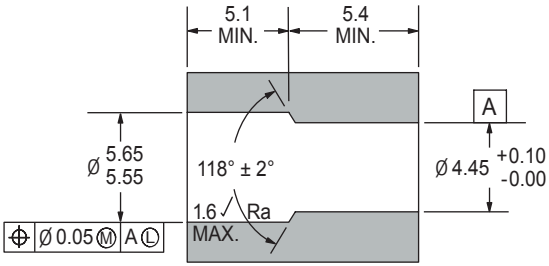
5.5 mm CHECK VALVE - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

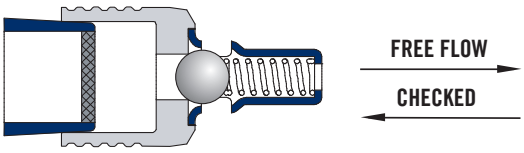
DIMENSIONAL VIEW



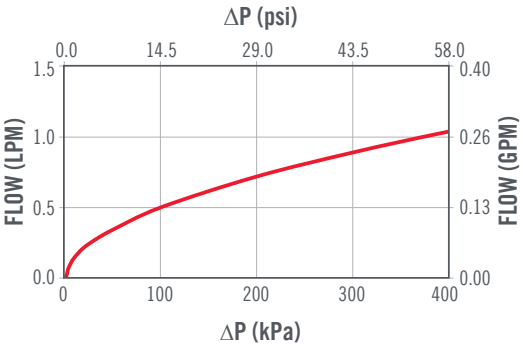
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCFM2553000S	0 kPa (no spring)
CCFM2553014S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2553040S	40 ± 15 kPa (6 ± 2.2 psid)
CCFM2553069S	69 ± 17 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	550 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Screen Size:	125 microns
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.8 grams

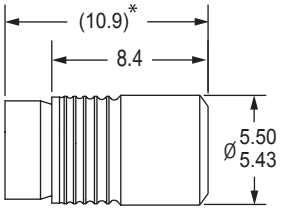
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

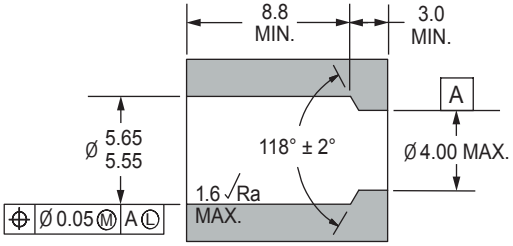
5.5 mm CHECK VALVE - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

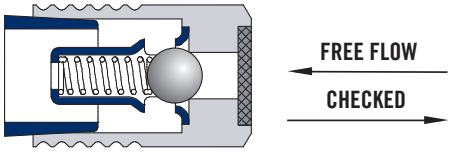
DIMENSIONAL VIEW



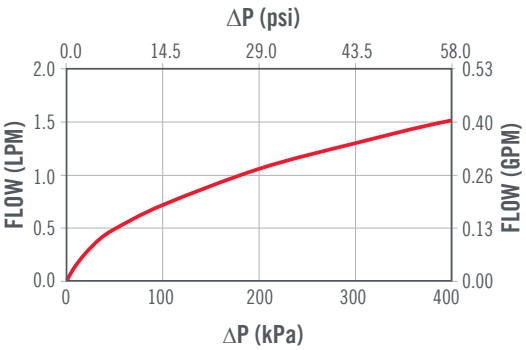
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	400 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Screen Size:	125 microns
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.95 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert - Screened (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

PART NUMBER	CRACKING PRESSURE**
CCRM2553000S	0 kPa (no spring)
CCRM2553014S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2553040S	40 ± 15 kPa (6 ± 2.2 psid)
CCRM2553069S	69 ± 17 kPa (10 ± 2.5 psid)

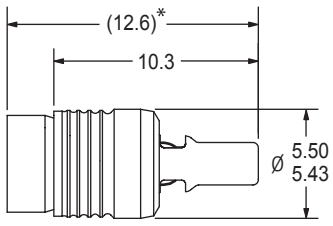
**The pressure at which uprun flow exceeds 50 SCCM of air.

5.5 mm CHECK VALVE - FORWARD FLOW, CERAMIC BALL

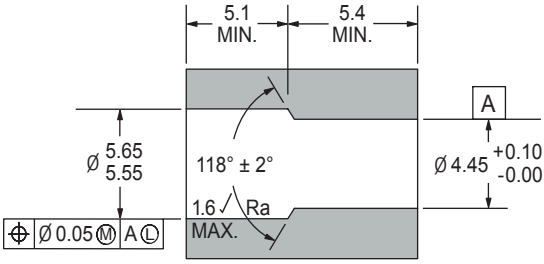
INSERT: FOR INSTALLATION INTO METAL

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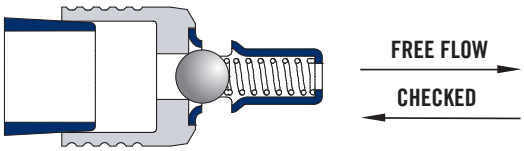
DIMENSIONAL VIEW



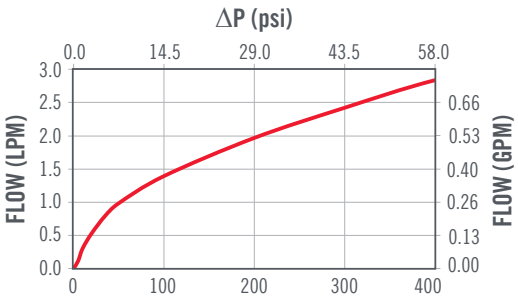
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.7 grams

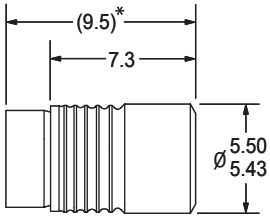
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

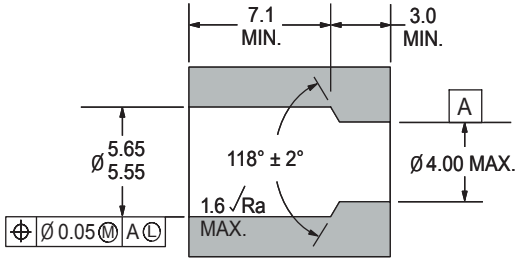
PART NUMBER	CRACKING PRESSURE**
CCFM2550800S	0 kPa (no spring)
CCFM2550814S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2550840S	40 ± 15 kPa (6 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

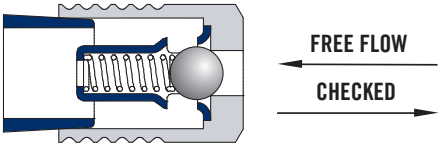
DIMENSIONAL VIEW



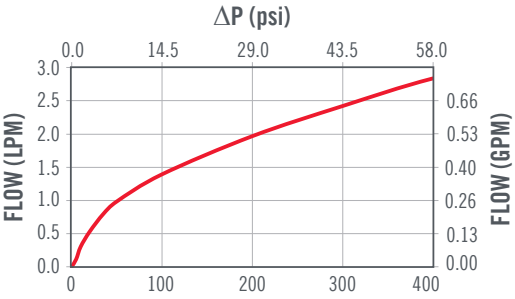
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCRM2550800S	0 kPa (no spring)
CCRM2550814S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2550840S	40 ± 15 kPa (6 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.85 grams

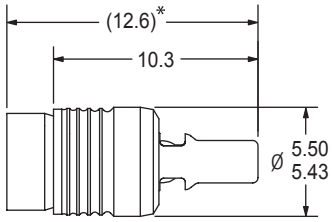
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert - Unscreened (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

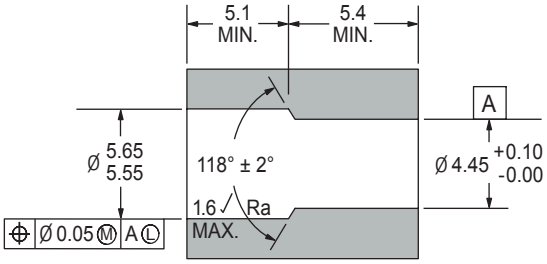
5.5 mm 316L CHECK VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

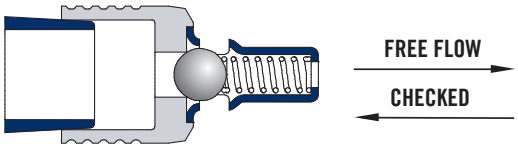
DIMENSIONAL VIEW



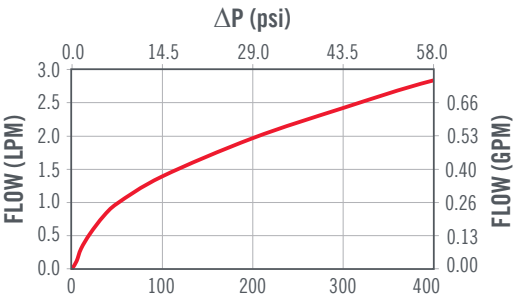
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.73 grams

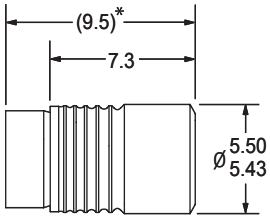
MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

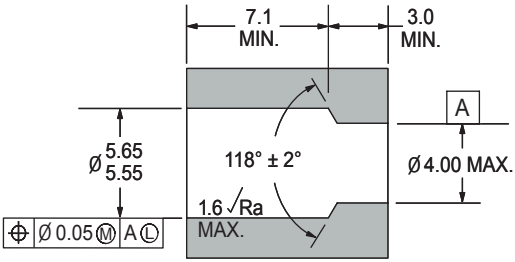
PART NUMBER	CRACKING PRESSURE**
CCFM2554800S	0 kPa (no spring)
CCFM2554807S	7 ± 5 kPa (1 ± 0.7 psid)
CCFM2554814S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2554840S	40 ± 15 kPa (6 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

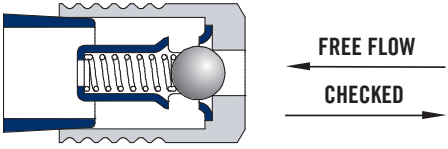
DIMENSIONAL VIEW



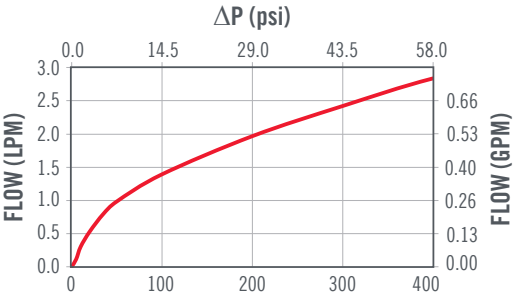
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	0.86 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert-Unscreened (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

PART NUMBER	CRACKING PRESSURE**
CCRM2554800S	0 kPa (no spring)
CCRM2554807S	7 ± 5 kPa (1 ± 0.7 psid)
CCRM2554814S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2554840S	40 ± 15 kPa (6 ± 2.2 psid)

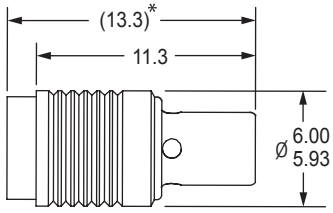
**The pressure at which uprun flow exceeds 50 SCCM of air.

6 mm 400 BAR CHECK VALVE - FORWARD FLOW

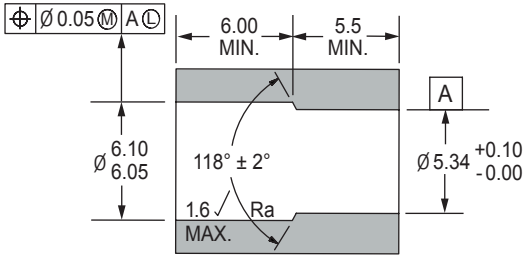
INSERT: FOR INSTALLATION INTO METAL

A

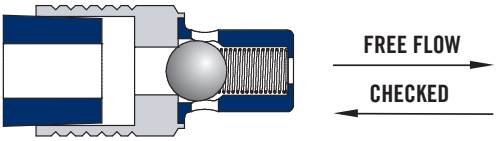
DIMENSIONAL VIEW



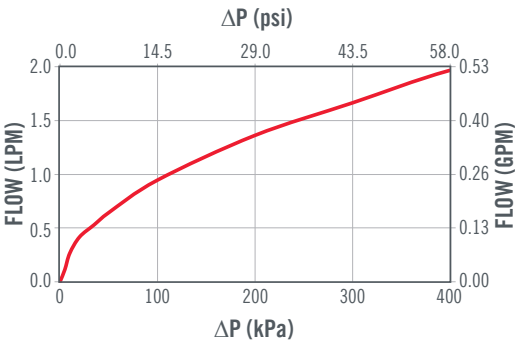
INSTALLATION HOLE



**Overall length before installation.*
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	320 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	400 bar (5800 psid) checked direction 40 bar (580 psid) flow direction
Weight:	1.3 grams

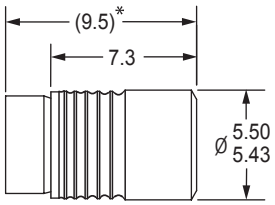
MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 400 Bar Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0051078S
Installation Force:	8.9 kN max.

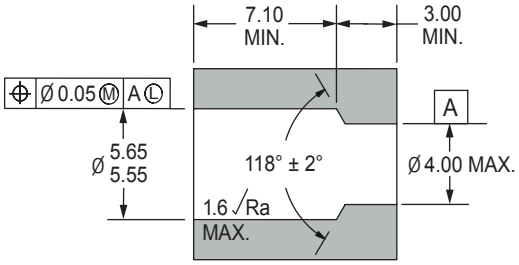
PART NUMBER	CRACKING PRESSURE**
CCHF6010000S	0 kPa (no spring)
CCHF6010014S	14 ± 5 kPa (2 ± 0.7 psid)
CCHF6010040S	40 ± 15 kPa (6 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

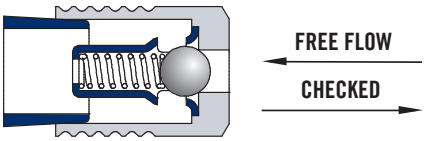
DIMENSIONAL VIEW



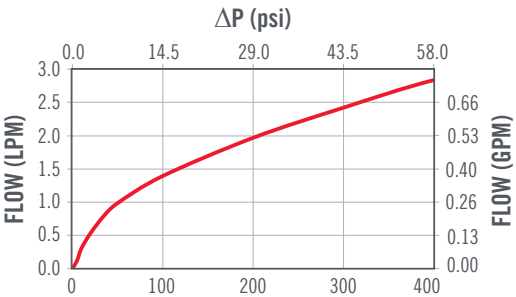
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	400 bar (5800 psid) checked direction 40 bar (580 psid) flow direction
Weight:	0.86 grams

MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 400 Bar Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

PART NUMBER	CRACKING PRESSURE**
CCHR5510000S	0 kPa (no spring)
CCHR5510014S	14 ± 5 kPa (2 ± 0.7 psid)
CCHR5510040S	40 ± 15 kPa (6 ± 2.2 psid)

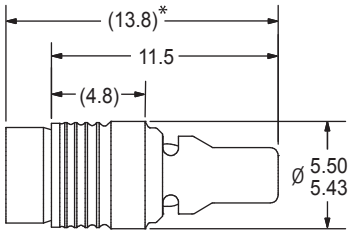
**The pressure at which uprun flow exceeds 50 SCCM of air.

5.5 mm LC CHECK VALVE - FORWARD FLOW

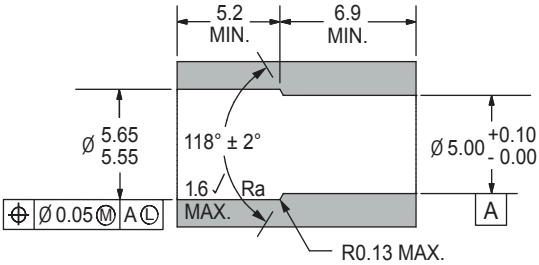
INSERT: FOR INSTALLATION INTO METAL

A

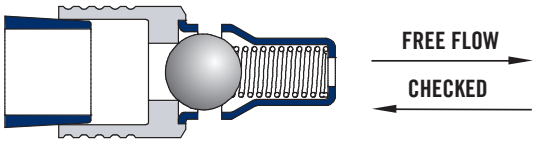
DIMENSIONAL VIEW



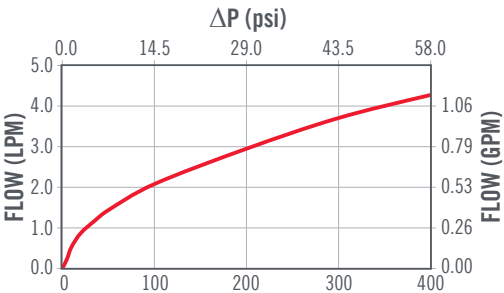
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CLCF5510000S	0 kPa (no spring)
CLCF5510004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CLCF5510007S	7 ± 5 kPa (1 ± 0.7 psid)
CLCF5510014S	14 ± 5 kPa (2 ± 0.7 psid)
CLCF5510040S	40 ± 15 kPa (6 ± 2.2 psid)
CLCF5510069S	69 ± 17.3 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	150 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	1.0 gram

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

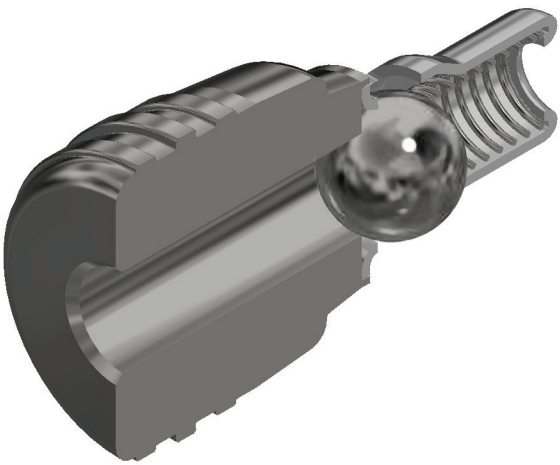
INSTALLATION	
Installation Procedure:	IP 558 LC Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

LOOKING FOR A REVERSE VERSION?

The 5.5 mm LC Check Valve offers higher flow rates than our other standard 5.5 mm version valves, but in a forward flow version only. If you need a higher flow rate, but in a reverse configuration, customers can often use another standard option—such as the reverse configuration of our 8 mm Check Valve (see page A17)—as a suitable alternative. Please contact a Lee Sales Engineer so that we can find the best solution for your application requirements. With our diverse product portfolio, it's likely that we already have the precise flow control solution you need.

CUSTOM CAPABILITIES

We routinely modify our standard offering to meet application requirements without significantly increasing costs or lead times. Because these modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. Over 80% of our sales to automotive and industrial customers are customized versions of our standard products. And with our rapid prototyping capabilities, we can make sure you have a solution in hand every step of the way.

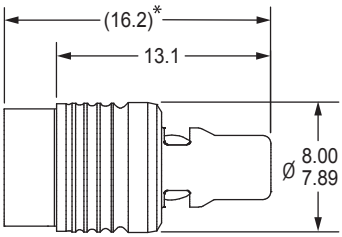


Custom configurations can be made for specific flow requirements or unique external geometry for retention in application specific housings. Contact your local Lee Sales Engineer to discuss your application requirements.

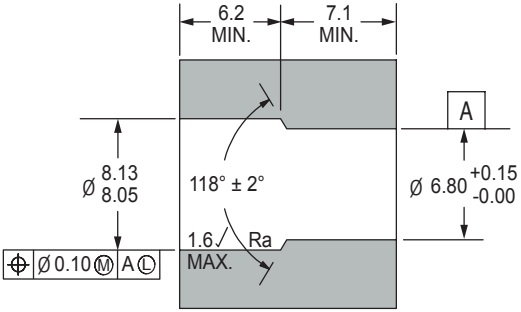
8 mm CHECK VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

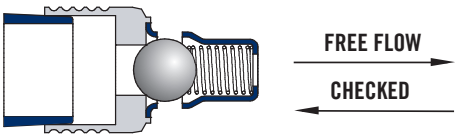
DIMENSIONAL VIEW



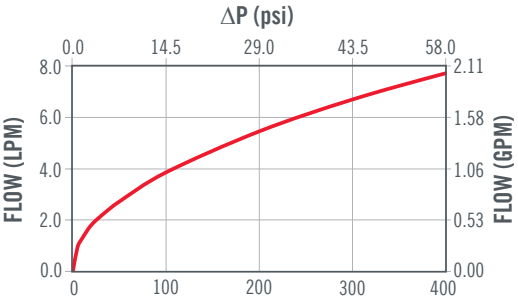
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCFM2800200S	0 kPa (no spring)
CCFM2800204S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCFM2800207S	7 ± 5 kPa (1 ± 0.7 psid)
CCFM2800214S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2800240S	40 ± 15 kPa (6 ± 2.2 psid)
CCFM2800269S	69 ± 30 kPa (10 ± 4.4 psid)

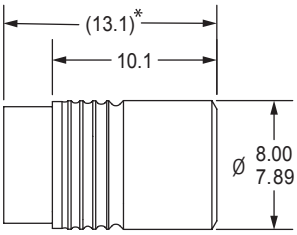
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	1.8 grams

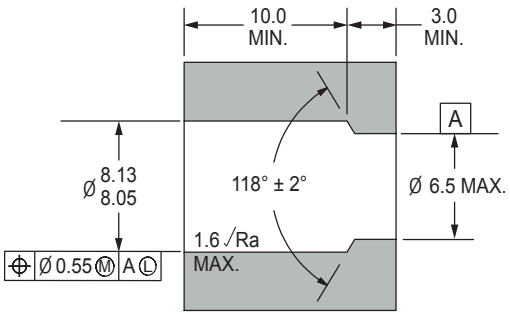
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

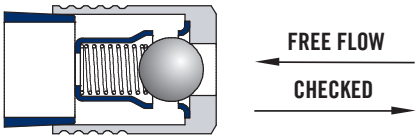
DIMENSIONAL VIEW



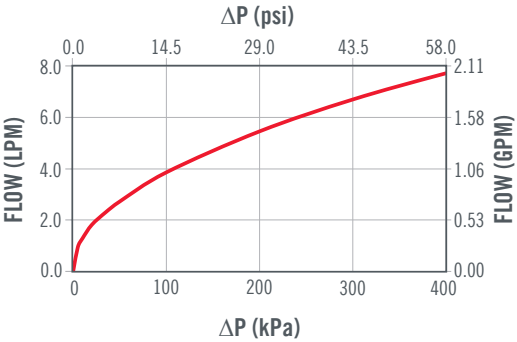
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCRM2800200S	0 kPa (no spring)
CCRM2800204S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCRM2800207S	7 ± 5 kPa (1 ± 0.7 psid)
CCRM2800214S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2800240S	40 ± 15 kPa (6 ± 2.2 psid)
CCRM2800269S	69 ± 30 kPa (10 ± 4.4 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.2 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

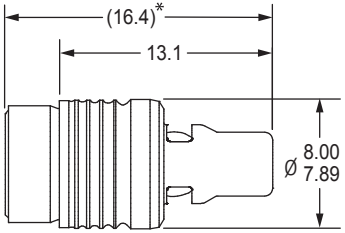
INSTALLATION	
Installation Procedure:	IP 855 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

8 mm CHECK VALVE - FORWARD FLOW, SCREENED

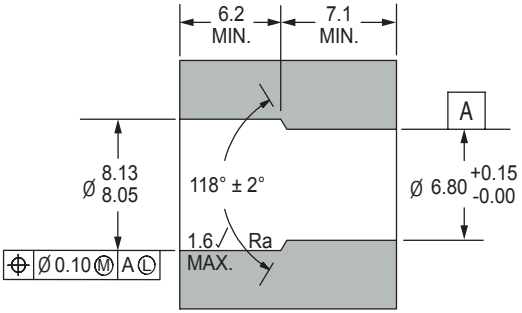
INSERT: FOR INSTALLATION INTO METAL

A

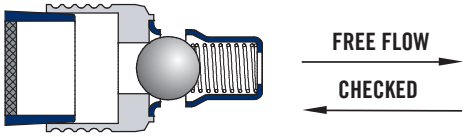
DIMENSIONAL VIEW



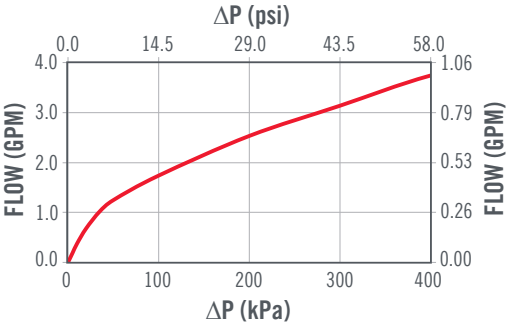
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	170 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Screen Size:	125 microns
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.0 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Forward Insert (file available at: theleeco.com/installation
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

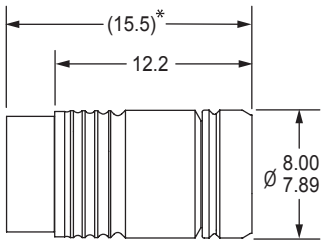
PART NUMBER	CRACKING PRESSURE**
CCFM2803000S	0 kPa (no spring)
CCFM2803014S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2803040S	40 ± 15 kPa (6 ± 2.2 psid)
CCFM2803069S	69 ± 30 kPa (10 ± 4.4 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

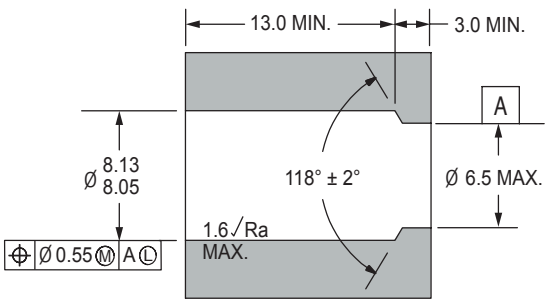
8 mm CHECK VALVE - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

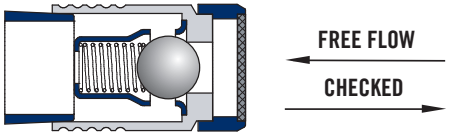
DIMENSIONAL VIEW



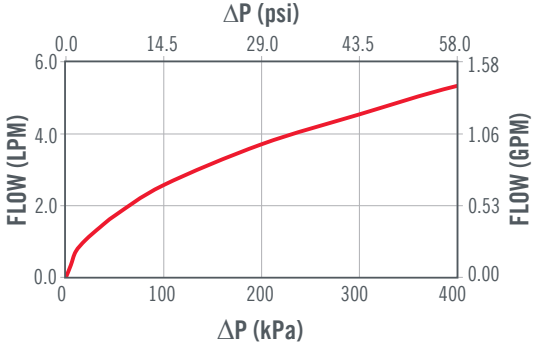
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	130 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Screen Size:	125 microns
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.5 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Reverse Insert - Screened (file available at: theleeco.com/installation
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

PART NUMBER	CRACKING PRESSURE**
CCRM2803000S	0 kPa (no spring)
CCRM2803014S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2803040S	40 ± 15 kPa (6 ± 2.2 psid)
CCRM2803069S	69 ± 30 kPa (10 ± 4.4 psid)

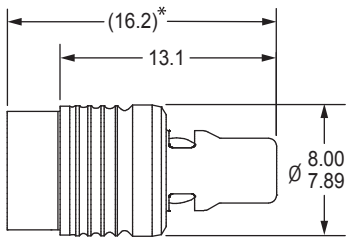
**The pressure at which uprun flow exceeds 50 SCCM of air.

8 mm CHECK VALVE - FORWARD FLOW, CERAMIC BALL

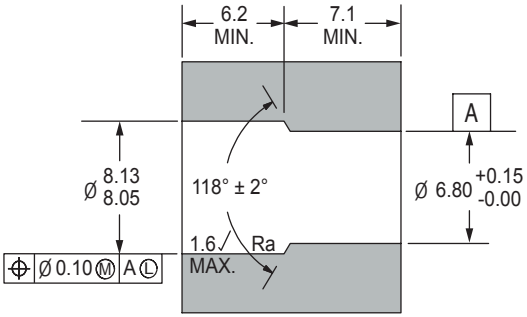
INSERT: FOR INSTALLATION INTO METAL

A

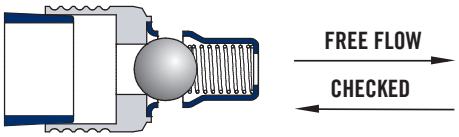
DIMENSIONAL VIEW



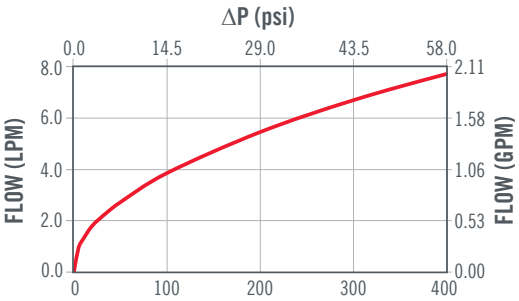
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCFM2800800S	0 kPa (no spring)
CCFM2800804S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCFM2800807S	7 ± 5 kPa (1 ± 0.7 psid)
CCFM2800814S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2800840S	40 ± 15 kPa (6 ± 2.2 psid)

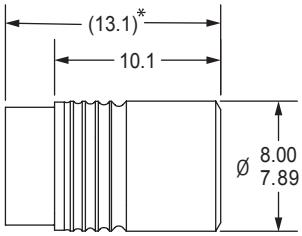
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	1.8 grams

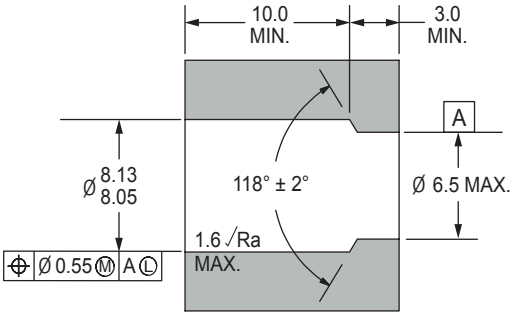
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 855 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

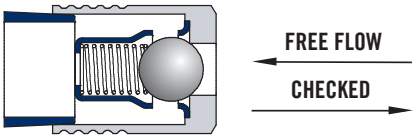
DIMENSIONAL VIEW



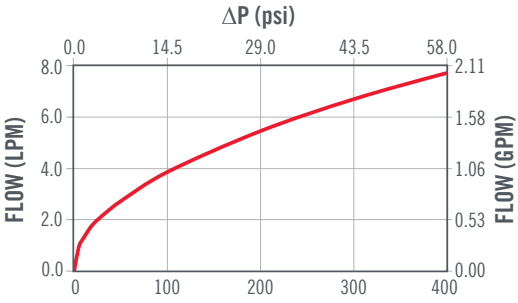
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCRM2800800S	0 kPa (no spring)
CCRM2800804S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCRM2800807S	7 ± 5 kPa (1 ± 0.7 psid)
CCRM2800814S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2800840S	40 ± 15 kPa (6 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.2 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

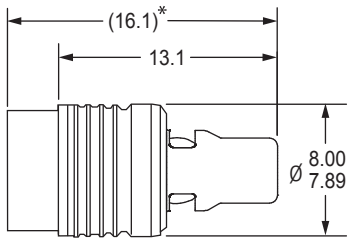
INSTALLATION	
Installation Procedure:	IP 855 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

8 mm 316L CHECK VALVE - FORWARD FLOW

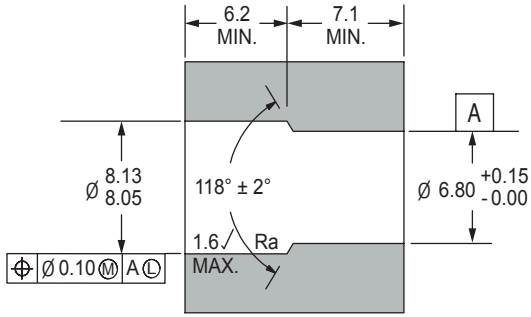
INSERT: FOR INSTALLATION INTO METAL

A

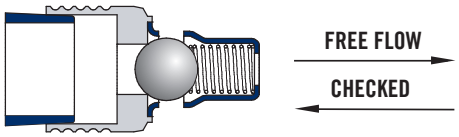
DIMENSIONAL VIEW



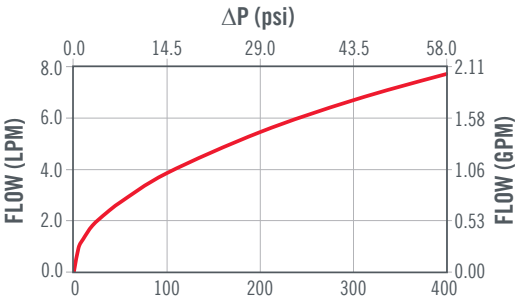
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCFM2804800S	0 kPa (no spring)
CCFM2804804S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCFM2804807S	7 ± 5 kPa (1 ± 0.7 psid)
CCFM2804814S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM2804840S	40 ± 15 kPa (6 ± 2.2 psid)
CCFM2804869S	69 ± 15 kPa (10 ± 2.2 psid)

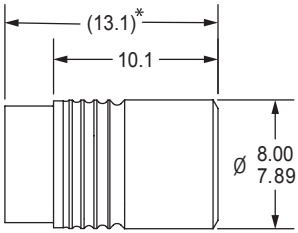
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	16 MPa (2320 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	1.75 grams

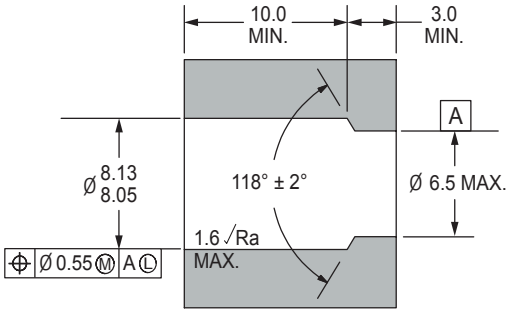
MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 855 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

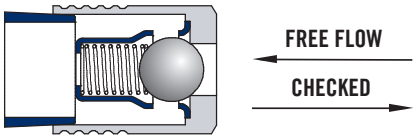
DIMENSIONAL VIEW



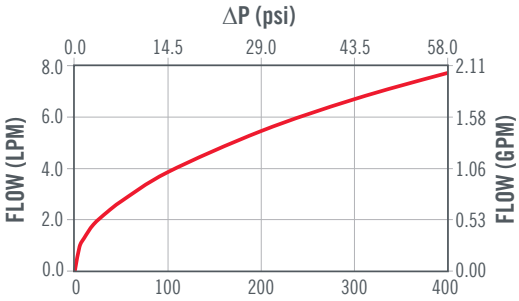
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCRM2804800S	0 kPa (no spring)
CCRM2804804S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCRM2804807S	7 ± 5 kPa (1 ± 0.7 psid)
CCRM2804814S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM2804840S	40 ± 15 kPa (6 ± 2.2 psid)
CCRM2804869S	69 ± 15 kPa (10 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.25 grams

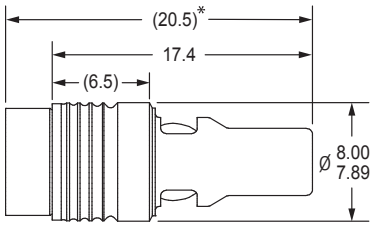
MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 855 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

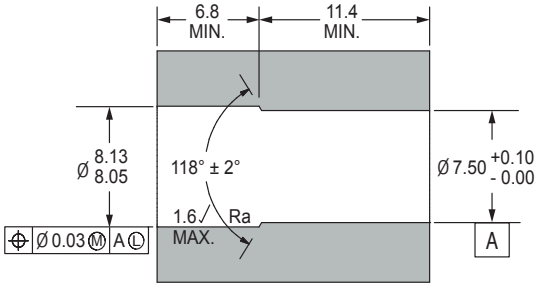
8 mm LC CHECK VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

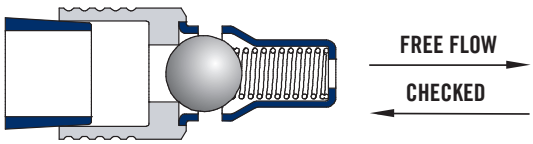
DIMENSIONAL VIEW



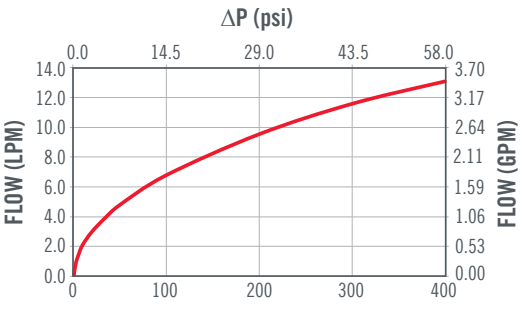
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CLCF8010000S	0 kPa (no spring)
CLCF8010004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CLCF8010007S	7 ± 5 kPa (1 ± 0.7 psid)
CLCF8010014S	14 ± 5 kPa (2 ± 0.7 psid)
CLCF8010040S	40 ± 15 kPa (6 ± 2.2 psid)
CLCF8010069S	69 ± 17.3 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	45 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.35 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 LC2 Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

LOOKING FOR A REVERSE VERSION?

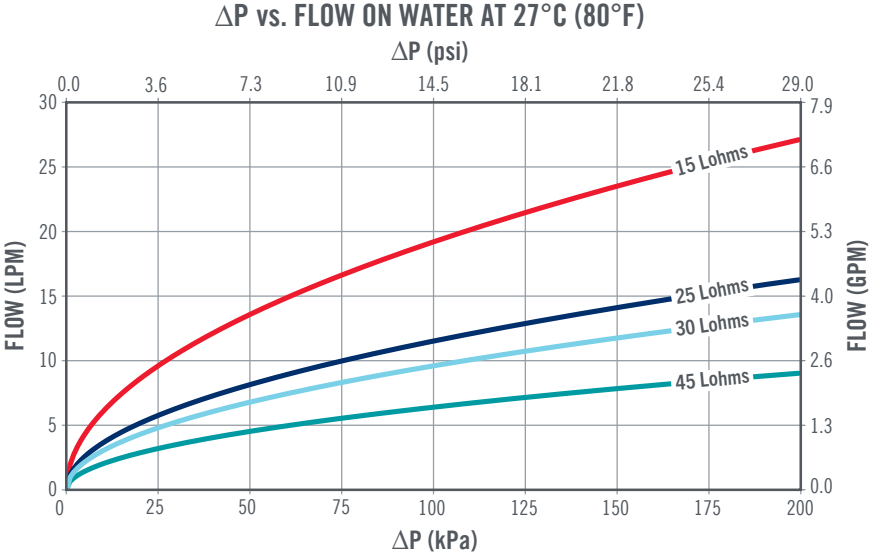
The 8 mm LC Check Valve offers higher flow rates than our other standard 8 mm version valves, but in a forward flow version only. If you need a higher flow rate, but in a reverse configuration, we can offer custom solutions in a larger diameter as a suitable alternative. Please contact a Lee Sales Engineer so that we can review your application and find the best solution for your requirements. With our diverse product portfolio, it's likely that we already have the precise flow control solution you need.

CUSTOM CAPABILITIES

We routinely modify our standard offering to meet application requirements without significantly increasing costs or lead times. Because these modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. Over 80% of our sales to automotive and industrial customers are customized versions of our standard products. And with our rapid prototyping capabilities, we can make sure you have a solution in hand every step of the way.

LOOKING FOR EVEN MORE FLOW?

Our products are small but are designed to be as efficient as possible to save on space and weight. We have developed custom capabilities to provide our customers with even higher flowing custom valves to meet their flow requirements.



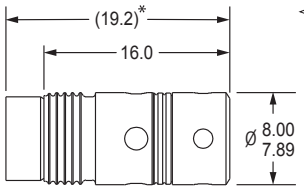
This graph represents flow curves for valves up to Ø14 mm. Multiple sizes are available. Contact your local Lee Sales Engineer for more information and to discuss your application requirements.

8 mm SIDE EXIT CHECK VALVE - FORWARD FLOW

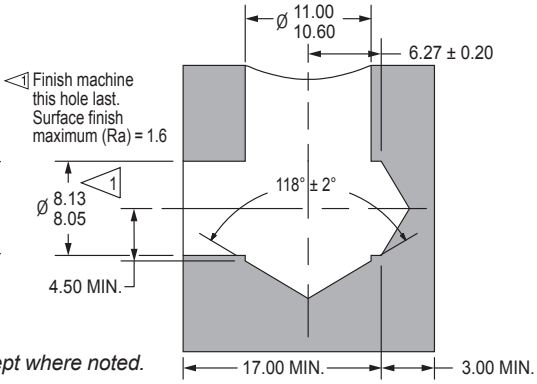
INSERT: FOR INSTALLATION INTO METAL

A

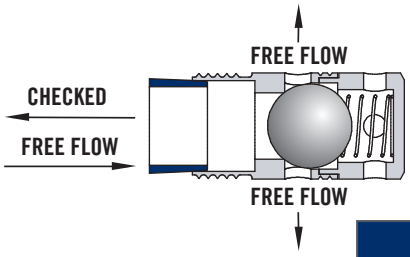
DIMENSIONAL VIEW



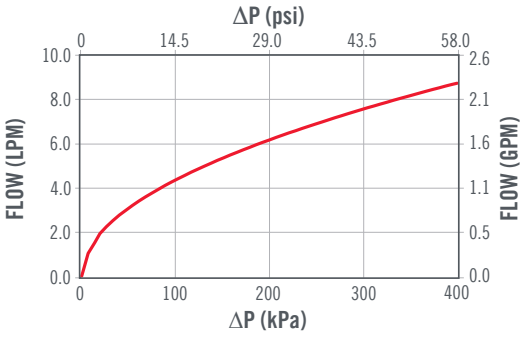
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCFM8321000S	0 kPa (no spring)
CCFM8321014S	14 ± 5 kPa (2 ± 0.7 psid)
CCFM8321040S	40 ± 15 kPa (6 ± 2.2 psid)

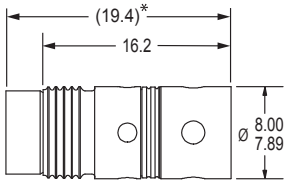
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	65 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	3.7 grams

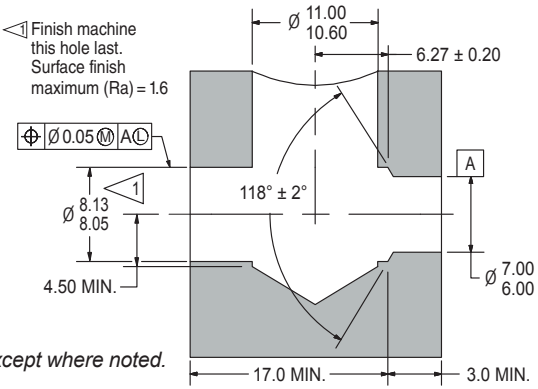
MATERIALS	
Upper Body:	303 stainless steel
Lower Body:	303 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 832 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	5.3 kN min. to 6.2 kN max.

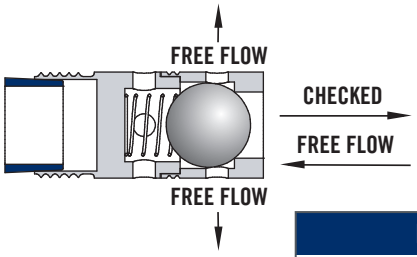
DIMENSIONAL VIEW



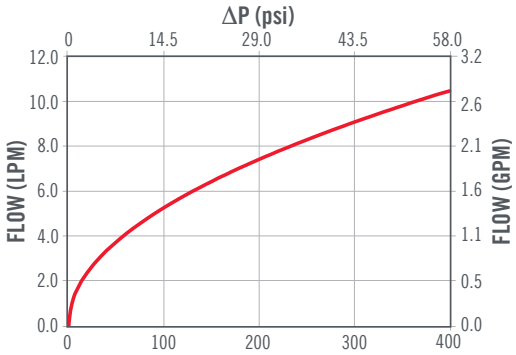
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.*



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCRM8321000S	0 kPa (no spring)
CCRM8321014S	14 ± 5 kPa (2 ± 0.7 psid)
CCRM8321040S	40 ± 15 kPa (6 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	55 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	3.8 grams

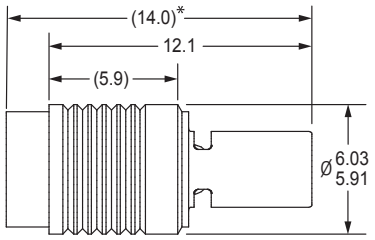
MATERIALS	
Upper Body:	303 stainless steel
Lower Body:	303 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 832 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	5.3 kN min. to 6.2 kN max.

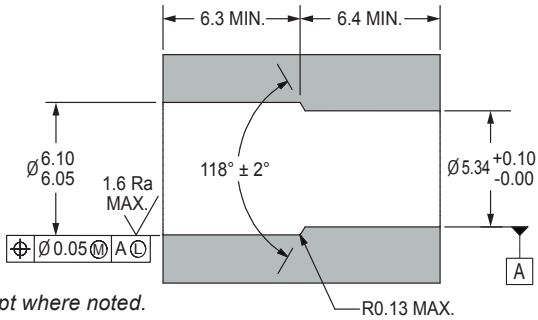
6 mm ZERO LEAK CHECK VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

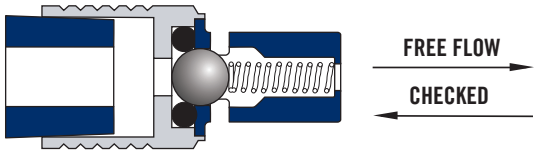
DIMENSIONAL VIEW



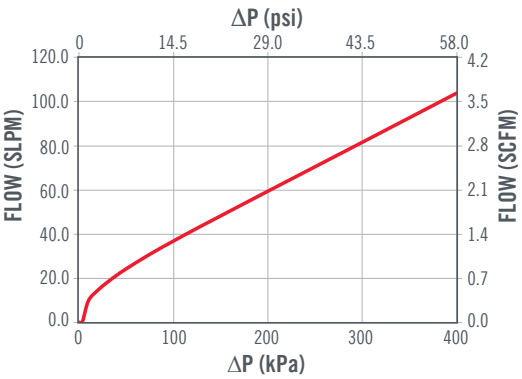
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 4 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZFM6001004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZFM6001007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZFM6001014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZFM6001040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZFM6001069S	69 ± 48 kPa (10 ± 7.0 psid)
EPDM	CZFM6002004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZFM6002007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZFM6002014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZFM6002040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZFM6002069S	69 ± 48 kPa (10 ± 7.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Maximum Working Pressure Differential:	40 MPa (5800 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	1.3 grams

MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Seal:	EPDM or FKM

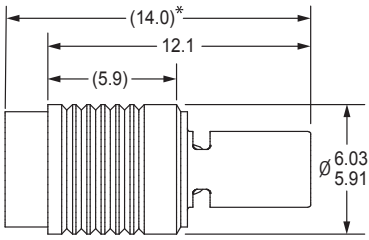
Other seal materials are available upon request.

INSTALLATION	
Installation Procedure:	IP CZFM 6.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0051078S
Installation Force:	See installation procedure

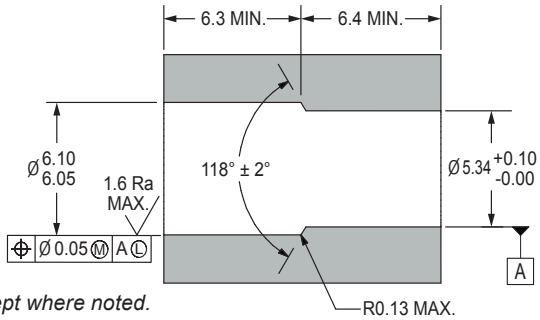
6 mm ZERO LEAK 316L CHECK VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

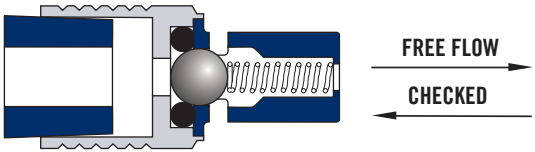
DIMENSIONAL VIEW



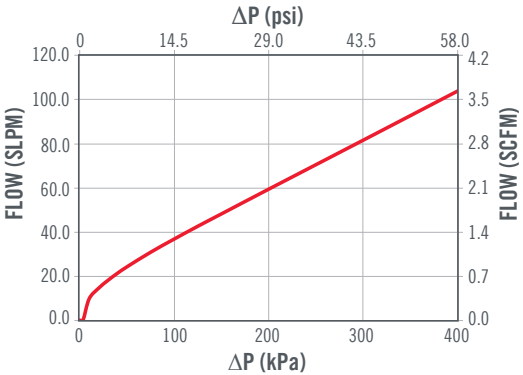
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 4 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZFM6041004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZFM6041007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZFM6041014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZFM6041040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZFM6041069S	69 ± 48 kPa (10 ± 7.0 psid)
EPDM	CZFM6042004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZFM6042007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZFM6042014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZFM6042040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZFM6042069S	69 ± 48 kPa (10 ± 7.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Maximum Working Pressure Differential:	40 MPa (5800 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	1.3 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic
Seal:	EPDM or FKM

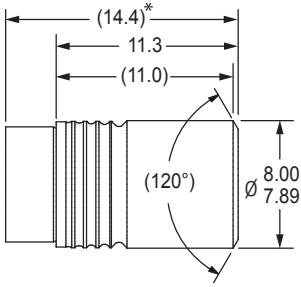
Other seal materials are available upon request.

INSTALLATION	
Installation Procedure:	IP CZFM 6.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0051078S
Installation Force:	See installation procedure

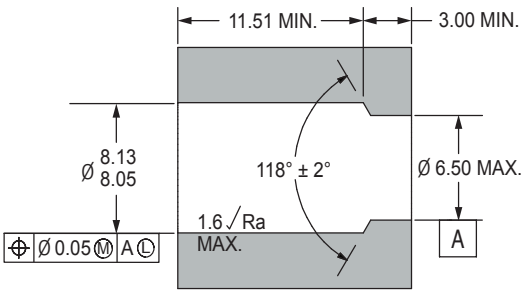
8 mm ZERO LEAK CHECK VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

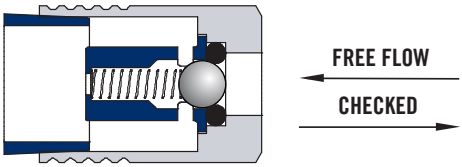
DIMENSIONAL VIEW



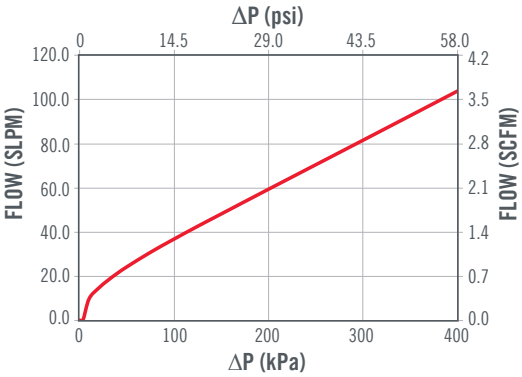
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 4 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZRM8001004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZRM8001007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZRM8001014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZRM8001040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZRM8001069S	69 ± 48 kPa (10 ± 7.0 psid)
EPDM	CZRM8002004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZRM8002007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZRM8002014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZRM8002040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZRM8002069S	69 ± 48 kPa (10 ± 7.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Maximum Working Pressure Differential:	40 MPa (5800 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.6 grams

MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Seal:	EPDM or FKM

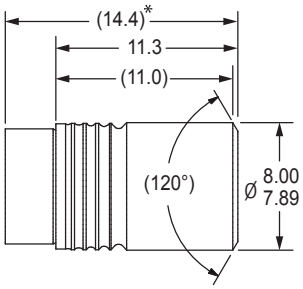
Other seal materials are available upon request.

INSTALLATION	
Installation Procedure:	IP CZFM 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

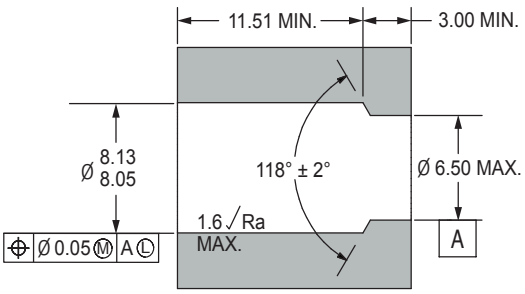
8 mm ZERO LEAK 316L CHECK VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

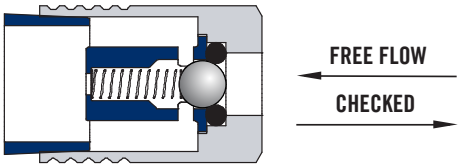
DIMENSIONAL VIEW



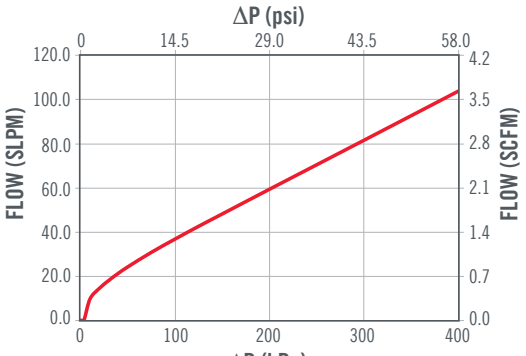
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 4 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZRM8041004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZRM8041007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZRM8041014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZRM8041040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZRM8041069S	69 ± 48 kPa (10 ± 7.0 psid)
EPDM	CZRM8042004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZRM8042007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZRM8042014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZRM8042040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZRM8042069S	69 ± 48 kPa (10 ± 7.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Maximum Working Pressure Differential:	40 MPa (5800 psid) checked direction 4 MPa (580 psid) flow direction
Weight:	2.6 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic
Seal:	EPDM or FKM

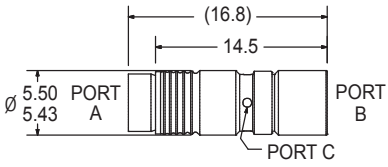
Other seal materials are available upon request.

INSTALLATION	
Installation Procedure:	IP CZRM 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

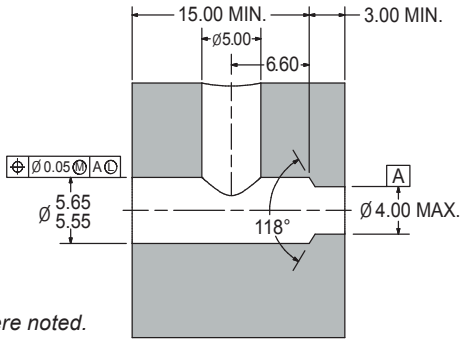
5.5 mm PILOT-OPERATED CHECK VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

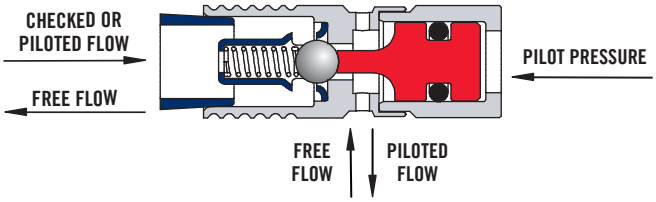
DIMENSIONAL VIEW



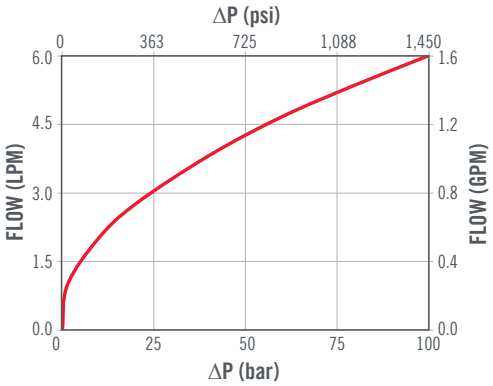
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON HYDRAULIC FLUID AT 27°C (80°F)



FLOW CURVE FROM PILOTED PORT A TO C, FOR 250 kPa VALVE

PERFORMANCE	
Piloted Lohm Rate [Port A to Port C]:	525 Lohms
Minimum Pilot Ratio [Port A Pressure / Port B Pressure]:	3:1
Checked Direction Leakage [Port A to Port B]:	20 SCCM max at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid)
Weight:	1.8 grams

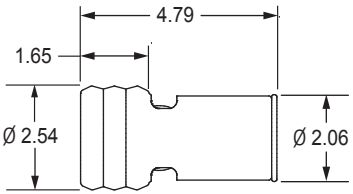
PART NUMBER	CRACKING PRESSURE**
POCR5531025S	250 ± 37.5 kPa (36.3 ± 5.4 psid)
POCR5531050S	500 ± 75 kPa (72.5 ± 10.9 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air. Measured from piloted Port A to Port C.

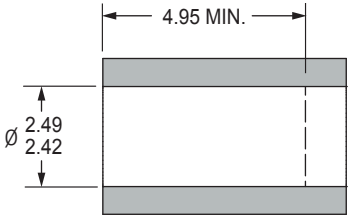
INSTALLATION	
Installation Procedure:	IP POCR 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	4.5 kN (min.) to 6.3 kN (max.)

MATERIALS	
Upper Body:	303 stainless steel
Lower Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Piston:	416 stainless steel
Seal:	FKM

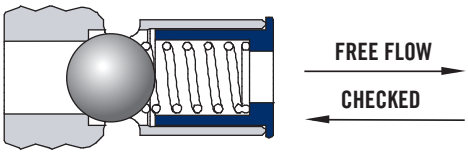
DIMENSIONAL VIEW



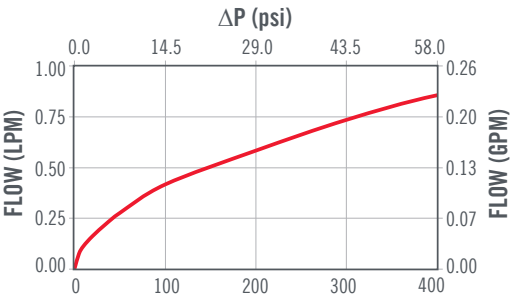
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI2510000S	0 kPa (no spring)
CCPI2510004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI2510007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI2510014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI2510040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI2510069S	69 ± 15 kPa (10 ± 2.2 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	750 Lohms
Leakage:	10 SCCM max. at 500 kPa (72.5 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.1 grams

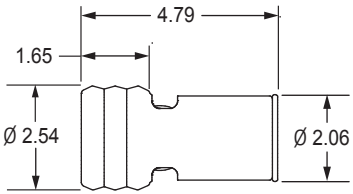
MATERIALS	
Body:	303 stainless steel
Ball Stop:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	For forward flow, IP 2.5 mm Press-In F; for reverse flow, IP 2.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0024277S; for reverse flow, CCRT0048048S

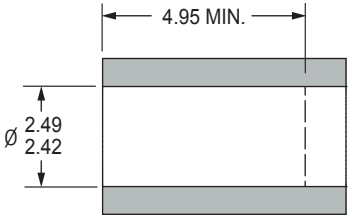
2.5 mm CHECK VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

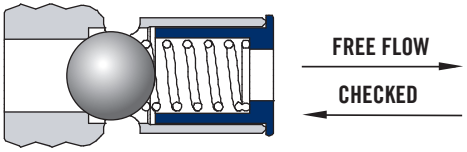
DIMENSIONAL VIEW



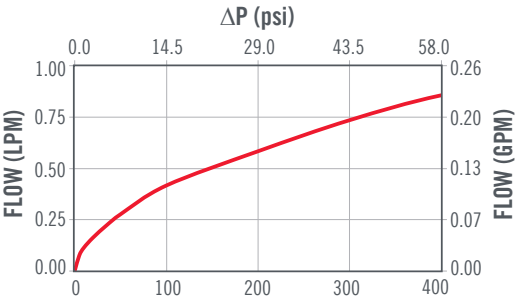
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI2580000S	0 kPa (no spring)
CCPI2580004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI2580007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI2580014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI2580040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI2580069S	69 ± 15 kPa (10 ± 2.2 psid)

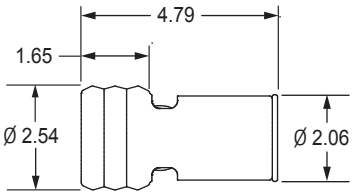
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	750 Lohms
Leakage:	10 SCCM max. at 500 kPa (72.5 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.09 grams

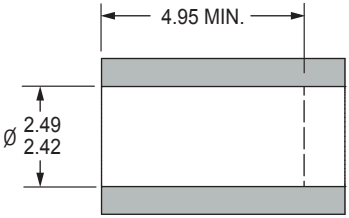
MATERIALS	
Body:	303 stainless steel
Ball Stop:	303 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	For forward flow, IP 2.5 mm Press-In F; for reverse flow, IP 2.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0024277S; for reverse flow, CCRT0048048S

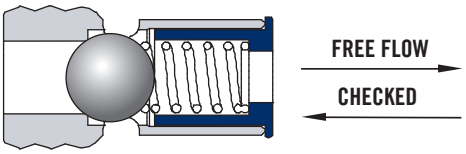
DIMENSIONAL VIEW



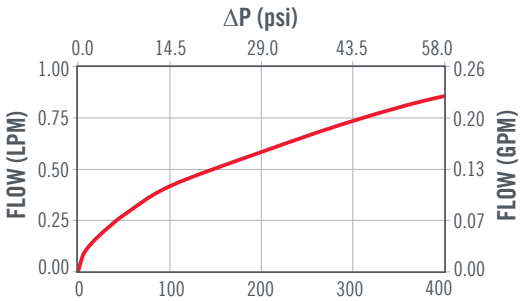
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	750 Lohms
Leakage:	10 SCCM max. at 500 kPa (72.5 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.09 grams

MATERIALS	
Body:	316L stainless steel
Ball Stop:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

PART NUMBER	CRACKING PRESSURE**
CCPI2540000S	0 kPa (no spring)
CCPI2540004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI2540007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI2540014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI2540040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI2540069S	69 ± 15 kPa (10 ± 2.2 psid)

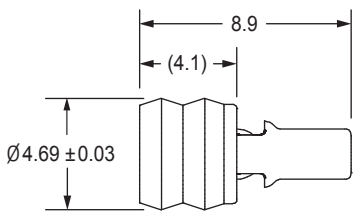
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	For forward flow, IP 2.5 mm Press-In F; for reverse flow, IP 2.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0024277S; for reverse flow, CCRT0048048S

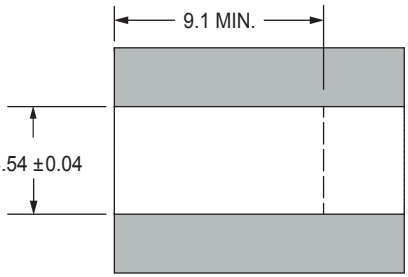
4.5 mm CHECK VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

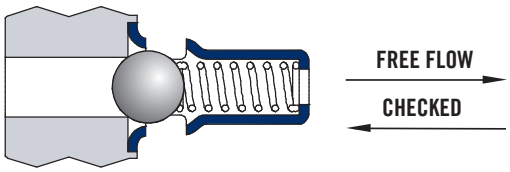
DIMENSIONAL VIEW



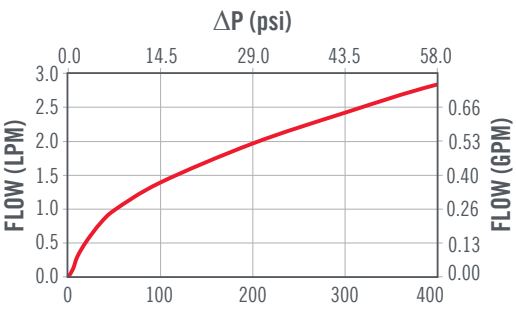
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.5 grams

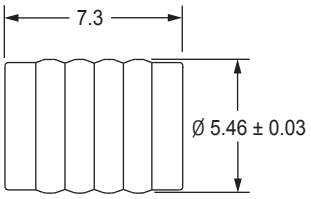
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

PART NUMBER	CRACKING PRESSURE**
CCPI4510000S	0 kPa (no spring)
CCPI4510004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI4510007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI4510014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI4510040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI4510069S	69 ± 15 kPa (10 ± 2.2 psid)

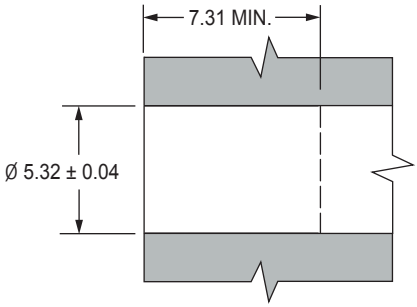
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	For forward flow, IP 4.5 mm Press-In F; for reverse flow, IP 4.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0055034S; for reverse flow, CCRT0055036S

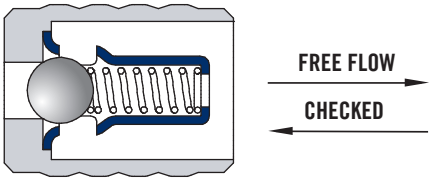
DIMENSIONAL VIEW



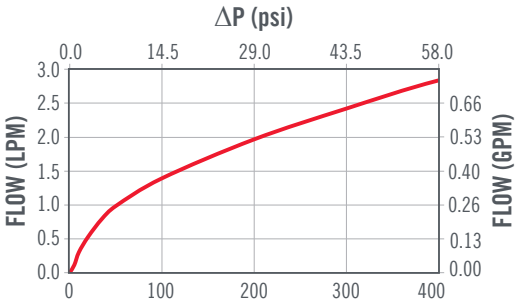
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI5510000S	0 kPa (no spring)
CCPI5510004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI5510007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI5510014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI5510040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI5510069S	69 ± 17.3 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.65 grams

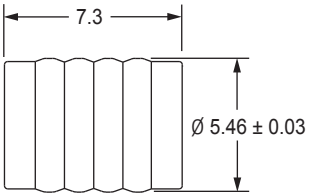
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

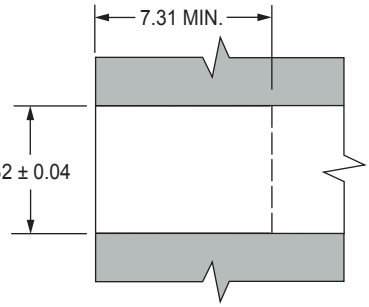
5.5 mm CHECK VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

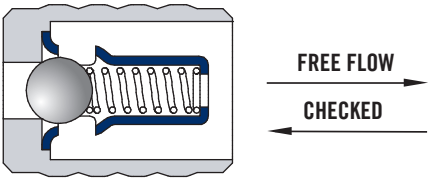
DIMENSIONAL VIEW



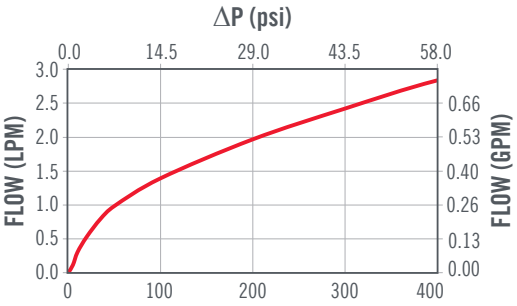
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI5580000S	0 kPa (no spring)
CCPI5580007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI5580014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI5580040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI5580069S	69 ± 17.3 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.65 grams

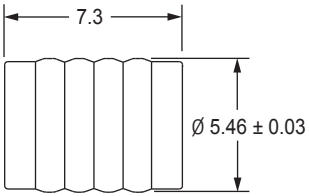
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

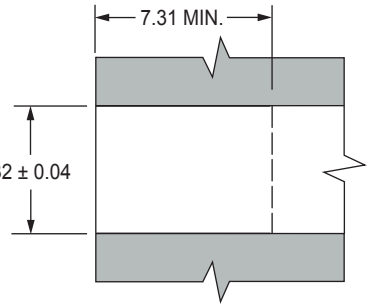
5.5 mm 316L CHECK VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

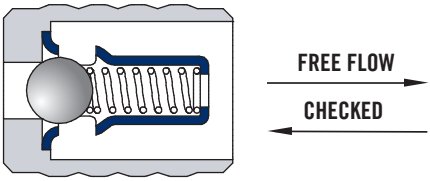
DIMENSIONAL VIEW



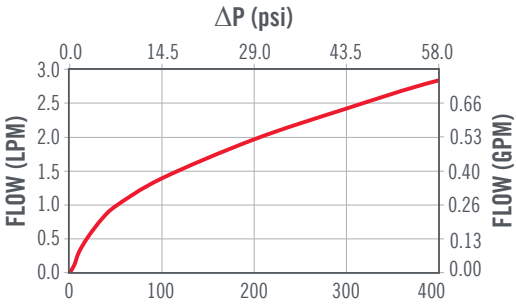
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.65 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

PART NUMBER	CRACKING PRESSURE**
CCPI5540000S	0 kPa (no spring)
CCPI5540007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI5540014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI5540040S	40 ± 15 kPa (6 ± 2.2 psid)

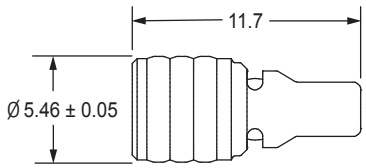
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

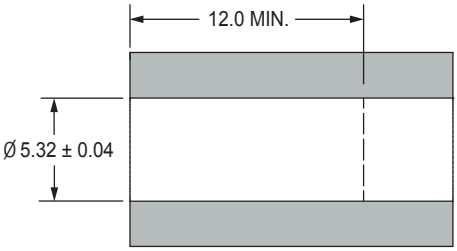
5.5 mm LC CHECK VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

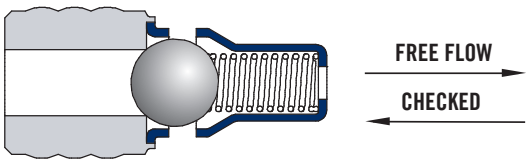
DIMENSIONAL VIEW



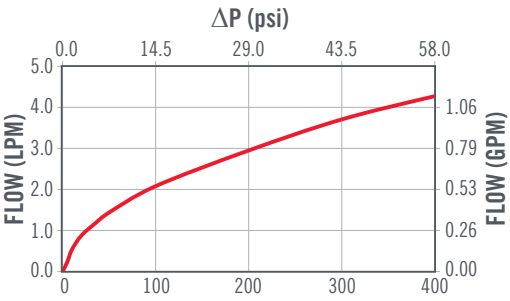
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CLCP5510000S	0 kPa (no spring)
CLCP5510004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CLCP5510007S	7 ± 5 kPa (1 ± 0.7 psid)
CLCP5510014S	14 ± 5 kPa (2 ± 0.7 psid)
CLCP5510040S	40 ± 15 kPa (6 ± 2.2 psid)
CLCP5510069S	69 ± 17.3 kPa (10 ± 2.5 psid)

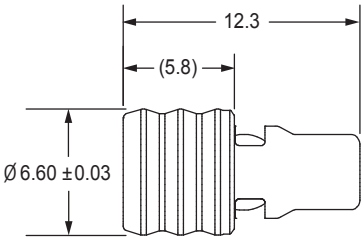
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	140 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.87 grams

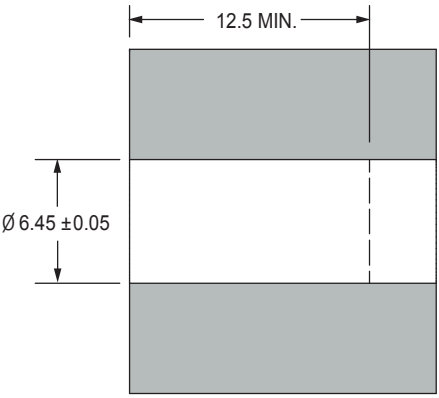
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	For forward flow, IP 558 LC Press-In F; for reverse flow, IP 558 LC Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0900170S; for reverse flow, CCRT0072391S

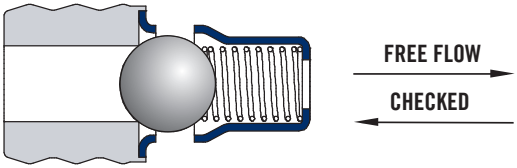
DIMENSIONAL VIEW



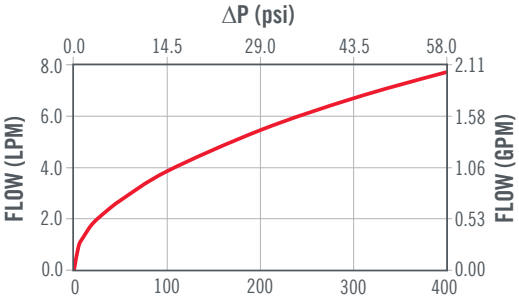
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI6510000S	0 kPa (no spring)
CCPI6510004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI6510007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI6510014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI6510040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI6510069S	69 ± 17.3 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

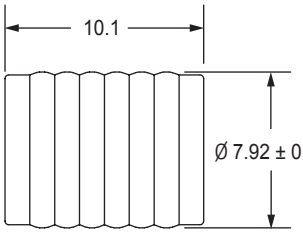
PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	1.5 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

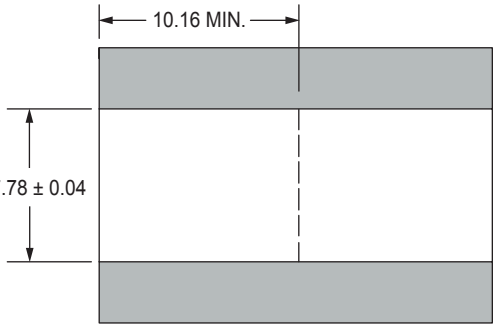
INSTALLATION	
Installation Procedure:	For forward flow, IP 6.5 mm Press-In F; for reverse flow, IP 6.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0086564S, for reverse flow, CCRT0056802S

8 mm CHECK VALVE
PRESS-IN: FOR INSTALLATION INTO PLASTIC

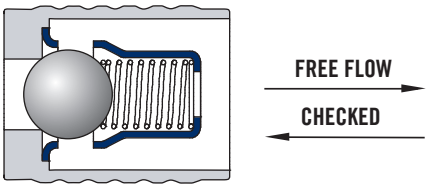
DIMENSIONAL VIEW



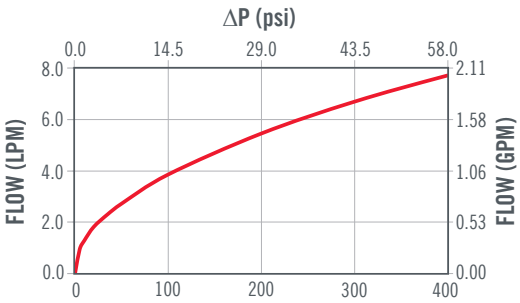
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI8010000S	0 kPa (no spring)
CCPI8010004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI8010007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI8010014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI8010040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI8010069S	69 ± 17.3 kPa (10 ± 2.5 psid)

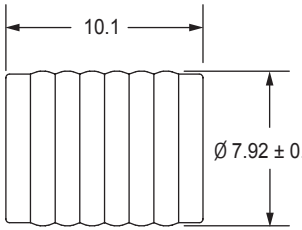
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	1.8 grams

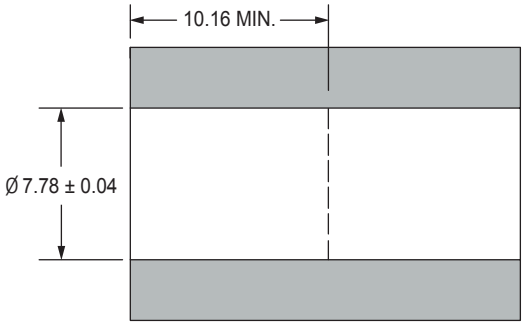
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

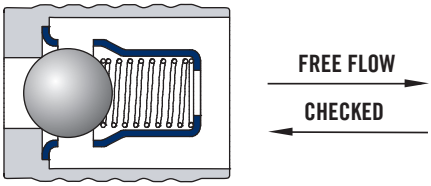
DIMENSIONAL VIEW



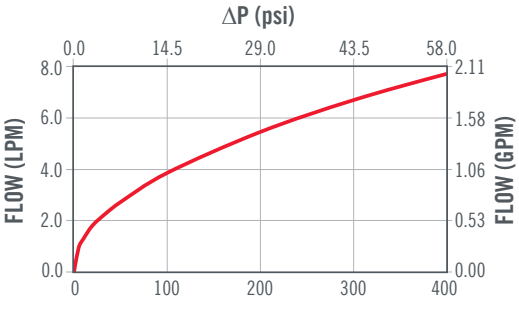
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI8080000S	0 kPa (no spring)
CCPI8080007S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI8080014S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI8080040S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI8080069S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI8080069S	69 ± 17.3 kPa (10 ± 2.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	1.75 grams

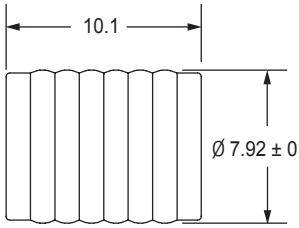
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 855 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

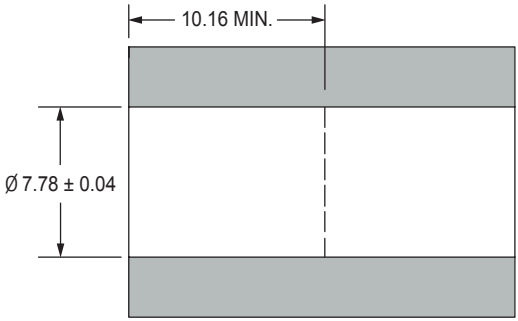
8 mm 316L CHECK VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

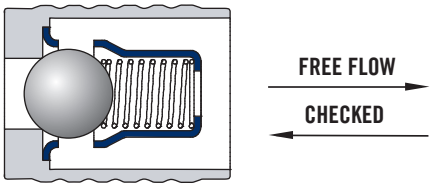
DIMENSIONAL VIEW



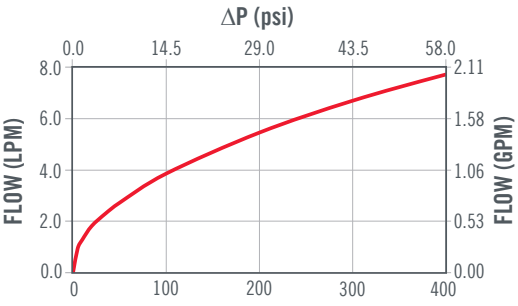
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI8040000S	0 kPa (no spring)
CCPI8040004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CCPI8040007S	7 ± 5 kPa (1 ± 0.7 psid)
CCPI8040014S	14 ± 5 kPa (2 ± 0.7 psid)
CCPI8040040S	40 ± 15 kPa (6 ± 2.2 psid)
CCPI8040069S	69 ± 15 kPa (10 ± 2.2 psid)

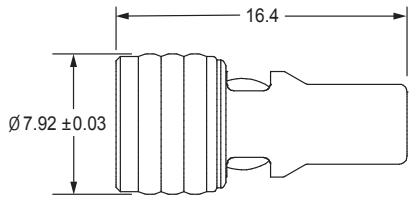
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	1.75 grams

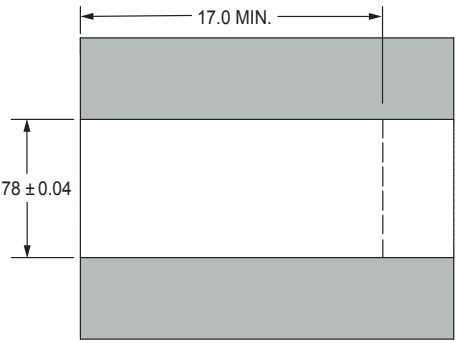
MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 855 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

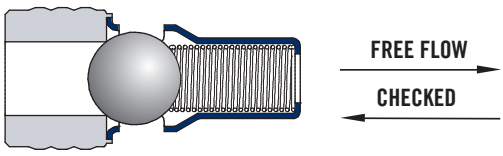
DIMENSIONAL VIEW



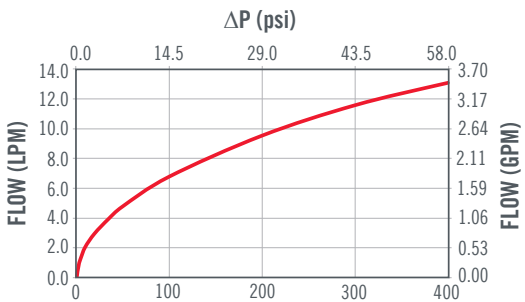
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 0 kPa VALVE

PERFORMANCE	
Lohm Rate:	45 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Weight:	2.5 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

PART NUMBER	CRACKING PRESSURE**
CLCP8010000S	0 kPa (no spring)
CLCP8010004S	4 ± 3 kPa (0.6 ± 0.4 psid)
CLCP8010007S	7 ± 5 kPa (1 ± 0.7 psid)
CLCP8010014S	14 ± 5 kPa (2 ± 0.7 psid)
CLCP8010040S	40 ± 15 kPa (6 ± 2.2 psid)
CLCP8010069S	69 ± 17.3 kPa (10 ± 2.5 psid)

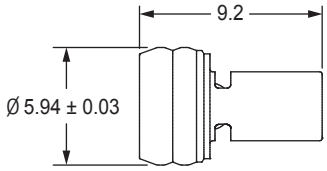
**The pressure at which uprun flow exceeds 300 SCCM of air.

INSTALLATION	
Installation Procedure:	For forward flow, IP 855 LC2 Press-In F; for reverse flow, IP 855 LC2 Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0900180S; for reverse flow, CCRT0065726S

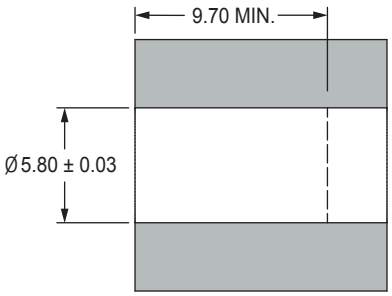
6 mm ZERO LEAK CHECK VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

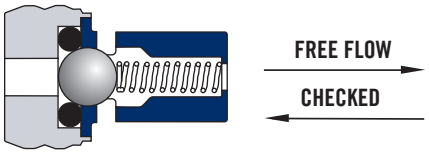
DIMENSIONAL VIEW



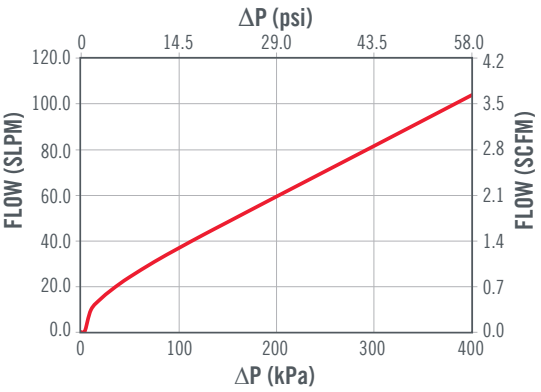
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 4 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZPM6001004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZPM6001007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZPM6001014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZPM6001040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZPM6001069S	69 ± 48 kPa (10 ± 7.0 psid)
EPDM	CZPM6002004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZPM6002007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZPM6002014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZPM6002040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZPM6002069S	69 ± 48 kPa (10 ± 7.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Weight:	0.9 grams

MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Seal:	EPDM or FKM

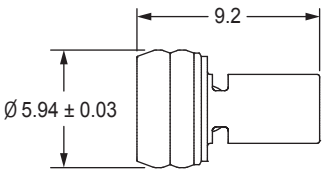
Other seal materials and brass versions are available upon request.

INSTALLATION	
Installation Procedure:	For forward flow, IP CZPM 6.0 F; for reverse flow, IP CZPM 6.0 R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0068699S; for reverse flow, CCRT0068697S

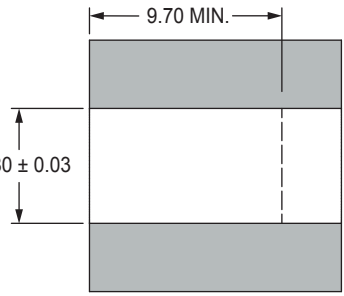
6 mm ZERO LEAK 316L CHECK VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

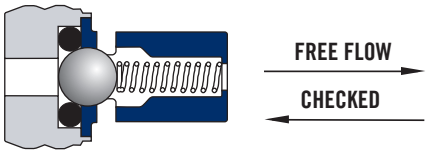
DIMENSIONAL VIEW



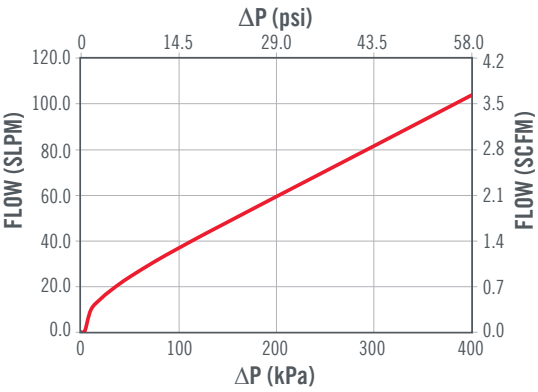
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 4 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZPM6041004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZPM6041007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZPM6041014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZPM6041040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZPM6041069S	69 ± 48 kPa (10 ± 7.0 psid)
EPDM	CZPM6042004S	4 ± 3 kPa (0.6 ± 0.4 psid)
	CZPM6042007S	7 ± 5 kPa (1 ± 0.7 psid)
	CZPM6042014S	14 ± 10 kPa (2 ± 1.4 psid)
	CZPM6042040S	40 ± 30 kPa (6 ± 4.4 psid)
	CZPM6042069S	69 ± 48 kPa (10 ± 7.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Weight:	0.9 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic
Seal:	EPDM or FKM

Other seal materials and brass versions are available upon request.

INSTALLATION	
Installation Procedure:	For forward flow, IP CZPM 6.0 F; for reverse flow, IP CZPM 6.0 R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0068699S; for reverse flow, CCRT0068697S

PRESSURE RELIEF VALVES



TABLE OF CONTENTS

INSERT: FOR INSTALLATION INTO METAL

Metal Seat Ball Pressure Relief Valves B4-B15

- 5.5 mm Pressure Relief Valves
- 5.5 mm LC Pressure Relief Valves
- 8 mm Pressure Relief Valves
- 8 mm LC Pressure Relief Valves

Metal Seat Poppet Pressure Relief Valves B16-B19

- 5.5 mm Poppet Pressure Relief Valves
- 8 mm Poppet Pressure Relief Valves

Elastomer Seat Ball Pressure Relief Valves B20-B21

- 6 mm Zero Leak Pressure Relief Valves
- 8 mm Zero Leak Pressure Relief Valves

PRESS-IN: FOR INSTALLATION INTO PLASTIC

Metal Seat Ball Pressure Relief Valves B22-B34

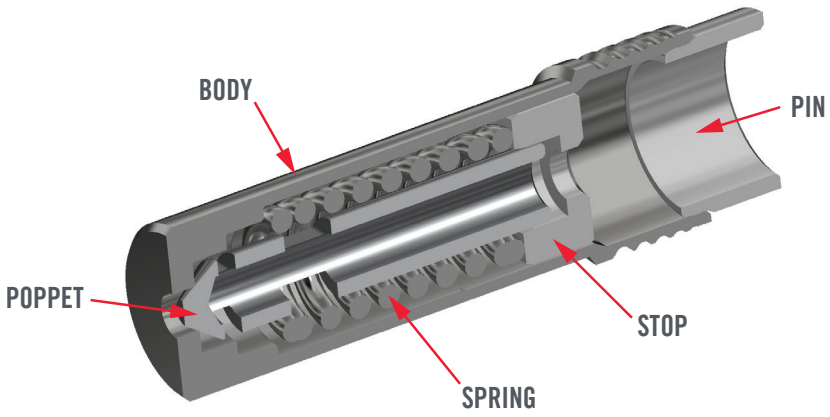
- 2.5 mm Pressure Relief Valves
- 4.5 mm Pressure Relief Valves
- 5.5 mm Pressure Relief Valves
- 5.5 mm LC Pressure Relief Valves
- 6.5 mm Pressure Relief Valves
- 8 mm Pressure Relief Valves
- 8 mm LC Pressure Relief Valves

Elastomer Seat Ball Pressure Relief Valves B35

- 6 mm Zero Leak Pressure Relief Valves

WHAT IS A PRESSURE RELIEF VALVE?

A pressure relief valve is a mechanical device which allows a gas or liquid to escape from a section of a fluidic system when the pressure exceeds a predetermined limit.



ENGINEERED FOR SUPERIOR PERFORMANCE

The Lee Company offers a wide range of pressure relief valves designed to be the smallest and most reliable relief valves available. Every valve is engineered to meet exacting standards, ensuring consistent performance in a compact, easy-to-install design.

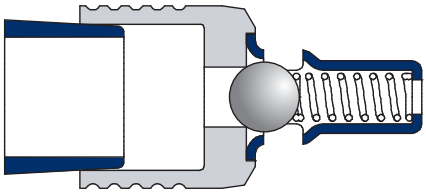
Designed for seamless installation in both metal and plastic manifolds, Lee pressure relief valves respond rapidly and reliably to protect hydraulic systems from overpressurization and pressure spikes. Their design guarantees repeatable performance and stable flow, all within an ultra-compact footprint. Lee pressure relief valves are **leak tight**, enabling efficient system performance even under demanding conditions. **Metal-to-metal sealing** helps ensure **long life, high reliability**, and a **repeatable cracking pressure**. Their design delivers **fast response** and **low hysteresis**. Every valve is **100% tested**, helping to eliminate rework.

PRESSURE RELIEF VALVES

The following section provides information on available pressure relief valve configurations.

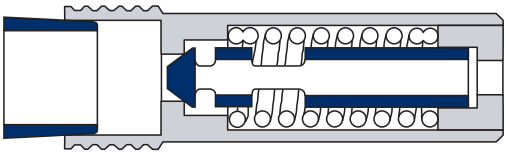
BALL PRESSURE RELIEF VALVES

Ball pressure relief valve designs provide rapid response, minimal hysteresis, and consistent cracking pressures. Available in multiple diameters, these valves can be configured for forward or reverse flow and feature a metal or elastomeric seat. For enhanced protection, an integral safety screen can be added to guard against contamination.



POPPET PRESSURE RELIEF VALVES

Our poppet pressure relief valves deliver rapid response, stable flow, and higher cracking pressure capability with lower hysteresis than conventional ball type valves. These valves combine exceptional flow capacity in a miniaturized package, outperforming legacy and in-house designs. Standard offerings are rated for relief pressures up to 280 bar, but we can engineer custom solutions for higher requirements.



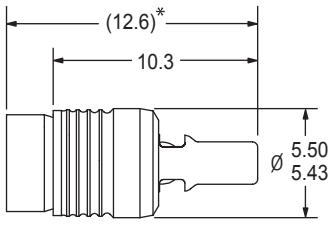
CUSTOMIZATION OPTIONS

Each model is constructed from all stainless steel, with select designs incorporating a ceramic ball or 316L stainless steel for compatibility with a wide variety of liquids and gases. For applications where zero leakage is required, an elastomeric valve seat helps provide improved checked direction leakage performance. Designs are also available in forward and reverse flow configurations to allow engineers more flexibility. Because modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. For more information or design support, please contact a Lee Sales Engineer.

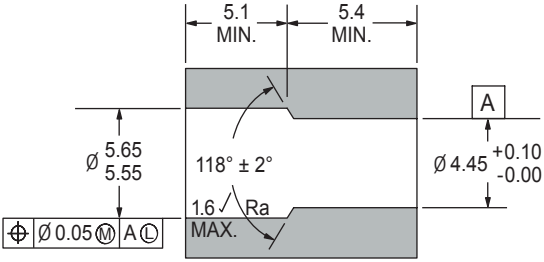
5.5 mm PRESSURE RELIEF VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

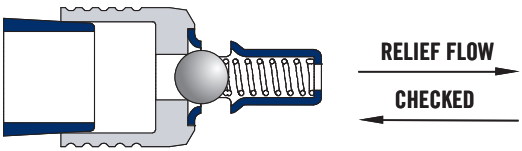
DIMENSIONAL VIEW



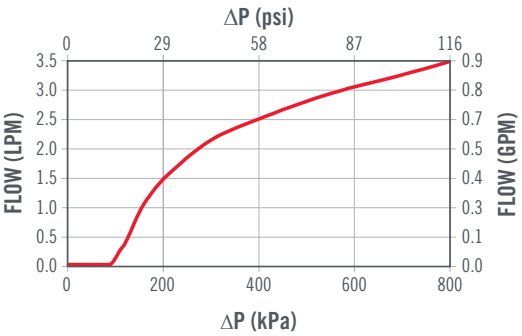
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
PCFM2550210S	100 kPa (14.5 psid)
PCFM2550215S	150 kPa (21.8 psid)
PCFM2550220S	200 kPa (29 psid)
PCFM2550225S	250 kPa (36.6 psid)
PCFM2550230S	300 kPa (43.5 psid)
PCFM2550235S	350 kPa (50.8 psid)
PCFM2550240S	400 kPa (58 psid)
PCFM2550250S	500 kPa (72.5 psid)
PCFM2550255S	550 kPa (79.8 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	0.7 grams

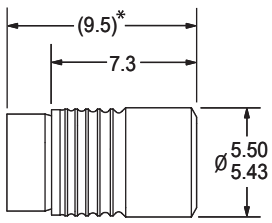
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

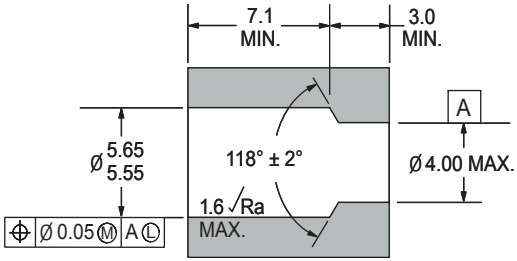
5.5 mm PRESSURE RELIEF VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

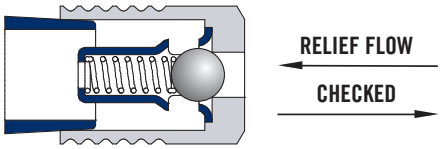
DIMENSIONAL VIEW



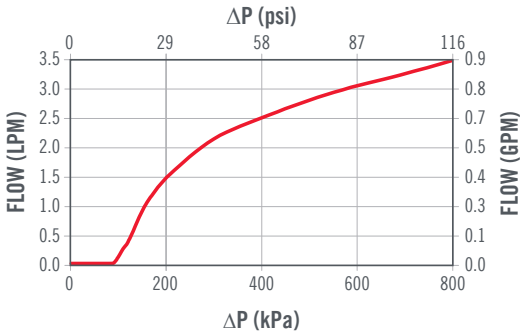
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	0.85 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

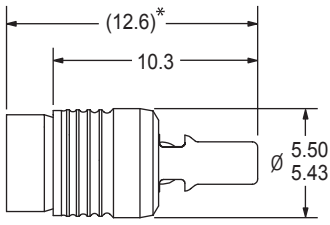
PART NUMBER	CRACKING PRESSURE**
PCRM2550210S	100 kPa (14.5 psid)
PCRM2550215S	150 kPa (21.8 psid)
PCRM2550220S	200 kPa (29 psid)
PCRM2550225S	250 kPa (36.6 psid)
PCRM2550230S	300 kPa (43.5 psid)
PCRM2550235S	350 kPa (50.8 psid)
PCRM2550240S	400 kPa (58 psid)
PCRM2550250S	500 kPa (72.5 psid)
PCRM2550255S	550 kPa (79.8 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

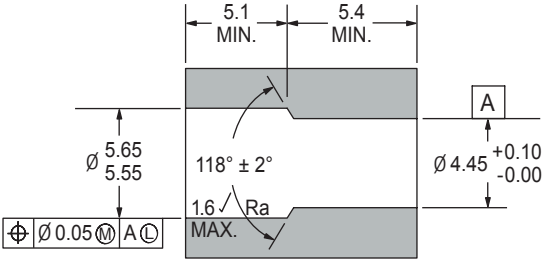
5.5 mm 316L PRESSURE RELIEF VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

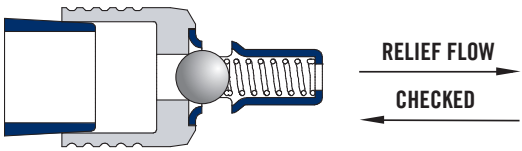
DIMENSIONAL VIEW



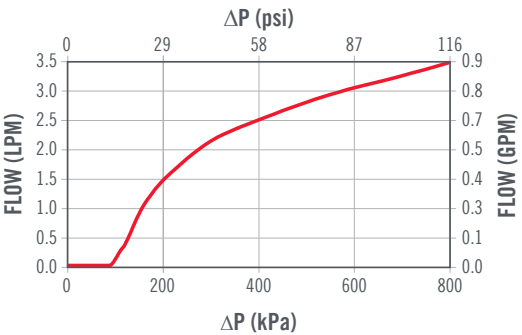
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	0.73 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

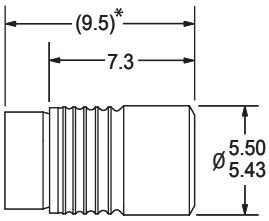
PART NUMBER	CRACKING PRESSURE**
PCFM2554810S	100 kPa (14.5 psid)
PCFM2554815S	150 kPa (21.8 psid)
PCFM2554820S	200 kPa (29 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

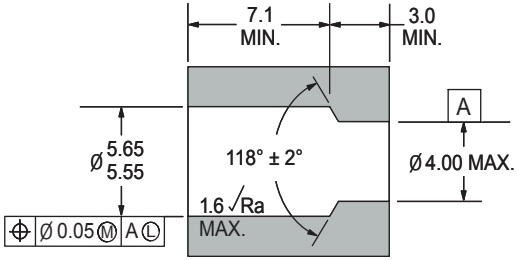
5.5 mm 316L PRESSURE RELIEF VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

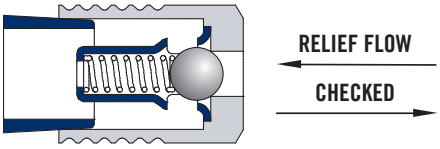
DIMENSIONAL VIEW



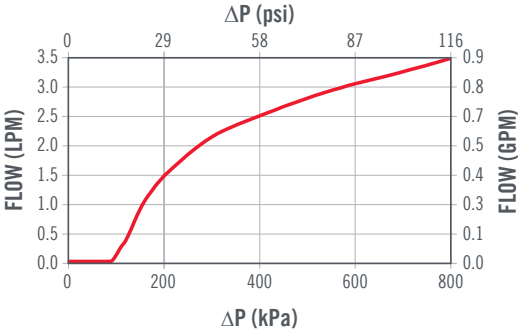
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	0.87 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

PART NUMBER	CRACKING PRESSURE**
PCRM2554810S	100 kPa (14.5 psid)
PCRM2554815S	150 kPa (21.8 psid)
PCRM2554820S	200 kPa (29 psid)

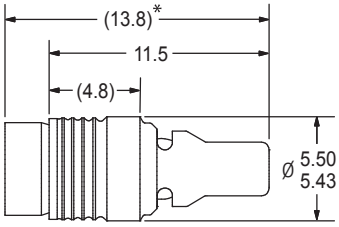
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert - Unscreened (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

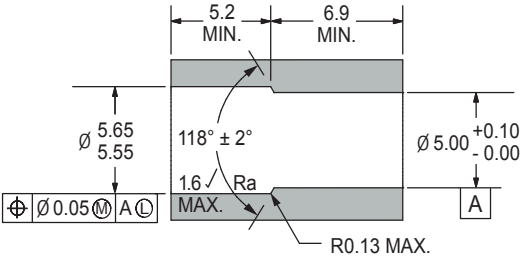
5.5 mm LC PRESSURE RELIEF VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

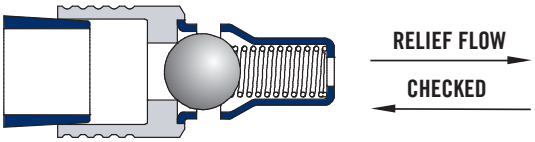
DIMENSIONAL VIEW



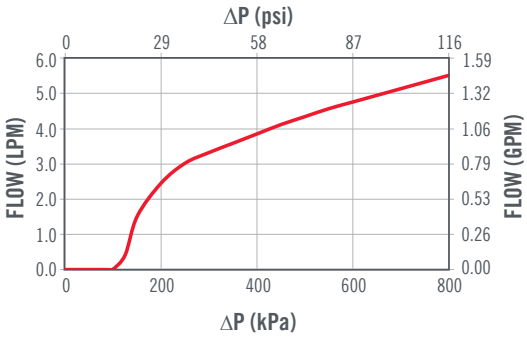
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	150 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	1.0 gram

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 LC Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

PART NUMBER	CRACKING PRESSURE**
CLCF5510100S	100 kPa (14.5 psid)
CLCF5510200S	200 kPa (29 psid)
CLCF5510300S	300 kPa (43.5 psid)
CLCF5510400S	400 kPa (58 psid)
CLCF5510500S	500 kPa (72.5 psid)

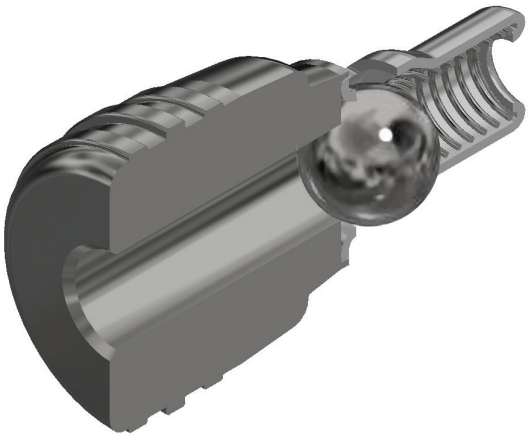
**The pressure at which uprun flow exceeds 50 SCCM of air.

LOOKING FOR A REVERSE VERSION?

The 5.5 mm LC Pressure Relief Valve offers higher flow rates than our other standard 5.5 mm version valves, but in a forward flow version only. If you need a higher flow rate, but in a reverse configuration, customers can often use another standard option—such as the reverse configuration of our 8 mm Pressure Relief Valve (see page B11)—as a suitable alternative. Please contact a Lee Sales Engineer so that we can find the best solution for your application requirements. With our diverse product portfolio, it's likely that we already have the precise flow control solution you need.

CUSTOM CAPABILITIES

We routinely modify our standard offering to meet application requirements without significantly increasing costs or lead times. Because these modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. Over 80% of our sales to automotive and industrial customers are customized versions of our standard products. And with our rapid prototyping capabilities, we can make sure you have a solution in hand every step of the way.

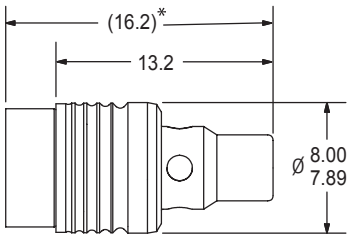


Custom configurations can be made for specific flow requirements or unique external geometry for retention in application specific housings. Contact your local Lee Sales Engineer to discuss your application requirements.

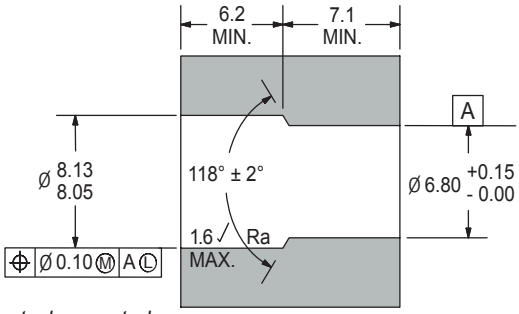
8 mm PRESSURE RELIEF VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

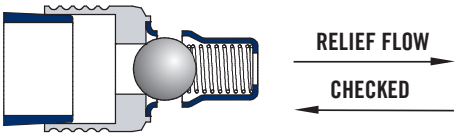
DIMENSIONAL VIEW



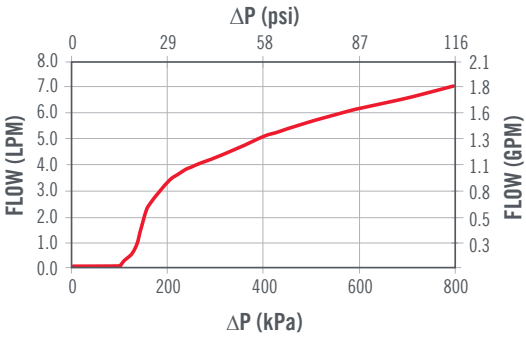
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
PCFM3800210S	100 kPa (14.5 psid)
PCFM3800215S	150 kPa (21.8 psid)
PCFM3800220S	200 kPa (29 psid)
PCFM3800225S	250 kPa (36.6 psid)
PCFM3800230S	300 kPa (43.5 psid)
PCFM3800235S	350 kPa (50.8 psid)
PCFM3800240S	400 kPa (58 psid)
PCFM3800250S	500 kPa (72.5 psid)
PCFM3800255S***	550 kPa (79.8 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	120 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	1.85 grams

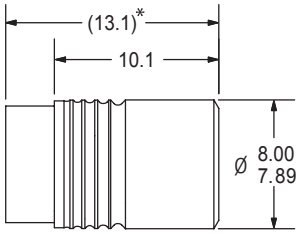
MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302/17-7*** stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

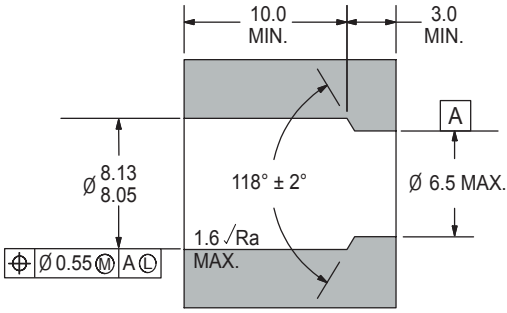
8 mm PRESSURE RELIEF VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

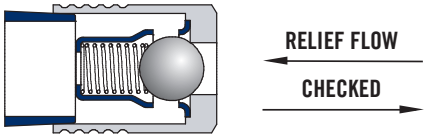
DIMENSIONAL VIEW



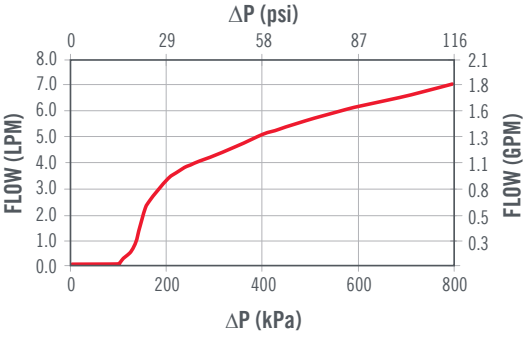
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
PCRM3800210S	100 kPa (14.5 psid)
PCRM3800215S	150 kPa (21.8 psid)
PCRM3800220S	200 kPa (29 psid)
PCRM3800225S	250 kPa (36.6 psid)
PCRM3800230S	300 kPa (43.5 psid)
PCRM3800235S	350 kPa (50.8 psid)
PCRM3800240S	400 kPa (58 psid)
PCRM3800250S	500 kPa (72.5 psid)
PCRM3800255S***	550 kPa (79.8 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	120 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	2.3 grams

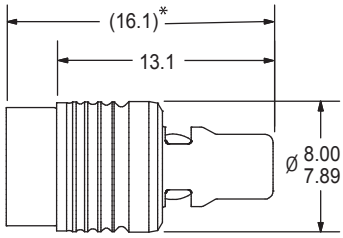
MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302/17-7*** stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

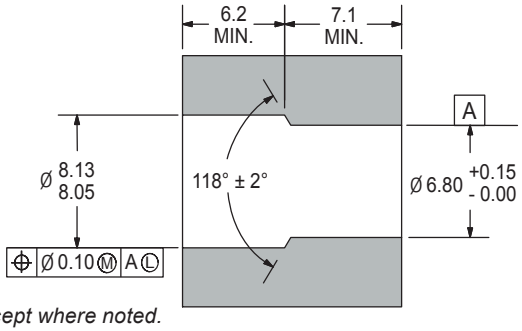
8 mm 316L PRESSURE RELIEF VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

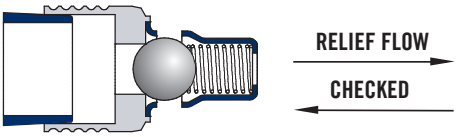
DIMENSIONAL VIEW



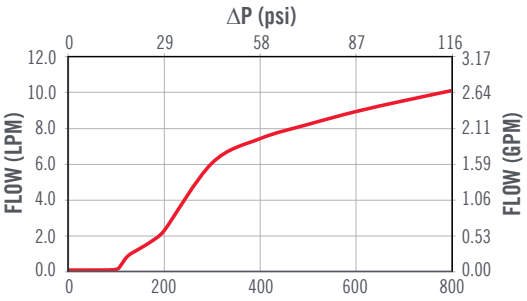
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.*



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	16 MPa (2320 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	1.75 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 855 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

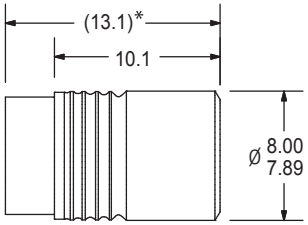
PART NUMBER	CRACKING PRESSURE**
PCFM2804810S	100 kPa (14.5 psid)
PCFM2804815S	150 kPa (21.8 psid)
PCFM2804820S	200 kPa (29 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

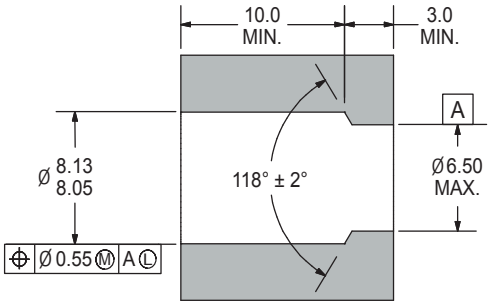
8 mm 316L PRESSURE RELIEF VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

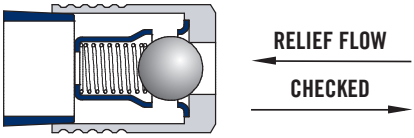
DIMENSIONAL VIEW



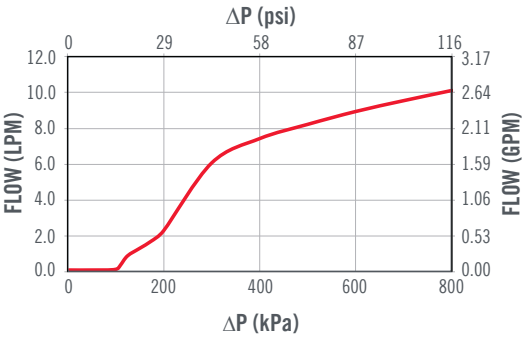
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	2.25 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Pin:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

PART NUMBER	CRACKING PRESSURE**
PCRM2804810S	100 kPa (14.5 psid)
PCRM2804815S	150 kPa (21.8 psid)
PCRM2804820S	200 kPa (29 psid)

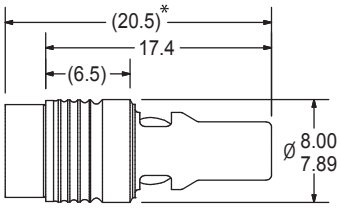
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	IP 855 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

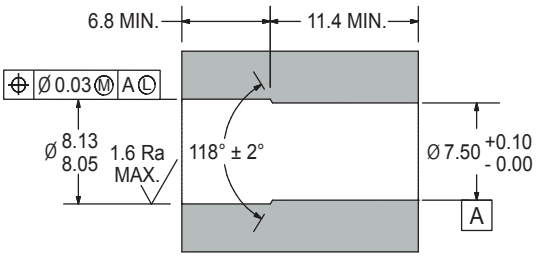
8 mm LC PRESSURE RELIEF VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

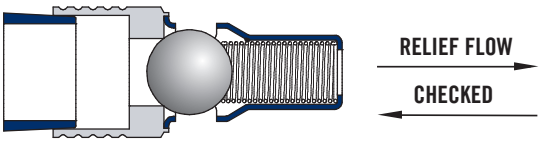
DIMENSIONAL VIEW



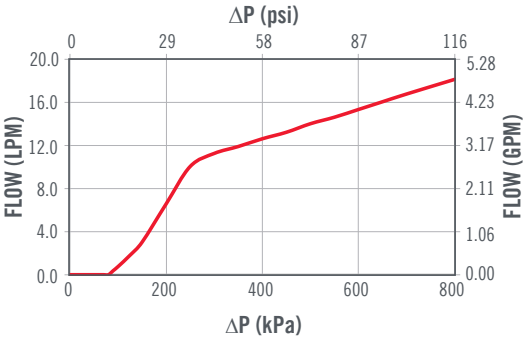
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	45 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	2.35 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 LC2 Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

PART NUMBER	CRACKING PRESSURE**
CLCF8010100S	100 kPa (14.5 psid)
CLCF8010200S	200 kPa (29 psid)
CLCF8010300S	300 kPa (43.5 psid)
CLCF8010400S	400 kPa (58 psid)
CLCF8010500S	500 kPa (72.5 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

LOOKING FOR A REVERSE VERSION?

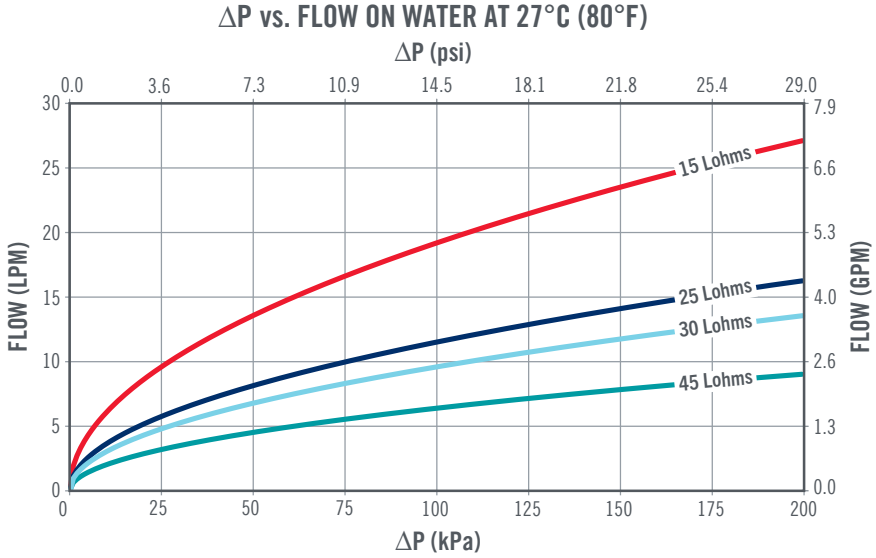
The 8 mm LC Pressure Relief Valve offers higher flow rates than our other standard 8 mm version valves, but in a forward flow version only. If you need a higher flow rate, but in a reverse configuration, we can offer custom solutions in a larger diameter as a suitable alternative. Please contact a Lee Sales Engineer so that we can review your application and find the best solution for your requirements. With our diverse product portfolio, it's likely that we already have the precise flow control solution you need.

CUSTOM CAPABILITIES

We routinely modify our standard offering to meet application requirements without significantly increasing costs or lead times. Because these modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. Over 80% of our sales to automotive and industrial customers are customized versions of our standard products. And with our rapid prototyping capabilities, we can make sure you have a solution in hand every step of the way.

LOOKING FOR EVEN MORE FLOW?

Our products are small but are designed to be as efficient as possible to save on space and weight. We have developed custom capabilities to provide our customers with even higher flowing custom valves to meet their flow requirements.



This graph represents flow curves for valves up to Ø14 mm. Multiple sizes are available. Contact your local Lee Sales Engineer for more information and to discuss your application requirements.

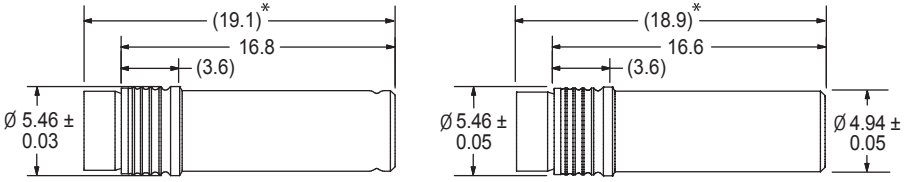
5.5 mm POPPET PRESSURE RELIEF VALVE

INSERT: FOR INSTALLATION INTO METAL

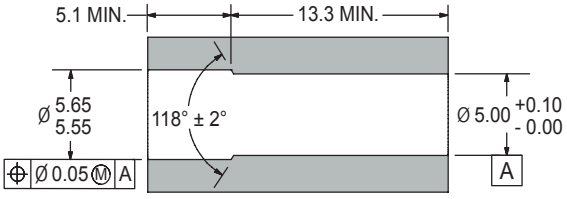
FORWARD FLOW

REVERSE FLOW

DIMENSIONAL VIEW

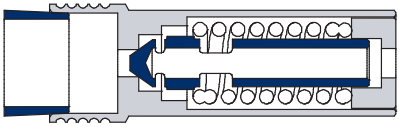


INSTALLATION HOLE



Overall length before installation. All dimensions are in millimeters, except where noted.

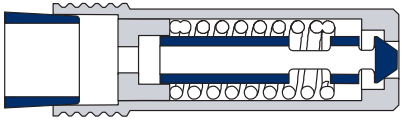
FORWARD FLOW



RELIEF FLOW

CHECKED

REVERSE FLOW



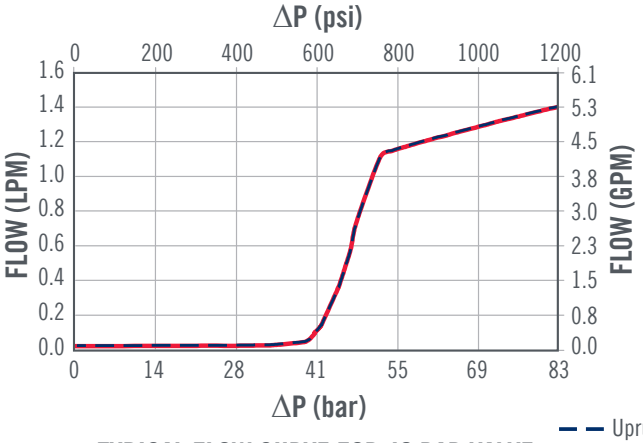
RELIEF FLOW

CHECKED

PART NUMBER		NOMINAL CRACKING PRESSURE**	FULL OPEN LOHM RATE
FORWARD FLOW	REVERSE FLOW		
PCHF5520020S	PCHR5520020S	20 bar (290 psi)	650 Lohms
PCHF5520040S	PCHR5520040S	40 bar (580 psi)	650 Lohms
PCHF5520060S	PCHR5520060S	60 bar (870 psi)	650 Lohms
PCHF5520080S	PCHR5520080S	80 bar (1160 psi)	650 Lohms
PCHF5520100S	PCHR5520100S	100 bar (1450 psi)	650 Lohms

**Custom and higher cracking pressure versions are available. Contact your local Lee Sales Engineer to discuss your application requirements.

ΔP vs. FLOW ON HYDRAULIC FLUID AT 45°C (113°F)



TYPICAL FLOW CURVE FOR 40 BAR VALVE

MATERIALS	
Body:	303 stainless steel
Stop:	416 stainless steel
Pin:	416 stainless steel
Spring:	17-7 stainless steel
Poppet:	416 stainless steel

INSTALLATION	
Installation Procedure:	For forward flow, IP PCHF 5.5; for reverse flow, IP PCHR 5.5 (files available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

PERFORMANCE	
Uprun Leakage:	Less than 1.0 CCM at 90% of nominal cracking pressure
Flow Point:	125% of nominal cracking pressure
Reseat:	Less than 0.05 LPM at 88% of nominal cracking pressure
Maximum Working Pressure Differential:	280 bar (4060 psi) checked direction 280 bar (4060 psi) relief direction
Weight:	1.7 - 1.76 grams

All flows are specified on hydraulic oil at 45°C (113°F).

UPRUN LEAKAGE		FLOW POINT		RESEAT PRESSURE (bar)
MAX. LEAKAGE (CCM)	PRESSURE (bar)	MIN. FLOW (LPM)	PRESSURE (bar)	FLOW LESS THAN 0.05 LPM
1	18	1.0	25	17.6
1	36	1.8	50	35.2
1	54	2.5	75	52.8
1	72	3.0	100	70.4
1	90	3.5	125	88.0

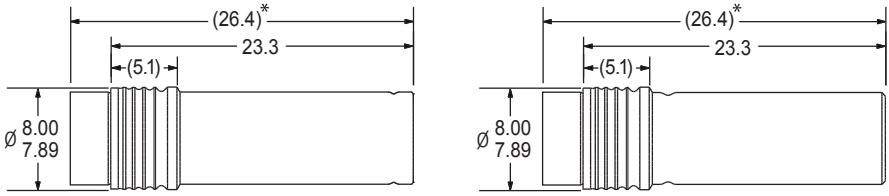
8 mm POPPET PRESSURE RELIEF VALVE

INSERT: FOR INSTALLATION INTO METAL

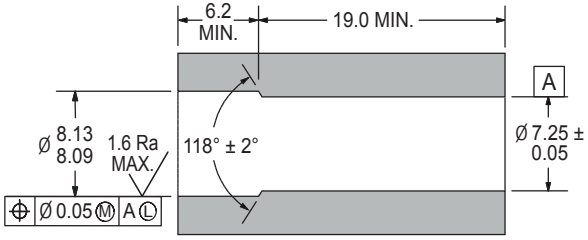
FORWARD FLOW

REVERSE FLOW

DIMENSIONAL VIEW

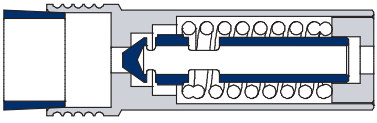


INSTALLATION HOLE



Overall length before installation. All dimensions are in millimeters, except where noted.

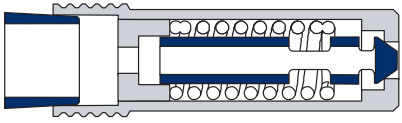
FORWARD FLOW



RELIEF FLOW →

← CHECKED

REVERSE FLOW



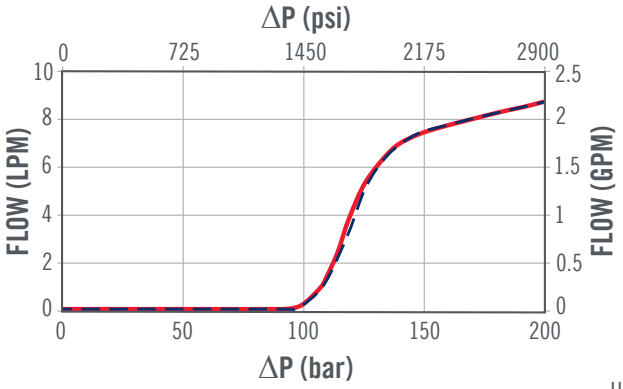
← RELIEF FLOW

CHECKED →

PART NUMBER		NOMINAL CRACKING PRESSURE**	FULL OPEN LOHM RATE
FORWARD FLOW	REVERSE FLOW		
PCHF8010020S	PCHR8010020S	20 bar (290 psi)	150 Lohms
PCHF8010040S	PCHR8010040S	40 bar (580 psi)	150 Lohms
PCHF8010060S	PCHR8010060S	60 bar (870 psi)	150 Lohms
PCHF8010080S	PCHR8010080S	80 bar (1160 psi)	550 Lohms
PCHF8010100S	PCHR8010100S	100 bar (1450 psi)	550 Lohms
PCHF8010140S	PCHR8010140S	140 bar (2030 psi)	750 Lohms
PCHF8010180S	PCHR8010180S	180 bar (2610 psi)	750 Lohms
PCHF8010220S	PCHR8010220S	220 bar (3191 psi)	750 Lohms
PCHF8010240S	PCHR8010240S	240 bar (3481 psi)	450 Lohms
PCHF8010260S	PCHR8010260S	260 bar (3771 psi)	450 Lohms
PCHF8010280S	PCHR8010280S	280 bar (4061 psi)	450 Lohms

**Custom and higher cracking pressure versions are available. Contact your local Lee Sales Engineer to discuss your application requirements.

ΔP vs. FLOW ON HYDRAULIC FLUID AT 45°C (113°F)



TYPICAL FLOW CURVE FOR 100 BAR VALVE

Uprun Flow
Downrun Flow

MATERIALS	
Body:	303 stainless steel
Stop:	416 stainless steel
Pin:	416 stainless steel
Spring:	17-7 stainless steel
Poppet:	416 stainless steel

INSTALLATION	
Installation Procedure:	IP PCHF/R 8.0 (file available at: theleeco.com/installation)
Installation Tool Drawing:	CCRT0900120S
Installation Force:	6.6 kN max.

PERFORMANCE	
Uprun Leakage:	Less than 5.0 CCM at 90% of nominal cracking pressure
Flow Point:	130% of nominal cracking pressure
Reseat:	Less than 0.05 LPM at 88% of nominal cracking pressure
Maximum Working Pressure Differential:	400 bar (5802 psi) checked direction 400 bar (5802 psi) relief direction
Weight:	4.4 - 4.65 grams

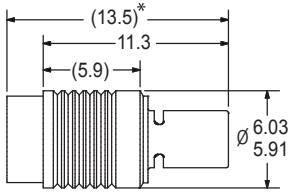
All flows are specified on hydraulic oil at 45°C (113°F).

UPRUN LEAKAGE		FLOW POINT		RESEAT PRESSURE (bar)
MAX. LEAKAGE (CCM)	PRESSURE (bar)	MIN. FLOW (LPM)	PRESSURE (bar)	FLOW LESS THAN 0.05 LPM
5	18	6.00	28	17.6
5	36	12.00	52	35.2
5	54	18.00	78	52.8
5	72	3.00	104	70.4
5	90	3.25	130	88.0
5	126	3.50	182	123.2
5	162	4.00	234	158.4
5	198	4.50	286	193.6
10	216	5.00	312	211.2
10	234	5.00	338	228.8
10	252	7.00	364	246.4

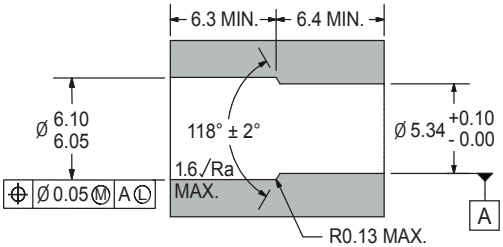
6 mm ZERO LEAK PRESSURE RELIEF VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

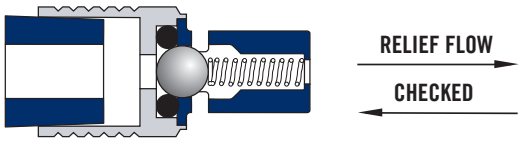
DIMENSIONAL VIEW



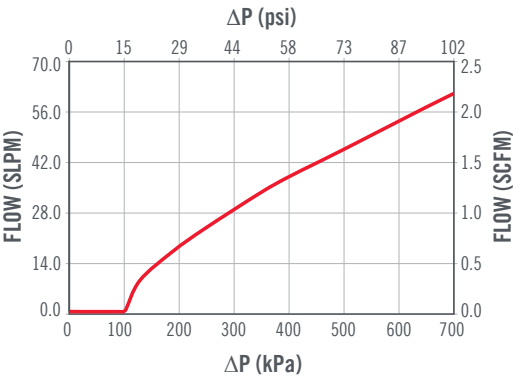
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	700 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Maximum Working Pressure Differential:	40 MPa (5800 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	1.3 grams

MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Seal:	EPDM or FKM

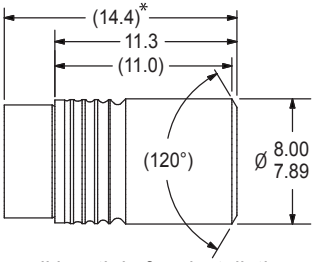
Other seal materials are available upon request.

INSTALLATION	
Installation Procedure:	IP CZFM 6.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0051078S
Installation Force:	See installation procedure

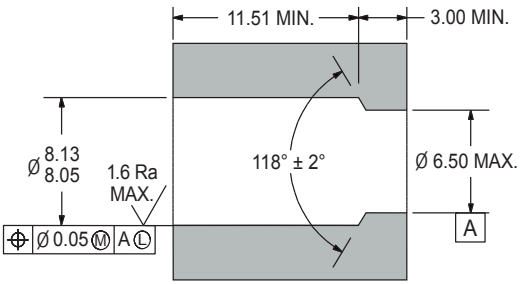
SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZFM6001100S	100 kPa (14.5 psid)
	CZFM6001200S	200 kPa (29.0 psid)
	CZFM6001300S	300 kPa (43.5 psid)
	CZFM6001400S	400 kPa (58.0 psid)
EPDM	CZFM6002100S	100 kPa (14.5 psid)
	CZFM6002200S	200 kPa (29.0 psid)
	CZFM6002300S	300 kPa (43.5 psid)
	CZFM6002400S	400 kPa (58.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

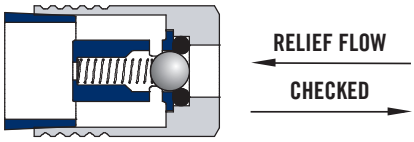
DIMENSIONAL VIEW



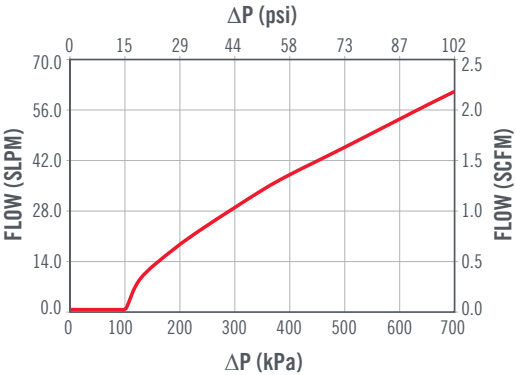
INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZRM8001100S	100 kPa (14.5 psid)
	CZRM8001200S	200 kPa (29.0 psid)
	CZRM8001300S	300 kPa (43.5 psid)
	CZRM8001400S	400 kPa (58.0 psid)
EPDM	CZRM8002100S	100 kPa (14.5 psid)
	CZRM8002200S	200 kPa (29.0 psid)
	CZRM8002300S	300 kPa (43.5 psid)
	CZRM8002400S	400 kPa (58.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	700 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa).
Maximum Working Pressure Differential:	40 MPa (5800 psid) checked direction 4 MPa (580 psid) relief direction
Cracking Pressure Tolerance:	± 15%
Weight:	2.6 grams

MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Seal:	EPDM or FKM

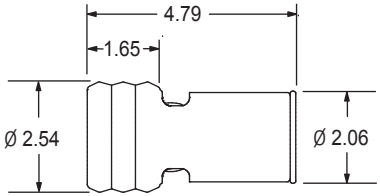
Other seal materials are available upon request.

INSTALLATION	
Installation Procedure:	IP CZRM 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

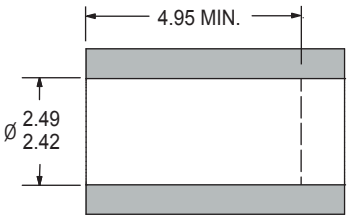
2.5 mm PRESSURE RELIEF VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

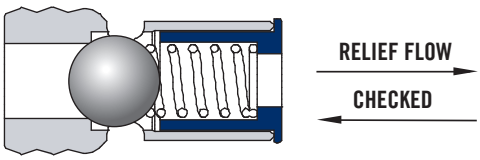
DIMENSIONAL VIEW



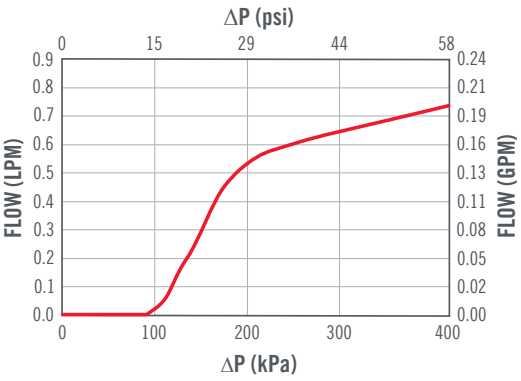
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI2510100S	100 kPa (14.5 psid)
CCPI2510150S	150 kPa (21.8 psid)
CCPI2510200S	200 kPa (29 psid)
CCPI2510250S	250 kPa (36.6 psid)
CCPI2510300S	300 kPa (43.5 psid)
CCPI2510345S	345 kPa (50 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	750 Lohms
Leakage:	10 SCCM max. at 500 kPa (725 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	0.1 grams

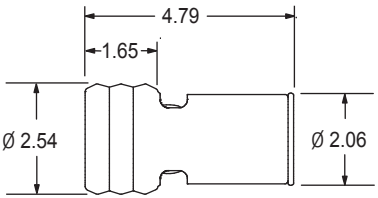
MATERIALS	
Body:	303 stainless steel
Ball Stop:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	For forward flow, IP 2.5 mm Press-In F; for reverse flow: IP 2.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool Drawing:	For forward flow, CCRT0024277S for reverse flow, CCRT0048048S

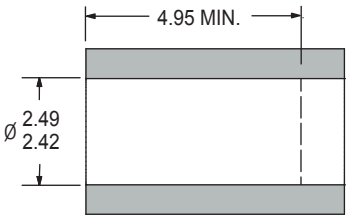
2.5 mm PRESSURE RELIEF VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

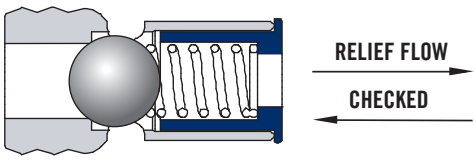
DIMENSIONAL VIEW



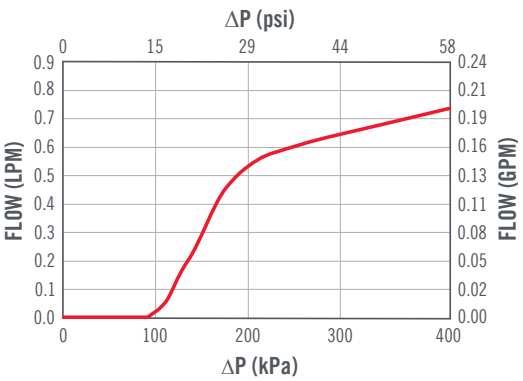
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI2580100S	100 kPa (14.5 psid)
CCPI2580150S	150 kPa (21.8 psid)
CCPI2580200S	200 kPa (29 psid)
CCPI2580250S	250 kPa (36.6 psid)
CCPI2580300S	300 kPa (43.5 psid)
CCPI2580345S	345 kPa (50 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	750 Lohms
Leakage:	10 SCCM max. at 500 kPa (725 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	0.09 grams

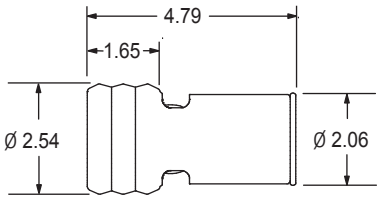
MATERIALS	
Body:	303 stainless steel
Ball Stop:	303 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	For forward flow, IP 2.5 mm Press-In F; for reverse flow: IP 2.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool Drawing:	For forward flow, CCRT0024277S for reverse flow, CCRT0048048S

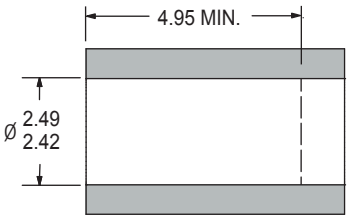
2.5 mm 316L PRESSURE RELIEF VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

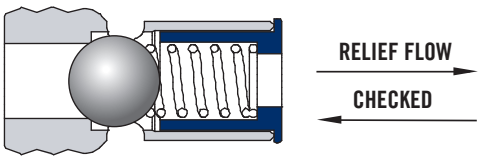
DIMENSIONAL VIEW



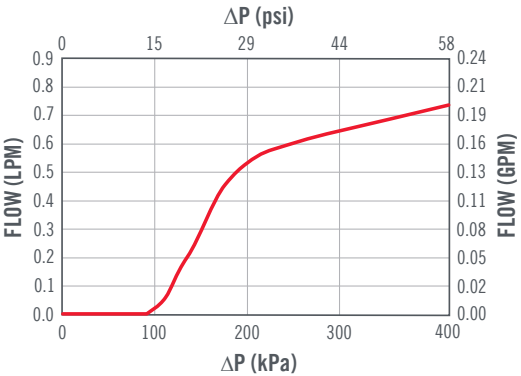
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	750 Lohms
Leakage:	10 SCCM max. at 500 kPa (725 psid) on air (ref. 1 drop/min max. on water).
Cracking Pressure Tolerance:	± 15%
Weight:	0.09 grams

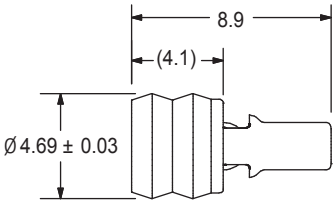
MATERIALS	
Body:	316L stainless steel
Ball Stop:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	For forward flow, IP 2.5 mm Press-In F; for reverse flow, IP 2.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0024277S; for reverse flow, CCRT0048048S

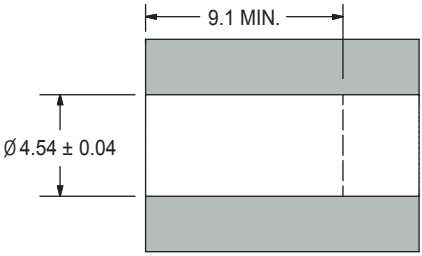
PART NUMBER	CRACKING PRESSURE**
CCPI2540100S	100 kPa (14.5 psid)
CCPI2540150S	150 kPa (21.8 psid)
CCPI2540200S	200 kPa (29 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

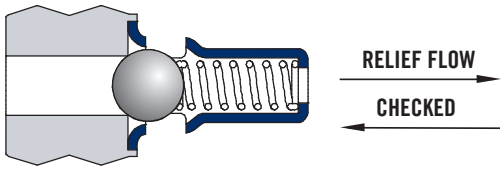
DIMENSIONAL VIEW



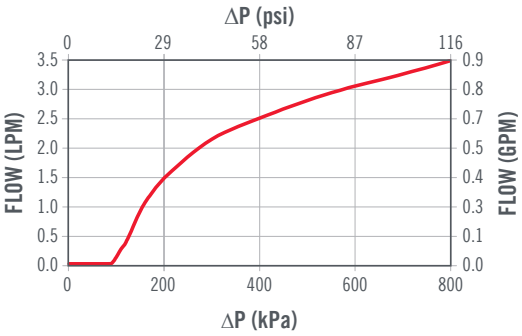
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid).
Cracking Pressure Tolerance:	± 15%
Weight:	0.5 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	For forward flow, IP 4.5 mm Press-In F; for reverse flow, IP 4.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0055034S; for reverse flow, CCRT0055036S

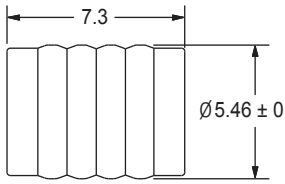
PART NUMBER	CRACKING PRESSURE**
CCPI4510100S	100 kPa (14.5 psid)
CCPI4510150S	150 kPa (21.8 psid)
CCPI4510200S	200 kPa (29 psid)
CCPI4510250S	250 kPa (36.6 psid)
CCPI4510300S	300 kPa (43.5 psid)
CCPI4510350S	350 kPa (50.8 psid)
CCPI4510400S	400 kPa (58 psid)
CCPI4510500S	500 kPa (72.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

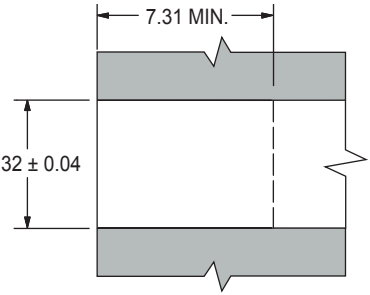
5.5 mm PRESSURE RELIEF VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

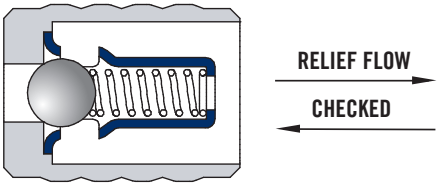
DIMENSIONAL VIEW



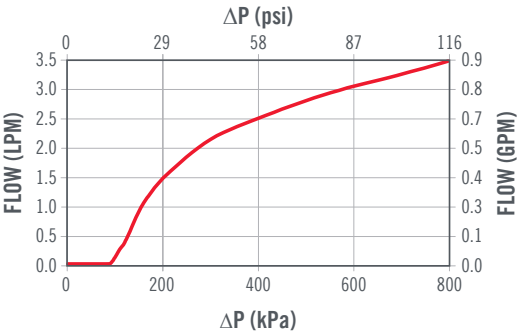
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI5510100S	100 kPa (14.5 psid)
CCPI5510150S	150 kPa (21.8 psid)
CCPI5510200S	200 kPa (29 psid)
CCPI5510250S	250 kPa (36.6 psid)
CCPI5510300S	300 kPa (43.5 psid)
CCPI5510350S	350 kPa (50.8 psid)
CCPI5510400S	400 kPa (58 psid)
CCPI5510500S	500 kPa (72.5 psid)
CCPI5510550S	550 kPa (79.8 psid)
CCPI5510625S	625 kPa (90.6 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	0.65 grams

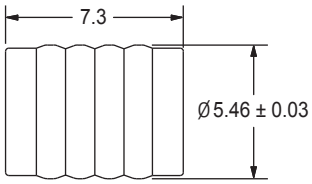
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

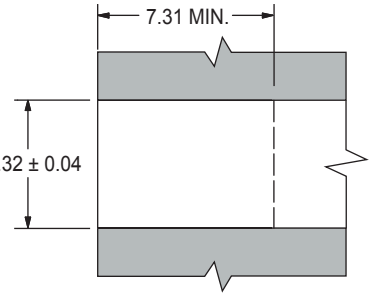
5.5 mm PRESSURE RELIEF VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

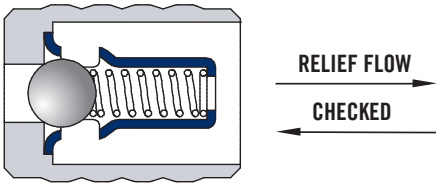
DIMENSIONAL VIEW



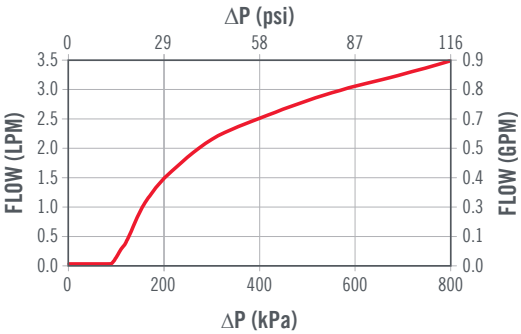
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI5580100S	100 kPa (14.5 psid)
CCPI5580150S	150 kPa (21.8 psid)
CCPI5580200S	200 kPa (29 psid)
CCPI5580250S	250 kPa (36.6 psid)
CCPI5580300S	300 kPa (43.5 psid)
CCPI5580350S	350 kPa (50.8 psid)
CCPI5580400S	400 kPa (58 psid)
CCPI5580500S	500 kPa (72.5 psid)
CCPI5580550S	550 kPa (79.8 psid)
CCPI5580625S	625 kPa (90.6 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	0.65 grams

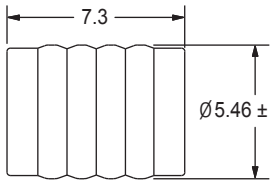
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

5.5 mm 316L PRESSURE RELIEF VALVE - CERAMIC BALL

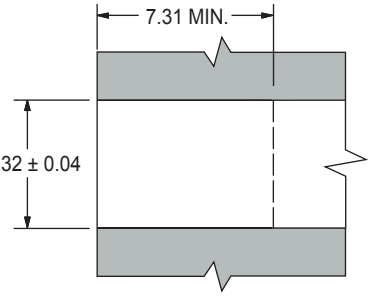
PRESS-IN: FOR INSTALLATION INTO PLASTIC

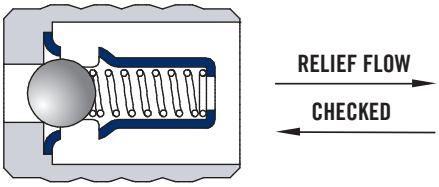
DIMENSIONAL VIEW



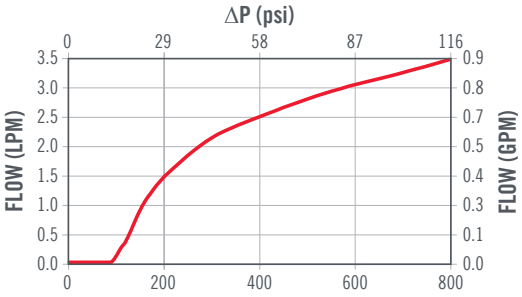
All dimensions are in millimeters.

INSTALLATION HOLE





ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	0.65 grams

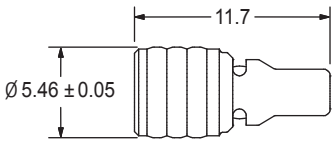
MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

PART NUMBER	CRACKING PRESSURE**
CCPI5540100S	100 kPa (14.5 psid)
CCPI5540150S	150 kPa (21.8 psid)
CCPI5540200S	200 kPa (29 psid)

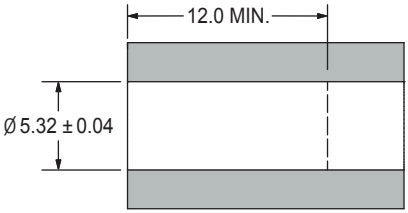
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

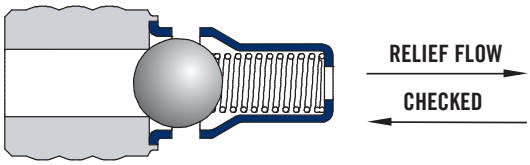
DIMENSIONAL VIEW



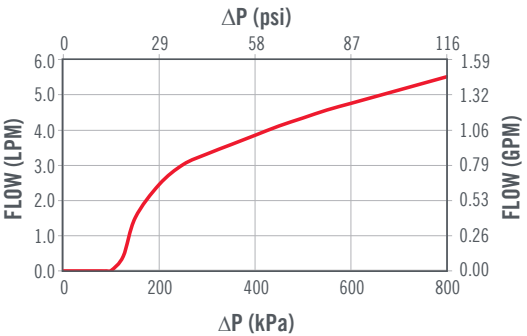
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	140 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	0.87 grams

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

PART NUMBER	CRACKING PRESSURE**
CLCP5510100S	100 kPa (14.5 psid)
CLCP5510200S	200 kPa (29 psid)
CLCP5510300S	300 kPa (43.5 psid)
CLCP5510400S	400 kPa (58 psid)
CLCP5510500S	500 kPa (72.5 psid)

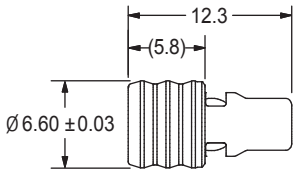
**The pressure at which uprun flow exceeds 300 SCCM of air.

INSTALLATION	
Installation Procedure:	For forward flow, IP 558 LC Press-In F; for reverse flow, IP 558 LC Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0900170S; for reverse flow, CCRT0072391S

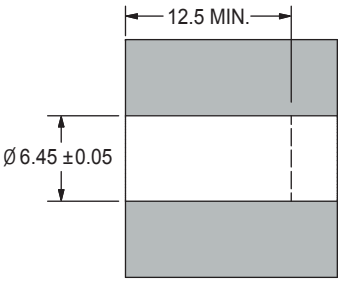
6.5 mm PRESSURE RELIEF VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

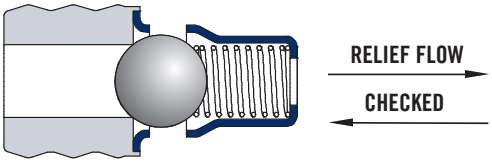
DIMENSIONAL VIEW



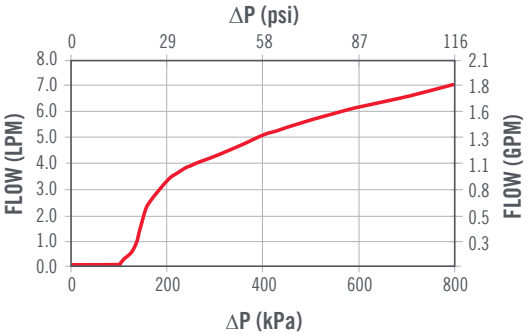
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI6510150S	100 kPa (14.5 psid)
CCPI6510200S	150 kPa (21.8 psid)
CCPI6510250S	200 kPa (29 psid)
CCPI5510250S	250 kPa (36.6 psid)
CCPI6510300S	300 kPa (43.5 psid)
CCPI6510350S	350 kPa (50.8 psid)
CCPI6510400S	400 kPa (58 psid)
CCPI6510500S	500 kPa (72.5 psid)

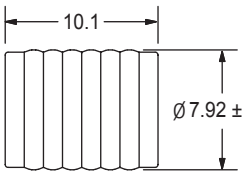
**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	1.5 grams

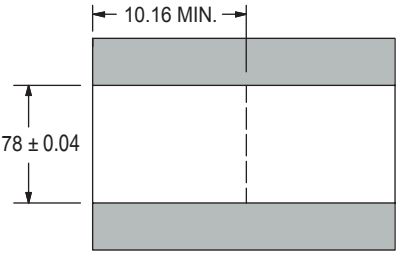
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	For forward flow, IP 6.5 mm Press-In F; for reverse flow, IP 6.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0086564S; for reverse flow, CCRT0056802S

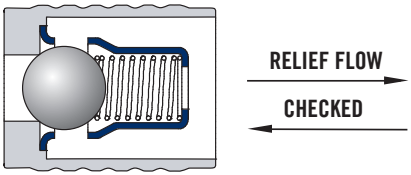
DIMENSIONAL VIEW



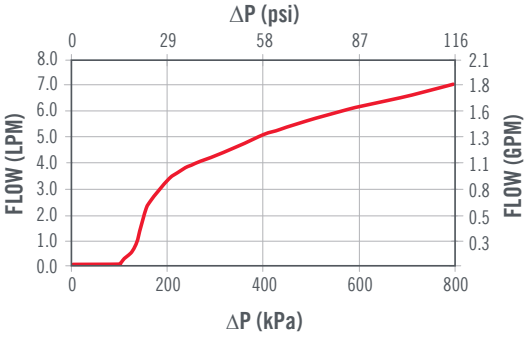
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI8010100S	100 kPa (14.5 psid)
CCPI8010150S	150 kPa (21.8 psid)
CCPI8010200S	200 kPa (29 psid)
CCPI8010250S	250 kPa (36.6 psid)
CCPI8010300S	300 kPa (43.5 psid)
CCPI8010350S	350 kPa (50.8 psid)
CCPI8010400S	400 kPa (58 psid)
CCPI8010500S	500 kPa (72.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	1.8 grams

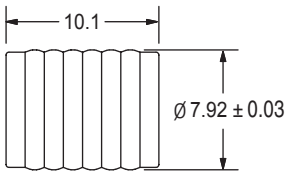
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

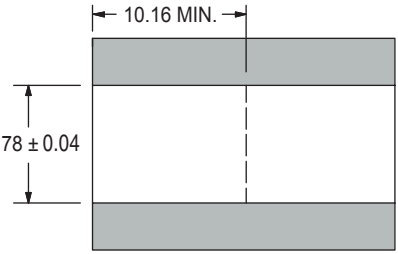
8 mm PRESSURE RELIEF VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

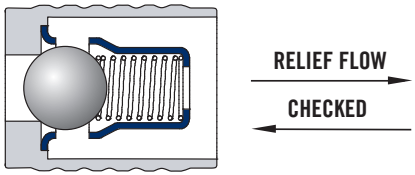
DIMENSIONAL VIEW



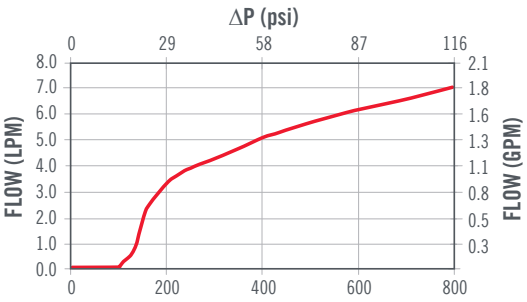
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PART NUMBER	CRACKING PRESSURE**
CCPI8080100S	100 kPa (14.5 psid)
CCPI8080150S	150 kPa (21.8 psid)
CCPI8080200S	200 kPa (29 psid)
CCPI8080250S	250 kPa (36.6 psid)
CCPI8080300S	300 kPa (43.5 psid)
CCPI8080350S	350 kPa (50.8 psid)
CCPI8080400S	400 kPa (58 psid)
CCPI8080500S	500 kPa (72.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	1.75 grams

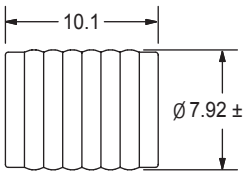
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	Ceramic

INSTALLATION	
Installation Procedure:	IP 855 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

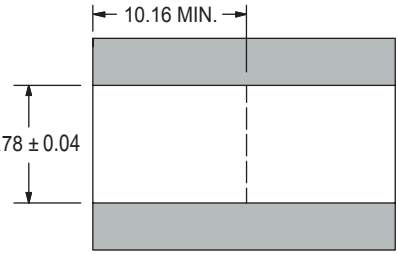
8 mm 316L PRESSURE RELIEF VALVE - CERAMIC BALL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

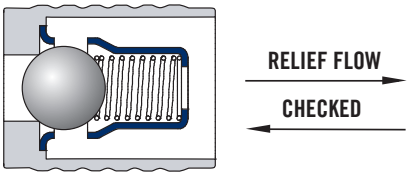
DIMENSIONAL VIEW



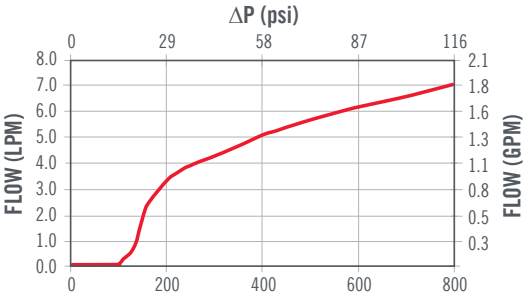
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	75 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	1.75 grams

MATERIALS	
Body:	316L stainless steel
Cage:	316L stainless steel
Spring:	316L stainless steel
Ball:	Ceramic

PART NUMBER	CRACKING PRESSURE**
CCPI8040100S	100 kPa (14.5 psid)
CCPI8040150S	150 kPa (21.8 psid)
CCPI8040200S	200 kPa (29 psid)

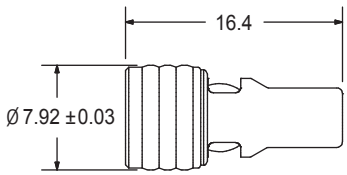
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	IP 855 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

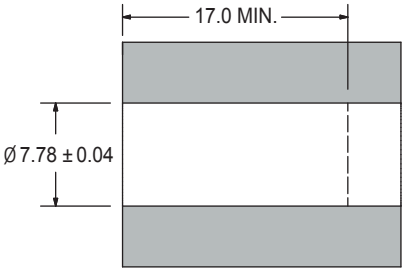
8 mm LC PRESSURE RELIEF VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

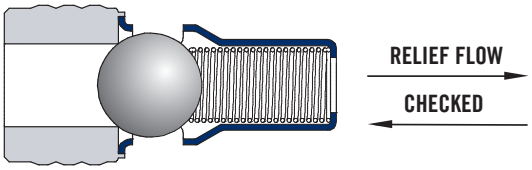
DIMENSIONAL VIEW



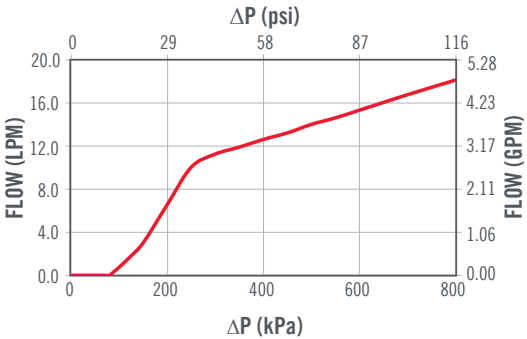
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

PERFORMANCE	
Lohm Rate:	45 Lohms
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	2.5 grams

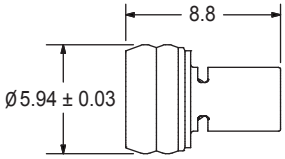
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

PART NUMBER	CRACKING PRESSURE**
CLCP8010100S	100 kPa (14.5 psid)
CLCP8010200S	200 kPa (29 psid)
CLCP8010300S	300 kPa (43.5 psid)
CLCP8010400S	400 kPa (58 psid)
CLCP8010500S	500 kPa (72.5 psid)

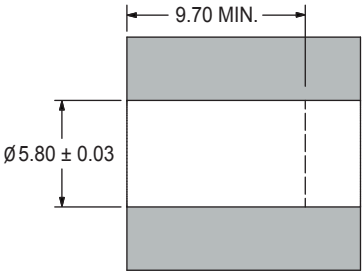
**The pressure at which uprun flow exceeds 300 SCCM of air.

INSTALLATION	
Installation Procedure:	For forward flow, IP 855 LC2 Press-In F; for reverse flow, IP 855 LC2 Press-In R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0900180S; for reverse flow, CCRT0065726S

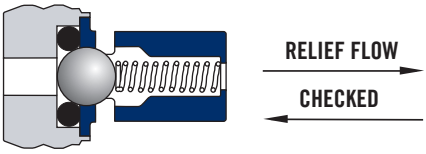
DIMENSIONAL VIEW



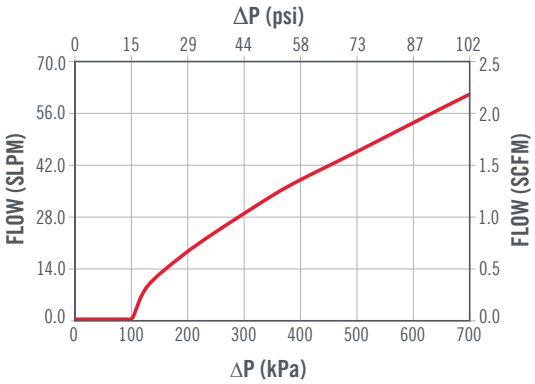
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON AIR AT 27°C (80°F)



FLOW CURVE FOR 100 kPa VALVE

SEAL MATERIAL	PART NUMBER	CRACKING PRESSURE**
FKM	CZPM6001100S	100 kPa (14.5 psid)
	CZPM6001200S	200 kPa (29.0 psid)
	CZPM6001300S	300 kPa (43.5 psid)
	CZPM6001400S	400 kPa (58.0 psid)
EPDM	CZPM6002100S	100 kPa (14.5 psid)
	CZPM6002200S	200 kPa (29.0 psid)
	CZPM6002300S	300 kPa (43.5 psid)
	CZPM6002400S	400 kPa (58.0 psid)

**The pressure at which uprun flow exceeds 300 SCCM of air.

PERFORMANCE	
Lohm Rate:	700 Lohms
Leakage:	Zero drops/minute on hydraulic fluid. Verified on air (0.05 SCCM max. at 150 kPa)
Cracking Pressure Tolerance:	± 15%
Weight:	0.9 grams

MATERIALS	
Body:	303 stainless steel
Cage:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Seal:	EPDM or FKM

Other seal materials and brass versions are available upon request.

INSTALLATION	
Installation Procedure:	For forward flow, IP CZPM 6.0 F; for reverse flow, IP CZPM 6.0 R (files available at: theleeco.com/installation)
Installation Tool:	For forward flow, CCRT0068699S; for reverse flow, CCRT0068697S

FLOW RESTRICTORS



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INSERT: FOR INSTALLATION INTO METAL

Single-Orifice Gas Restrictors C2-C15
- 2.5 mm Orifice Restrictors
- 5.5 mm Orifice Restrictors
- 8 mm Orifice Restrictors
- 5.5 mm Air Bleed Orifices

Single-Orifice Liquid Restrictors..... C16-C27
- 2.5 mm Orifice Restrictors
- 5.5 mm Orifice Restrictors
- 8 mm Orifice Restrictors

PRESS-IN: FOR INSTALLATION INTO PLASTIC

Single-Orifice Gas Restrictors C28-C30
- 2.5 mm Orifice Restrictors

Single-Orifice Liquid Restrictors..... C31-C32
- 2.5 mm Orifice Restrictors

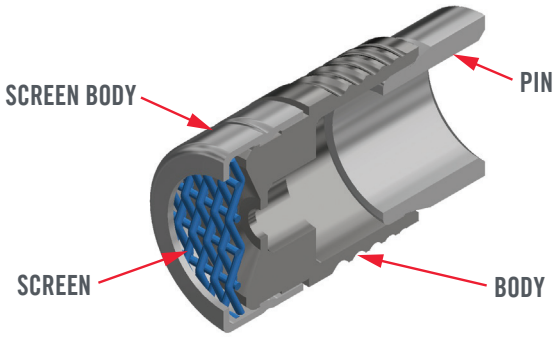
WHAT IS A FLOW RESTRICTOR?

A flow restrictor is a precision component designed to control the rate of liquid or gas flow within a system. Unlike simple drilled holes, which can vary widely in performance even when held to tight dimensional tolerances, Lee precision flow restrictors deliver unmatched accuracy and consistency.

ENGINEERED FOR SUPERIOR PERFORMANCE

The Lee Company offers the most accurate flow restrictors available. Every restrictor is **100% flow tested** to ensure **consistent batch-to-batch performance**. This level of precision far exceeds what can be achieved by specifying hole size alone, providing superior system reliability and reducing costly rework.

Lee flow restrictors deliver extremely **accurate** flow, enabling consistent system performance while eliminating the need for costly alternative components. Their self-retained design **simplifies installation** without compromising flow accuracy. Integral safety screens add value by **saving space and weight**, streamlining assembly, and enhancing reliability.



Offered in a wide range of sizes, configurations, and materials, Lee flow restrictors are easy to integrate into diverse systems. Each design installs quickly and securely, without threads, O-rings, or adhesives. They are available for both gas and liquid applications and tested under controlled conditions: gas restrictors on clean, dry nitrogen and liquid restrictors on distilled water. Testing is performed in the direction of use to maximize accuracy.

SINGLE-ORIFICE RESTRICTORS

A single-orifice restrictor is a fluid control device with a precisely-sized hole that limits flow rate by creating a pressure drop. It is a passive, fixed restriction with no moving parts. The Lohm rate of the orifice determines the flow rate at a given pressure differential.

AIR BLEED ORIFICES

An air bleed orifice is a small, precision-engineered component in a hydraulic system that allows trapped air to escape while preventing fluid loss. It combines a calibrated orifice with an integrated fine screen to efficiently remove air bubbles that can cause delayed response and spongy operation. This design helps to maintain system pressure and performance while improving overall efficiency, reliability, and responsiveness in automotive, off-road, and industrial hydraulic applications.

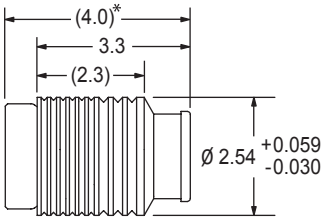
CUSTOMIZATION OPTIONS

Lee flow restrictors are engineered for high performance and long service life. Additional customizations are available, allowing engineers to optimize flow restrictor performance based on criteria such as fluid compatibility, nominal Lohm rate and tolerance, or packaging constraints. Select models are available with an integral safety screen for added protection against contamination. For more information or design support, please contact a Lee Sales Engineer.

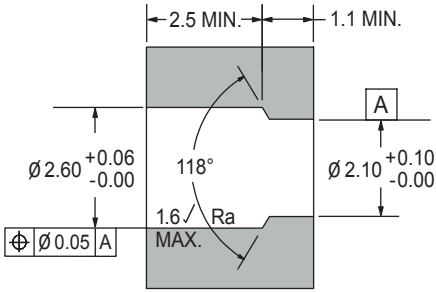
2.5 mm ORIFICE FOR GASES - FORWARD FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

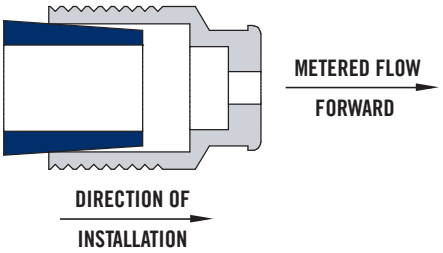
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RIGF2551012S	1200 Lohms
RIGF2551015S	1500 Lohms
RIGF2551020S	2000 Lohms
RIGF2551025S	2500 Lohms
RIGF2551030S	3000 Lohms
RIGF2551040S	4000 Lohms
RIGF2551050S	5000 Lohms
RIGF2551060S	6000 Lohms

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

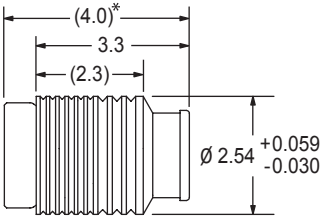
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.08 grams

INSTALLATION	
Installation Procedure:	IP RI Forward Unscreened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

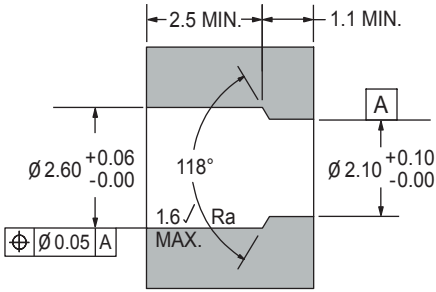
2.5 mm ORIFICE FOR GASES - REVERSE FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

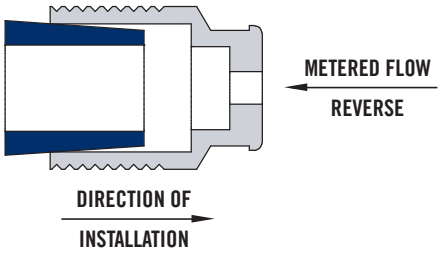
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RIGR2551012S	1200 Lohms
RIGR2551015S	1500 Lohms
RIGR2551020S	2000 Lohms
RIGR2551025S	2500 Lohms
RIGR2551030S	3000 Lohms
RIGR2551040S	4000 Lohms
RIGR2551050S	5000 Lohms
RIGR2551060S	6000 Lohms

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

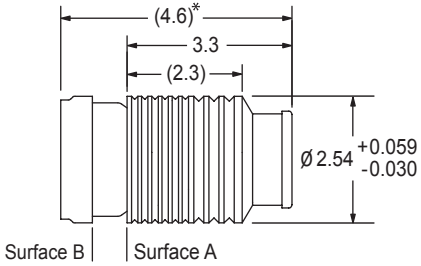
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.08 grams

INSTALLATION	
Installation Procedure:	IP RI Reverse Unscreened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

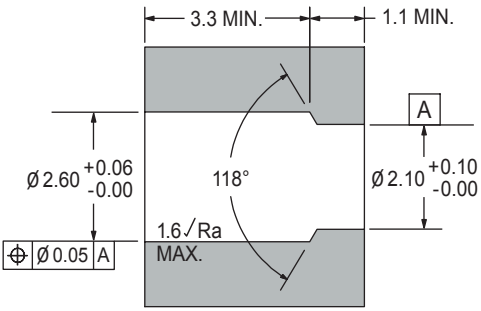
2.5 mm ORIFICE FOR GASES - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

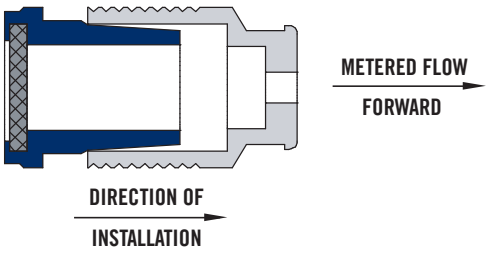
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RIGF2553080S	8000 Lohms	40
RIGF2553100S	10,000 Lohms	40
RIGF2553120S	12,000 Lohms	40
RIGF2553150S	15,000 Lohms	40
RIGF2553200S	20,000 Lohms	40
RIGF2553250S	25,000 Lohms	40
RIGF2553300S	30,000 Lohms	40
RIGF2553400S	40,000 Lohms	40
RIGF2553450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	303 stainless steel
Screen:	316 stainless steel

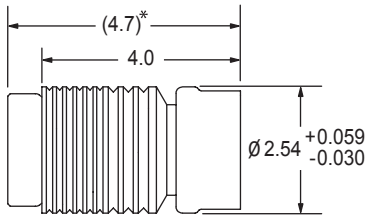
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.1 grams

INSTALLATION	
Installation Procedure:	IP RI Forward Screened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

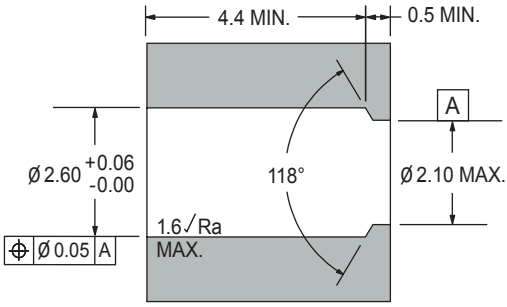
2.5 mm ORIFICE FOR GASES - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

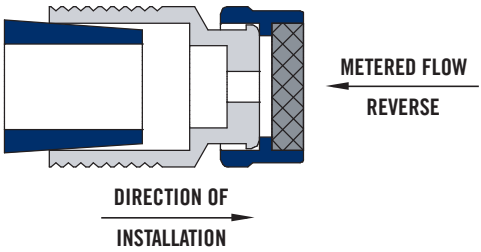
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RIGR2553080S	8000 Lohms	40
RIGR2553100S	10,000 Lohms	40
RIGR2553120S	12,000 Lohms	40
RIGR2553150S	15,000 Lohms	40
RIGR2553200S	20,000 Lohms	40
RIGR2553250S	25,000 Lohms	40
RIGR2553300S	30,000 Lohms	40
RIGR2553400S	40,000 Lohms	40
RIGR2553450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel

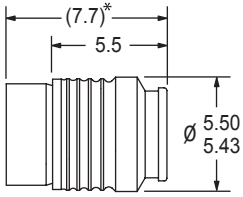
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.1 grams

INSTALLATION	
Installation Procedure:	IP RI Reverse Screened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

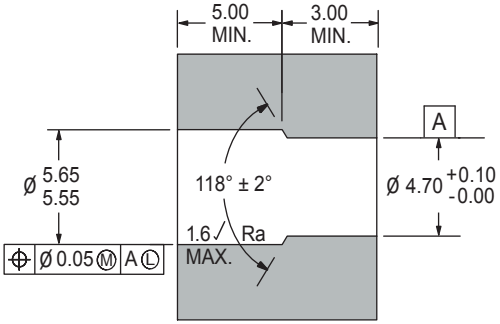
5.5 mm ORIFICE FOR GASES - FORWARD FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

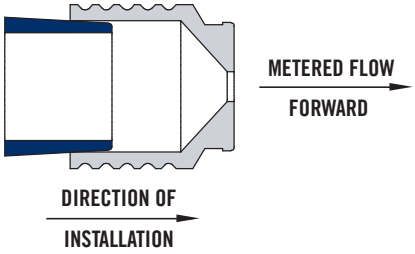
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RIGF5551005S	500 Lohms
RIGF5551006S	600 Lohms
RIGF5551008S	800 Lohms
RIGF5551010S	1000 Lohms
RIGF5551012S	1200 Lohms
RIGF5551015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.55 grams

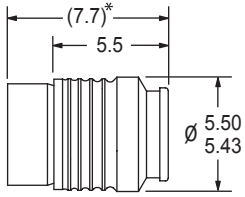
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Forward 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

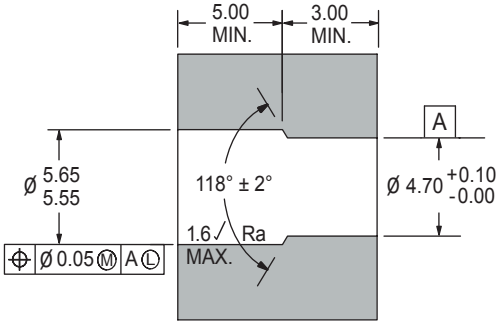
5.5 mm ORIFICE FOR GASES - REVERSE FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

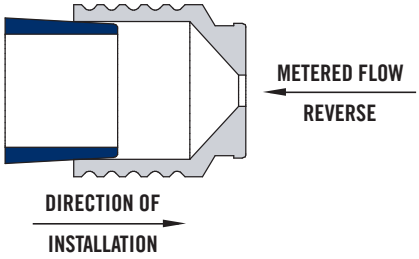
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RIGF5551005S	500 Lohms
RIGF5551006S	600 Lohms
RIGF5551008S	800 Lohms
RIGF5551010S	1000 Lohms
RIGF5551012S	1200 Lohms
RIGF5551015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.55 grams

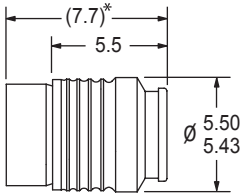
INSTALLATION	
Installation Procedure:	IP RI Reverse Unscreened 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

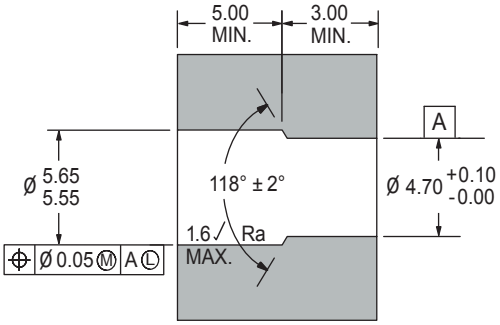
5.5 mm ORIFICE FOR GASES - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

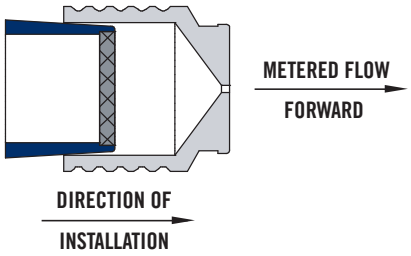
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RIGF5553020S	2000 Lohms	125
RIGF5553025S	2500 Lohms	125
RIGF5553030S	3000 Lohms	125
RIGF5553040S	4000 Lohms	125
RIGF5553050S	5000 Lohms	125
RIGF5553060S	6000 Lohms	75
RIGF5553080S	8000 Lohms	75
RIGF5553100S	10,000 Lohms	75
RIGF5553120S	12,000 Lohms	75
RIGF5553150S	15,000 Lohms	75
RIGF5553200S	20,000 Lohms	40
RIGF5553250S	25,000 Lohms	40
RIGF5553300S	30,000 Lohms	40
RIGF5553400S	40,000 Lohms	40
RIGF5553450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	303 stainless steel
Screen:	316 stainless steel

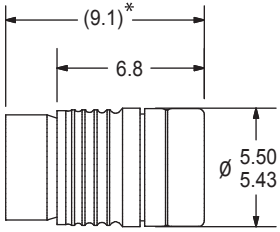
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.62 - 0.63 grams

INSTALLATION	
Installation Procedure:	IP RI Forward Screened 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

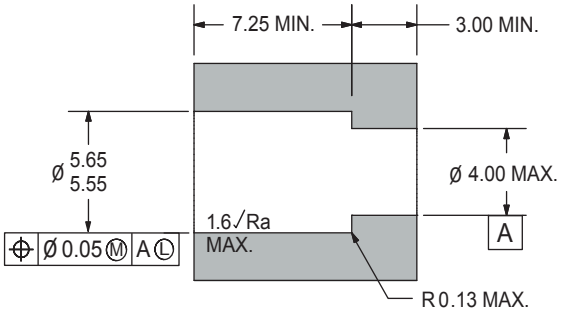
5.5 mm ORIFICE FOR GASES - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

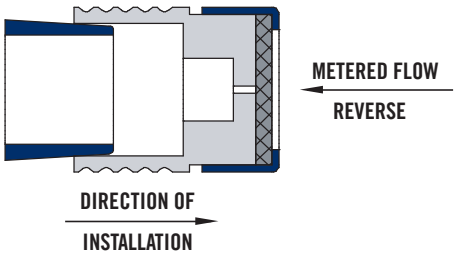
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RIGR5557020S	2000 Lohms	125
RIGR5557025S	2500 Lohms	125
RIGR5557030S	3000 Lohms	125
RIGR5557040S	4000 Lohms	125
RIGR5557050S	5000 Lohms	125
RIGR5557060S	6000 Lohms	75
RIGR5557080S	8000 Lohms	75
RIGR5557100S	10,000 Lohms	75
RIGR5557120S	12,000 Lohms	75
RIGR5557150S	15,000 Lohms	75
RIGR5557200S	20,000 Lohms	40
RIGR5557250S	25,000 Lohms	40
RIGR5557300S	30,000 Lohms	40
RIGR5557400S	40,000 Lohms	40
RIGR5557450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel
Screen Body:	305 stainless steel
Screen:	316 stainless steel

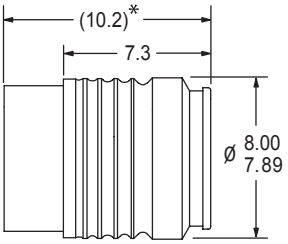
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.8 grams

INSTALLATION	
Installation Procedure:	IP RI Reverse Screened 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

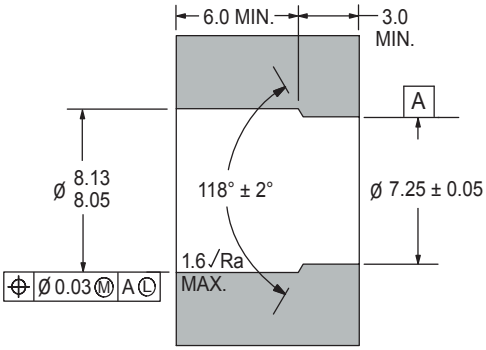
8 mm ORIFICE FOR GASES - FORWARD FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

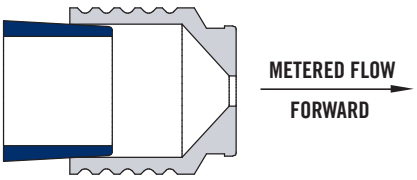
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.





PART NUMBER	LOHM RATE
RIGF8051005S	500 Lohms
RIGF8051006S	600 Lohms
RIGF8051008S	800 Lohms
RIGF8051010S	1000 Lohms
RIGF8051012S	1200 Lohms
RIGF8051015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.3 grams

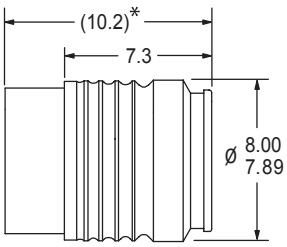
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Forward 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

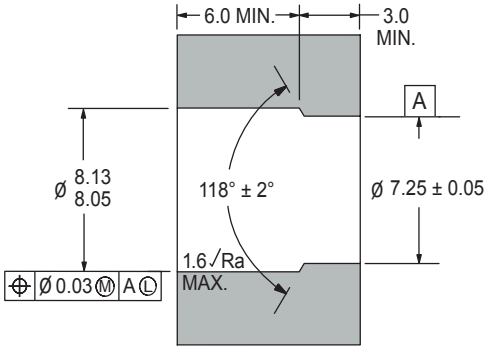
8 mm ORIFICE FOR GASES - REVERSE FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

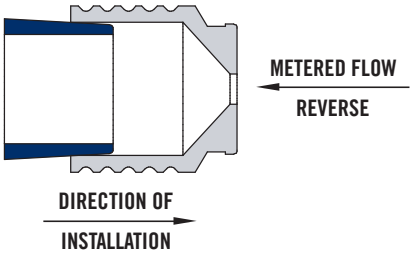
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RIGR8051005S	500 Lohms
RIGR8051006S	600 Lohms
RIGR8051008S	800 Lohms
RIGR8051010S	1000 Lohms
RIGR8051012S	1200 Lohms
RIGR8051015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.3 grams

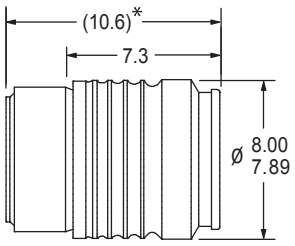
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Reverse Unscreened 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

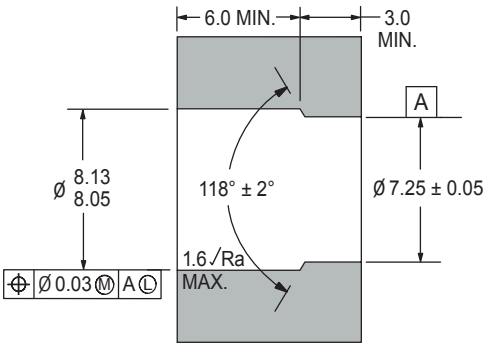
8 mm ORIFICE FOR GASES - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

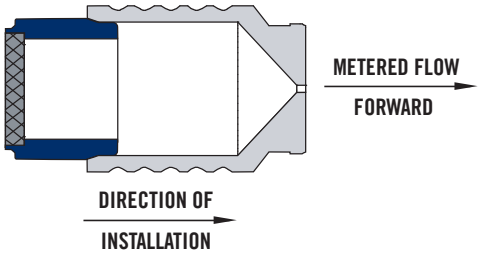
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RIGF8053020S	2000 Lohms	125
RIGF8053025S	2500 Lohms	125
RIGF8053030S	3000 Lohms	125
RIGF8053040S	4000 Lohms	125
RIGF8053050S	5000 Lohms	125
RIGF8053060S	6000 Lohms	75
RIGF8053080S	8000 Lohms	75
RIGF8053100S	10,000 Lohms	75
RIGF8053120S	12,000 Lohms	75
RIGF8053150S	15,000 Lohms	75
RIGF8053200S	20,000 Lohms	40
RIGF8053250S	25,000 Lohms	40
RIGF8053300S	30,000 Lohms	40
RIGF8053400S	40,000 Lohms	40
RIGF8053450S	45,000 Lohms	40

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.6 grams

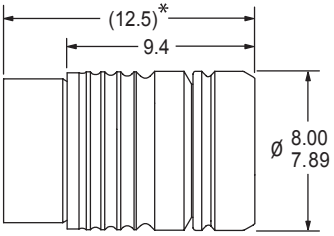
MATERIALS	
Body:	303 stainless steel
Pin:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Forward 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

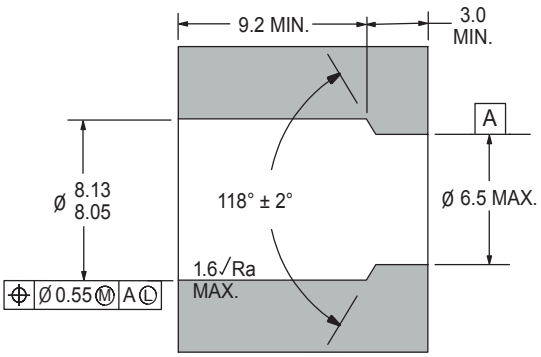
8 mm ORIFICE FOR GASES - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

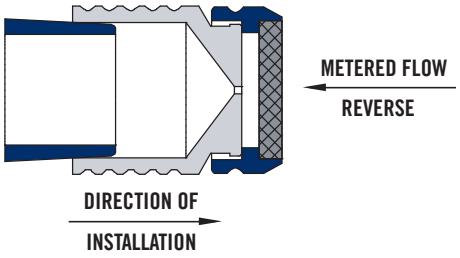
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RIGR8053020S	2000 Lohms	125
RIGR8053025S	2500 Lohms	125
RIGR8053030S	3000 Lohms	125
RIGR8053040S	4000 Lohms	125
RIGR8053050S	5000 Lohms	125
RIGR8053060S	6000 Lohms	75
RIGR8053080S	8000 Lohms	75
RIGR8053100S	10,000 Lohms	75
RIGR8053120S	12,000 Lohms	75
RIGR8053150S	15,000 Lohms	75
RIGR8053200S	20,000 Lohms	40
RIGR8053250S	25,000 Lohms	40
RIGR8053300S	30,000 Lohms	40
RIGR8053400S	40,000 Lohms	40
RIGR8053450S	45,000 Lohms	40

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.7 - 1.8 grams

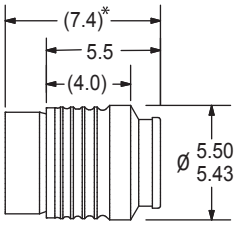
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Reverse Screened 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

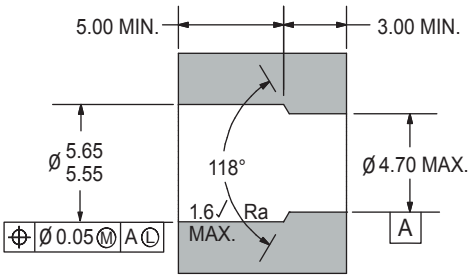
5.5 mm AIR BLEED ORIFICE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

DIMENSIONAL VIEW

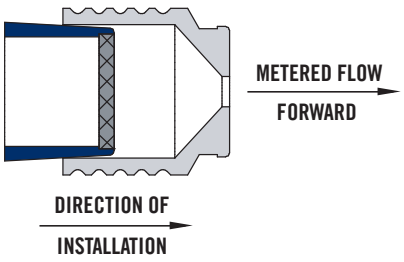


INSTALLATION HOLE



C

Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RHGF4030100S	100,000 Lohms	25
RHGF4030180S	180,000 Lohms	25

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 10%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.63 grams

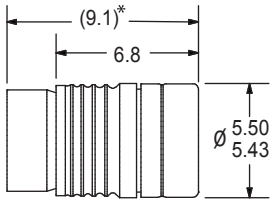
MATERIALS	
Body:	303 stainless steel
Pin:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Forward 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

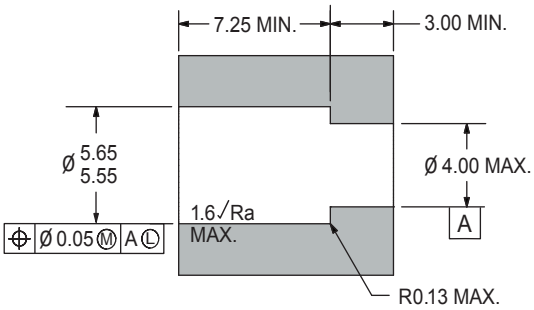
5.5 mm AIR BLEED ORIFICE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

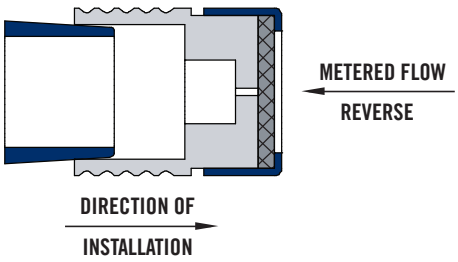
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RHGR4030100S	100,000 Lohms	25
RHGR4030180S	180,000 Lohms	25

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 10%
Test Fluid:	Clean and dry nitrogen
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.8 grams

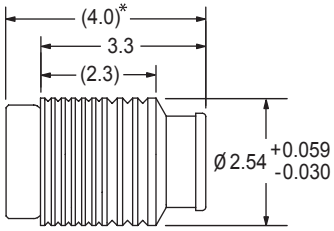
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel
Screen Body:	305 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Reverse Screened 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

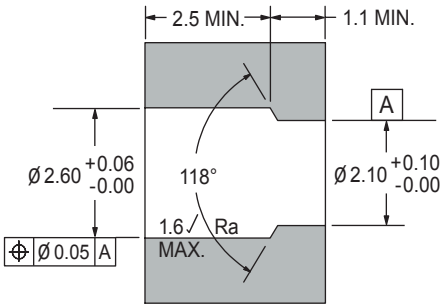
2.5 mm ORIFICE FOR LIQUIDS - FORWARD FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

DIMENSIONAL VIEW

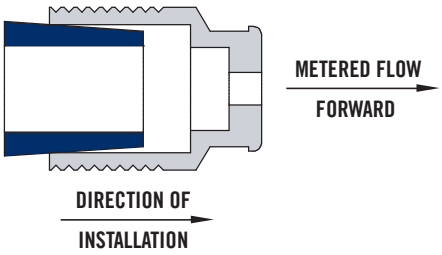


INSTALLATION HOLE



C

*Overall length before installation.
All dimensions are in millimeters, except where noted.*



PART NUMBER	LOHM RATE
RILF2551012S	1200 Lohms
RILF2551015S	1500 Lohms
RILF2551020S	2000 Lohms
RILF2551025S	2500 Lohms
RILF2551030S	3000 Lohms
RILF2551040S	4000 Lohms
RILF2551050S	5000 Lohms
RILF2551060S	6000 Lohms

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

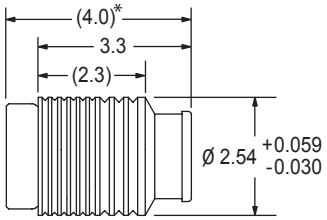
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.08 grams

INSTALLATION	
Installation Procedure:	IP RI Forward Unscreened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

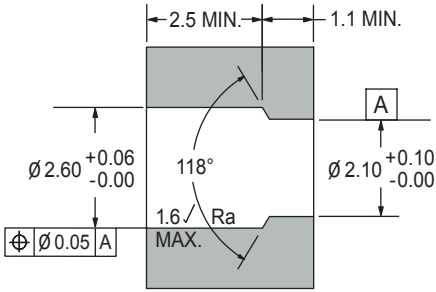
2.5 mm ORIFICE FOR LIQUIDS - REVERSE FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

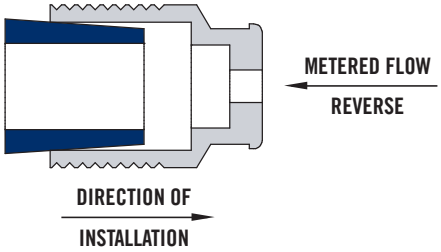
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RILR2551012S	1200 Lohms
RILR2551015S	1500 Lohms
RILR2551020S	2000 Lohms
RILR2551025S	2500 Lohms
RILR2551030S	3000 Lohms
RILR2551040S	4000 Lohms
RILR2551050S	5000 Lohms
RILR2551060S	6000 Lohms

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

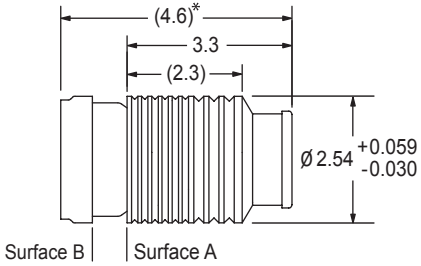
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.08 grams

INSTALLATION	
Installation Procedure:	IP RI Reverse Unscreened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

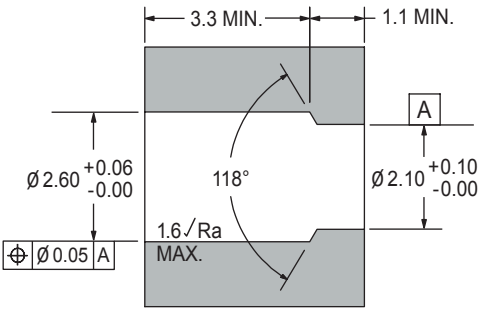
2.5 mm ORIFICE FOR LIQUIDS - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

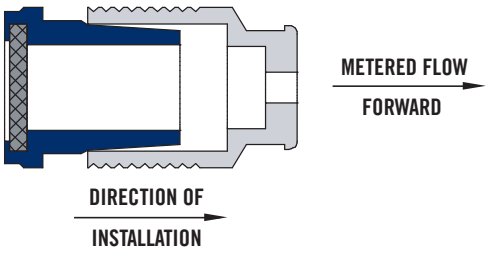
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RILF2553080S	8000 Lohms	40
RILF2553100S	10,000 Lohms	40
RILF2553120S	12,000 Lohms	40
RILF2553150S	15,000 Lohms	40
RILF2553200S	20,000 Lohms	40
RILF2553250S	25,000 Lohms	40
RILF2553300S	30,000 Lohms	40
RILF2553400S	40,000 Lohms	40
RILF2553450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	303 stainless steel
Screen:	316 stainless steel

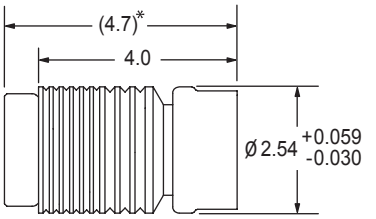
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.1 grams

INSTALLATION	
Installation Procedure:	IP RI Forward Screened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

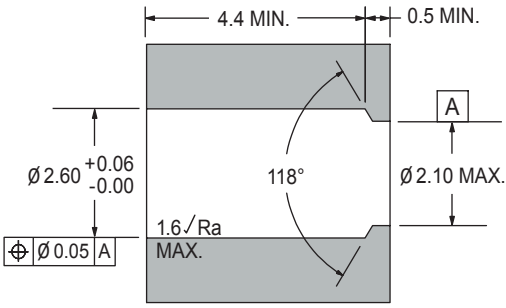
2.5 mm ORIFICE FOR LIQUIDS - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

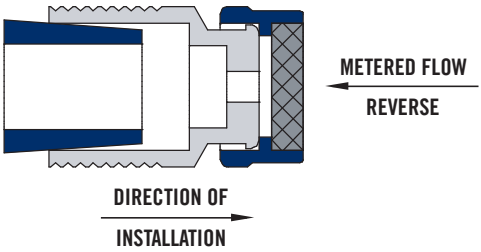
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RILR2553080S	8000 Lohms	40
RILR2553100S	10,000 Lohms	40
RILR2553120S	12,000 Lohms	40
RILR2553150S	15,000 Lohms	40
RILR2553200S	20,000 Lohms	40
RILR2553250S	25,000 Lohms	40
RILR2553300S	30,000 Lohms	40
RILR2553400S	40,000 Lohms	40
RILR2553450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel

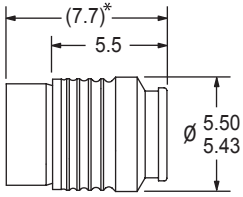
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.1 grams

INSTALLATION	
Installation Procedure:	IP RI Reverse Screened 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S
Installation Force:	1.75 kN max.

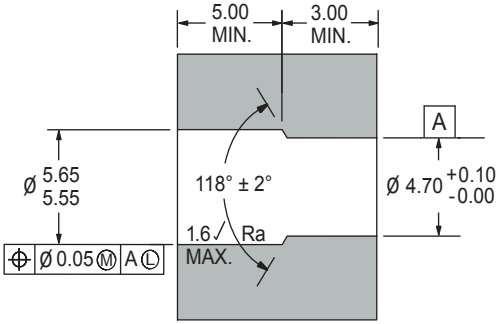
5.5 mm ORIFICE FOR LIQUIDS - FORWARD FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

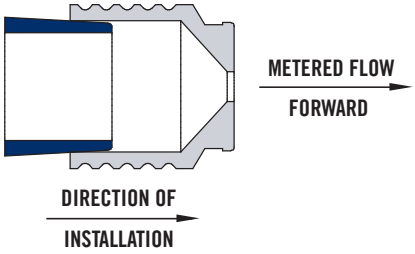
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RILF5551005S	500 Lohms
RILF5551006S	600 Lohms
RILF5551008S	800 Lohms
RILF5551010S	1000 Lohms
RILF5551012S	1200 Lohms
RILF5551015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.55 grams

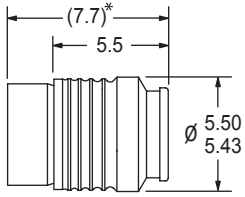
INSTALLATION	
Installation Procedure:	IP RI Forward 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

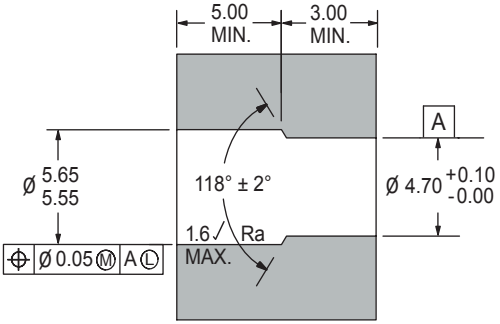
5.5 mm ORIFICE FOR LIQUIDS - REVERSE FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

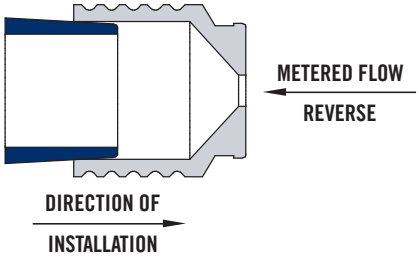
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RILR5551005S	500 Lohms
RILR5551006S	600 Lohms
RILR5551008S	800 Lohms
RILR5551010S	1000 Lohms
RILR5551012S	1200 Lohms
RILR5551015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.55 grams

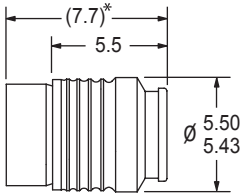
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Reverse Unscreened 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

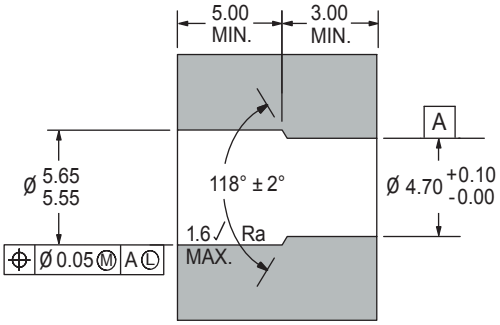
5.5 mm ORIFICE FOR LIQUIDS - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

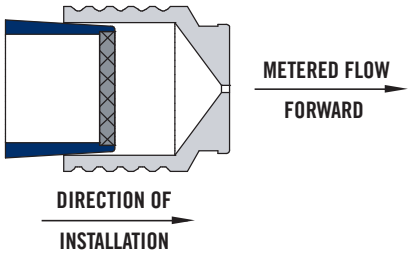
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RILF5553020S	2000 Lohms	125
RILF5553025S	2500 Lohms	125
RILF5553030S	3000 Lohms	125
RILF5553040S	4000 Lohms	125
RILF5553050S	5000 Lohms	125
RILF5553060S	6000 Lohms	75
RILF5553080S	8000 Lohms	75
RILF5553100S	10,000 Lohms	75
RILF5553120S	12,000 Lohms	75
RILF5553150S	15,000 Lohms	75
RILF5553200S	20,000 Lohms	40
RILF5553250S	25,000 Lohms	40
RILF5553300S	30,000 Lohms	40
RILF5553400S	40,000 Lohms	40
RILF5553450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	303 stainless steel
Screen:	316 stainless steel

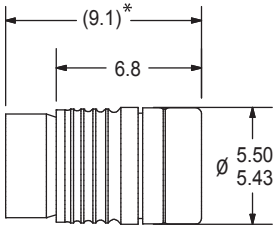
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.62 - 0.63 grams

INSTALLATION	
Installation Procedure:	IP RI Forward Screened 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

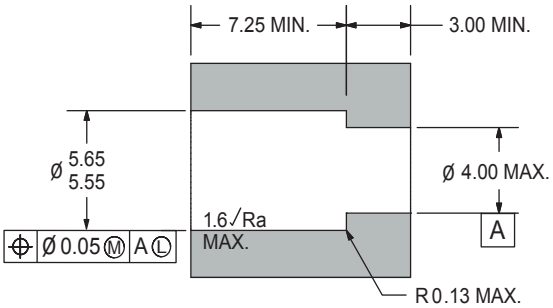
5.5 mm ORIFICE FOR LIQUIDS - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

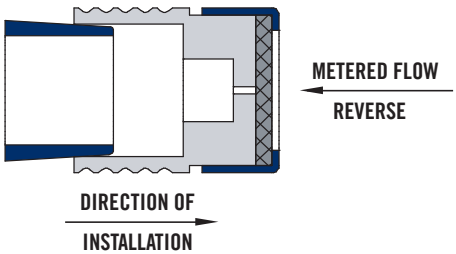
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RILR5557020S	2000 Lohms	125
RILR5557025S	2500 Lohms	125
RILR5557030S	3000 Lohms	125
RILR5557040S	4000 Lohms	125
RILR5557050S	5000 Lohms	125
RILR5557060S	6000 Lohms	75
RILR5557080S	8000 Lohms	75
RILR5557100S	10,000 Lohms	75
RILR5557120S	12,000 Lohms	75
RILR5557150S	15,000 Lohms	75
RILR5557200S	20,000 Lohms	40
RILR5557250S	25,000 Lohms	40
RILR5557300S	30,000 Lohms	40
RILR5557400S	40,000 Lohms	40
RILR5557450S	45,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel
Screen Body:	305 stainless steel
Screen:	316 stainless steel

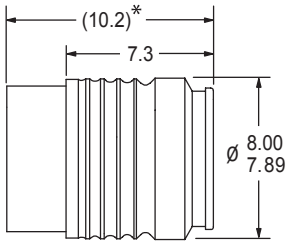
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	0.8 grams

INSTALLATION	
Installation Procedure:	IP RI Reverse Screened 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

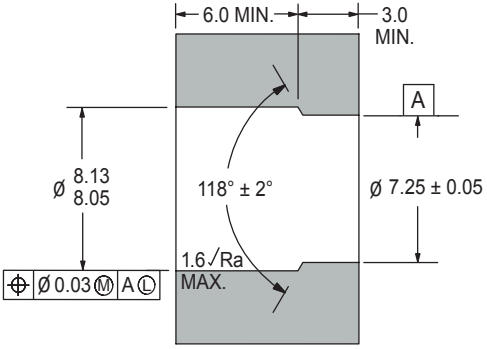
8 mm ORIFICE FOR LIQUIDS - FORWARD FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

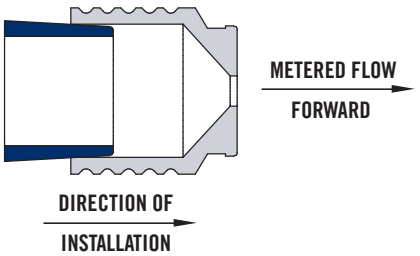
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RILF8051005S	500 Lohms
RILF8051006S	600 Lohms
RILF8051008S	800 Lohms
RILF8051010S	1000 Lohms
RILF8051012S	1200 Lohms
RILF8051015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.3 grams

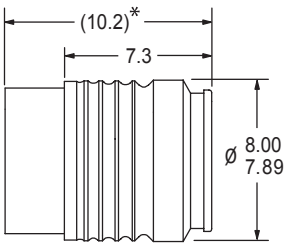
INSTALLATION	
Installation Procedure:	IP RI Forward 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

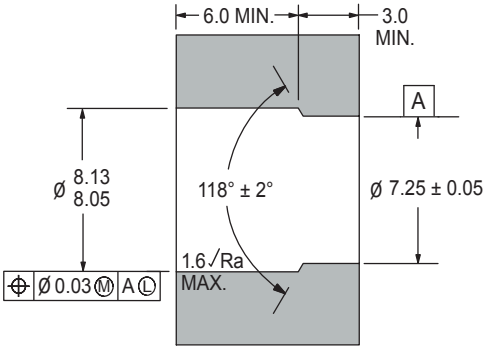
8 mm ORIFICE FOR LIQUIDS - REVERSE FLOW, UNSCREENED

INSERT: FOR INSTALLATION INTO METAL

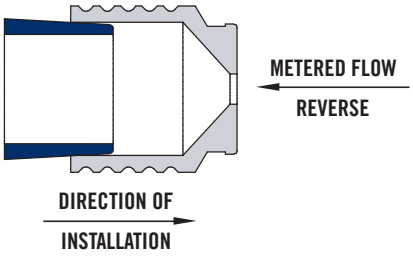
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE
RILR8051005S	500 Lohms
RILR8051006S	600 Lohms
RILR8051008S	800 Lohms
RILR8051010S	1000 Lohms
RILR8051012S	1200 Lohms
RILR8051015S	1500 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.3 grams

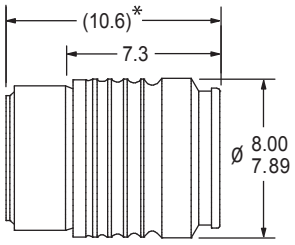
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Reverse Unscreened 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

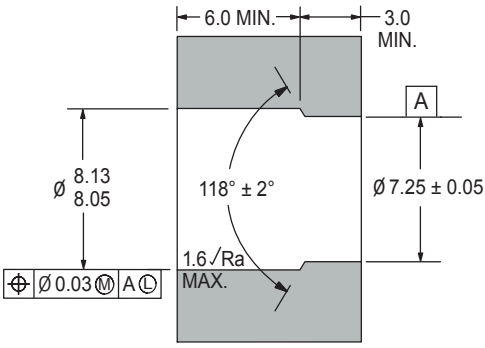
8 mm ORIFICE FOR LIQUIDS - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

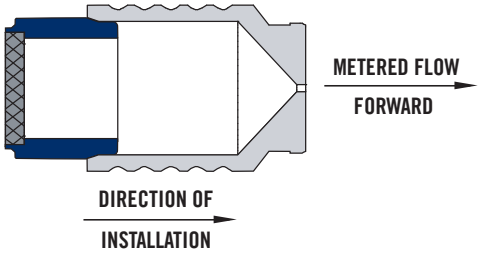
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RILF8053020S	2000 Lohms	125
RILF8053025S	2500 Lohms	125
RILF8053030S	3000 Lohms	125
RILF8053040S	4000 Lohms	125
RILF8053050S	5000 Lohms	125
RILF8053060S	6000 Lohms	75
RILF8053080S	8000 Lohms	75
RILF8053100S	10,000 Lohms	75
RILF8053120S	12,000 Lohms	75
RILF8053150S	15,000 Lohms	75
RILF8053200S	20,000 Lohms	40
RILF8053250S	25,000 Lohms	40
RILF8053300S	30,000 Lohms	40
RILF8053400S	40,000 Lohms	40
RILF8053450S	45,000 Lohms	40

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.6 grams

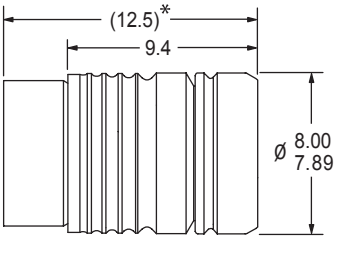
MATERIALS	
Body:	303 stainless steel
Pin:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Forward 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

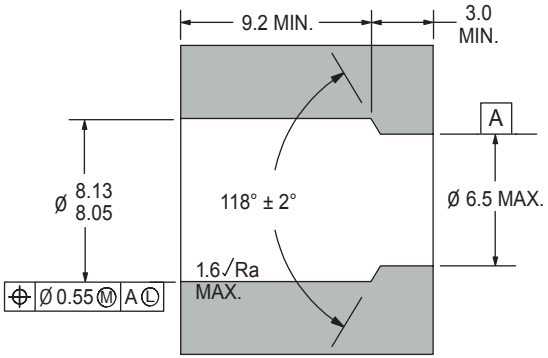
8 mm ORIFICE FOR LIQUIDS - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

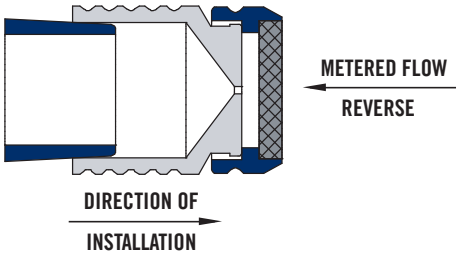
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
RILR8053020S	2000 Lohms	125
RILR8053025S	2500 Lohms	125
RILR8053030S	3000 Lohms	125
RILR8053040S	4000 Lohms	125
RILR8053050S	5000 Lohms	125
RILR8053060S	6000 Lohms	75
RILR8053080S	8000 Lohms	75
RILR8053100S	10,000 Lohms	75
RILR8053120S	12,000 Lohms	75
RILR8053150S	15,000 Lohms	75
RILR8053200S	20,000 Lohms	40
RILR8053250S	25,000 Lohms	40
RILR8053300S	30,000 Lohms	40
RILR8053400S	40,000 Lohms	40
RILR8053450S	45,000 Lohms	40

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Maximum Working Pressure Differential:	21 MPa (3045 psid) (in aluminum)
Weight:	1.7 - 1.8 grams

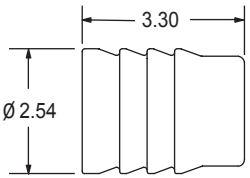
MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP RI Reverse Screened 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

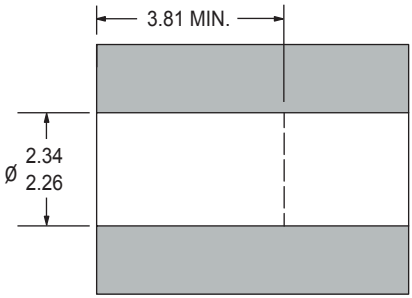
2.5 mm ORIFICE FOR GASES - 303 STAINLESS STEEL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

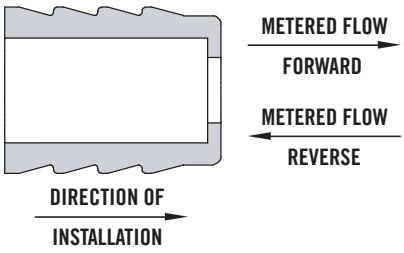
DIMENSIONAL VIEW



INSTALLATION HOLE



All dimensions are in millimeters.



PART NUMBER METERED FLOW DIRECTION		LOHM RATE
FORWARD	REVERSE	
RPGF2551005S	RPGR2551005S	500 Lohms
RPGF2551006S	RPGR2551006S	600 Lohms
RPGF2551008S	RPGR2551008S	800 Lohms
RPGF2551010S	RPGR2551010S	1000 Lohms
RPGF2551012S	RPGR2551012S	1200 Lohms
RPGF2551015S	RPGR2551015S	1500 Lohms
RPGF2551020S	RPGR2551020S	2000 Lohms
RPGF2551025S	RPGR2551025S	2500 Lohms
RPGF2551030S	RPGR2551030S	3000 Lohms
RPGF2551040S	RPGR2551040S	4000 Lohms
RPGF2551050S	RPGR2551050S	5000 Lohms
RPGF2551060S	RPGR2551060S	6000 Lohms
RPGF2551080S	RPGR2551080S	8000 Lohms
RPGF2551100S	RPGR2551100S	10,000 Lohms
RPGF2551120S	RPGR2551120S	12,000 Lohms
RPGF2551150S	RPGR2551150S	15,000 Lohms
RPGF2551200S	RPGR2551200S	20,000 Lohms
RPGF2551250S	RPGR2551250S	25,000 Lohms
RPGF2551300S	RPGR2551300S	30,000 Lohms
RPGF2551400S	RPGR2551400S	40,000 Lohms
RPGF2551450S	RPGR2551450S	45,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Weight:	0.07 grams

MATERIALS	
Body:	303 stainless steel

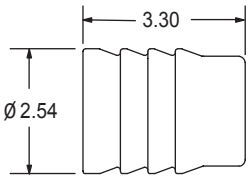
INSTALLATION	
Installation Procedure:	IP RP 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S

For companion 2.5 mm Safety Screen Filter, see page G10.

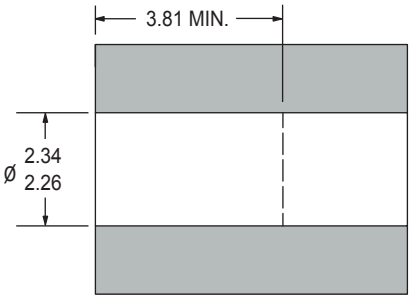
2.5 mm ORIFICE FOR GASES - 316 STAINLESS STEEL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

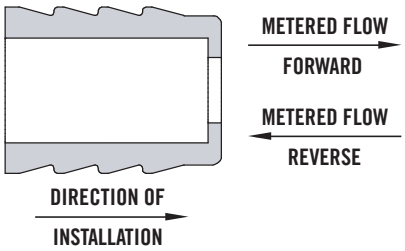
DIMENSIONAL VIEW



INSTALLATION HOLE



All dimensions are in millimeters.



PART NUMBER METERED FLOW DIRECTION		LOHM RATE
FORWARD	REVERSE	
RPGF2552005S	RPGR2552005S	500 Lohms
RPGF2552006S	RPGR2552006S	600 Lohms
RPGF2552008S	RPGR2552008S	800 Lohms
RPGF2552010S	RPGR2552010S	1000 Lohms
RPGF2552012S	RPGR2552012S	1200 Lohms
RPGF2552015S	RPGR2552015S	1500 Lohms
RPGF2552020S	RPGR2552020S	2000 Lohms
RPGF2552025S	RPGR2552025S	2500 Lohms
RPGF2552030S	RPGR2552030S	3000 Lohms
RPGF2552040S	RPGR2552040S	4000 Lohms
RPGF2552050S	RPGR2552050S	5000 Lohms
RPGF2552060S	RPGR2552060S	6000 Lohms
RPGF2552080S	RPGR2552080S	8000 Lohms
RPGF2552100S	RPGR2552100S	10,000 Lohms
RPGF2552120S	RPGR2552120S	12,000 Lohms
RPGF2552150S	RPGR2552150S	15,000 Lohms
RPGF2552200S	RPGR2552200S	20,000 Lohms
RPGF2552250S	RPGR2552250S	25,000 Lohms
RPGF2552300S	RPGR2552300S	30,000 Lohms
RPGF2552400S	RPGR2552400S	40,000 Lohms
RPGF2552450S	RPGR2552450S	45,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Weight:	0.07 grams

MATERIALS	
Body:	316 stainless steel

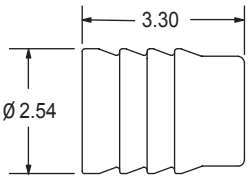
INSTALLATION	
Installation Procedure:	IP RP 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S

For companion 2.5 mm Safety Screen Filter, see page G10.

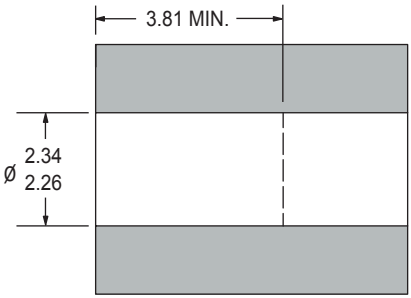
2.5 mm ORIFICE FOR GASES - BRASS

PRESS-IN: FOR INSTALLATION INTO PLASTIC

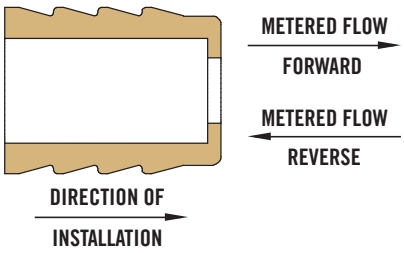
DIMENSIONAL VIEW



INSTALLATION HOLE



All dimensions are in millimeters.



PART NUMBER METERED FLOW DIRECTION		LOHM RATE
FORWARD	REVERSE	
RPGF2554005S	RPGR2554005S	500 Lohms
RPGF2554006S	RPGR2554006S	600 Lohms
RPGF2554008S	RPGR2554008S	800 Lohms
RPGF2554010S	RPGR2554010S	1000 Lohms
RPGF2554012S	RPGR2554012S	1200 Lohms
RPGF2554015S	RPGR2554015S	1500 Lohms
RPGF2554020S	RPGR2554020S	2000 Lohms
RPGF2554025S	RPGR2554025S	2500 Lohms
RPGF2554030S	RPGR2554030S	3000 Lohms
RPGF2554040S	RPGR2554040S	4000 Lohms
RPGF2554050S	RPGR2554050S	5000 Lohms
RPGF2554060S	RPGR2554060S	6000 Lohms
RPGF2554080S	RPGR2554080S	8000 Lohms
RPGF2554100S	RPGR2554100S	10,000 Lohms
RPGF2554120S	RPGR2554120S	12,000 Lohms
RPGF2554150S	RPGR2554150S	15,000 Lohms
RPGF2554200S	RPGR2554200S	20,000 Lohms
RPGF2554250S	RPGR2554250S	25,000 Lohms
RPGF2554300S	RPGR2554300S	30,000 Lohms
RPGF2554400S	RPGR2554400S	40,000 Lohms
RPGF2554450S	RPGR2554450S	45,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Clean and dry nitrogen
Weight:	0.08 grams

MATERIALS	
Body:	Brass C36000

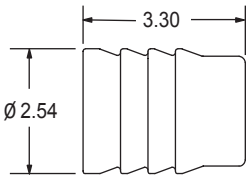
INSTALLATION	
Installation Procedure:	IP RP 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S

For companion 2.5 mm Safety Screen Filter, see page G10.

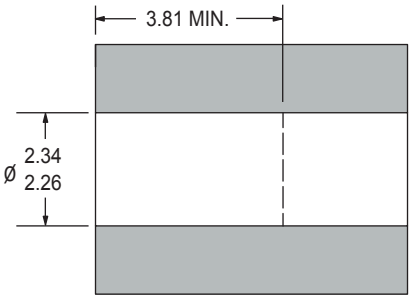
2.5 mm ORIFICE FOR LIQUIDS - 303 STAINLESS STEEL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

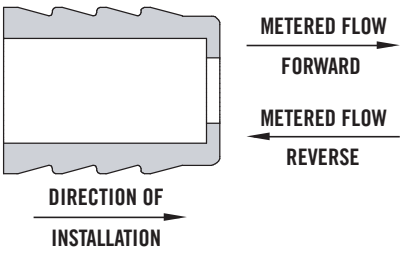
DIMENSIONAL VIEW



INSTALLATION HOLE



All dimensions are in millimeters.



PART NUMBER METERED FLOW DIRECTION		LOHM RATE
FORWARD	REVERSE	
RPLF2551005S	RPLR2551005S	500 Lohms
RPLF2551006S	RPLR2551006S	600 Lohms
RPLF2551008S	RPLR2551008S	800 Lohms
RPLF2551010S	RPLR2551010S	1000 Lohms
RPLF2551012S	RPLR2551012S	1200 Lohms
RPLF2551015S	RPLR2551015S	1500 Lohms
RPLF2551020S	RPLR2551020S	2000 Lohms
RPLF2551025S	RPLR2551025S	2500 Lohms
RPLF2551030S	RPLR2551030S	3000 Lohms
RPLF2551040S	RPLR2551040S	4000 Lohms
RPLF2551050S	RPLR2551050S	5000 Lohms
RPLF2551060S	RPLR2551060S	6000 Lohms
RPLF2551080S	RPLR2551080S	8000 Lohms
RPLF2551100S	RPLR2551100S	10,000 Lohms
RPLF2551120S	RPLR2551120S	12,000 Lohms
RPLF2551150S	RPLR2551150S	15,000 Lohms
RPLF2551200S	RPLR2551200S	20,000 Lohms
RPLF2551250S	RPLR2551250S	25,000 Lohms
RPLF2551300S	RPLR2551300S	30,000 Lohms
RPLF2551400S	RPLR2551400S	40,000 Lohms
RPLF2551450S	RPLR2551450S	45,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Weight:	0.07 grams

MATERIALS	
Body:	303 stainless steel

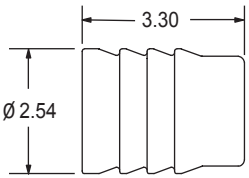
INSTALLATION	
Installation Procedure:	IP RP 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S

For companion 2.5 mm Safety Screen Filter, see page G10.

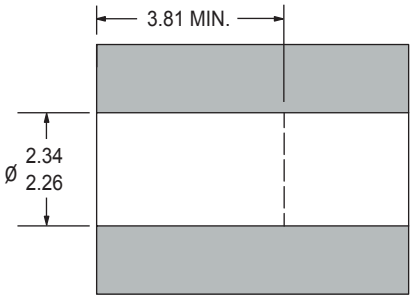
2.5 mm ORIFICE FOR LIQUIDS - 316 STAINLESS STEEL

PRESS-IN: FOR INSTALLATION INTO PLASTIC

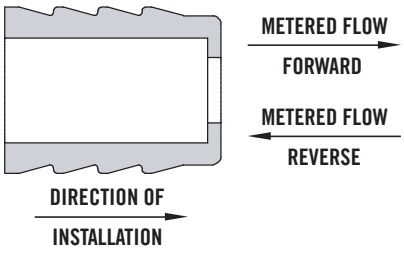
DIMENSIONAL VIEW



INSTALLATION HOLE



All dimensions are in millimeters.



PART NUMBER METERED FLOW DIRECTION		LOHM RATE
FORWARD	REVERSE	
RPLF2552005S	RPLR2552005S	500 Lohms
RPLF2552006S	RPLR2552006S	600 Lohms
RPLF2552008S	RPLR2552008S	800 Lohms
RPLF2552010S	RPLR2552010S	1000 Lohms
RPLF2552012S	RPLR2552012S	1200 Lohms
RPLF2552015S	RPLR2552015S	1500 Lohms
RPLF2552020S	RPLR2552020S	2000 Lohms
RPLF2552025S	RPLR2552025S	2500 Lohms
RPLF2552030S	RPLR2552030S	3000 Lohms
RPLF2552040S	RPLR2552040S	4000 Lohms
RPLF2552050S	RPLR2552050S	5000 Lohms
RPLF2552060S	RPLR2552060S	6000 Lohms
RPLF2552080S	RPLR2552080S	8000 Lohms
RPLF2552100S	RPLR2552100S	10,000 Lohms
RPLF2552120S	RPLR2552120S	12,000 Lohms
RPLF2552150S	RPLR2552150S	15,000 Lohms
RPLF2552200S	RPLR2552200S	20,000 Lohms
RPLF2552250S	RPLR2552250S	25,000 Lohms
RPLF2552300S	RPLR2552300S	30,000 Lohms
RPLF2552400S	RPLR2552400S	40,000 Lohms
RPLF2552450S	RPLR2552450S	45,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Test Fluid:	Distilled water
Weight:	0.07 grams

MATERIALS	
Body:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP RP 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S

For companion 2.5 mm Safety Screen Filter, see page G10.

C



FLOW METERING VALVES



TABLE OF CONTENTS

FLOW CONTROL VALVES

INSERT: FOR INSTALLATION INTO METAL D2-D5
- 5.5 mm Flow Control Valves
- 8 mm Flow Control Valves

PRESS-IN: FOR INSTALLATION INTO PLASTIC D6-D7
- 5.5 mm Flow Control Valves
- 8 mm Flow Control Valves

RESTRICTOR CHECK VALVES

INSERT: FOR INSTALLATION INTO METAL D8-D11
- 5.5 mm Restrictor Check Valves

PRESS-IN: FOR INSTALLATION INTO PLASTIC D12
- 5.5 mm Restrictor Check Valves

FLOW REGULATING VALVES

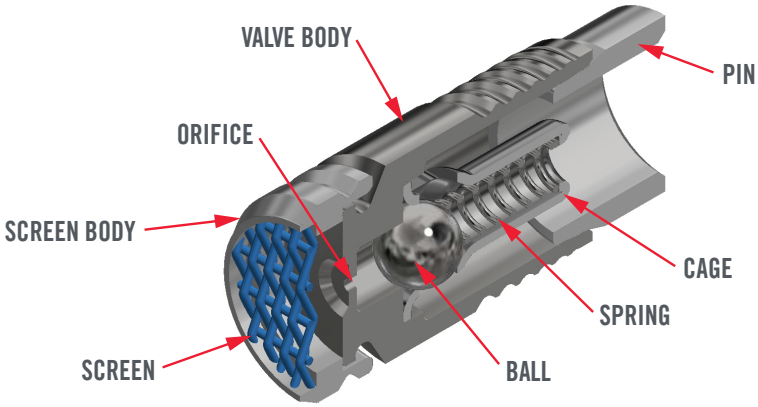
DL: FOR INSTALLATION INTO SOFT METAL D13
- 8 mm Flow Regulating Valves

WHAT IS A FLOW METERING VALVE?

Lee flow metering valves combine multiple hydraulic functions into a single part. These products are classified as **flow control valves, restrictor check valves,** and **flow regulating valves**.

ENGINEERED FOR SUPERIOR PERFORMANCE

Flow metering valves from The Lee Company are designed to add flexibility and functionality to your application. By combining multiple hydraulic functions, they **simplify manifold design** and minimize complexity. Their **accurate flow** control delivers more **reliable system performance** and eliminates the need for expensive alternative components.



FLOW CONTROL VALVES

A flow control valve operates like a flow restrictor placed **in parallel** with a check valve. It provides metered flow in one direction and free, unrestricted flow in the opposite direction.

RESTRICTOR CHECK VALVES

A restrictor check valve provides metered flow in one flow direction and blocks flow in the opposite direction. Functionally, it combines a flow restrictor **in series** with a check valve to provide controlled flow only in the permitted direction.

FLOW REGULATING VALVES

A flow regulating valve maintains a **stable, consistent flow rate** by controlling flow even at low pressure differences. It ensures predictable fluid control for efficient cooling performance applications by delivering consistent flow across varying pressures.

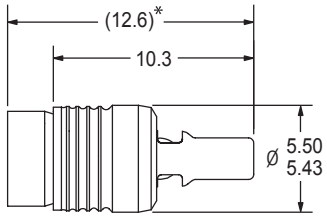
CUSTOMIZATION OPTIONS

Additional customizations are available, allowing engineers to optimize performance based on criteria such as fluid compatibility, nominal Lohm rate and tolerance, or packaging constraints. Select models are also available with an **integral safety screen** for added protection against contamination. For more information or design support, please contact a Lee Sales Engineer.

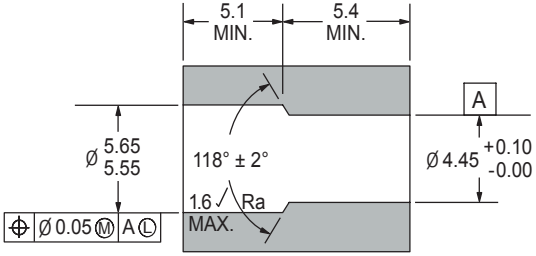
5.5 mm FLOW CONTROL VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

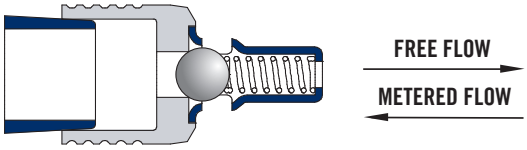
DIMENSIONAL VIEW



INSTALLATION HOLE

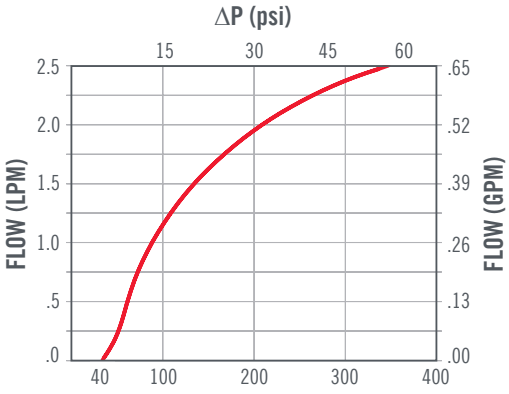


Overall length before installation.
All dimensions are in millimeters, except where noted.



D

ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 40 kPa VALVE

PART NUMBER	LOHM RATE
CFFM5501020S	2000 Lohms
CFFM5501025S	2500 Lohms
CFFM5501030S	3000 Lohms
CFFM5501040S	4000 Lohms
CFFM5501050S	5000 Lohms
CFFM5501060S	6000 Lohms
CFFM5501080S	8000 Lohms
CFFM5501100S	10,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 15%
Free Flow Lohm Rate:	250 Lohms
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) metered flow direction 4 MPa (580 psid) flow direction
Weight:	0.7 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

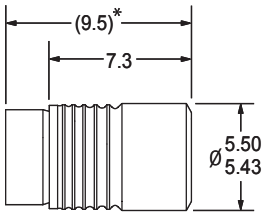
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

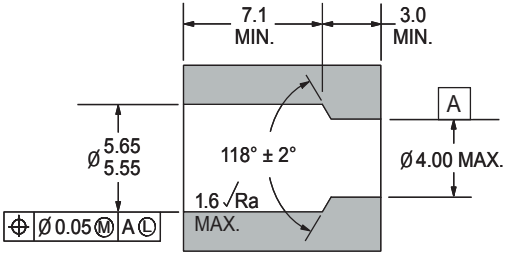
5.5 mm FLOW CONTROL VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

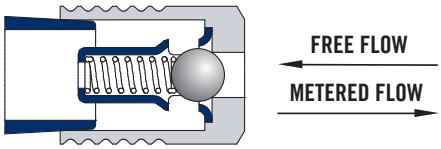
DIMENSIONAL VIEW



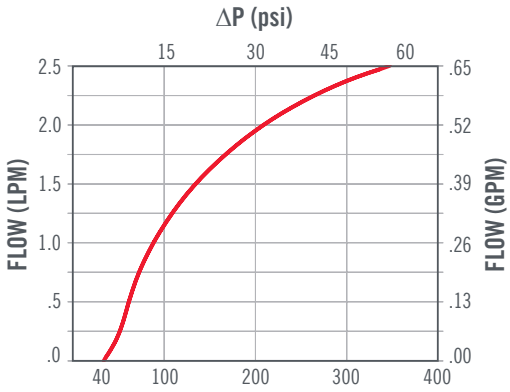
INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 40 kPa VALVE

PART NUMBER	LOHM RATE
CFRM5501020S	2000 Lohms
CFRM5501025S	2500 Lohms
CFRM5501030S	3000 Lohms
CFRM5501040S	4000 Lohms
CFRM5501050S	5000 Lohms
CFRM5501060S	6000 Lohms
CFRM5501080S	8000 Lohms
CFRM5501100S	10,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 15%
Free Flow Lohm Rate:	250 Lohms
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) metered flow direction 4 MPa (580 psid) flow direction
Weight:	0.85 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

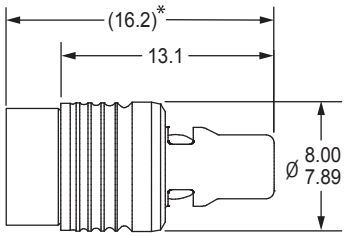
INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

D

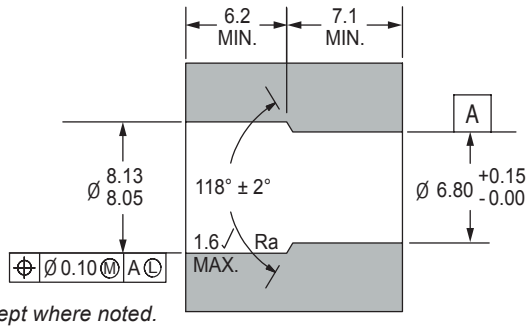
8 mm FLOW CONTROL VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

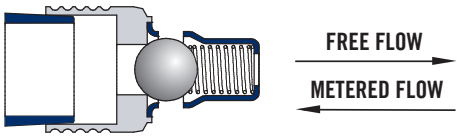
DIMENSIONAL VIEW



INSTALLATION HOLE

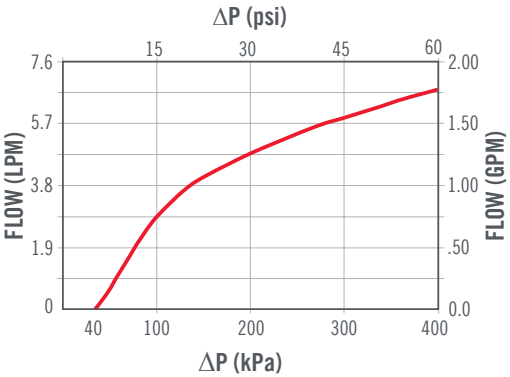


*Overall length before installation.
All dimensions are in millimeters, except where noted.



D

ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 40 kPa VALVE

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 15%
Free Flow Lohm Rate:	75 Lohms
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) metered flow direction 4 MPa (580 psid) flow direction
Weight:	1.8 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

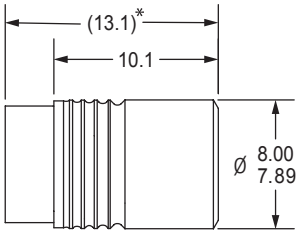
INSTALLATION	
Installation Procedure:	IP 855 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

PART NUMBER	LOHM RATE
CFFM8001005S	500 Lohms
CFFM8001006S	600 Lohms
CFFM8001008S	800 Lohms
CFFM8001010S	1000 Lohms
CFFM8001012S	1200 Lohms
CFFM8001015S	1500 Lohms
CFFM8001020S	2000 Lohms

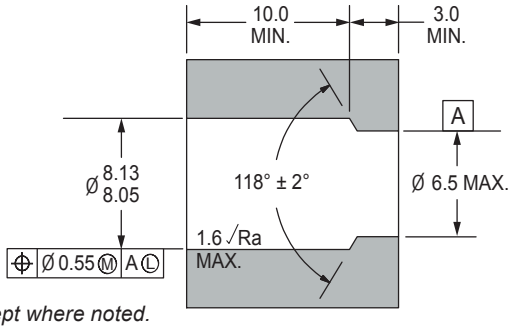
8 mm FLOW CONTROL VALVE - REVERSE FLOW

INSERT: FOR INSTALLATION INTO METAL

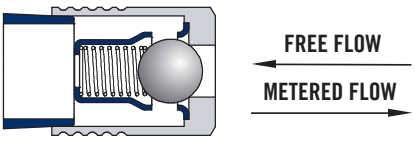
DIMENSIONAL VIEW



INSTALLATION HOLE

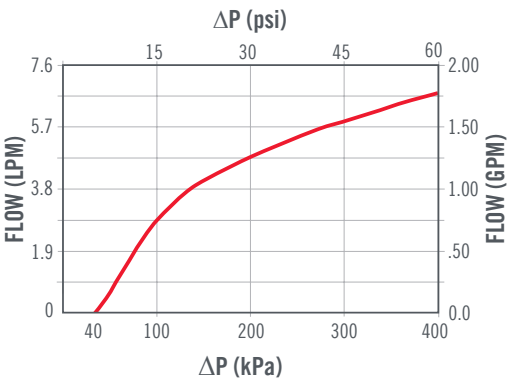


*Overall length before installation.
All dimensions are in millimeters, except where noted.



D

ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 40 kPa VALVE

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 15%
Free Flow Lohm Rate:	75 Lohms
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) metered flow direction 4 MPa (580 psid) flow direction
Weight:	2.3 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

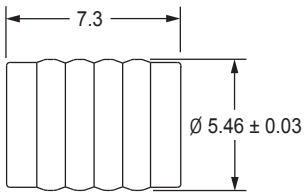
INSTALLATION	
Installation Procedure:	IP 855 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	6.6 kN max.

PART NUMBER	LOHM RATE
CFRM8001005S	500 Lohms
CFRM8001006S	600 Lohms
CFRM8001008S	800 Lohms
CFRM8001010S	1000 Lohms
CFRM8001012S	1200 Lohms
CFRM8001015S	1500 Lohms
CFRM8001020S	2000 Lohms

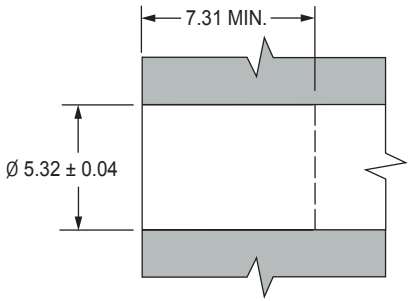
5.5 mm FLOW CONTROL VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

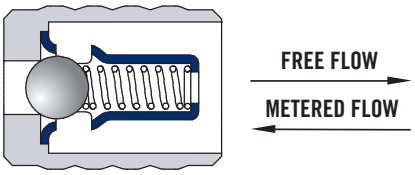
DIMENSIONAL VIEW



INSTALLATION HOLE

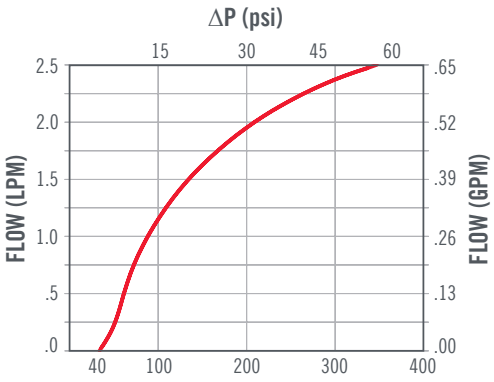


All dimensions are in millimeters.



D

ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 40 kPa VALVE

PART NUMBER	LOHM RATE
CFPM5501020S	2000 Lohms
CFPM5501025S	2500 Lohms
CFPM5501030S	3000 Lohms
CFPM5501040S	4000 Lohms
CFPM5501050S	5000 Lohms
CFPM5501060S	6000 Lohms
CFPM5501080S	8000 Lohms
CFPM5501100S	10,000 Lohms

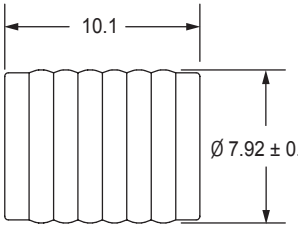
PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 15%
Free Flow Lohm Rate:	250 Lohms
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Weight:	0.65 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

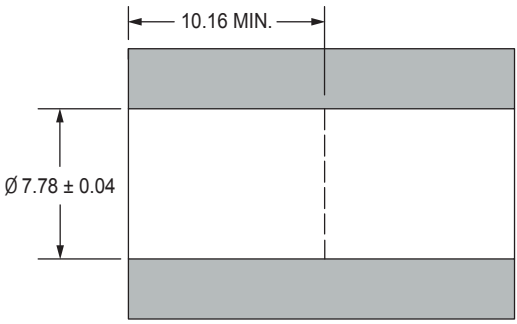
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

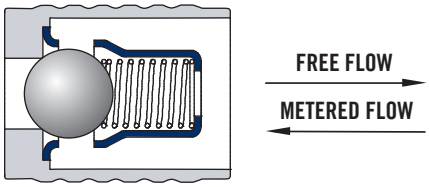
DIMENSIONAL VIEW



INSTALLATION HOLE

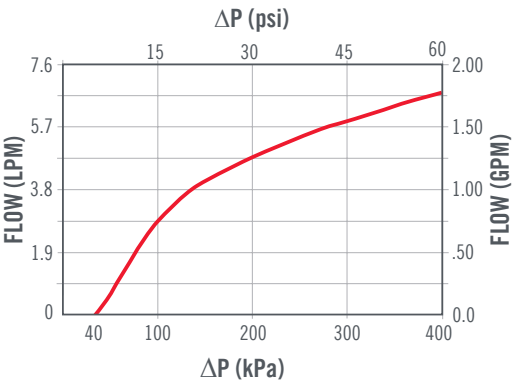


All dimensions are in millimeters.



D

ΔP vs. FLOW ON WATER AT 27°C (80°F)



FLOW CURVE FOR 40 kPa VALVE

PART NUMBER	LOHM RATE
CFPM8001005S	500 Lohms
CFPM8001006S	600 Lohms
CFPM8001008S	800 Lohms
CFPM8001010S	1000 Lohms
CFPM8001012S	1200 Lohms
CFPM8001015S	1500 Lohms
CFPM8001020S	2000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 15%
Free Flow Lohm Rate:	75 Lohms
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Weight:	1.8 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

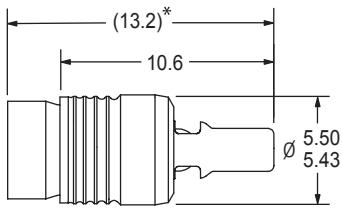
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 855 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

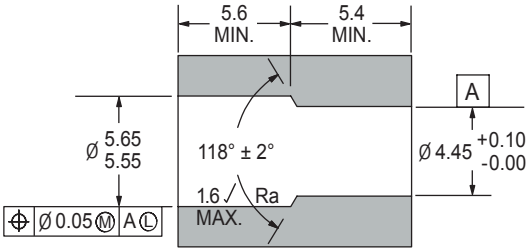
5.5 mm RESTRICTOR CHECK VALVE - FORWARD FLOW

INSERT: FOR INSTALLATION INTO METAL

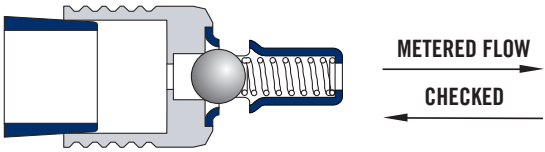
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



D

PART NUMBER	LOHM RATE
COFM5501004S	400 Lohms
COFM5501005S	500 Lohms
COFM5501006S	600 Lohms
COFM5501008S	800 Lohms
COFM5501010S	1000 Lohms
COFM5501012S	1200 Lohms
COFM5501015S	1500 Lohms
COFM5501020S	2000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) metered flow direction
Weight:	0.75 grams

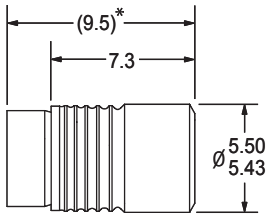
**The pressure at which uprun flow exceeds 50 SCCM of air.

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

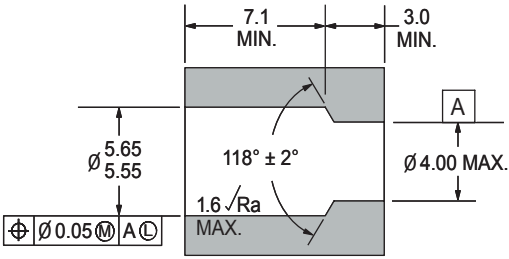
INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

5.5 mm RESTRICTOR CHECK VALVE - REVERSE FLOW
INSERT: FOR INSTALLATION INTO METAL

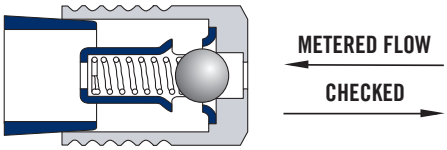
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



D

PART NUMBER	LOHM RATE
CORM5501004S	400 Lohms
CORM5501005S	500 Lohms
CORM5501006S	600 Lohms
CORM5501008S	800 Lohms
CORM5501010S	1000 Lohms
CORM5501012S	1200 Lohms
CORM5501015S	1500 Lohms
CORM5501020S	2000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) metered flow direction
Weight:	0.85 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

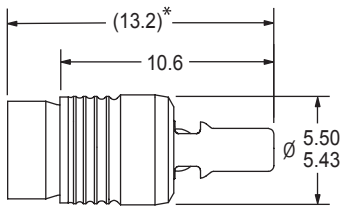
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

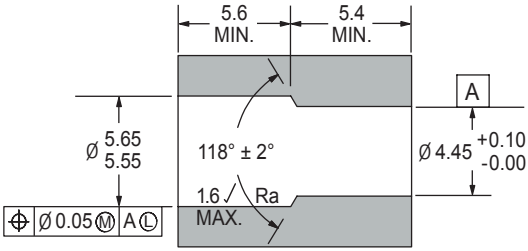
5.5 mm RESTRICTOR CHECK VALVE - FORWARD, SCREENED

INSERT: FOR INSTALLATION INTO METAL

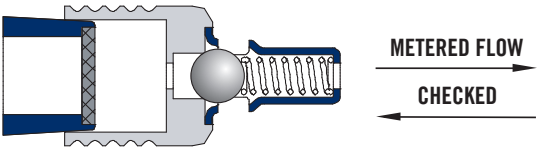
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



D

PART NUMBER	LOHM RATE	SCREEN MICRON RATING
COFM5521025S	2500 Lohms	125
COFM5521030S	3000 Lohms	125
COFM5521040S	4000 Lohms	125
COFM5521050S	5000 Lohms	125
COFM5571060S	6000 Lohms	75
COFM5571080S	8000 Lohms	75
COFM5571100S	10,000 Lohms	75
COFM5571120S	12,000 Lohms	75
COFM5571150S	15,000 Lohms	75

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) metered flow direction
Weight:	0.85 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

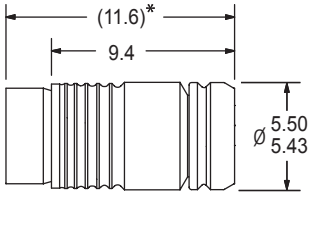
MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

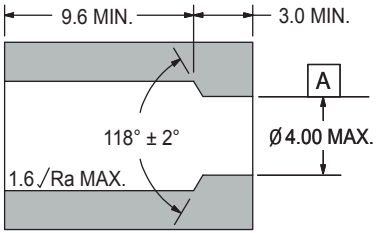
5.5 mm RESTRICTOR CHECK VALVE - REVERSE, SCREENED

INSERT: FOR INSTALLATION INTO METAL

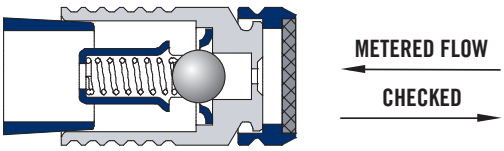
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



PART NUMBER	LOHM RATE	SCREEN MICRON RATING
CORM5521025S	2500 Lohms	125
CORM5521030S	3000 Lohms	125
CORM5521040S	4000 Lohms	125
CORM5521050S	5000 Lohms	125
CORM5571060S	6000 Lohms	75
CORM5571080S	8000 Lohms	75
CORM5571100S	10,000 Lohms	75
CORM5571120S	12,000 Lohms	75
CORM5571150S	15,000 Lohms	75
CORM5541200S	20,000 Lohms	40
CORM5541300S	30,000 Lohms	40
CORM5541400S	40,000 Lohms	40

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) metered flow direction
Weight:	1.05 grams

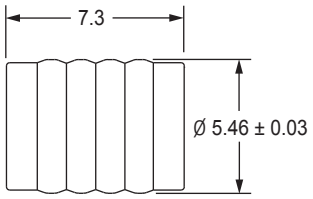
**The pressure at which uprun flow exceeds 50 SCCM of air.

INSTALLATION	
Installation Procedure:	IP 558 RC Reverse Insert - Screened (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

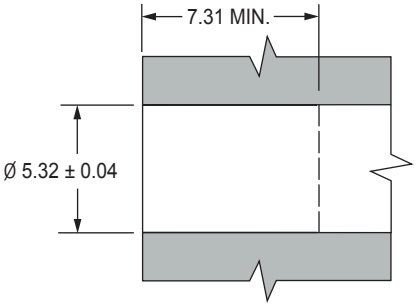
5.5 mm RESTRICTOR CHECK VALVE

PRESS-IN: FOR INSTALLATION INTO PLASTIC

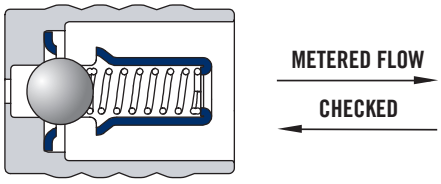
DIMENSIONAL VIEW



INSTALLATION HOLE



All dimensions are in millimeters.



PART NUMBER	LOHM RATE
COPM5501004S	400 Lohms
COPM5501005S	500 Lohms
COPM5501006S	600 Lohms
COPM5501008S	800 Lohms
COPM5501010S	1000 Lohms
COPM5501012S	1200 Lohms
COPM5501015S	1500 Lohms
COPM5501020S	2000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Leakage:	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure**:	40 ± 30 kPa (6 ± 4.4 psid)
Weight:	0.65 grams

**The pressure at which uprun flow exceeds 50 SCCM of air.

MATERIALS	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

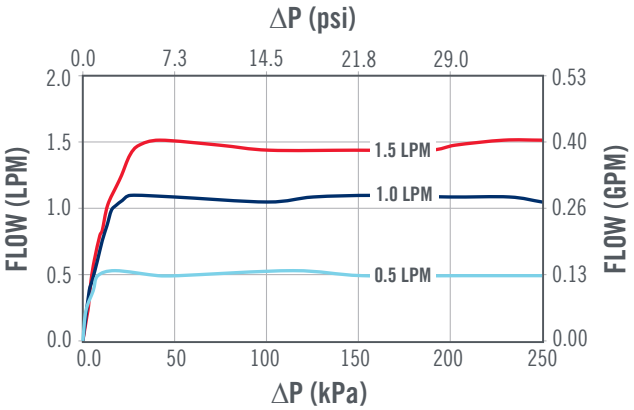
INSTALLATION	
Installation Procedure:	IP 558 Press-In (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

LOOKING FOR CONSTANT, REGULATED FLOW?

The 8 mm Flow Regulating Valve delivers stable, constant flow in demanding systems. It maintains a constant flow rate across a wide range of pump pressures (1.5 to 35 psid), eliminating performance variability caused by pressure fluctuations and pump ripple. Available in multiple configurations, this compact, highly precise valve is designed to ensure stable flow rates at low pressures. It is ideal for controlling flow at the chip and cold plate level in direct-to-chip liquid cooling for AI data centers to ensure consistent thermal performance as workloads and pressures change. The valve can also be utilized in other advanced liquid cooling architectures in the automotive and industrial markets. The valve's design supports scalable system expansion without rebalancing and allows for quick, drop-in installation to minimize maintenance and downtime.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



Visit theleeco.com/flowregulatingvalve to learn more about this product.

LEARN MORE

VENT VALVES



TABLE OF CONTENTS

INSERT: FOR INSTALLATION INTO METAL

- 5.5 mm Vent Valves..... E2-E3

PRESS-IN: FOR INSTALLATION INTO PLASTIC

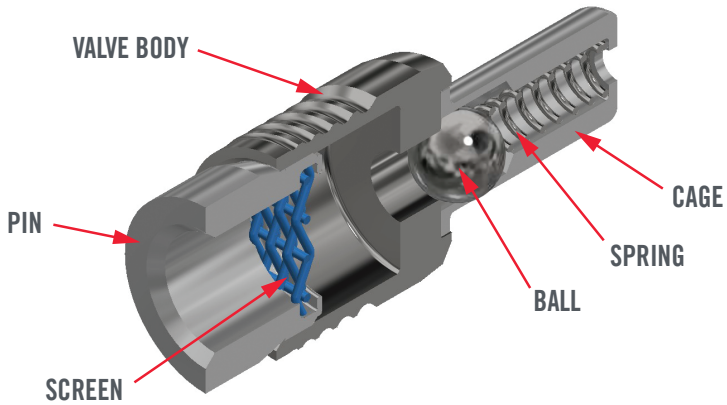
- 4.5 mm Vent Valves..... E4

WHAT IS A VENT VALVE?

Vent valves provide a more efficient way to prime a system and minimize the effects of trapped air. They are normally closed valves that prohibit air from being drawn back into a system during shutdown. During startup, the system pressure increases and opens the valve, allowing any trapped air to vent out of the system. The valve then closes as the system approaches its operating pressure, eliminating further hydraulic losses.

ENGINEERED FOR SUPERIOR PERFORMANCE

Lee vent valves offer a **unique solution** to remove trapped air in hydraulic systems. Their compact design, superior performance, and simple installation make them ideal for high volume applications across automotive, off-road, and industrial hydraulic systems.



Historically, trapped air in hydraulic systems is removed either by manually bleeding the system or by drilling a small vent hole in the manifold to allow air to escape to the sump. Manual bleeding increases equipment downtime and reduces overall productivity. Drilled vent holes allow hydraulic fluid to flow continuously from the system, resulting in unnecessary hydraulic losses, reduced efficiency, and wasted energy.

Lee vent valves give system designers a way to **improve system efficiencies, eliminate wasted energy**, and **restore system performance**. Available in designs for retention into metal or plastic housings, these vent valves remove trapped air while preventing continuous fluid loss.

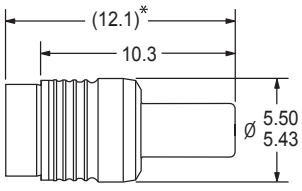
CUSTOMIZATION OPTIONS

Additional customizations are available, allowing engineers to optimize performance based on criteria such as flow rate, shut-off pressure, normally open configuration, leakage performance, envelope, or material. Because these modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. For more information or design support, please contact a Lee Sales Engineer.

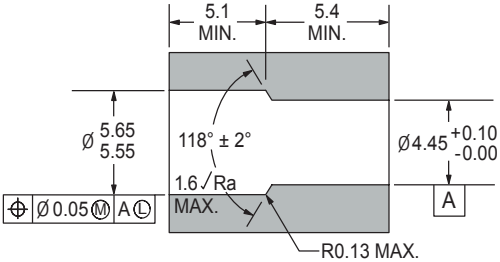
5.5 mm VENT VALVE - FORWARD FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

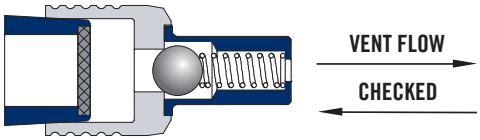
DIMENSIONAL VIEW



INSTALLATION HOLE



*Overall length before installation.
All dimensions are in millimeters, except where noted.

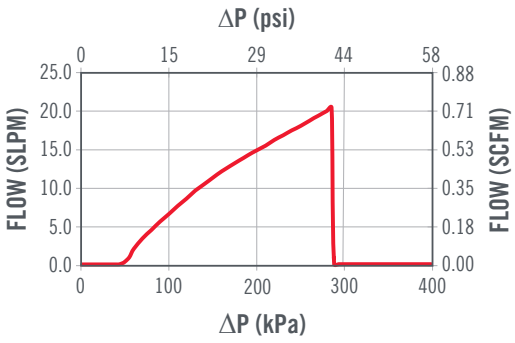


PERFORMANCE	
Lohm Rate:	1100 Lohms
Leakage:	Vent valves are normally closed. Specials are available for normally open versions.
Screen Size:	125 microns
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) vent direction
Weight:	0.88 grams

E

A B

ΔP vs. FLOW ON AIR



TYPICAL FLOW CURVE for CCVF5530290S

MATERIALS	
Body:	303 stainless steel
Cage:	303 stainless steel
Pin:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP 558 Vent Forward Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

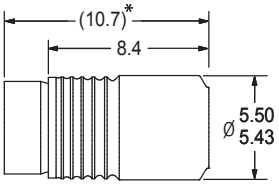
PART NUMBER	CRACKING PRESSURE**	FLOW POINT - MIN. FLOW (REF.)	FLOW POINT PRESSURE	SHUTOFF PRESSURE***
CCVF5530120S	10 ± 5 kPa (1.5 ± 0.7 psid)	5 SLPM	60 ± 10 kPa (8.7 ± 1.5 psid)	120 ± 30 kPa (17.4 ± 4.4 psid)
CCVF5530290S	50 ± 30 kPa (7.3 ± 4.4 psid)	10 SLPM	200 ± 10 kPa (29.0 ± 1.5 psid)	290 ± 60 kPa (42.1 ± 8.7 psid)
CCVF5530540S	100 ± 30 kPa (14.5 ± 4.4 psid)	17 SLPM	400 ± 10 kPa (58.0 ± 1.5 psid)	540 ± 120 kPa (78.3 ± 17.4 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.
***The pressure at which uprun flow is less than 20 SCCM of air.

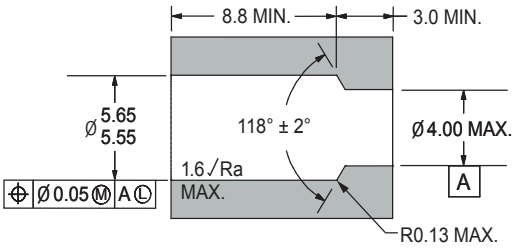
5.5 mm VENT VALVE - REVERSE FLOW, SCREENED

INSERT: FOR INSTALLATION INTO METAL

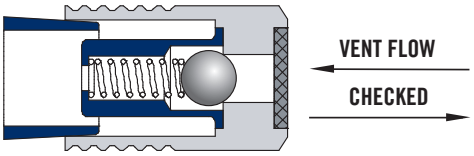
DIMENSIONAL VIEW



INSTALLATION HOLE

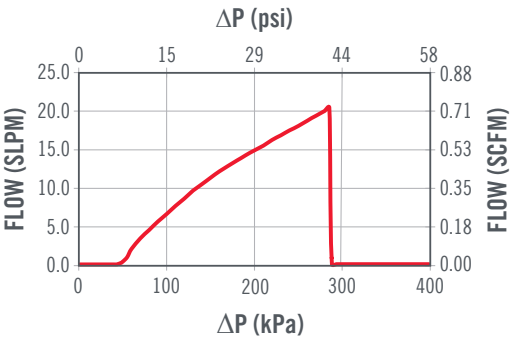


*Overall length before installation.
All dimensions are in millimeters, except where noted.



PERFORMANCE	
Lohm Rate:	1100 Lohms
Leakage:	Vent valves are normally closed. Specials are available for normally open versions.
Screen Size:	125 microns
Maximum Working Pressure Differential:	28 MPa (4060 psid) checked direction 4 MPa (580 psid) vent direction
Weight:	1.03 grams

ΔP vs. FLOW ON AIR



TYPICAL FLOW CURVE for CCVR5530290S

MATERIALS	
Body:	303 stainless steel
Cage:	303 stainless steel
Pin:	416 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel
Screen:	316 stainless steel

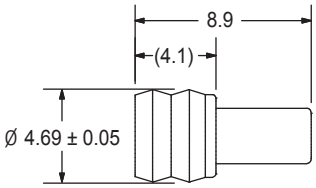
INSTALLATION	
Installation Procedure:	IP 558 Vent Reverse Insert (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	6.1 kN max.

PART NUMBER	CRACKING PRESSURE**	FLOW POINT - MIN. FLOW (REF.)	FLOW POINT PRESSURE	SHUTOFF PRESSURE***
CCVR5530120S	10 ± 5 kPa (1.5 ± 0.7 psid)	5 SLPM	60 ± 10 kPa (8.7 ± 1.5 psid)	120 ± 30 kPa (17.4 ± 4.4 psid)
CCVR5530290S	50 ± 30 kPa (7.3 ± 4.4 psid)	10 SLPM	200 ± 10 kPa (29.0 ± 1.5 psid)	290 ± 60 kPa (42.1 ± 8.7 psid)
CCVR5530540S	100 ± 30 kPa (14.5 ± 4.4 psid)	17 SLPM	400 ± 10 kPa (58.0 ± 1.5 psid)	540 ± 120 kPa (78.3 ± 17.4 psid)

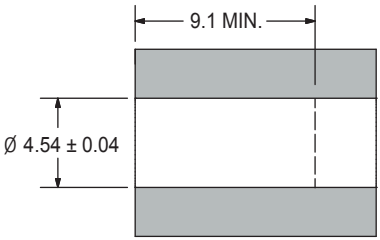
**The pressure at which uprun flow exceeds 50 SCCM of air.
***The pressure at which uprun flow is less than 20 SCCM of air.

4.5 mm VENT VALVE
PRESS-IN: FOR INSTALLATION INTO PLASTIC

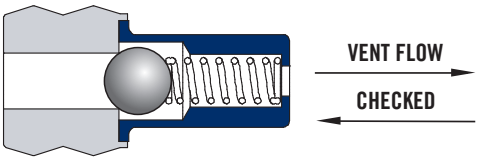
DIMENSIONAL VIEW



INSTALLATION HOLE



All dimensions are in millimeters.

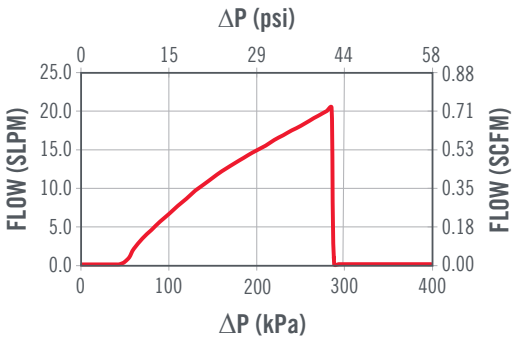


PERFORMANCE	
Lohm Rate:	1100 Lohms
Leakage:	Vent valves are normally closed. Specials available for normally open versions.
Screen Size:	125 microns
Weight:	0.57 grams

MATERIALS	
Body:	303 stainless steel
Cage:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	For forward flow, IP 4.5 mm Press-In F; for reverse flow, IP 4.5 mm Press-In R (files available at: theleeco.com/installation)
Installation Tool:	Forward Flow, CCRT0055034S; Reverse Flow, CCRT0055036S

ΔP vs. FLOW ON AIR



TYPICAL FLOW CURVE for CCVP4500290S

PART NUMBER	CRACKING PRESSURE*	FLOW POINT - MIN. FLOW (REF.)	FLOW POINT PRESSURE	SHUTOFF PRESSURE**
CCVP4500120S	10 ± 5 kPa (1.5 ± 0.7 psid)	5 SLPM	60 ± 10 kPa (8.7 ± 1.5 psid)	120 ± 30 kPa (17.4 ± 4.4 psid)
CCVP4500290S	50 ± 30 kPa (7.3 ± 4.4 psid)	10 SLPM	200 ± 10 kPa (29.0 ± 1.5 psid)	290 ± 60 kPa (42.1 ± 8.7 psid)
CCVP4500540S	100 ± 30 kPa (14.5 ± 4.4 psid)	17 SLPM	400 ± 10 kPa (58.0 ± 1.5 psid)	540 ± 120 kPa (78.3 ± 17.4 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.*
***The pressure at which uprun flow is less than 20 SCCM of air.*

SHUTTLE VALVES



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INSERT: FOR INSTALLATION INTO METAL

- 5.5 mm Shuttle Valves F2
- 6 mm Shuttle Valves F3
- 8 mm Shuttle Valves F4

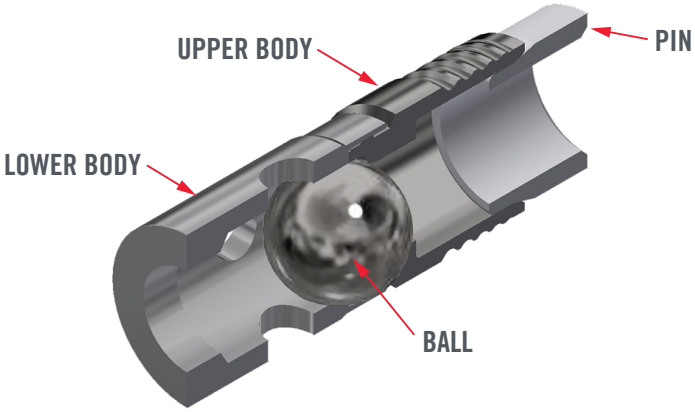
WHAT IS A SHUTTLE VALVE?

A shuttle valve is a three-port device that allows flow from one of two sources to a single outlet, automatically selecting the source with higher pressure.

ENGINEERED FOR SUPERIOR PERFORMANCE

The Lee Company has developed a wide range of miniature shuttle valves designed for precision hydraulic controls. These valves feature exceptionally **low shuttling pressure**, which enables fast system response and reliable performance. Shuttling pressure is the point at which the internal shuttle – a sliding element inside the valve – moves from one inlet to the other, a critical factor for maintaining system stability and ensuring predictable performance under varying operating conditions.

Lee shuttle valves feature a compact, non-detented, selective design that delivers dependable hydraulic isolation within manifold systems. Each valve is the **smallest in its flow class** – often just one-third the size of comparable valves with similar flow rates – allowing system designers to substantially **minimize housing size**.



The valve's insert locking end uses the field-proven Lee Controlled Expansion Principle to provide secure **all-metal** retention **without the need for threads, O-rings, or sealants**. By eliminating these components, the design reduces potential leak paths and simplifies installation, making it an ideal choice for auxiliary hydraulic functions such as load-sensing and braking applications. Their **leak-tight construction** prevents system drift and eliminates unnecessary losses.

Lee shuttle valves are available in three different sizes depending on the flow capacity and pressure in your system:

- **5.5 mm Shuttle Valve:** 75 Lohms (7.95 LPM at 345 kPa), 280 bar
- **6 mm Shuttle Valve:** 150 Lohms (3.9 LPM at 345 kPa), 400 bar
- **8 mm Shuttle Valve:** 32 Lohms (18.2 LPM at 345 kPa), 280 bar

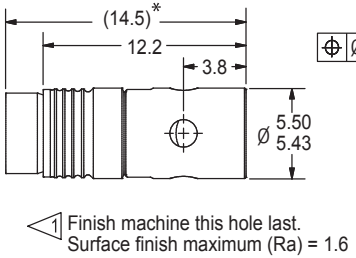
CUSTOMIZATION OPTIONS

In addition to the standard shuttle valve configurations listed in this handbook, The Lee Company offers custom designs to meet unique application needs. Examples include spring-biased shuttle valves, which manage directional flow in unequal area actuators by responding to pressure inputs, and inverse shuttle valves, which connect the lower pressure inlet to the common port instead of the higher pressure side. Because these modifications are often straightforward to implement, customized solutions can typically be delivered quickly and cost-effectively. For more information or design support, please contact a Lee Sales Engineer.

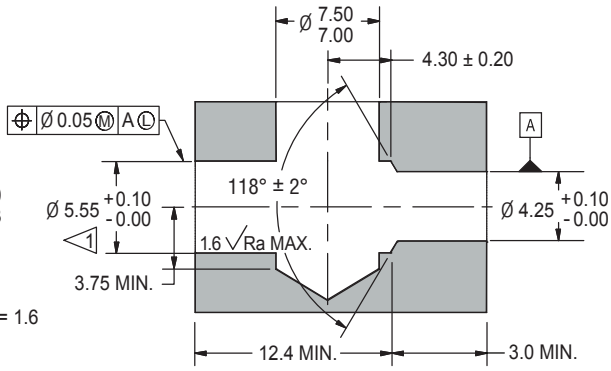
5.5 mm SHUTTLE VALVE

INSERT: FOR INSTALLATION INTO METAL

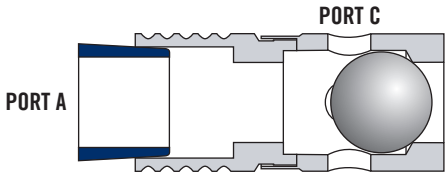
DIMENSIONAL VIEW



INSTALLATION HOLE

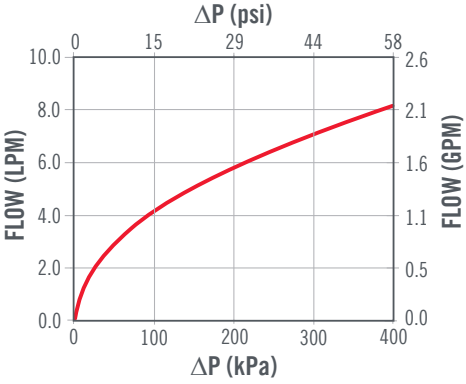


Overall length before installation.
All dimensions are in millimeters, except where noted.



FLOW DIRECTION:
Port A to Port C or
Port B to Port C

ΔP vs. FLOW ON WATER AT 27°C (80°F)



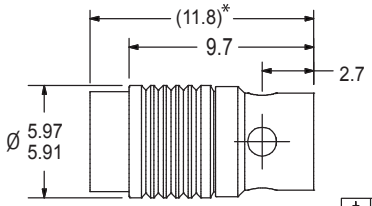
PERFORMANCE	
Lohm Rate: (A to C or B to C)	75 Lohms, 7.95 LPM at 345 kPa (2.1 GPM at 50 psid) on hydraulic fluid
Shuttling Pressure:	7 kPa (1 psid) max.
Leakage: (A to B or B to A)	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid)
Weight:	1.35 grams

PART NUMBER
CCSV5510000S

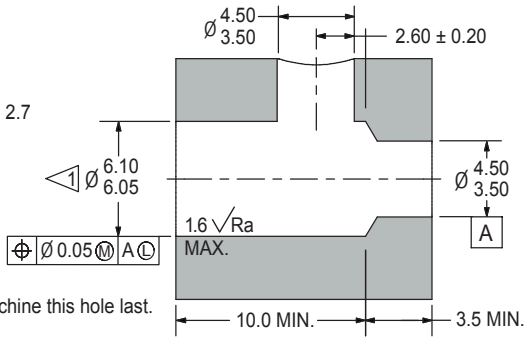
MATERIALS	
Upper Body:	303 stainless steel
Lower Body:	303 stainless steel
Pin:	416 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP SV 55 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900120S
Installation Force:	5.3 kN min. to 6.2 kN max.

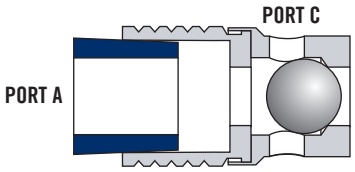
DIMENSIONAL VIEW



INSTALLATION HOLE

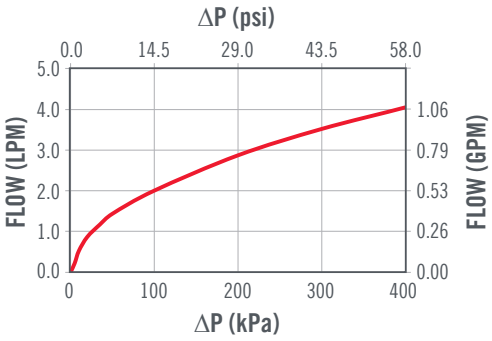


Overall length before installation.
All dimensions are in millimeters, except where noted.



FLOW DIRECTION:
Port A to Port C or
Port B to Port C

ΔP vs. FLOW ON WATER AT 27°C (80°F)



PERFORMANCE	
Lohm Rate: (A to C or B to C)	150 Lohms, 3.9 LPM at 350 kPa (1.05 GPM at 51 psid) on hydraulic fluid
Shuttling Pressure:	7 kPa (1 psid) max.
Leakage: (A to B or B to A)	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	400 bar (5800 psid)
Weight:	1.35 grams

PART NUMBER
CCSV6010000S

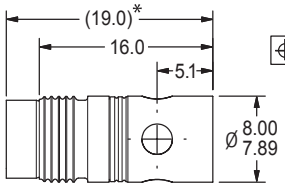
MATERIALS	
Upper Body:	303 stainless steel
Lower Body:	416 stainless steel
Pin:	416 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP 400 Bar Shuttle (file available at: theleeco.com/installation)
Installation Tool:	CCRT0051078S
Installation Force:	6.7 kN min. to 8.9 kN max.

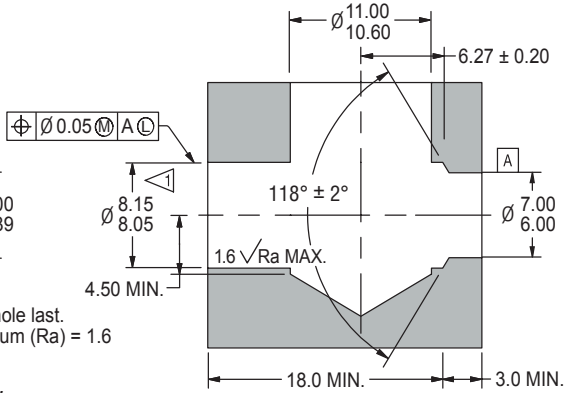
8 mm SHUTTLE VALVE

INSERT: FOR INSTALLATION INTO METAL

DIMENSIONAL VIEW

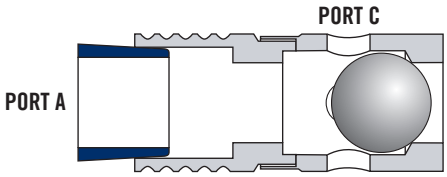


INSTALLATION HOLE



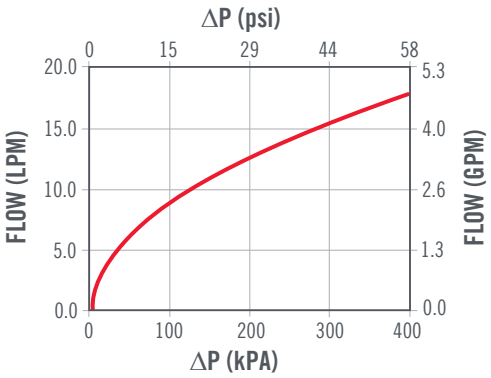
1 Finish machine this hole last.
Surface finish maximum (Ra) = 1.6

Overall length before installation.
All dimensions are in millimeters, except where noted.



FLOW DIRECTION:
Port A to Port C or
Port B to Port C

ΔP vs. FLOW ON WATER AT 27°C (80°F)



PERFORMANCE	
Lohm Rate: (A to C or B to C)	32 Lohms, 18.2 LPM at 345 kPa (4.8 GPM at 50 psid) on hydraulic fluid
Shuttling Pressure:	7 kPa (1 psid) max.
Leakage: (A to B or B to A)	20 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on hydraulic fluid)
Maximum Working Pressure Differential:	28 MPa (4060 psid)
Weight:	3.5 grams

PART NUMBER
CCSV8010000S

MATERIALS	
Upper Body:	303 stainless steel
Lower Body:	303 stainless steel
Pin:	416 stainless steel
Ball:	440C stainless steel

INSTALLATION	
Installation Procedure:	IP SV 8 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900150S
Installation Force:	5.3 kN min. to 6.2 kN max.

SAFETY SCREEN FILTERS

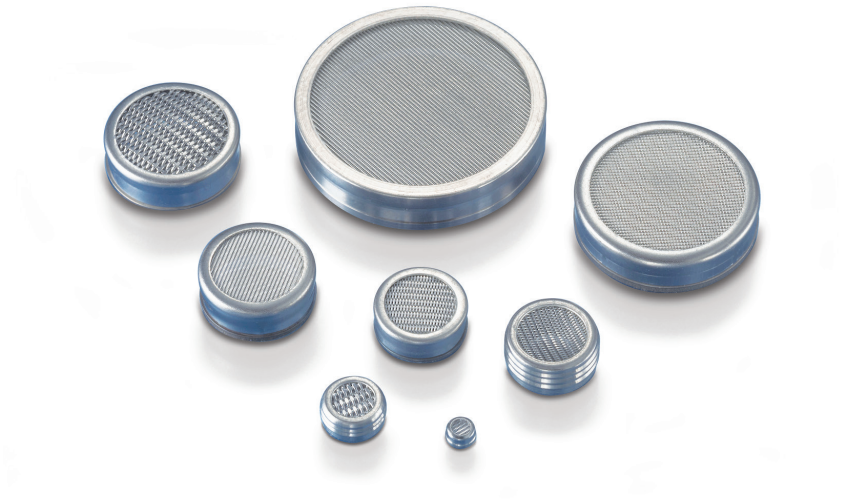


TABLE OF CONTENTS

CARTRIDGE: CUSTOMER RETAINED G2-G8

- 5.5 mm Safety Screen Filters
  - 5.5 mm Safety Screen Filter Retainer
- 8 mm Safety Screen Filters
  - 8 mm Safety Screen Filter Retainer
- 10 mm Safety Screen Filters
- 12 mm Safety Screen Filters
- 16 mm Safety Screen Filters

BARB RETENTION: FOR INSTALLATION INTO METAL G9

- 12 mm BR Series Safety Screen Filters

PRESS-IN: FOR INSTALLATION INTO PLASTIC G10-G12

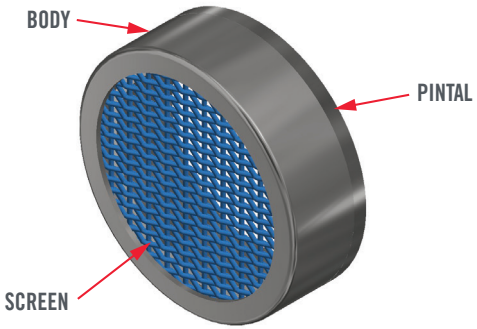
- 2.5 mm Safety Screen Filters
- 5.5 mm Safety Screen Filters
- 8 mm Safety Screen Filters

WHAT IS A SAFETY SCREEN FILTER?

Contamination poses a serious risk to downstream components and can be introduced at any stage – from assembly to maintenance. Last chance safety screen filters act as a final safeguard, helping prevent sudden and costly failures caused by rogue particles. These screens are not intended for full-system filtration, but rather as critical point-of-use protection.

ENGINEERED FOR SUPERIOR PERFORMANCE

Safety screen filters from The Lee Company are designed to be **effective, economical, and easy to install**. They are constructed of **stainless steel woven wire mesh** and bonded together using a proprietary process that enhances structural integrity and extends life. Lee safety screen filters are engineered to prevent a rupture and instead allow a gradual reduction in flow performance. They are available in various diameters for ultimate **design flexibility**.



CARTRIDGE RETENTION

Cartridge safety screen filters are designed to slip into a drilled flat bottom hole and be retained by a secondary means. Secondary retention options for safety screen filters include insert retainers, threaded retainers, C-clips, or designs that integrate directly into an existing manifold layout. This helps ensure the screen remains securely mounted under demanding operating conditions.

BARB RETENTION

BR Series safety screen filters use a threadless mechanical retention method in which small, engineered barbs on the exterior of the screen grip the walls of a housing as the screen is pressed into place. This allows for quick, secure installation without the need for threads, sealants, or O-rings.

PRESS-IN RETENTION

Press-in safety screen filters are designed for simple installation into plastic housings and fittings, using a unique barbed design that ensures secure retention. See page i1 for more information about press-in retention.

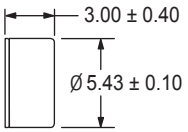
CUSTOMIZATION OPTIONS

Additional customizations are available, allowing engineers to optimize performance based on criteria such as fluid compatibility, micron rating, Lohm rate, or packaging constraints. For more information or design support, please contact a Lee Sales Engineer.

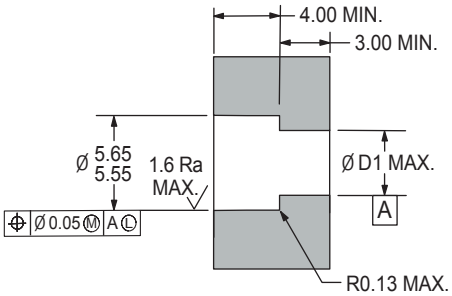
5.5 mm SAFETY SCREEN FILTER

CARTRIDGE: CUSTOMER RETAINED

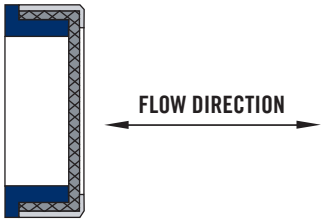
DIMENSIONAL VIEW



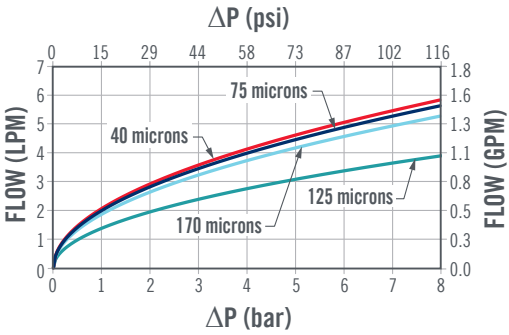
INSTALLATION HOLE



All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	305 stainless steel
Pintal:	17-7 stainless steel
Screen:	316 stainless steel

INSTALLATION

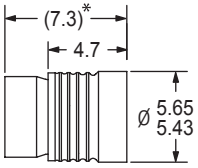
The 5.5 mm Safety Screen Filter is designed to slip into a drilled flat bottom hole and be retained by a secondary means. The 5.5 mm Safety Screen Filter Retainer shown on the following page is available for this purpose.

PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	MIN. BURST PRESSURE (MPa)**	D1 MAX. (mm)	WEIGHT (g)
SCRM7551040S	40	145 Lohms	3.2	0.06	24	3.84	0.17
SCRM7551075S	75	140 Lohms	2.5	0.10	24	3.66	0.18
SCRM7551125S	125	210 Lohms	1.6	0.14	24	3.41	0.22
SCRM7551170S	170	155 Lohms	1.8	0.33	24	2.91	0.24

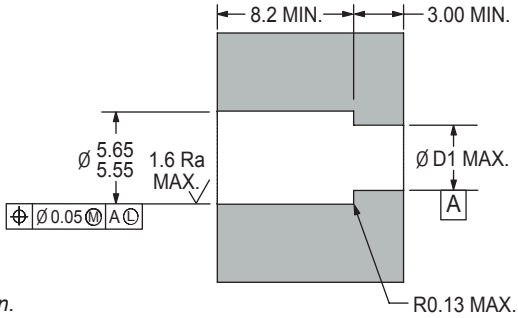
**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

***Minimum burst pressure for a fully clogged safety screen filter.*

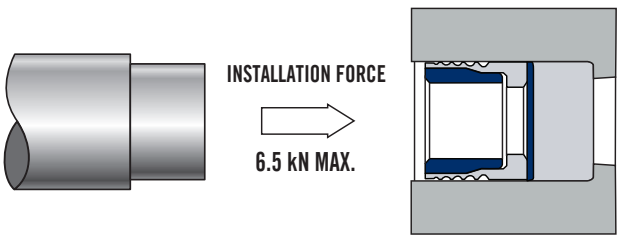
DIMENSIONAL VIEW



INSTALLATION HOLE



Overall length before installation.
All dimensions are in millimeters, except where noted.



SCREEN PART NUMBER	D1 MAX. (mm)
SCRM7551040S	3.84
SCRM7551075S	3.66
SCRM7551125S	3.41
SCRM7551170S	2.91

RETAINER PART NUMBER	WEIGHT (g)
SCRR5510001S	0.5

Screen and retainer sold separately.

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

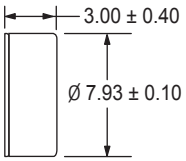
INSTALLATION	
Installation Tool:	CCRT0900120S
Installation Force:	6.5 kN max.

To install, insert the 5.5 mm Safety Screen Filter into the installation hole as shown above. Then place the screen retainer into the installation hole and drive the expansion pin flush to within 0.25 mm above flush of the retainer. The installation tool can bottom on the retainer body with no consequence.

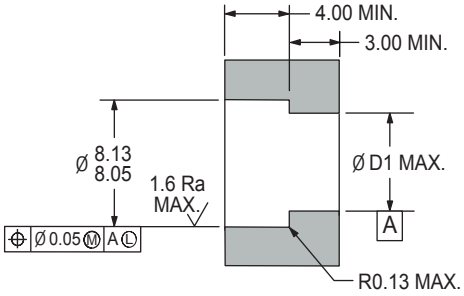
8 mm SAFETY SCREEN FILTER

CARTRIDGE: CUSTOMER RETAINED

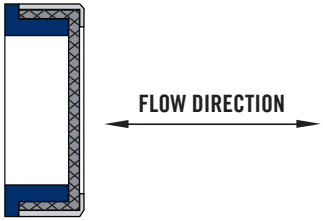
DIMENSIONAL VIEW



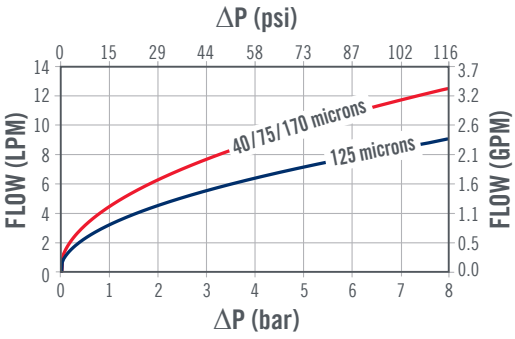
INSTALLATION HOLE



All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	305 stainless steel
Pintal:	17-7 stainless steel
Screen:	316 stainless steel

INSTALLATION

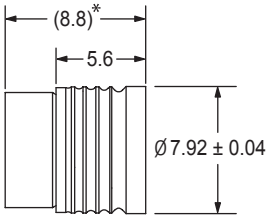
The 8 mm Safety Screen Filter is designed to slip into a drilled flat bottom hole and be retained by a secondary means. The 8 mm Safety Screen Filter Retainer shown on the following page is available for this purpose.

PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	MIN. BURST PRESSURE (MPa)**	D1 MAX. (mm)	WEIGHT (g)
SCRM7801040S	40	65 Lohms	7.7	0.14	24	6.03	0.33
SCRM7801075S	75	65 Lohms	7.3	0.29	24	5.81	0.36
SCRM7801125S	125	90 Lohms	4.7	0.41	24	5.54	0.44
SCRM7801170S	170	65 Lohms	5.4	0.96	24	5.10	0.46

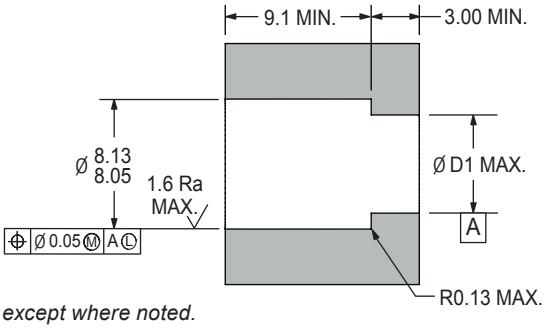
**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

***Minimum burst pressure for a fully clogged safety screen filter.*

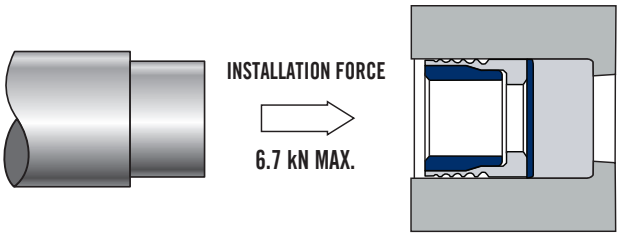
DIMENSIONAL VIEW



INSTALLATION HOLE



**Overall length before installation.*
All dimensions are in millimeters, except where noted.



SCREEN PART NUMBER	D1 MAX. (mm)
SCRM7801040S	6.03
SCRM7801075S	5.81
SCRM7801125S	5.54
SCRM7801170S	5.10

RETAINER PART NUMBER	WEIGHT (g)
SCRR8010001S	1

Screen and retainer sold separately.

MATERIALS	
Body:	303 stainless steel
Pin:	416 stainless steel

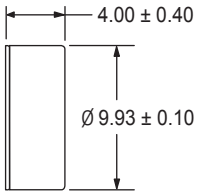
INSTALLATION	
Installation Tool:	CCRT0900150S
Installation Force:	6.7 kN max.

To install, insert the 8 mm Safety Screen Filter into the installation hole as shown above. Then place the screen retainer into the installation hole and drive the expansion pin flush to within 0.25 mm above flush of the retainer. The installation tool can bottom on the retainer body with no consequence.

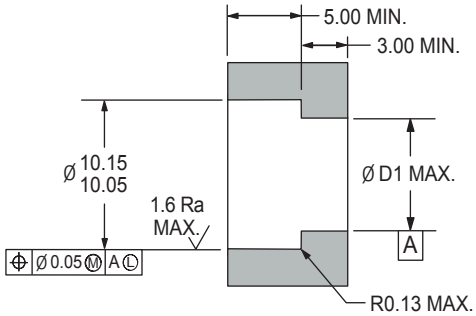
10 mm SAFETY SCREEN FILTER

CARTRIDGE: CUSTOMER RETAINED

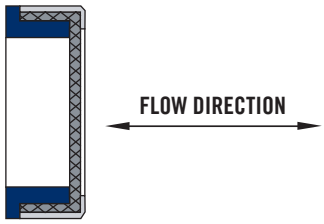
DIMENSIONAL VIEW



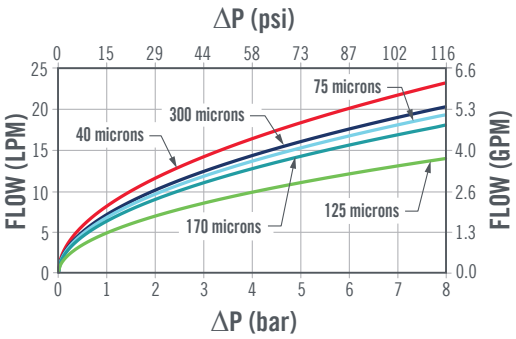
INSTALLATION HOLE



All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	305 stainless steel
Pintal:	17-7 stainless steel
Screen:	316 stainless steel

INSTALLATION

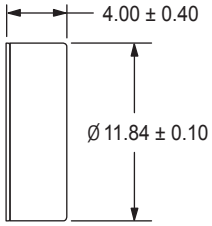
The 10 mm Safety Screen Filter is designed to slip into a drilled flat bottom hole and be retained by a secondary means.

PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	MIN. BURST PRESSURE (MPa)**	D1 MAX. (mm)	WEIGHT (g)
SCRM7101040S	40	35 Lohms	11.6	0.22	24	7.56	0.71
SCRM7101075S	75	42 Lohms	9.6	0.39	24	7.31	0.71
SCRM7101125S	125	58 Lohms	7.4	0.65	24	6.98	0.84
SCRM7101170S	170	45 Lohms	8.7	1.53	24	6.49	0.88
SCRM7101300S	300	40 Lohms	10.0	6.75	24	6.01	0.90

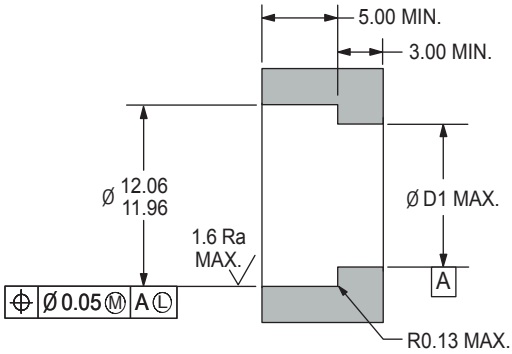
**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

***Minimum burst pressure for a fully clogged safety screen filter.*

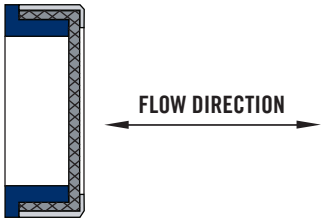
DIMENSIONAL VIEW



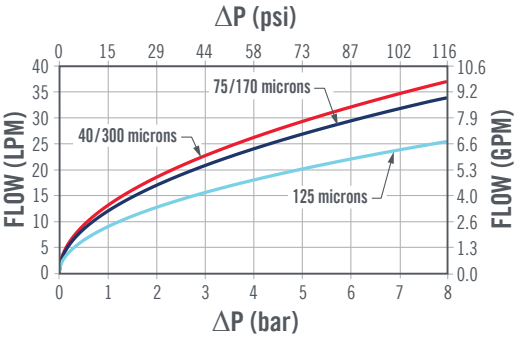
INSTALLATION HOLE



All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	305 stainless steel
Pintal:	17-7 stainless steel
Screen:	316 stainless steel

INSTALLATION

The 12 mm Safety Screen Filter is designed to slip into a drilled flat bottom hole and be retained by a secondary means.

PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	MIN. BURST PRESSURE (MPa)**	D1 MAX. (mm)	WEIGHT (g)
SCRM7121040S	40	22 Lohms	18.1	0.34	24	9.46	0.87
SCRM7121075S	75	24 Lohms	14.9	0.60	24	9.16	0.91
SCRM7121125S	125	32 Lohms	11.6	1.02	24	8.79	1.15
SCRM7121170S	170	24 Lohms	14.3	2.52	24	8.37	1.15
SCRM7121300S	300	22 Lohms	17.0	11.44	24	8.02	1.19

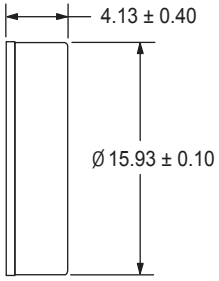
**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

***Minimum burst pressure for a fully clogged safety screen filter.*

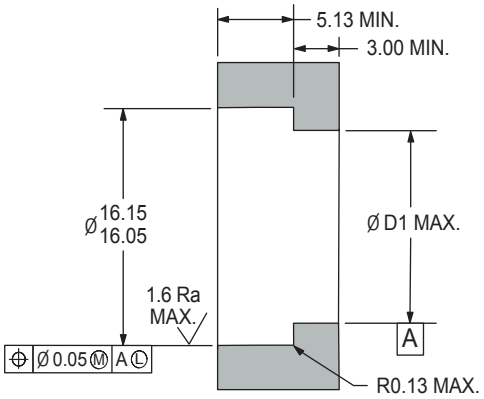
16 mm SAFETY SCREEN FILTER

CARTRIDGE: CUSTOMER RETAINED

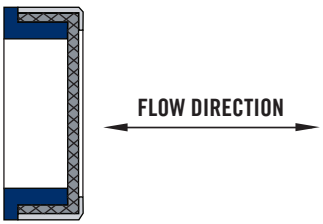
DIMENSIONAL VIEW



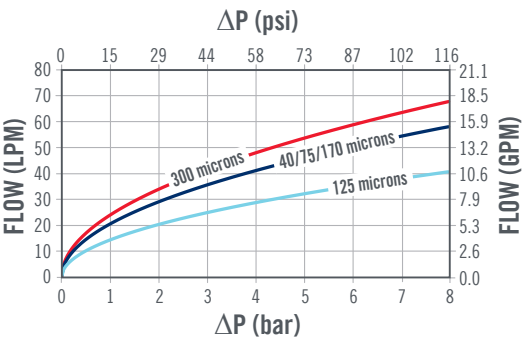
INSTALLATION HOLE



All dimensions are in millimeters, except where noted.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	305 stainless steel
Pintal:	17-7 stainless steel
Screen:	316 stainless steel

INSTALLATION

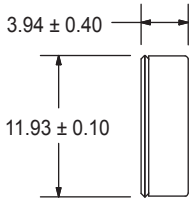
The 16 mm Safety Screen Filter is designed to slip into a drilled flat bottom hole and be retained by a secondary means.

PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	MIN. BURST PRESSURE (MPa)**	D1 MAX. (mm)	WEIGHT (g)
SCRM7161040S	40	14 Lohms	34	0.64	24	13.08	1.49
SCRM7161075S	75	14 Lohms	29	1.16	24	12.8	1.65
SCRM7161125S	125	20 Lohms	23	2.05	24	12.68	1.86
SCRM7161170S	170	14 Lohms	28	5.06	24	11.92	2.06
SCRM7161300S	300	12 Lohms	35	23.5	24	11.65	2.18

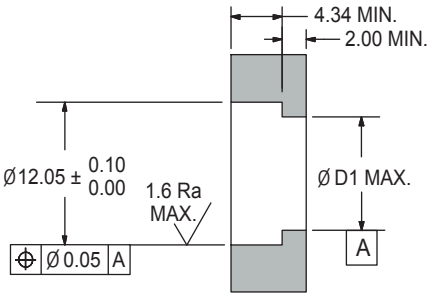
**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

***Minimum burst pressure for a fully clogged safety screen filter.*

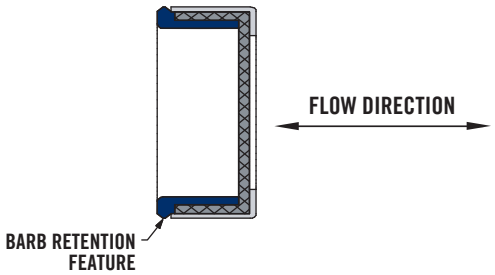
DIMENSIONAL VIEW



INSTALLATION HOLE



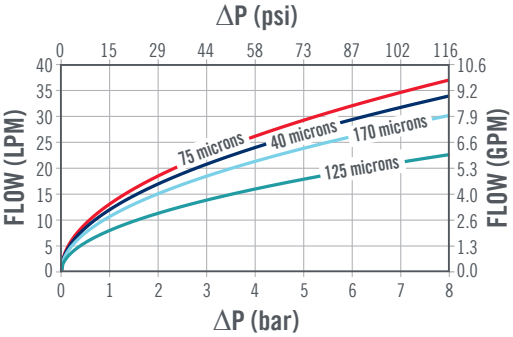
All dimensions are in millimeters, except where noted.



MATERIALS	
Body:	305 stainless steel
Pintal:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP SCRM BR (file available at: theleeco.com/installation)
Installation Tool:	See installation tool table below
Installation Force:	See installation procedure

ΔP vs. FLOW ON WATER AT 27°C (80°F)



PART NUMBER	INSTALLATION TOOL PART NUMBER
SCRM5121040S	CCRT5120040S
SCRM5121075S	CCRT5120075S
SCRM5121125S	CCRT5120125S
SCRM5121170S	CCRT5120170S

PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	MIN. BURST PRESSURE (MPa)**	D1 MAX. (mm)	WEIGHT (g)
SCRM5121040S	40	24 Lohms	18.0	0.34	24	9.60	1.0
SCRM5121075S	75	22 Lohms	15.9	0.64	24	9.60	1.0
SCRM5121125S	125	36 Lohms	13.3	1.17	24	9.58	1.0
SCRM5121170S	170	27 Lohms	16.8	2.95	24	9.22	1.1

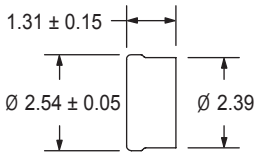
**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

***Minimum burst pressure for a fully clogged safety screen filter.*

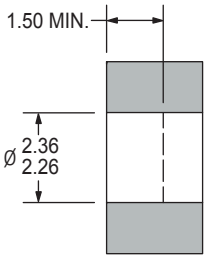
2.5 mm SAFETY SCREEN FILTER

PRESS-IN: FOR INSTALLATION INTO PLASTIC

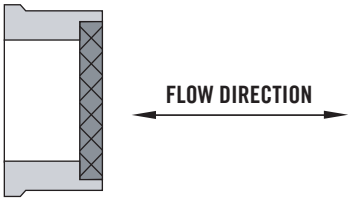
DIMENSIONAL VIEW



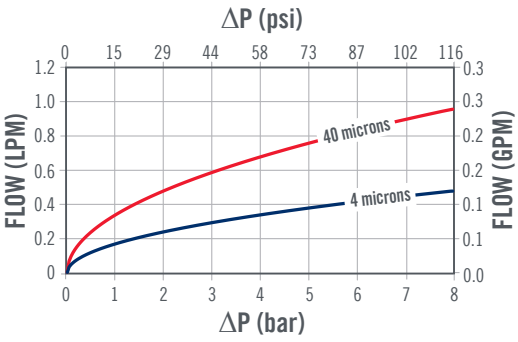
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	303 stainless steel
Screen:	316 stainless steel

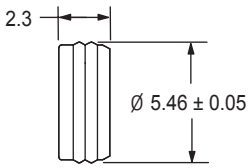
INSTALLATION	
Installation Procedure:	IP SCRM PI 2.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0029354S

To install, simply press the screen into a plastic installation hole, narrow end first, until the screen is flush minimum with the top of the installation hole.

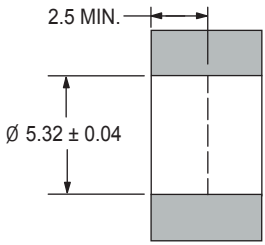
PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	WEIGHT (g)
SCRM4253004S	4	1700 Lohms	0.2	0.0033	0.03
SCRM4252040S	40	850 Lohms	0.5	0.0097	0.03

**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

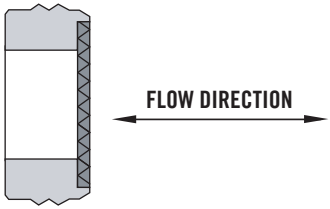
DIMENSIONAL VIEW



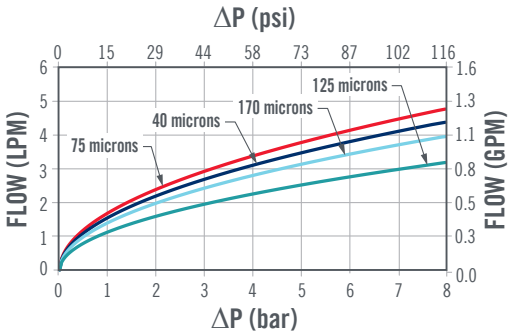
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP SCRM PI 5.5 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900170S

To install, simply press the screen into a plastic installation hole, narrow end first, until the screen is flush minimum with the top of the installation hole.

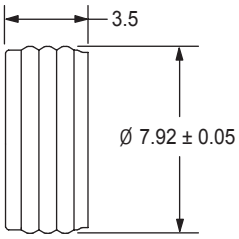
PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	WEIGHT (g)
SCRM4551040S	40	185 Lohms	2.8	0.05	0.26
SCRM4551075S	75	170 Lohms	2.4	0.10	0.26
SCRM4551125S	125	255 Lohms	2.1	0.18	0.26
SCRM4551170S	170	205 Lohms	2.8	0.49	0.26

**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

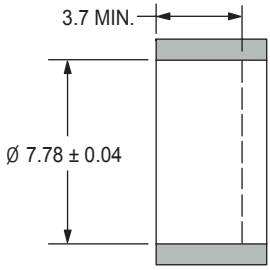
8 mm SAFETY SCREEN FILTER

PRESS-IN: FOR INSTALLATION INTO PLASTIC

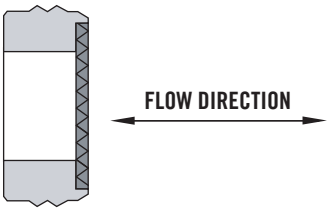
DIMENSIONAL VIEW



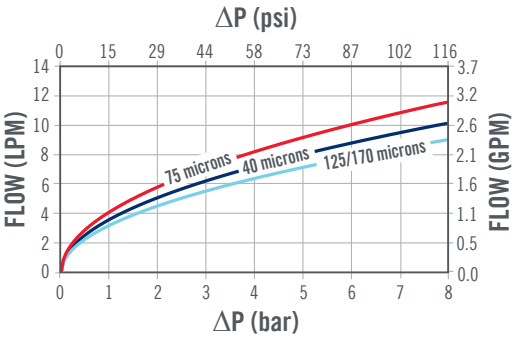
INSTALLATION HOLE



All dimensions are in millimeters.



ΔP vs. FLOW ON WATER AT 27°C (80°F)



MATERIALS	
Body:	303 stainless steel
Screen:	316 stainless steel

INSTALLATION	
Installation Procedure:	IP SCRM PI 8.0 (file available at: theleeco.com/installation)
Installation Tool:	CCRT0900180S

To install, simply press the screen into a plastic installation hole, narrow end first, until the screen is flush minimum with the top of the installation hole.

PART NUMBER	MICRON RATING	LOHM RATE	OPEN AREA (mm^2)	ROB NUMBER*	WEIGHT (g)
SCRM4801040S	40	80 Lohms	7.1	0.13	0.8
SCRM4801075S	75	70 Lohms	6.3	0.25	0.8
SCRM4801125S	125	90 Lohms	5.3	0.47	0.8
SCRM4801170S	170	90 Lohms	7.2	1.27	0.8

**The higher the ROB Number, the greater the resistance to blockage. See page J52 for more information on ROB Number.*

EXPANSION PLUGS



TABLE OF CONTENTS

BETAPLUG® RETENTION: FOR INSTALLATION INTO METAL

- Short Betaplug® Expansion Plugs.....H3-H7
- Long Betaplug® Expansion Plugs.....H8-H11

DL RETENTION: FOR INSTALLATION INTO ALUMINUM

- DL Series Expansion Plugs.....H12-H13

WHAT IS AN EXPANSION PLUG?

An expansion plug is a precision engineered component that is expanded within a machined or cross drilled hole to create a permanent leak tight seal without the need for O-rings, threads, or sealants.

ENGINEERED FOR SUPERIOR PERFORMANCE

Expansion plugs from The Lee Company are designed for **maximum reliability** and **ease of installation**. They rely on the same time tested controlled expansion technology behind our original Lee Plug® — the industry standard for sealing high pressure aerospace manifolds. This pedigree gives our expansion plugs a long track record of consistent performance and quality across multiple industries. And with simple **one piece assembly** in a **range of diameters**, they're easy to work with in all kinds of systems.

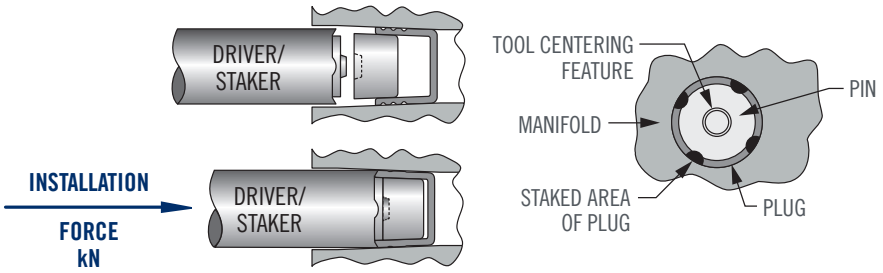


LEE BETAPLUG®

The Lee Betaplug is an aluminum expansion plug designed to seal cross-holes in metal housings using a tapered plug and installation hole design. Two versions are available. The **Short Betaplug** was developed to optimize process and product settings and allows for the shortest installed height in systems up to 500 psi. The **Long Betaplug** is built for high pressure systems up to 7000 psi and can also be used to seal cross-holes in plastic housings. Both versions are available in a variety of diameters and operate without the need for threads, sealants, or O-rings.

These pre-assembled, tapered expansion plugs seal cross-holes using the **Lee Principle of Controlled Expansion**. The lands and grooves on the plug's outer diameter bite into the housing wall during installation, creating a leak-tight seal and ensuring retention. This single assembly design reduces costs, making the component cost-effective for mass production.

The tapered design of the Betaplug eliminates the need for tight manufacturing tolerances, making it ideal for high volume applications. The matching tapers of the Betaplug and its installation hole create a perfect fit, eliminating the need for additional expansion. Since the size of the tapered pin precisely controls the Betaplug's expansion, the amount of expansion and any resulting boss stress is completely predictable. This means that installation is repeatable – the same size plug will create the same stress, an **important advantage for brittle materials or thin wall conditions.**



The installation of Lee Betaplugs®, whether performed manually or with automated equipment, is simple and economical. The preassembled Betaplug is inserted into the tapered installation hole, narrow end first. The pin is then driven into the plug using the recommended Lee Company Installation/Staking Tool until it reaches the specified depth below the surface and the plug is staked. The tool is designed to install the pin below flush while simultaneously staking the back edge of the plug.

The pins should be installed below flush. Please refer to installation procedures on the relevant product pages for more information.

The installation tool includes a centering feature that ensures proper alignment during installation. All Betaplug pins are coated with a wax-based lubricant that forms a thin, solid lubricating film, reducing friction and allowing the pin to be driven to its correct position within the plug. The pins should not be cleaned prior to installation.

The force required to drive the pin into a Betaplug depends on several factors, including the boss material, installation hole geometry, boss geometry, wall thickness, and plug size. Bosses made from stronger materials or with thicker walls generally require greater installation force than those made from weaker materials or with thinner walls. Typical installation forces for A380 die-cast aluminum are provided for each Betaplug. See the tooling table on the applicable product page for detailed force specifications.

Note: Betaplugs are not recommended for use above 275°F (135°C).

DL SERIES PLUG

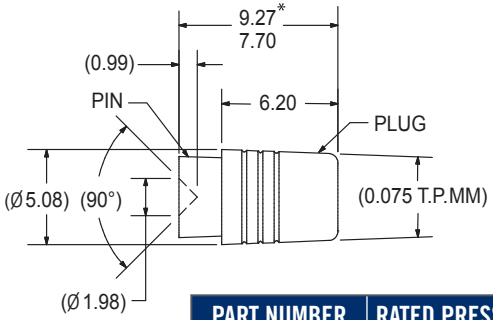
The DL Series Plug is a **single-piece**, stainless-steel expansion plug ideal for sealing cross-holes in aluminum and soft metal housings with a straight hole and shoulder design. This plug's **Drive Locking® technology** is purposely designed to facilitate reliable automated installation and verification processes, allowing customers to reduce scrap and labor costs while improving the reliability of their production processes.

CUSTOMIZATION OPTIONS

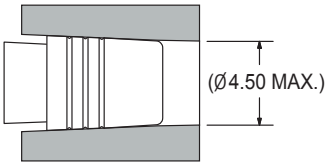
Additional customizations are available, allowing engineers to optimize performance based on criteria such as diameter or pressure tolerance. For more information or design support, please contact a Lee Sales Engineer.

5 mm

DIMENSIONAL VIEW



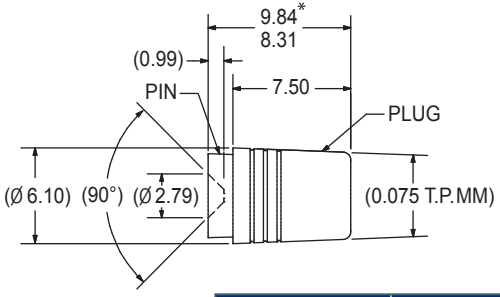
MAXIMUM PASSAGEWAY DIAMETER



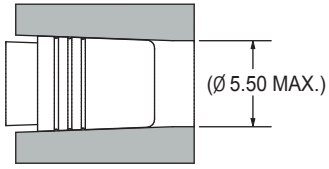
PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0502610S	35 bar (500 psi)	6061 Aluminum	0.29

6 mm

DIMENSIONAL VIEW



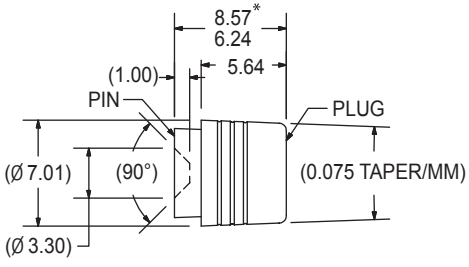
MAXIMUM PASSAGEWAY DIAMETER



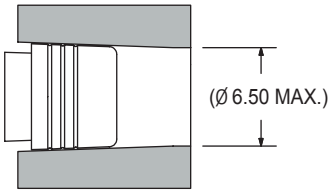
PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0602610S	35 bar (500 psi)	6061 Aluminum	0.5

7 mm

DIMENSIONAL VIEW



MAXIMUM PASSAGEWAY DIAMETER



PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0702610S	35 bar (500 psi)	6061 Aluminum	0.45

**Overall length before installation.*

***Rated pressures may be higher depending upon specific application requirements. Contact your Lee Sales Engineer for higher pressure requirements.*

All dimensions are in millimeters, except where noted.

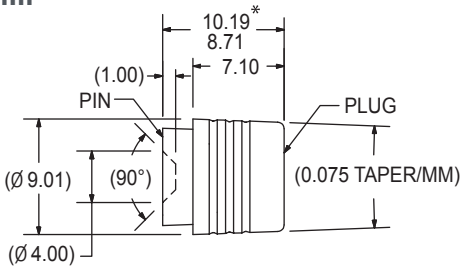
Betaplugs are not recommended for use above 275°F (135°C).

SHORT BETAPLUG® EXPANSION PLUG

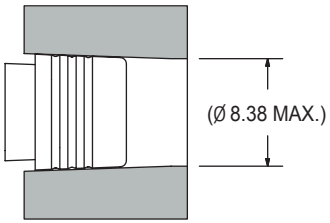
FOR INSTALLATION INTO METAL

9 mm

DIMENSIONAL VIEW



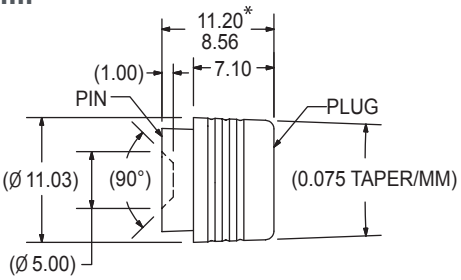
MAXIMUM PASSAGEWAY DIAMETER



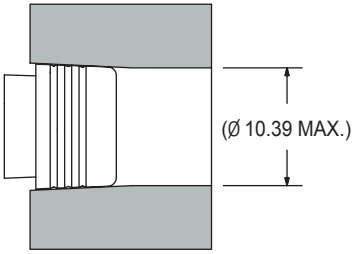
PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0903610S	35 bar (500 psi)	6061 Aluminum	0.99

11 mm

DIMENSIONAL VIEW



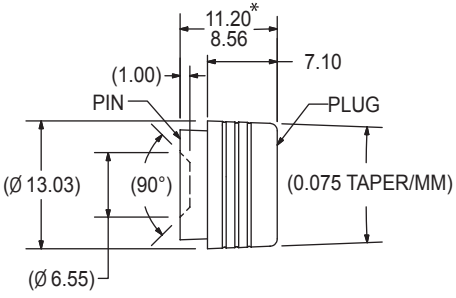
MAXIMUM PASSAGEWAY DIAMETER



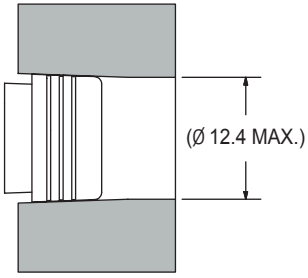
PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA1103610S	35 bar (500 psi)	6061 Aluminum	1.5

13 mm

DIMENSIONAL VIEW



MAXIMUM PASSAGEWAY DIAMETER



PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA1304610S	35 bar (500 psi)	6061 Aluminum	2.1

**Overall length before installation.*

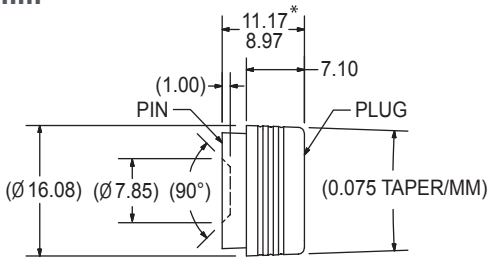
***Rated pressures may be higher depending upon specific application requirements. Contact your Lee Sales Engineer for higher pressure requirements.*

All dimensions are in millimeters, except where noted.

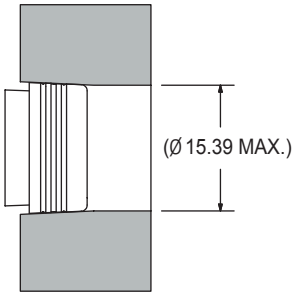
Betaplugs are not recommended for use above 275°F (135°C).

16 mm

DIMENSIONAL VIEW



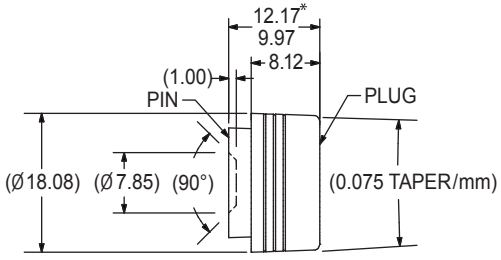
MAXIMUM PASSAGEWAY DIAMETER



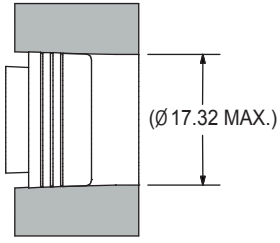
PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA1604610S	35 bar (500 psi)	6061 Aluminum	3.3

18 mm

DIMENSIONAL VIEW



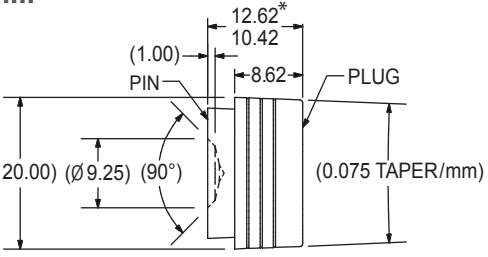
MAXIMUM PASSAGEWAY DIAMETER



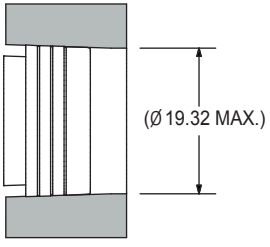
PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA1804610S	35 bar (500 psi)	6061 Aluminum	4.9

20 mm

DIMENSIONAL VIEW



MAXIMUM PASSAGEWAY DIAMETER



PART NUMBER	RATED PRESSURE**	MATERIAL	WEIGHT (g)
PLBA2004610S	35 bar (500 psi)	6061 Aluminum	6.4

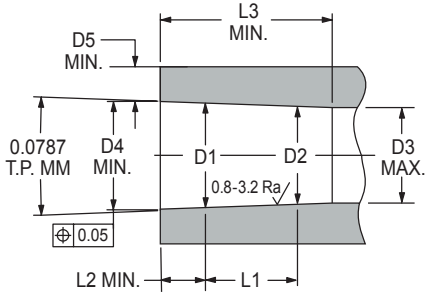
**Overall length before installation.*
***Rated pressures may be higher depending upon specific application requirements. Contact your Lee Sales Engineer for higher pressure requirements.*
All dimensions are in millimeters, except where noted.
Betaplugs are not recommended for use above 275°F (135°C).

SHORT BETAPLUG® EXPANSION PLUG
FOR INSTALLATION INTO METAL

HOLE PREPARATION

The Short Betaplug has been qualified to work in generously toleranced installation holes. The taper of the hole can range anywhere from 4° - 5° for the 7 to 20 mm sizes and 4° - 4.6° for the 5 and 6 mm sizes, giving designers flexibility in satisfying specific application requirements. Tapered reamers are available for every Short Betaplug size. See the tooling table on the following page for applicable part numbers.

The Lee Company recommends that the Short Betaplug be installed flush or below the surface of the housing to ensure optimum performance. The use of coatings or surface treatments in the area of the installation hole where the Short Betaplug is to be installed is not recommended.



GAGE DIMENSIONS AND MAXIMUM PASSAGEWAY DIAMETERS (mm)								
BETAPLUG SIZE	TOP GAGE DIA., D1	BOTTOM GAGE DIA., D2	MAX. PASSAGE DIA., D3	MIN. OPENING, D4	MIN. WALL THICKNESS, D5	GAGE LENGTH, L1	MIN. GAGE DEPTH, L2	MIN. TAPER DEPTH, L3*
5	5.08	4.70	4.50	5.19	1.8	4.75-5.43	1.38	8.59
6	6.10	5.60	5.50	6.21	2.2	6.25-7.14	1.38	10.06
7	7.01	6.69	6.50	7.16	2.45	3.66-4.58	1.90	10.00
9	9.01	8.69	8.38	9.16	3.15	3.66-4.58	1.90	12.00
11	11.03	10.71	10.39	11.18	3.85	3.66-4.58	1.90	12.00
13	13.03	12.71	12.40	13.18	4.55	3.66-4.58	1.90	12.00
16	16.08	15.76	15.39	16.23	5.6	3.66-4.58	1.90	12.00
18	18.08	17.76	17.32	18.23	5.6	3.66-4.58	1.90	13.00
20	20.08	19.76	19.32	20.22	7.1	3.66-4.58	1.90	14.00

**Depth of tapered hole (L3) from depth of minimum diameter (D4). Shorter installation holes can be considered. Please contact a Lee Sales Engineer for more information.*

TOOLING AND INSTALLATION PROCEDURES					
BETAPLUG SIZE (mm)	INSTALLATION/ STAKING TOOL PART NUMBER	TAPERED REAMER PART NUMBER	TAPERED REAMER, ROUGH FINISH PART NUMBER	TYPICAL INSTALLATION FORCE (kN)	INSTALLATION PROCEDURE
5	PLBT0570031S	PLBT0570020S	PLBT0500014S	4.5	IP SBP 5
6	PLBT0670031S	PLBT0670020S	PLBT0600014S	4.9	IP SBP 6
7	PLBT0070901S	PLBT0700012S	PLBT0700014S	4.9	IP SBP 7
9	PLBT0090901S	PLBT0900012S	PLBT0900014S	4.9	IP SBP 9
11	PLBT0110901S	PLBT1100012S	PLBT1100014S	6.2	IP SBP 11
13	PLBT0130901S	PLBT1300012S	PLBT1300014S	6.2	IP SBP 13
16	PLBT0160901S	PLBT1600012S	PLBT1600014S	6.5	IP SBP 16
18	PLBT0160901S	PLBT1800012S	PLBT1800014S	8.8	IP SBP 18
20	PLBT0200901S	PLBT2000012S	PLBT2000014S	11.5	IP SBP 20

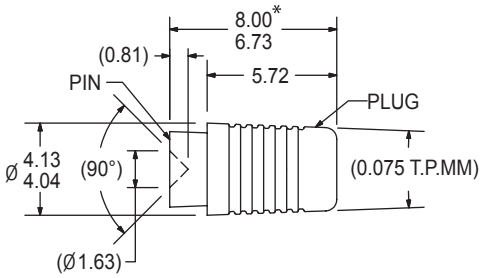
Visit theleeco.com/installation to access installation procedures for each product.

ACCESS INSTALLATION PROCEDURES

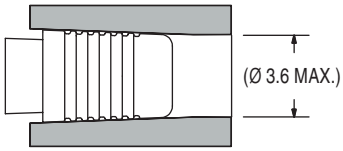
LONG BETAPLUG® EXPANSION PLUG
FOR INSTALLATION INTO METAL

4 mm

DIMENSIONAL VIEW



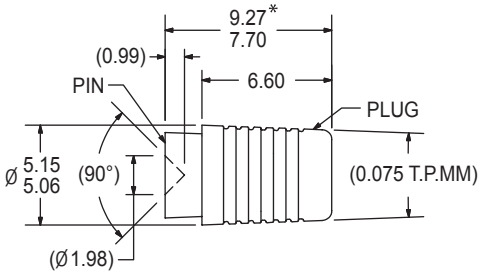
MAXIMUM PASSAGEWAY DIAMETER



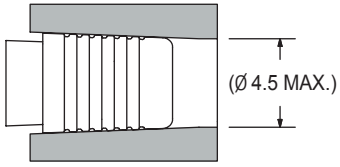
PART NUMBER	BURST PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0402604S	483 bar (7000 psi)	6061 Aluminum	0.16

5 mm

DIMENSIONAL VIEW



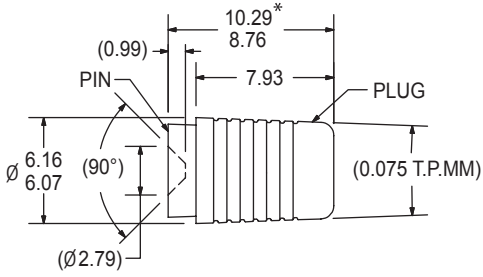
MAXIMUM PASSAGEWAY DIAMETER



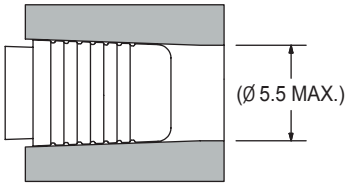
PART NUMBER	BURST PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0502604S	483 bar (7000 psi)	6061 Aluminum	0.3

6 mm

DIMENSIONAL VIEW



MAXIMUM PASSAGEWAY DIAMETER

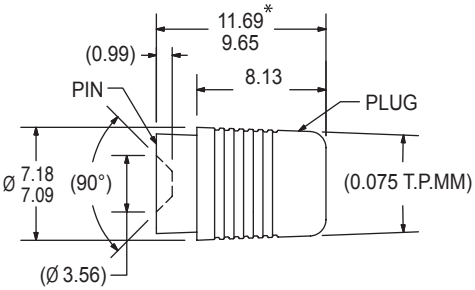


PART NUMBER	BURST PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0602604S	483 bar (7000 psi)	6061 Aluminum	0.52

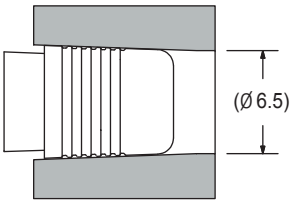
**Overall length before installation.*
***Typical burst pressure for A380 die-cast aluminum.*
All dimensions are in millimeters, except where noted.
Betaplugs are not recommended for use above 275°F (135°C).

7 mm

DIMENSIONAL VIEW



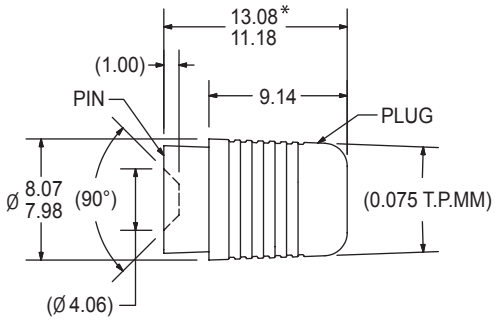
MAXIMUM PASSAGEWAY DIAMETER



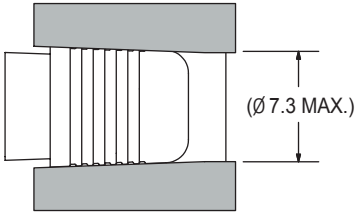
PART NUMBER	BURST PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0703604S	276 bar (4000 psi)	6061 Aluminum	0.71

8 mm

DIMENSIONAL VIEW



MAXIMUM PASSAGEWAY DIAMETER

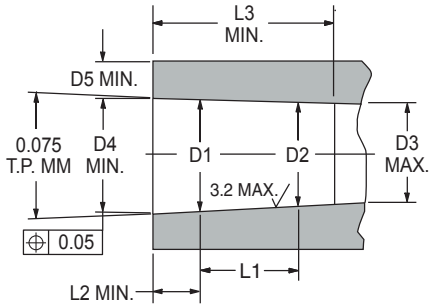


PART NUMBER	BURST PRESSURE**	MATERIAL	WEIGHT (g)
PLBA0803604S	276 bar (4000 psi)	6061 Aluminum	1.03

**Overall length before installation.*
***Typical burst pressure for A380 die-cast aluminum.*
All dimensions are in millimeters, except where noted.
Betaplugs are not recommended for use above 275°F (135°C).

LONG BETAPLUG® EXPANSION PLUG
FOR INSTALLATION INTO METAL

HOLE PREPARATION



The installation hole for a Long Betaplug has an included taper angle, beta, of 4.3°, which matches the tapered outside diameter of the Long Betaplug. This included draft angle of 4.3° is very easy to achieve with a core pin in a die-cast or molded part or to machine using a tapered tool.

A tolerance of ± 0.3° on the taper angle of 4.3° is specified to guarantee that the Long Betaplug's rated performance is achieved. If the taper angles are out of tolerance, the plug will either wedge first at the top or at the bottom, reducing sealing burst pressure. Tapered reamers are available for every size of Long Betaplug. See the tooling table on the following page for applicable part numbers.

The Lee Company recommends that the Long Betaplug be installed below the surface of the housing to ensure maximum plug retention capability. The use of coatings or surface treatments in the area of the installation hole where the Long Betaplug is to be installed is not recommended.

GAGE DIMENSIONS AND MAXIMUM PASSAGEWAY DIAMETERS (mm)								
BETAPLUG SIZE	TOP GAGE DIA., D1	BOTTOM GAGE DIA., D2	MAX. PASSAGE DIA., D3	MIN. OPENING, D4	MIN. WALL THICK-NESS, D5	GAGE LENGTH, L1	MIN. GAGE DEPTH, L2	MIN. TAPER DEPTH, L3*
4	4.07	3.68	3.60	4.16	1.40	4.88 - 5.57	1.12	7.54
5	5.08	4.70	4.50	5.19	1.80	4.75 - 5.43	1.38	8.59
6	6.10	5.60	5.50	6.21	2.20	6.25 - 7.14	1.38	10.06
7	7.11	6.58	6.50	7.23	2.50	6.63 - 7.57	1.50	10.26
8	8.00	7.37	7.30	8.13	2.80	7.87 - 9.00	1.63	11.41

**Depth of tapered hole (L3) from depth of minimum diameter (D4). Shorter installation holes can be considered. Please contact a Lee Sales Engineer for more information.*

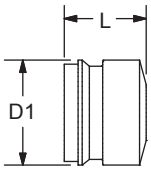
TOOLING AND INSTALLATION PROCEDURES				
BETAPLUG SIZE (mm)	INSTALLATION/ STAKING TOOL PART NUMBER	TAPERED REAMER PART NUMBER	TYPICAL INSTALLATION FORCE (kN)	INSTALLATION PROCEDURE
4	PLBT0470030S	PLBT0470020S	2.9	IP 6000 BP 4
5	PLBT0570031S	PLBT0570020S	2.4	IP 6000 BP 5
6	PLBT0670031S	PLBT0670020S	2.6	IP 6000 BP 6
7	PLBT0770030S	PLBT0770020S	4	IP 6000 BP 7
8	PLBT0870030S	PLBT0870020S	4.4	IP 6000 BP 8

Visit theleeco.com/installation to access installation procedures for each product.

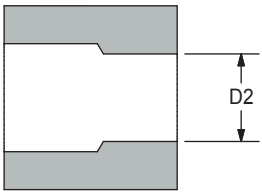
ACCESS INSTALLATION PROCEDURES

DL SERIES EXPANSION PLUG
FOR INSTALLATION INTO ALUMINUM

DIMENSIONAL VIEW



INSTALLATION HOLE

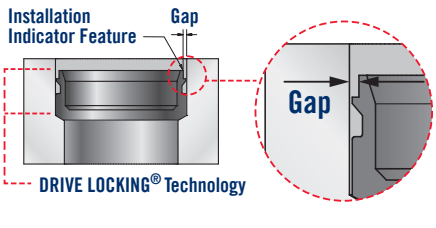


PLUG SIZE	PART NUMBER	PLUG DIAMETER (D1)	MAXIMUM SEALABLE PASSAGEWAY (D2)	PLUG LENGTH (L)	RATED PRESSURE*	PLUG MATERIAL	WEIGHT (g)
4	DLPM0410100S	3.91 - 3.99	3.3	3.00	69 bar (1000 psi)	303 stainless steel	0.08
5	DLPM0510100S	4.91 - 4.99	4.3	3.00	69 bar (1000 psi)	303 stainless steel	0.17
6	DLPM0610100S	5.91 - 5.99	5.3	3.00	69 bar (1000 psi)	303 stainless steel	0.25
7	DLPM0710100S	6.91 - 6.99	6.2	3.00	69 bar (1000 psi)	303 stainless steel	0.32
8	DLPM0810100S	7.91 - 7.99	7.2	3.00	69 bar (1000 psi)	303 stainless steel	0.42

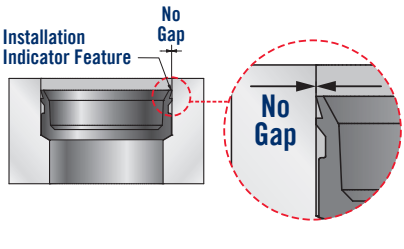
All dimensions are in millimeters, except where noted.

**Rated pressure in 6061 aluminum. Rated pressures may be higher depending on specific application requirements. Contact your local Lee Sales Engineer for higher pressure or different housing material requirements.*

VISUALLY VERIFY INSTALLATION



PRE-INSTALLATION

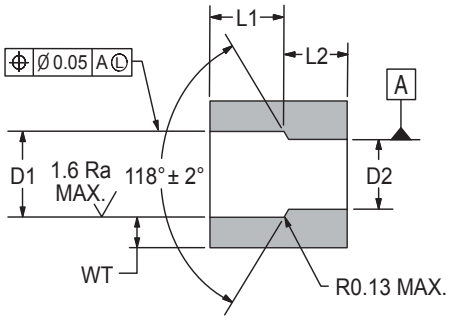


POST-INSTALLATION

DL SERIES PLUG INSTALLATION

The DL Series Plug utilizes our Drive Locking® technology with an Installation Indicator verification feature. To properly install the part, place it in the specified installation hole, Drive Locking feature facing up, and then apply a non-impact force using the recommended installation tool until the Installation Indicator feature (see prior page) is in contact with the housing wall 360° around the part. When no gap is visible between the Installation Indicator feature and housing wall, the part is fully installed.

INSTALLATION HOLE



INSTALLATION HOLE DIMENSIONS (mm)					
PLUG SIZE	MAJOR ID (D1)	MAX. SEALABLE PASSAGEWAY (D2)	MIN. HOLE DEPTH (L1)	MINIMUM THROUGH HOLE DEPTH (L2)	MINIMUM WALL THICKNESS (WT)
4	4.00 - 4.10	3.30	3.50	3.00	1.44
5	5.00 - 5.10	4.30	3.50	3.00	1.78
6	6.00 - 6.10	5.30	3.50	3.00	2.14
7	7.00 - 7.10	6.20	3.50	3.00	2.48
8	8.00 - 8.10	7.20	3.50	3.00	2.84

INSTALLATION SPECIFICATIONS			
PLUG SIZE (mm)	TYPICAL INSTALLATION FORCE (kN)	INSTALLATION TOOL PART NUMBER	INSTALLATION PROCEDURE
4	5 - 6	CCRT0400360S	IP DLP 04
5	5 - 6	CCRT0500360S	IP DLP 05
6	5 - 6	CCRT0600360S	IP DLP 06
7	5 - 6	CCRT0700360S	IP DLP 07
8	5 - 6	CCRT0800360S	IP DLP 08

Visit theleeco.com/installation to access installation procedures for each product.

ACCESS INSTALLATION PROCEDURES



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PRODUCTS IN FITTINGS I2-I9

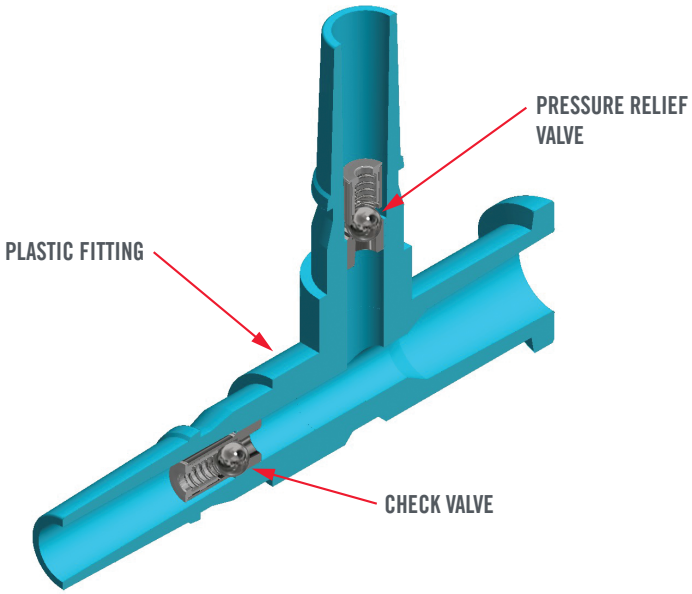
- Plastic Male to Female Luer
  - Orifice for Gases – Screened
  - Orifice for Liquids – Screened
- Plastic 1/8 Inch Barb to 3/32 Inch Barb Union
  - High Lohm Orifice for Gases – Screened
- Plastic Luer Tee
  - 2.5 mm Pressure Relief Valve
  - 5.5 mm Pressure Relief Valve
  - 2.5 mm Pressure Relief Valve and Check Valve
  - Pump Head Syringe T-Connector

WHAT ARE PRODUCTS IN FITTINGS?

Our products in fittings are specialized components that are integrated directly into a standard connection fitting. These integrated assemblies reduce assembly time, minimize potential leak points, and enhance overall system performance.

ENGINEERED FOR SUPERIOR PERFORMANCE

The Lee Company offers a wide range of components – such as flow restrictors, check valves, pressure relief valves, and safety screen filters – **pre-assembled** into many common plastic and metal fittings. Our plastic fittings include male to female Luer adapters, barb-to-barb unions, and tee fittings. These fittings are made of medical-grade polypropylene and the pre-installed Lee component is made of all stainless steel. We also offer metal fittings, including threaded hex fittings and custom options to meet your specific needs. All fitting assemblies are **100% functionally tested** to ensure **consistent batch-to-batch performance**.



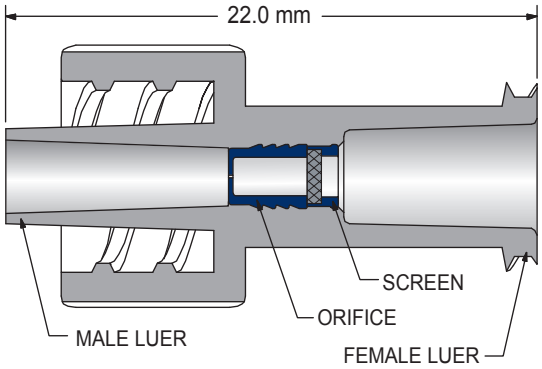
These **ready-to-use** components are offered in numerous configurations to maximize design flexibility.

CUSTOMIZATION OPTIONS

Additional customizations are available, allowing engineers to optimize performance based on criteria such as fitting configurations and materials. We also offer the flexibility to integrate a wider range of product types into standard connection fittings and can supply metal fittings with threads, O-rings, and other engineered features to meet specific application needs. For more information or design support, please contact a Lee Sales Engineer.

ORIFICE FOR GASES - SCREENED

PRODUCTS IN FITTINGS: PLASTIC MALE TO FEMALE LUER

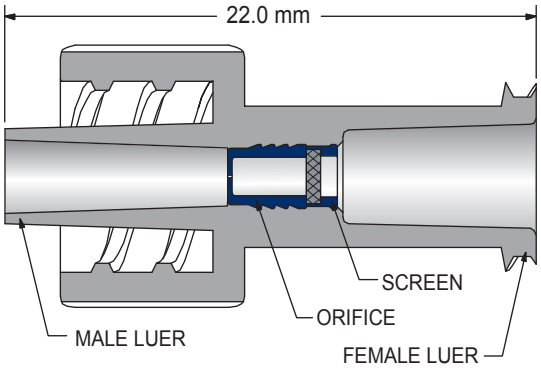


All dimensions are in millimeters.

PART NUMBER	LOHM RATE
RESM1505000S	5000 Lohms
RESM1505500S	5500 Lohms
RESM1506000S	6000 Lohms
RESM1506500S	6500 Lohms
RESM1507000S	7000 Lohms
RESM1507500S	7500 Lohms
RESM1508000S	8000 Lohms
RESM1508500S	8500 Lohms
RESM1509000S	9000 Lohms
RESM1509500S	9500 Lohms
RESM1510000S	10,000 Lohms
RESM1515000S	15,000 Lohms
RESM1520000S	20,000 Lohms
RESM1525000S	25,000 Lohms
RESM1530000S	30,000 Lohms
RESM1535000S	35,000 Lohms
RESM1540000S	40,000 Lohms
RESM1545000S	45,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Screen Micron Rating:	40 microns
Test Fluid:	Clean and dry nitrogen
Weight:	0.65 grams

MATERIALS	
Fitting:	Polypropylene - natural
Orifice and Screen:	
Orifice:	303 stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel



All dimensions are in millimeters.

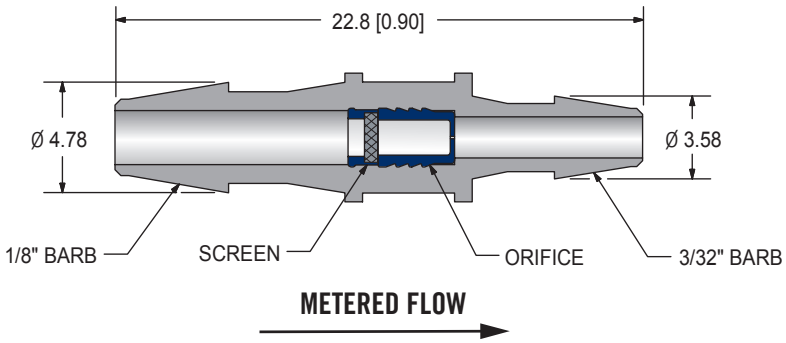
PART NUMBER	LOHM RATE
RESM0505000S	5000 Lohms
RESM0505500S	5500 Lohms
RESM0506000S	6000 Lohms
RESM0506500S	6500 Lohms
RESM0507000S	7000 Lohms
RESM0507500S	7500 Lohms
RESM0508000S	8000 Lohms
RESM0508500S	8500 Lohms
RESM0509000S	9000 Lohms
RESM0509500S	9500 Lohms
RESM0510000S	10,000 Lohms
RESM0515000S	15,000 Lohms
RESM0520000S	20,000 Lohms
RESM0525000S	25,000 Lohms
RESM0530000S	30,000 Lohms
RESM0535000S	35,000 Lohms
RESM0540000S	40,000 Lohms
RESM0545000S	45,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 5%
Screen Micron Rating:	40 microns
Test Fluid:	Distilled water
Weight:	0.65 grams

MATERIALS	
Fitting:	Polypropylene - natural
Orifice and Screen:	
Orifice:	303 stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel

HIGH LOHM ORIFICE FOR GASES - SCREENED

PRODUCTS IN FITTINGS: PLASTIC 1/8 INCH BARB TO 3/32 INCH BARB UNION

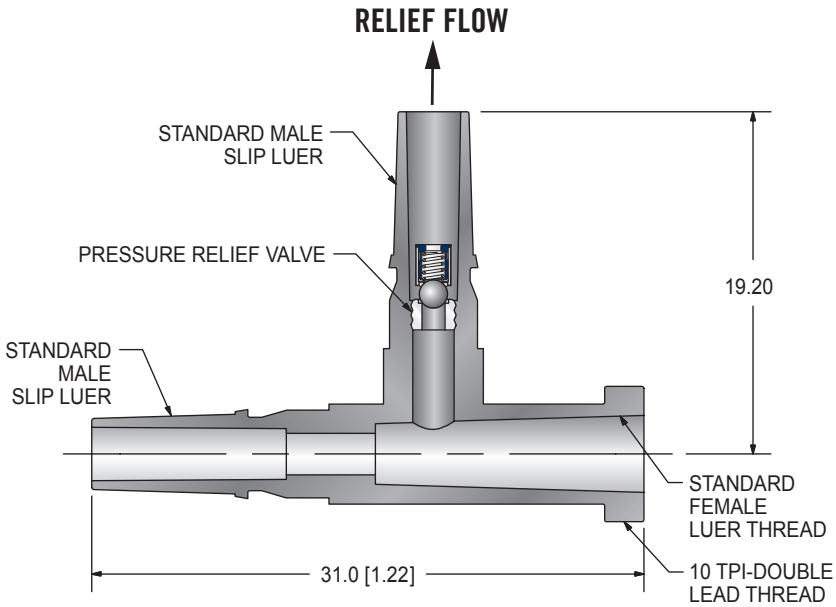


All dimensions are in millimeters.

PART NUMBER	LOHM RATE
RHGV1530060S	60,000 Lohms
RHGV1530075S	75,000 Lohms
RHGV1530100S	100,000 Lohms
RHGV1530250S	250,000 Lohms
RHGV1530500S	500,000 Lohms
RHGV1530750S	750,000 Lohms
RHGV1531000S	1,000,000 Lohms
RHGV1532000S	2,000,000 Lohms
RHGV1533000S	3,000,000 Lohms
RHGV1534000S	4,000,000 Lohms
RHGV1535000S	5,000,000 Lohms

PERFORMANCE	
Metered Flow Lohm Rate Tolerance:	± 10%
Screen Micron Rating:	4 microns
Test Fluid:	Clean and dry nitrogen
Weight:	0.3 grams

MATERIALS	
Fitting:	Polypropylene - blue
Orifice and Screen:	
Orifice:	303 stainless steel
Screen Body:	303 stainless steel
Screen:	316 stainless steel



All dimensions are in millimeters.

PART NUMBER	CRACKING PRESSURE*
CCPF0100100S	100 kPa (14.5 psid)
CCPF0100200S	200 kPa (29 psid)
CCPF0100300S	300 kPa (43.5 psid)

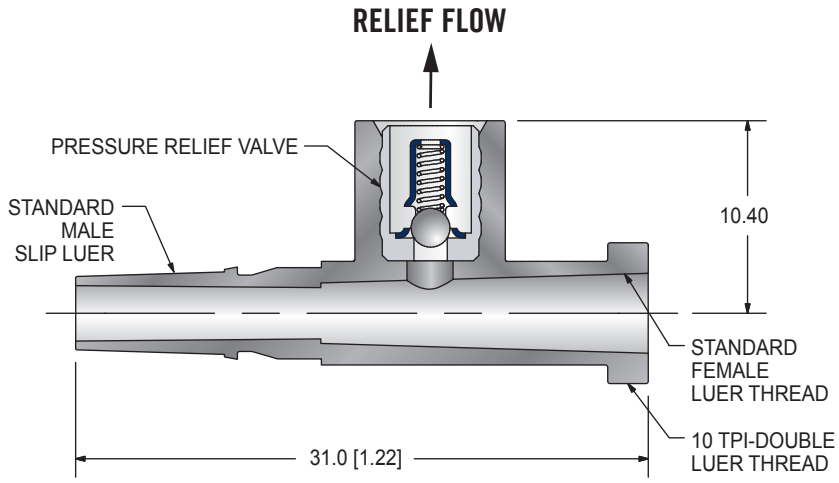
**The pressure at which uprun flow exceeds 50 SCCM of air.*

PERFORMANCE	
Pressure Relief Valve Lohm Rate:	750 Lohms
Leakage:	10 SCCM max. at 500 kPa (72.5 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	0.65 grams

MATERIALS	
Fitting:	Polypropylene - blue
Pressure Relief Valve:	
Body:	303 stainless steel
Ball Stop:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

5.5 mm PRESSURE RELIEF VALVE

PRODUCTS IN FITTINGS: PLASTIC LUER TEE



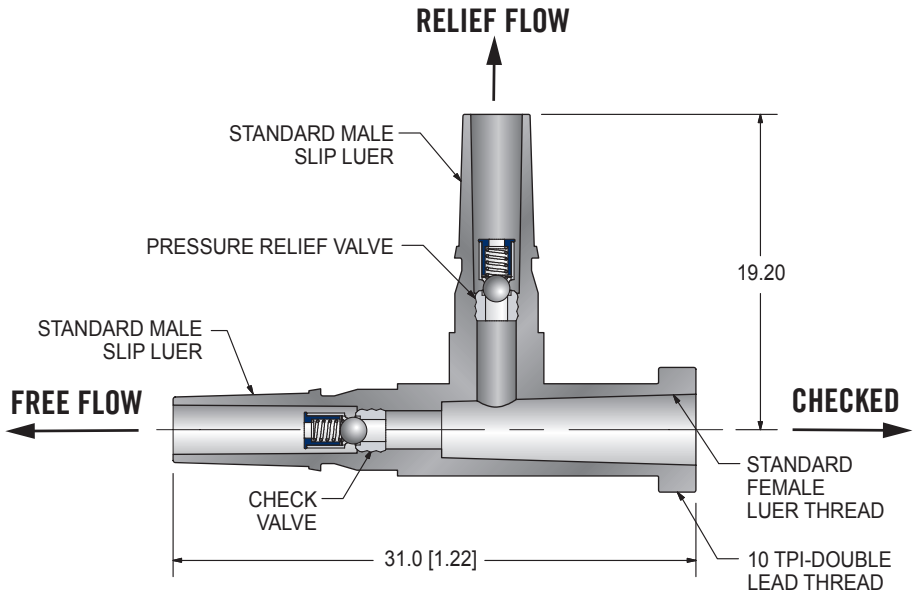
All dimensions are in millimeters.

PART NUMBER	CRACKING PRESSURE*
CCPF0300100S	100 kPa (14.5 psid)
CCPF0300200S	200 kPa (29 psid)
CCPF0300300S	300 kPa (43.5 psid)
CCPF0300400S	400 kPa (58 psid)
CCPF0300500S	500 kPa (72.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.*

PERFORMANCE	
Pressure Relief Valve Lohm Rate:	250 Lohms
Leakage:	10 SCCM max. at 172 kPa (25 psid) on air (ref. 1 drop/min max. on water)
Cracking Pressure Tolerance:	± 15%
Weight:	1.2 grams

MATERIALS	
Fitting:	Polypropylene - blue
Pressure Relief Valve:	
Body:	303 stainless steel
Cage:	305 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel



All dimensions are in millimeters.

MATERIALS	
Fitting:	Polypropylene - blue
Pressure Relief Valve and Check Valve:	
Body:	303 stainless steel
Ball Stop:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

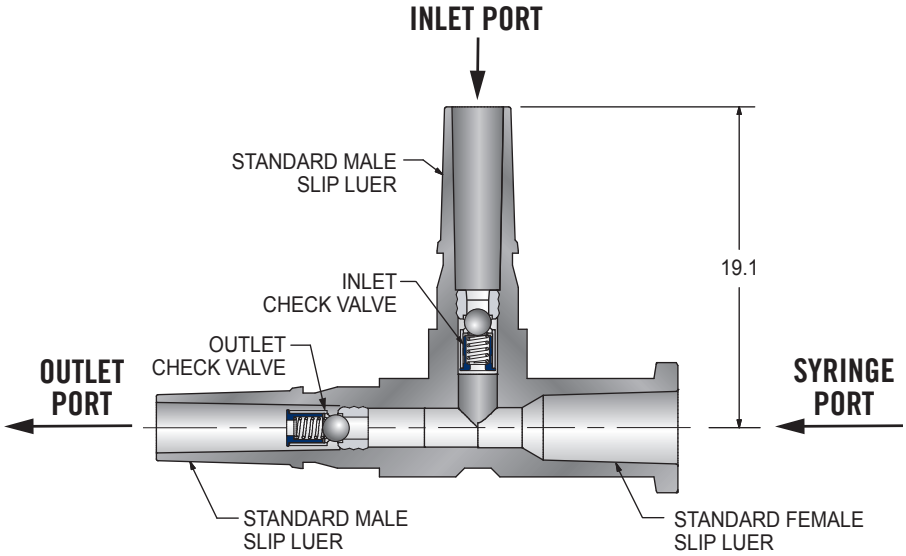
PART NUMBER	CRACKING PRESSURE*
CCPF0200100S	100 kPa (14.5 psid)
CCPF0200200S	200 kPa (29 psid)
CCPF0200300S	300 kPa (43.5 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.*

PERFORMANCE	
Pressure Relief Valve Lohm Rate:	750 Lohms
Pressure Relief Valve Cracking Pressure Tolerance:	± 15%
Pressure Relief Valve Leakage:	10 SCCM max. at 500 kPa (72.5 psid) on air (ref. 1 drop/min max. on water)
Check Valve Lohm Rate:	750 Lohms
Check Valve Cracking Pressure*:	4 ± 3 kPa (0.6 ± 0.4 psid)
Check Valve Leakage:	10 SCCM max. at 500 kPa (72.5 psid) on air (ref. 1 drop/min max. on water)
Weight:	0.75 grams

PUMP HEAD SYRINGE T-CONNECTOR

PRODUCTS IN FITTINGS: PLASTIC LUER TEE



All dimensions are in millimeters.

PART NUMBER	CRACKING PRESSURE*
CCPF0400404S	4 ± 3 kPa (0.6 ± 0.4 psid)

**The pressure at which uprun flow exceeds 50 SCCM of air.*

PERFORMANCE	
Check Valve Lohm Rate:	750 Lohms
Leakage:	10 SCCM (max.) at 500 kPa (72.5 psid) on air
Weight:	0.75 grams

MATERIALS	
Fitting:	Polypropylene - blue
Check Valves:	
Body:	303 stainless steel
Ball Stop:	303 stainless steel
Spring:	302 stainless steel
Ball:	440C stainless steel

I



J

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THE LEE COMPANY'S LOHM LAWS

Over the years, The Lee Company has developed the Lohm Laws for defining and measuring resistance to fluid flow. Just as the “Ohm” defines electrical resistance, the “Lohm” or “liquid Ohm” can be used as a measure of fluid resistance.

The Lohm is defined such that 1 Lohm will flow 100 gallons per minute of water with a pressure drop of 25 psi at a temperature of 80°F. Since resistance is inversely proportional to flow, by definition:

$$\text{Lohms} = \frac{100}{\text{flow (gal/min } H_2O \text{ @ 25 psid)}}$$

For example: 1000 Lohms will flow 0.1 GPM (378.5 mL/min)

378,500 Lohms will flow 1 mL/min

By using Lohms, one can specify performance without concern for coefficients for discharge, passageway geometrics, physical dimensions, or tolerances. The resistance of any flow can be expressed in Lohms and confirmed by actual flow tests.

Lohm Laws generalize the Lohm definition and allow the system designer to specify Lohm requirements for a particular application based on the desired pressures and flow rates.

LOHM SYSTEM SLIDE RULE

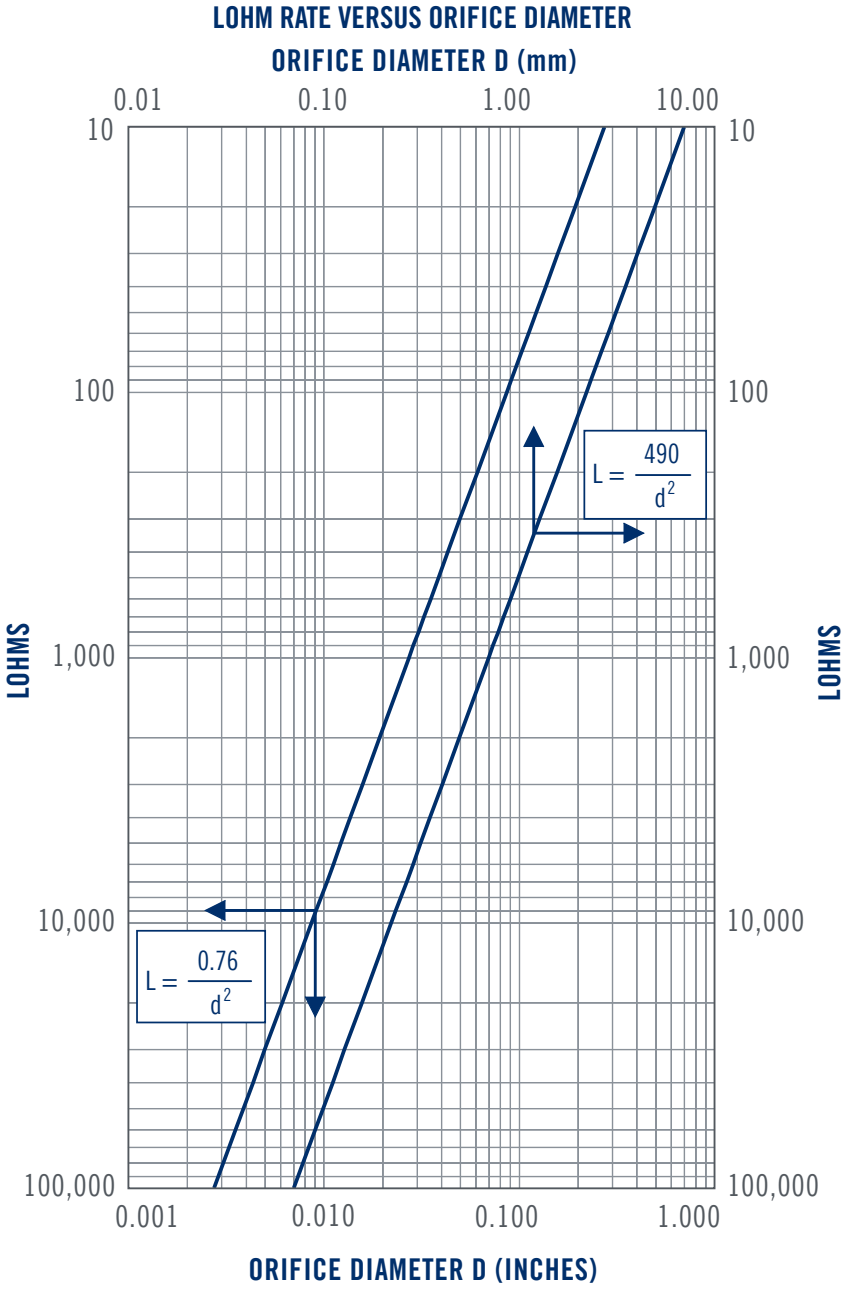
The Lee Company offers a specially designed Hydraulic and Pneumatic Flow Calculator to help in the transition to the Lohm System. This handy, free slide rule can be used to solve basic Lohm calculations.

Scan the QR Code or visit theleeco.com/lohm-calculator to access the Lohm Calculator.

theleeco.com/lohm-calculator

WORKING WITH LIQUIDS

HOW TO CALCULATE FLOW RESISTANCE FOR LIQUIDS



HOW TO CALCULATE FLOW RESISTANCE FOR LIQUIDS

WATER FLOW – LOHM RATE FORMULA

The Lohm has been selected so that a 1 Lohm restriction will permit a flow of 100 gallons of water per minute with a pressure drop of 25 psi at a temperature of 80°F.

$$L = 20 \frac{\sqrt{H}}{I}$$

$$I = 20 \frac{\sqrt{H}}{L}$$

$$H = \frac{I^2 \times L^2}{400}$$

Where:

I = Flow rate (gallons per minute)

H = Differential pressure (psi)

L = Lohm rate, a measure of resistance to liquid flow. It includes all density, viscosity, Reynolds number, coefficient of discharge, and area units (Lohms).

When testing on water at 25 psi, $\Delta P\sqrt{H} = 5$ and the above formulas simplify as follows:

$$L = \frac{100}{I} \quad \text{and} \quad I = \frac{100}{L}$$

Some useful relationships:

1. 1000 Lohms will permit flow of 50 lb/hr water at 25 psi ΔP.

2. Convert Lohms to Flow Coefficient:

$$C_v = \frac{20}{L}$$

3. Convert Orifice Diameter (in) to Lohms:

$$L = \frac{0.76}{d^2}$$

4. Convert Coefficient of Discharge to Lohms:

$$L = \frac{0.527}{C_d A}$$

For metric units L = where d = orifice diameter in millimeters

WATER FLOW – EXAMPLES

Example 1. What restriction will permit a flow of 1 gallon of water per hour at 50 psi ΔP?

$$I = 1/60 = 0.0167 \text{ GPM}$$

$$L = \frac{20\sqrt{H}}{I} = \frac{20\sqrt{50}}{0.0167} = 8500 \text{ Lohms}$$

Example 2. An orifice with an approximate hole diameter of 0.012 of an inch flows 18 lb/hr of water at 100 psi ΔP. How many Lohms?

$$I = \frac{18}{60 \times 8.345} = 0.036 \text{ GPM}$$

$$L = \frac{20\sqrt{H}}{I} = \frac{20\sqrt{100}}{0.036} = \frac{200}{0.036} = 5500 \text{ Lohms}$$

Example 3. What ΔP will be required to flow 20 gallons of water per hour through a 2000 Lohm orifice?

$$I = \frac{20}{60} = 0.333 \text{ GPM}$$

$$H = \frac{I^2 \times L^2}{400} = \frac{0.333^2 \times 2000^2}{400} \quad \frac{0.111 \times 4{,}000{,}000}{400} = 1110 \text{ psid}$$

Example 4. What water flow will result from a restriction of 500 Lohms and a ΔP of 500 psi?

$$I = \frac{20\sqrt{H}}{L} = \frac{20\sqrt{500}}{500} = 0.894 \text{ GPM}$$

NOTE: For special flow requirements, contact your local Lee Sales Engineer to determine the required Lohm rating.

TWO FORMULAS FOR COMBINATIONS OF RESTRICTORS

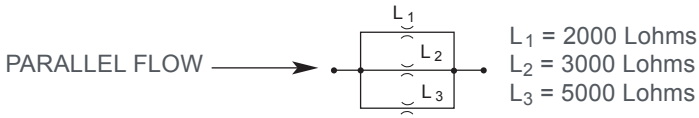
LIQUID FLOW – COMBINATIONS OF RESTRICTORS

For parallel flow, the total Lohm rating is:

$$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \cdots + \frac{1}{L_N}$$

Please note that this relationship is identical to the electrical equation.

Example 1: Parallel Flow



$$\frac{1}{L_T} = \frac{1}{2000} + \frac{1}{3000} + \frac{1}{5000} = 0.00103$$

and therefore L_T = 970 Lohms

For series flow, the total Lohm rating is:

$$L_T = \sqrt{L_1^2 + L_2^2 + L_3^2 + \cdots + L_N^2}$$

Please note that this relationship is not the same as in electrical problems. The difference is due to the non-linearity of:

$$H = \frac{I^2 L^2}{400}$$

Example 2: Series Flow



$$L_T = \sqrt{2000^2 + 3000^2 + 5000^2} = 6160 \text{ Lohms}$$

When $L_1 = L_2 = L_3$, then $L_T = L\sqrt{N}$

N = Number of equal resistors in series

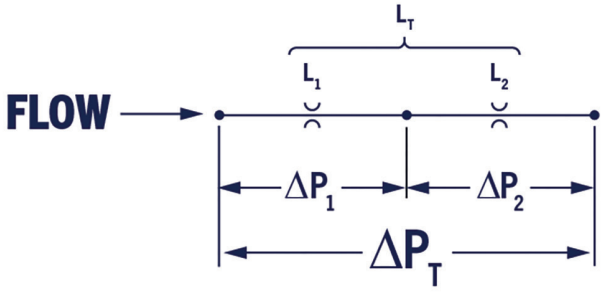
For passageway size: $D_T = D/N^{1/4}$

D_T = Diameter of a single equivalent orifice, with a Lohm rate = L_T

D = Diameter of the actual orifices, each with a Lohm rate = L_1

LIQUID FLOW – SERIES FLOW

One of the reasons for using two restrictors in series is to allow fine-tuning of a total resistance value. If L_1 is known and is more than 90% of L_T, then L_2 may vary by ±5% without altering the value of L_T by more than ±1%, even though the value of L_2 may be as high as 40% of L_T. This effect becomes even more pronounced as L_1 approaches L_T.



To determine the intermediate pressure between two restrictors in series, the following formulas may be used.

$$\Delta P_1 = \frac{\Delta P_T}{1 + \left(\frac{L_2}{L_1}\right)^2}$$

$$\Delta P_2 = \frac{\Delta P_T}{1 + \left(\frac{L_1}{L_2}\right)^2}$$

$$\left(\frac{L_1}{L_2}\right)^2 = \frac{\Delta P_1}{\Delta P_2}$$

GAS VS. LIQUID CALIBRATION

The majority of our automotive, industrial & off-highway, and medical equipment products are calibrated on gas for both gas and liquid service. Should it be necessary to use a gas calibrated component for liquid service, or a liquid calibrated component for gas service, the following factors should be considered.

Allowance should be made for variations in liquid/gas correlation of up to ±15%. This is caused by the response of different fluids to the orifice geometry.

Single-orifice restrictors will correlate directly from gas to liquid service, subject to the ±15% normal variation.

Multi-orifice restrictors will correlate directly only when the pneumatic pressure ratio is very low ($P_1 / P_2 < 1.2$).

When multi-orifice restrictors are used at higher pressure ratios, the gas flow will be up to 30% higher than expected from a liquid calibration. This is caused by gas compressibility which results in a non-uniform distribution of pressure drops through the restrictor.

WARNING: Do not substitute hydraulic restrictors in gas applications, or vice versa, without first considering the application and correlation accuracy.

STANDARD CONDITIONS

U.S. Standard Conditions at sea level are per ICAO STD ATMOSPHERE

Pressure ..... 14.70 psia (29.92 in Hg)

Temperature ..... 59°F (518.7°R)

Other references may use somewhat different conditions.

LIQUID FLOW – LOHM RATE FORMULA

The following formulas are presented to extend the use of the Lohm Laws to many different liquids, operating over a wide range of pressure conditions. These formulas introduce compensation factors for liquid density and viscosity. They apply to any liquid of known properties, with minimum restrictions on pressure levels or temperature. The units constant "K" eliminates the need to convert pressure and flow parameters to special units.

VOLUMETRIC FLOW UNITS

$$L = \frac{KV}{I}\sqrt{\frac{H}{S}}$$

GRAVIMETRIC FLOW UNITS

$$L = \frac{KV}{w}\sqrt{HS}$$

Where:

- L = Lohm rate (Lohms)
- H = Differential pressure
- I = Liquid flow rate: volumetric
- S = Specific gravity*
- V = Viscosity compensation factor** (view viscosity compensation factor on page J11)
- K = Units constant: liquid (see volumetric and gravimetric flow units on page J9)
- w = Liquid flow rate: gravimetric

*S = 1.0 for water at 80°F

**V = 1.0 for water at 80°F

LIQUID FLOW – UNITS CONSTANT K

To eliminate the need to convert pressure and flow parameters to specific units such as psi and GPM, the units constant K may be used in the Lohm formula:

Volumetric Flow Units:

$$L = \frac{KV}{I}\sqrt{\frac{H}{S}}$$

VOLUMETRIC FLOW UNITS							
FLOW UNITS	PRESSURE UNITS						
	psi	bar	kPa	N/m^2	kg/cm^2	ft H_2O	mm Hg
GPM	20	76.2	7.62	0.24	75.4	13.2	2.78
L/min	75.7	288	28.8	0.91	285	50	10.5
mL/min	75,700	288,000	28,800	911	285,000	50,000	10,500
in^3/min	4620	17,600	1760	55.6	17,400	3040	642
ft^3/min	2.67	10.2	1.02	0.032	10	1.76	0.372

Gravimetric Flow Units:

$$L = \frac{KV}{w}\sqrt{HS}$$

GRAVIMETRIC FLOW UNITS			
FLOW UNITS	PRESSURE UNITS		
	psi	bar	kPa
PPH	10,000	38,100	3810
g/min	75,700	288,000	28,800

LIQUID FLOW – EXAMPLES

Problem 1. An orifice is required to flow 0.15 GPM of MIL-H-83282 hydraulic fluid at 80°F and 100 psi ΔP. What restriction is required?

Solution:

1. Read specific gravity; S = 0.84 from chart on pages J14-J15
2. Read viscosity; ν = 21 cs from chart on pages J12-J13
3. Use viscosity and ΔP to determine viscosity compensation factor, V = 0.95 from graph on page J11
4. Select units constant K = 20 from table on page J9

$$L = \frac{KV}{I}\sqrt{\frac{H}{S}} = \frac{20\,(0.95)}{0.15}\sqrt{\frac{100}{0.84}} = 1380 \text{ Lohms}$$

Problem 2. What pressure drop will result from a flow of 5 PPH of SAE #10 lubricating oil at 20°F, flowing through a 1000 Lohm orifice?

Solution:

1. Read specific gravity and viscosity
   S = 0.90, ν = 600 cs
2. Use knowledge of system to assume solution
   H = 50 psid
3. Use assumed ΔP to determine V = 0.18
4. Select units constant K = 10,000 from table on page J9
5. Compute trial ΔP

$$H = \frac{w^2 L^2}{S K^2 V^2} = \frac{5^2\,(1000)^2}{0.90\,(10{,}000)^2\;0.18^2} = 8.6 \text{ psid}$$

6. Make trials as required to find correct solution
   H = 26 psid

Problem 3. A safety screen is required to flow 775 lb/hr of diesel fuel at 80°F with a maximum pressure drop of 5 psid. What is the maximum Lohm rate allowed for the safety screen?

Solution:

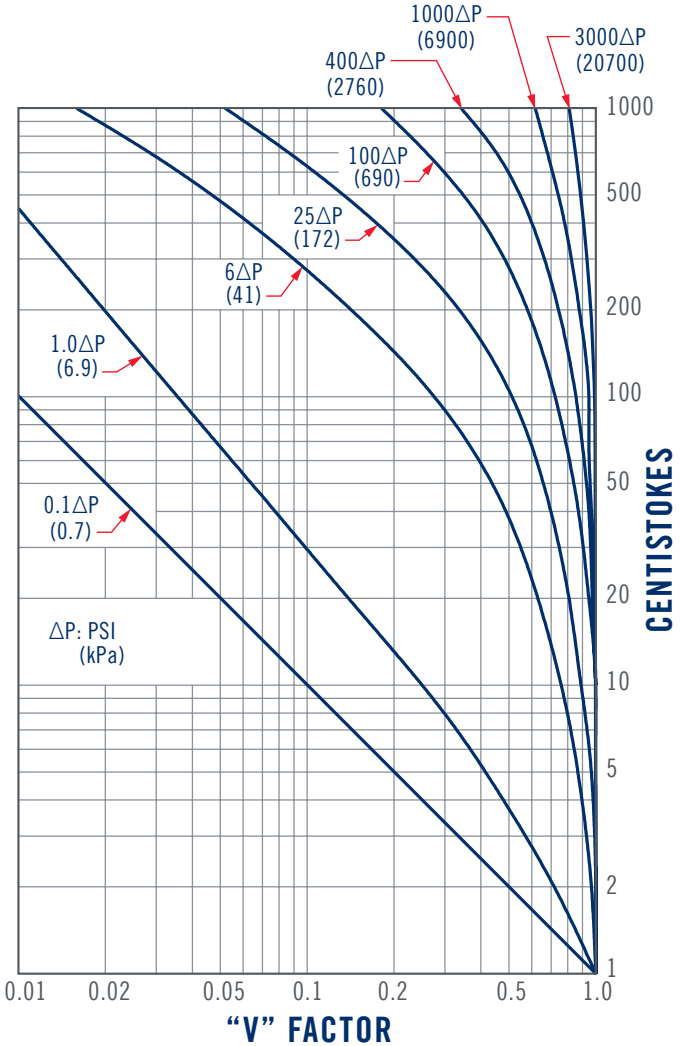
1. Find specific gravity; S = 0.87 from curve on pages J14-J15
2. Find viscosity; ν = 3.1 cs from curve on pages J12-J13
3. Use ν and ΔP to determine viscosity compensation factor, V = 0.87 from curve on page J11
4. Select units constant K = 10,000 from table on page J9

$$L = \frac{KV}{w}\sqrt{HS} = \frac{10{,}000\,(0.87)}{775}\sqrt{5\,(0.87)} = 23 \text{ Lohms maximum}$$

VISCOSITY COMPENSATION FACTOR "V" FOR A SINGLE ORIFICE

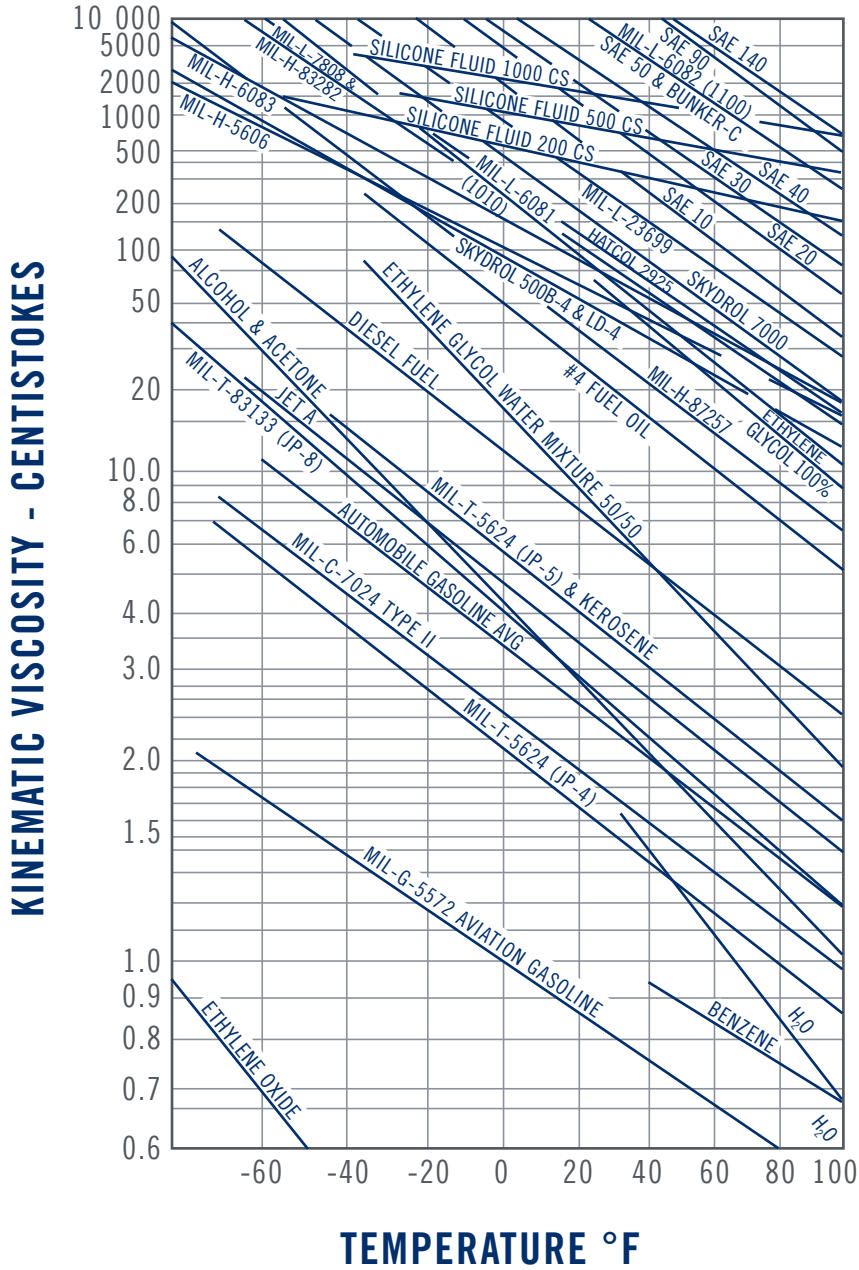
V-FACTOR

The Viscosity Compensation Factor (V-Factor) was developed for use with single orifice restrictors. If you know your V-Factor when using our online Lohm Calculator (see page J1), you can check the box and manually enter the value. Otherwise, the online calculator will compute it for you. Since V-Factor is an approximation for single orifice restrictions, its accuracy diminishes when applied to other geometries, with accuracy further diminished in applications where fluid viscosity is greatly increased. It should therefore only be used as a general guide if the resistance flow path is anything other than a single orifice.

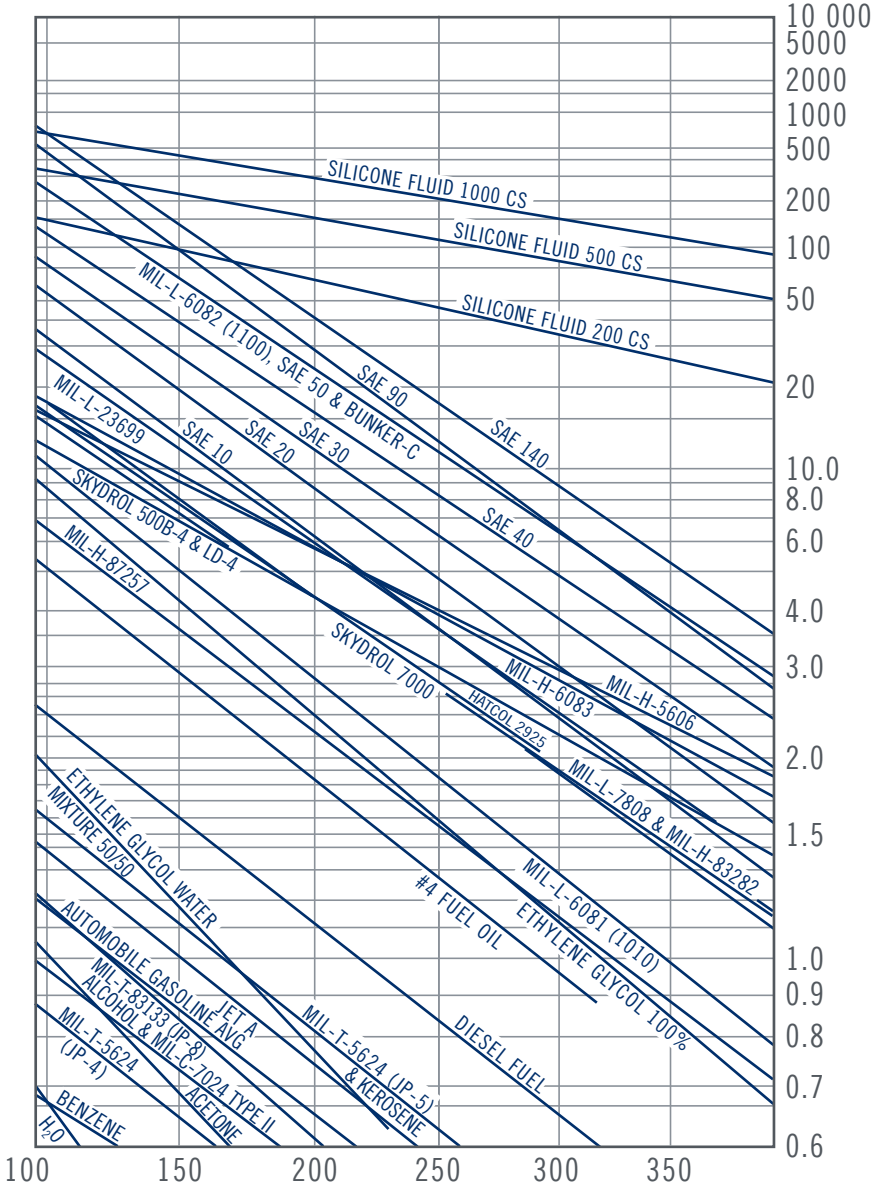


NOTE: V-Factor Curve may vary depending on specific geometry of the device.

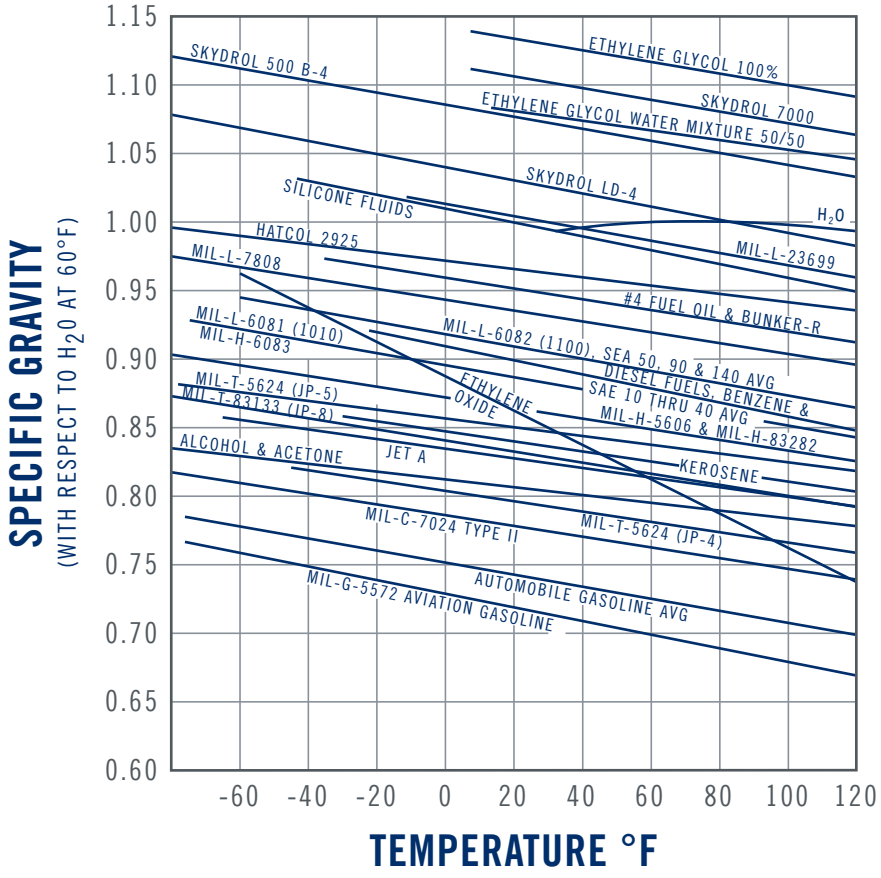
VISCOSITY OF TYPICAL FLUIDS VS. TEMPERATURE



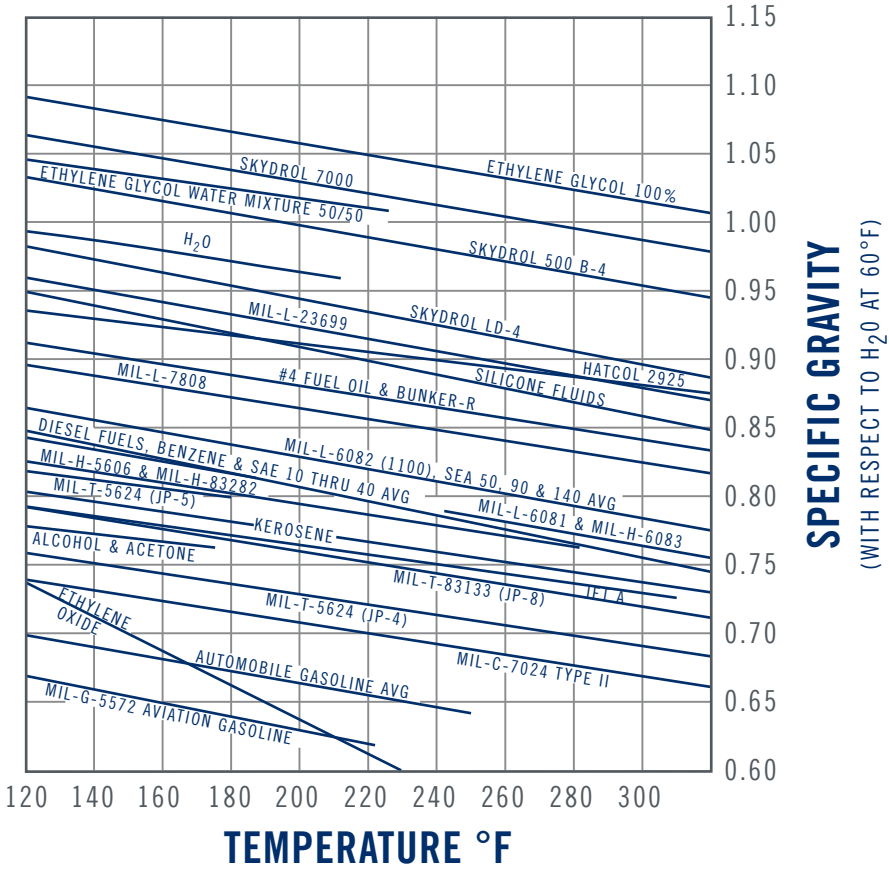
VISCOSITY OF TYPICAL FLUIDS VS. TEMPERATURE



SPECIFIC GRAVITY OF TYPICAL FLUIDS VS. TEMPERATURE



SPECIFIC GRAVITY OF TYPICAL FLUIDS VS. TEMPERATURE



HYDRAULIC POWER

Whenever there is flow through an orifice, there is power consumption (or loss) which is a function of the pressure drop and the flow rate. The following data is useful in calculating the hydraulic power requirements of a system.

$$HP = \frac{H \times I}{1714}$$

Where: H = Pressure drop (psi)
I = Flow rate (GPM)
HP = Hydraulic power (horsepower)

The hydraulic power can also be expressed in another convenient form.

For Water Applications:

$$HP = \frac{0.0117 H^{\frac{3}{2}}}{L} \quad \text{or} \quad \frac{0.0117 H \sqrt{H}}{L}$$

Since 1 HP = 746 watts, the above formula can be:

$$\text{Watts} = \frac{8.70 H^{\frac{3}{2}}}{L} \quad \text{or} \quad \frac{8.70 H \sqrt{H}}{L}$$

The nomogram on page J17 shows this relationship.

For Liquid Applications:

$$HP = \frac{0.0117 HV \sqrt{\frac{H}{SG}}}{L}$$

Where: V = Viscosity compensation factor
SG = Specific gravity
L = Lohm rate (Lohms)

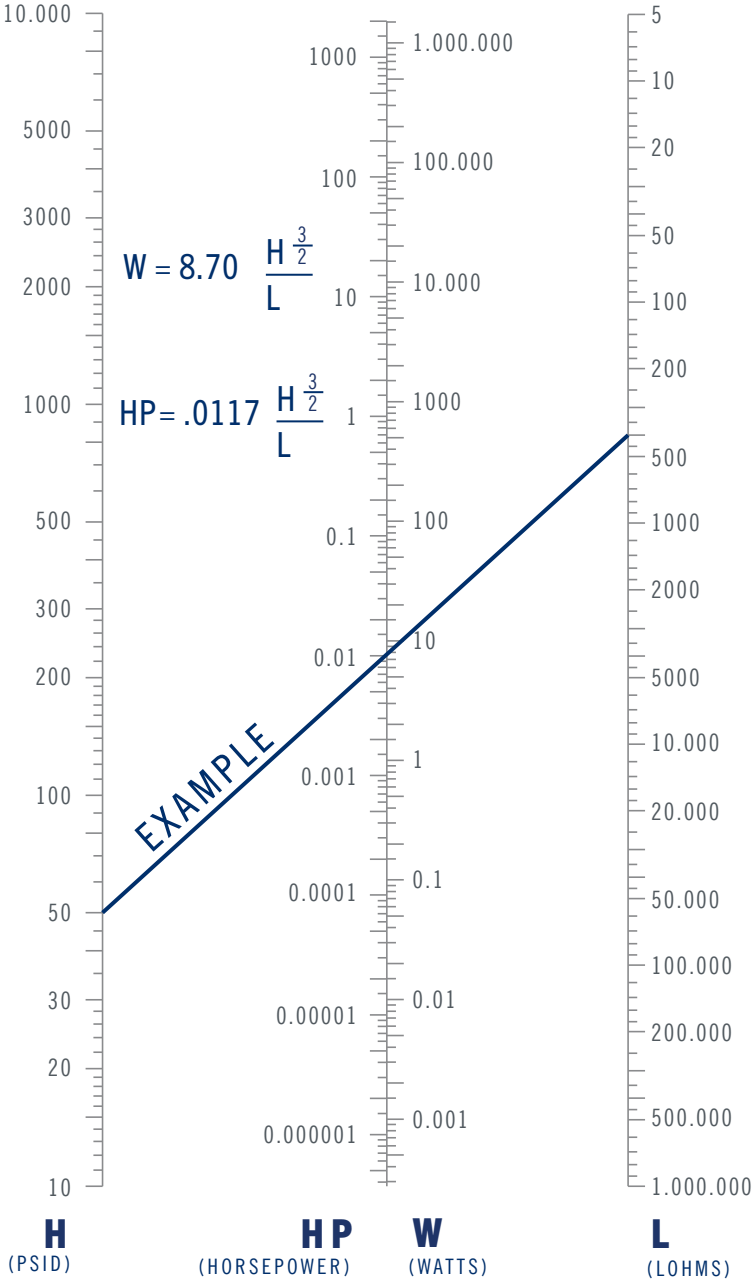
EXAMPLE

A Lee check valve such as CCRM2553000S with 400 Lohms will flow 0.35 GPM of water at 50 psid. At those conditions, what horsepower is lost?

$$HP = \frac{H \times I}{1714} = \frac{50 \times 0.35}{1714}$$

HP = 0.010 Horsepower

NOMOGRAM FOR HYDRAULIC POWER – WATER APPLICATIONS



TEMPERATURE RISE IN HYDRAULIC FLUIDS

Hydraulic fluid heats when flowing through a restriction as the pressure energy upstream of the restriction is converted into thermal energy.

$$\Delta T = \frac{0.003\ (\Delta P)}{(S)\ (c)}$$

Where:

ΔT = Temp. rise (˚F)

ΔP = Pressure drop (psi)

S = Specific gravity

c = Specific heat at 100˚F (BTU/LB_m˚F)

FLUID	C
Water	1.00
JP-4	0.50
JP-8/JET A	0.48
MIL-H-5606	0.47
MIL-H-83282	0.50
Skydrol 500 B-4	0.42
Skydrol LD-4	0.44
Silicone 100cs	0.35

EXAMPLE:

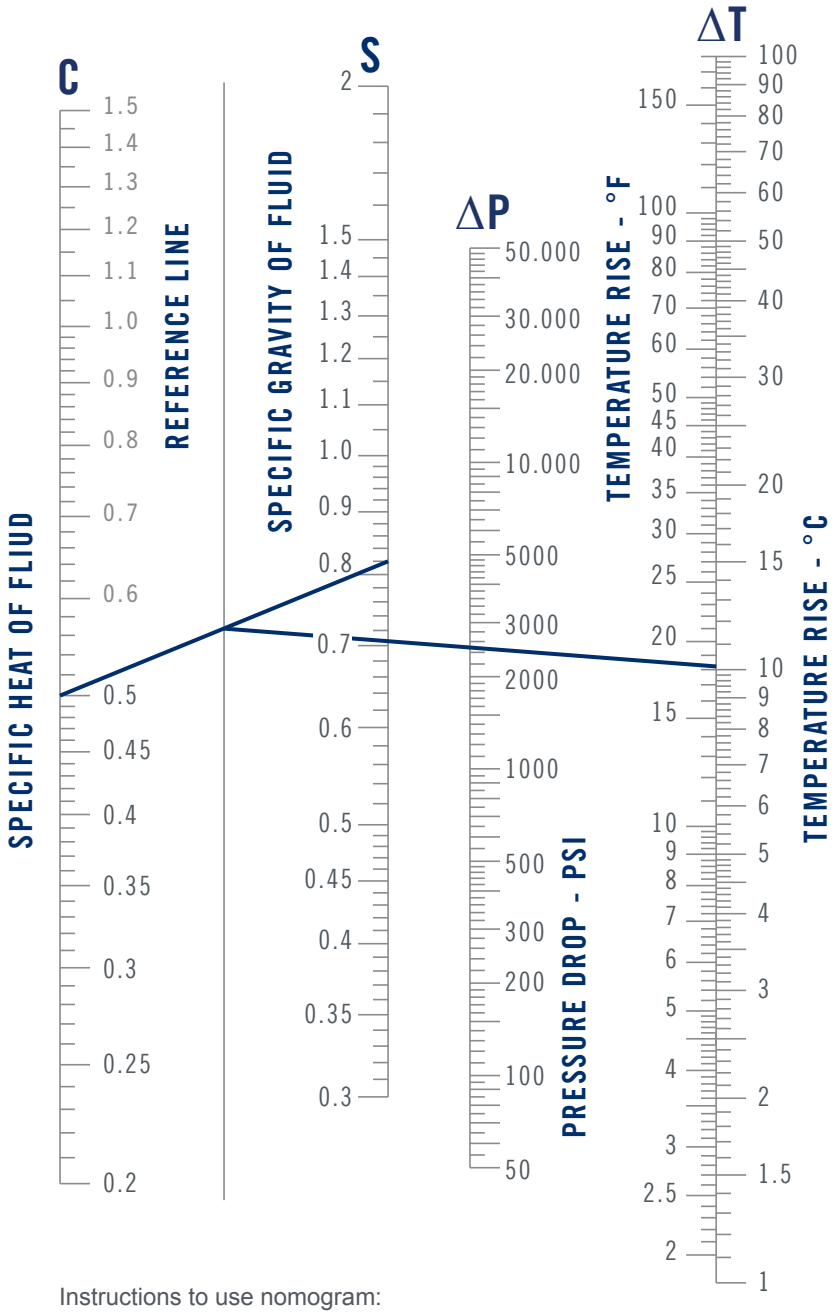
If a Lee flow restrictor is flowing MIL-H-83282 at 120°F and 2500 psid, the temperature rise across the Lee flow restrictor is computed as follows:

For MIL-H-83282 at 120°F, S = 0.82, c = 0.50

$$\Delta T = \frac{(0.003)\ (2500)}{(0.82)\ (0.50)} = 18.3^{\circ}F$$

This example is displayed on the nomogram on page J19.

NOMOGRAM OF TEMPERATURE RISE IN HYDRAULIC FLUIDS



Instructions to use nomogram:

1. Connect c to S
2. From point on reference line, connect ΔP to ΔT

MOMENTUM FORCES – LIQUID FLOW

The momentum Lohm Laws give the designer simple formulas to determine the forces caused by changes in velocity (either speed or direction) of a liquid.

$$F = \frac{SI^2 L}{431}$$

$$F = \frac{0.93\, H V^2}{L}$$

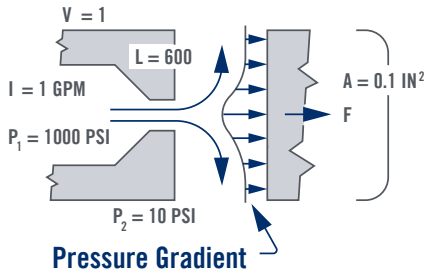
$$F = \frac{IV\sqrt{HS}}{21.5}$$

F = Force (lb_f)
I = Flow rate (GPM)
V = Viscosity compensation factor
H = Pressure drop (psi)
S = Specific gravity

These forces are produced by local pressure gradients and should be added to the forces produced by the static pressure. It is often useful to sketch these pressure gradients to determine the direction of the momentum forces.

EXAMPLE: Where a liquid changes direction.

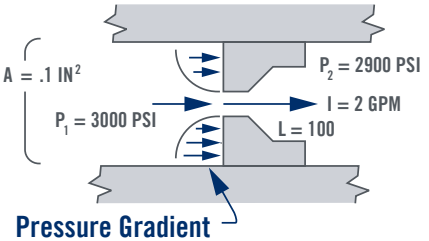
$$F_{momentum} = \frac{0.93\, H\, V^2}{L} = \frac{0.93 \times 990 \times 1^2}{600} = 1.53\ lb_f$$



The momentum force of 1.53 lb_f in this example must be added to the force produced by static pressure on the plate (of 0.1 in^2 x 10 psi = 1 lb_f) to give the total force on the plate, 2.53 lb_f.

EXAMPLE: Where a liquid changes speed.

$$F_{momentum} = \frac{SI^2 L}{431} = \frac{1 \times 2^2 \times 100}{431} = 0.9\ lb_f$$



The momentum force of 0.9 lb_f in this example must be subtracted from the force produced by static pressure on the plate (of 0.1 x [3000-2900] = 10 lb_f) to give the total force on the piston.

WATER HAMMER

A brief pressure spike, commonly called a water hammer, occurs when a high velocity fluid is suddenly stopped. It is often brought on by the fast closing of a valve somewhere in the system. The hydraulic system designer can approximate the magnitude of the pressure spike with the following formula. This formula assumes a "hard" system with non-compliant fluid passages, and will, therefore, yield a worst-case value for the peak pressure.

$$\Delta P = \frac{I}{16.6D^2}\sqrt{S \times B}$$

- ΔP = Pressure rise caused by water hammer effects (psi)
- I = Flow rate (GPM)
- S = Specific gravity
- B = Bulk modulus (psi)
- D = Inside diameter of fluid passageway upstream of the Lee component (inches)

EXAMPLE: A Lee component (such as RILF5551005S) is flowing 1 GPM of MIL-H-83282 at 80°F with 4000 psi upstream and 3500 psi downstream. The component is being fed through a 0.15 inch diameter passage upstream. If a valve is suddenly shut downstream of the component, the pressure spike will be:

$$\Delta P = \frac{1}{16.6(0.15)^2}\sqrt{0.84\,(300{,}000)} = 1340 \text{ psi}$$

The maximum upstream pressure would then be:
(4000 psi steady state) + (1340 psi spike) = 5340 psi total

BULK MODULUS

Bulk modulus is a measure of the resistance of a fluid to compression. It is defined as the ratio of pressure stress to volumetric strain. Assuming there is no entrained air in the system, bulk modulus can be expressed using the following formula:

$$B = -\frac{\Delta P}{\Delta V} \times V$$

Where:

- B = Bulk modulus (psi)
- ΔP = Change in pressure (psi)
- ΔV = Change in volume
- V = Initial volume

When the value of B is known (see reference table below), it is easy to calculate the effect of any pressure change on volume, or of any volume change on pressure.

$$\Delta V = -\frac{V}{B} \times \Delta P \quad \text{or} \quad \Delta P = -\frac{B}{V} \times \Delta V$$

EXAMPLE:
MIL-H-83282 oil has a bulk modulus of 3.0 x 105 psi. Thus, a pressure increase of 3000 psi will reduce its volume by 1.0%.

COEFFICIENT OF THERMAL EXPANSION

Thermal expansion is the tendency of a fluid to expand due to an increase in temperature. The coefficient of thermal expansion can be used to relate temperature change to volume change, as shown in the following formula:

$$\Delta V = V \times \gamma \times \Delta T$$

Where:

- γ = Coefficient of cubical thermal expansion/°F at 100°F
- ΔT = Temperature rise, °F

EXAMPLE:
MIL-H-83282 oil has a coefficient of cubical thermal expansion of 0.00046/°F. Thus, a temperature rise of 100°F will increase a 2.0 gallon volume by 0.09 gallons.

The bulk modulus and the coefficient of cubical thermal expansion can be used together to compute the pressure rise in a closed system subjected to an increasing temperature.

$$\text{Pressure Rise: } \Delta P = B \times \gamma \times \Delta T$$

BULK MODULUS

EXAMPLE:

MIL-H-83282 oil at 0 psi is heated from 70°F to 120°F in a closed, constant volume system containing 100 cubic inches.

$$\Delta P = 3.0 \times 10^5 \times 0.00046 \times 50 = 6900 \text{ psi}$$

This is the same ΔP which would be caused by adding 2.3 cubic inches of oil with no temperature change. It is also apparent that a constant system pressure could be maintained by bleeding off 2.3 cubic inches of oil while increasing the temperature by 50˚F.

REFERENCE TABLE

FLUID	$B_{ref.}$	γ
Units	psi	ΔV/V/°F
Gasoline	150,000	0.00072
JP-4	200,000	0.00057
MIL-H-5606	260,000	0.00046
MIL-H-83282	300,000	0.00046
MIL-H-6083	260,000	0.00044
SKYDROL 500B-4	340,000	0.00047
Silicone 100cs	150,000	0.00054
Water	310,000	0.00021

Where:

- ΔV = Change in volume
- V = Initial volume
- ΔT = Temperature rise, ˚F
- $B_{ref.}$ = Tangent adiabatic bulk modulus psi stated at 100˚F, 2500 psi and no entrained air. A reference point.
- γ = Coefficient of cubical thermal expansion/˚F at 100˚F

BULK MODULUS (ACTUAL)

The previous examples used a constant bulk modulus for simplicity. In actual use, the bulk modulus is affected by the working pressure, temperature, and percent of entrained air. Use the next three graphs to find the effect of these variables and you will get a close approximation of actual conditions. The actual bulk modulus, B, of a fluid is the value in the table as $B_{ref.}$ modified for the effect of pressure, temperature, and percent of entrained air.

$$\text{Actual Bulk Modulus: } B = E_P \times E_T \times E_A \times B_{ref.}$$

Where:

E_P = Effect on pressure

E_T = Effect on temperature

E_A = Effect on entrained air

EXAMPLE:

500 psi, 60°F, 2% entrained air, MIL-H-83282

$$\text{Actual B} = 0.91 \times 1.10 \times 0.8 \times 300{,}000 = 240{,}000 \text{ psi}$$

EXAMPLE:

2000 psi, 160°F, 2% entrained air, MIL-H-83282

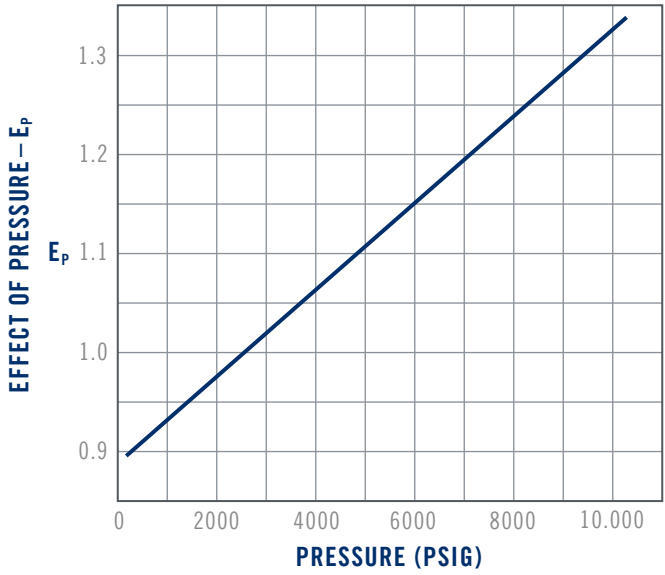
$$\text{Actual B} = 0.98 \times 0.86 \times 0.98 \times 300{,}000 = 248{,}000 \text{ psi}$$

With the corrected bulk moduli for the two end points of a thermal problem, an average bulk modulus can be selected for calculation purposes. We would use 244,000 psi for B.

BULK MODULUS

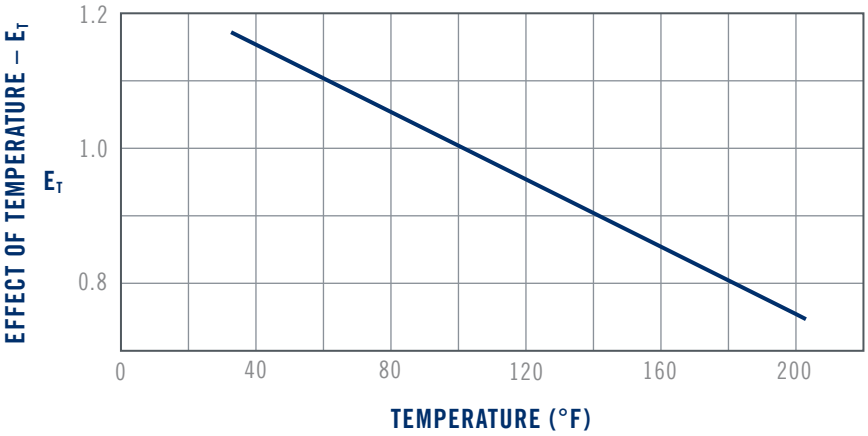
WORKING PRESSURE

The effect of working pressure on bulk modulus for hydrocarbon fluids.



TEMPERATURE

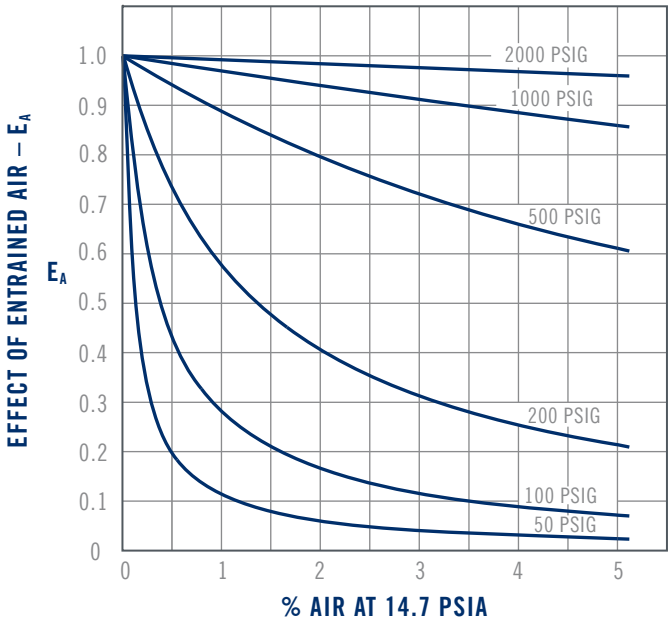
The effect of temperature on bulk modulus for hydrocarbon fluids.



BULK MODULUS

ENTRAINED AIR

The effect of entrained air on bulk modulus in hydrocarbon and other fluids for different working pressures.



To simplify the calculations of thermal problems with entrained air, these curves show the average effect on a 230,000 psi bulk modulus for pressure points fairly close together. If a wide change in pressure is encountered in a problem, it would be more accurate to break the changes down into two or more steps, depending on the accuracy desired.

An accurate one-step formula for this relationship follows:

$$E_A = \frac{1}{\frac{0.147\ B_{ref.}}{P_1 \times P_2} \times \%\ \text{air} + 1}$$

(Note that pressure is in units of psia.)

CAVITATION

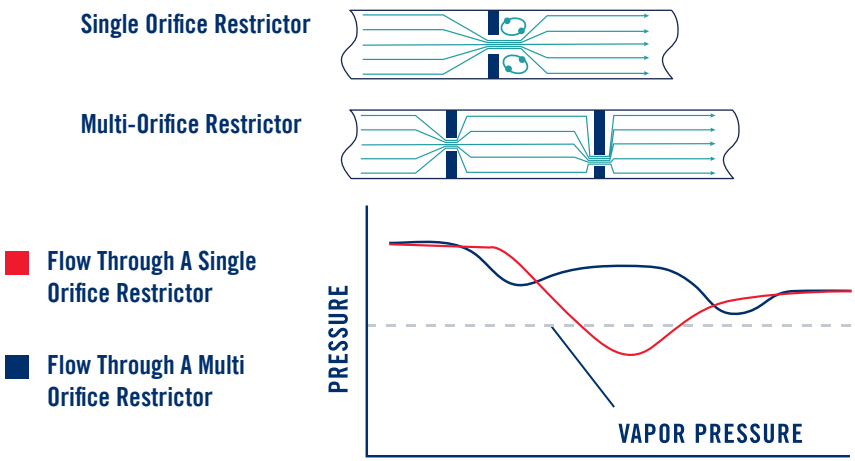
Liquid flowing through any orifice will cavitate whenever its velocity causes the pressure in the throat of the orifice to drop below the vapor pressure of the flowing liquid. If the velocity is high enough – even though there may be a high supply pressure and a high back pressure on the orifice – there will be a subsequent lowering of the pressure in the throat of the orifice and the possibility of cavitation.

The effects of cavitation are choked flow and erosion – both of which are undesirable. To mitigate cavitation, the throat pressure must be maintained, either by:

1. Applying sufficiently high back pressure, or
2. Reducing the velocity of the liquid as it flows through a restrictor.

The use of Lee multi-orifice restrictors (including the Bender Jet, Axial Visco Jet®, JEVA, and Visco Jet® restrictors) can significantly reduce the possibility of cavitation. Their unique designs allow the total pressure drop to be divided across each orifice, reducing throat velocity and increasing back pressure relative to the pressure drop across each orifice. The images below show how these types of restrictors create much smaller pressure drops across each of the orifices; and the individual drops are never below the vapor pressure. Therefore, the use of multi-orifice restrictors can significantly reduce the possibility of cavitation.

ELIMINATING CAVITATION WITH MULTIPLE FLOW RESTRICTORS IN SERIES



It is recommended that Lee multi-orifice restrictors be considered whenever high pressure drops and low back pressures are required. Contact your local Lee Sales Engineer to find the ideal solution for your application.

WORKING WITH GASES

The Lee Company has developed the Lohm Laws, a simple method of defining and measuring resistance to fluid flow for pneumatic components. Just as the Ohm is used in the electrical industry, we find that we can use a liquid Ohm or “Lohm” as an advantage when performing fluidic computations.

The benefit of using the Lohm Laws is that you can forget about coefficients of discharge and dimensional tolerances on drilled holes. These factors are automatically compensated for in the Lohm calculations and confirmed by our testing of each component to establish flow tolerances. The resistance to flow of any fluid component can be expressed in Lohms.

When using the Lohm system for pneumatics, the effect of flow in the subsonic region and the compressibility of gases is corrected for in the Lohm calculations. The resistance to flow of any component can be expressed in Lohms.

The Lohm has been selected so that a 100 Lohm restrictor will permit a flow of 250 standard liters per minute of nitrogen at a temperature of 59°F, and an upstream pressure of 90 psia discharging to atmosphere.

Due to the differences in fluid properties between gases and liquids, the equations for calculating the relationship between flow restriction, pressure differential, and flow rate are different.

HOW TO CALCULATE FLOW RESISTANCE FOR GASES

GAS FLOW – LOHM RATE FORMULA

The Lohm Laws extend the definition of Lohms for gas flow at any pressure and temperature, and with any gas. The formulas work well for all gases because they are corrected for the specific gas and for the flow conditions caused by the compressibility of gases due to pressure.

A 100 Lohm restriction will permit a flow of 250 standard liters per minute of nitrogen at a temperature of 59°F, and an upstream pressure of 90 psia discharging to the atmosphere.

The steps for using the gas Lohm rate formula are below.

SONIC CONDITION:

i.e. $P_1 / P_2 \geq 1.9$

$$L = \frac{K\ f_T\ P_1}{Q}$$

SUBSONIC CONDITION:

i.e. $P_1 / P_2 < 1.9$

$$L = \frac{2\ K\ f_T\ \sqrt{\Delta P\ P_2}}{Q}$$

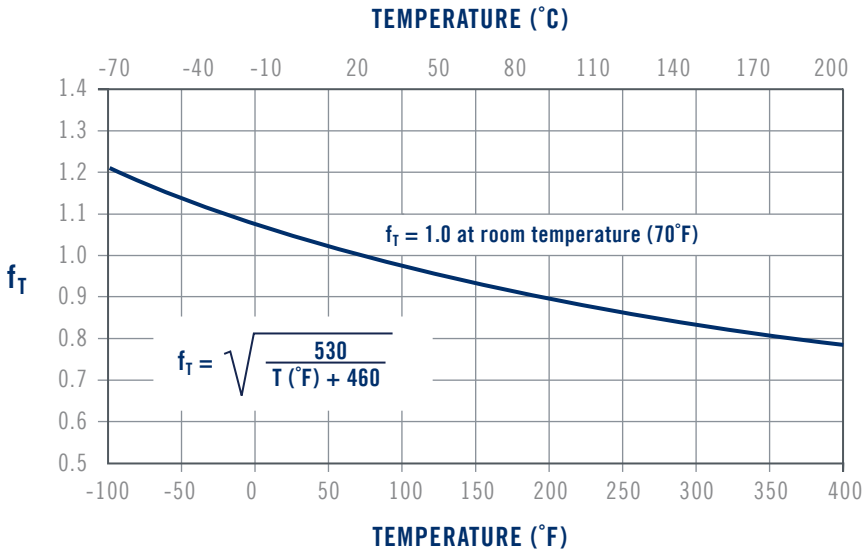
Where:

- L = Lohm rate (Lohms)
- K = Gas flow – Units Constant (see tables on pages J31-J32)
- f_T = Temperature correction factor (see chart on page J30)
- P_1 = Upstream absolute pressure
- P_2 = Downstream absolute pressure
- Q = Gas flow rate
- $\Delta P = P_1 - P_2$

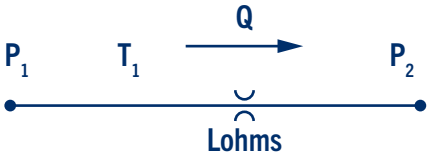
STEPS FOR USING THE GAS LOHM RATE FORMULA:

1. Compute the P_1 / P_2 pressure ratio
2. Select the correct formula for the flow condition
3. Look up the value of “K” for the gas
4. Determine the temperature correction factor, “ f_T”
5. Use the formula to solve for the unknown

TEMPERATURE CORRECTION FACTOR F_T



GAS FLOW EXAMPLE



EXAMPLE: What restriction will permit a flow of 1.00 SLPM of nitrogen at a temperature of 90°F with a supply pressure of 5 psig discharging to the atmosphere?

K = 276 (see table on pages J31-J32)
T_1 = 90˚F, f_T = 0.98 (see chart above)
P_1 = 5.0 + 14.7 = 19.7 psia, P_2 = 14.7 psia
P_1 / P_2 = 19.7/14.7 = 1.34 (subsonic)
ΔP = 5.0 psid
Q = 1.00 SLPM

$$L = \frac{2\,(276)\,0.98\,\sqrt{5.0\ \ (14.7)}}{1.00} = 4640 \text{ Lohms}$$

GAS FLOW – UNITS CONSTANT K

VOLUMETRIC

To eliminate the need to convert pressure and flow parameters into specific units such as psia and standard liters per minute, the tables below list the values of the units constant K, which is used in the gas flow Lohm formulas. Depending on your application, it may be more appropriate to use the volumetric or gravimetric flow units.

VOLUMETRIC FLOW UNITS							
Abs. Pressure	psia			bar		kPa	mm Hg
Flow	SLPM	SCFM	in^3/min	SLPM	SCFM	SLPM	mL/min
H^2	1030	36.3	62,700	14,900	526	149	19,900
He	771	27.2	47,100	11,200	395	112	14,900
Neon	343	12.1	20,900	4980	176	49.8	6640
Nat. Gas	319	11.3	19,400	4620	163	46.2	6160
N_2	276	9.73	16,800	4000	141	40.0	5330
CO	274	9.69	16,700	3980	141	39.8	5300
Air	271	9.56	16,500	3930	139	39.3	5230
Ethane	251	8.86	15,300	3640	129	36.4	4850
O_2	257	9.08	15,700	3730	132	37.3	4970
Argon	245	8.65	14,900	3550	125	35.5	4730
CO_2	213	7.52	13,000	3090	109	30.9	4110
N_2O	214	7.56	13,100	3100	110	31.0	4140
SO_2	176	6.21	10,700	2550	90.1	25.5	3400
Freon-12	123	4.34	7510	1780	63.0	17.8	2380
Xe	135	4.77	8253	1956	69.1	19.6	2605

GAS FLOW – UNITS CONSTANT K

GRAVIMETRIC

See examples below for using the Units Constant K with flow specified in either volume or weight units.

GRAVIMETRIC FLOW UNITS							
Abs. Pressure	psia			bar		kPa	mm Hg
Flow	PPH	lb_m /s	kg/min	PPH	kg/min	kg/min	gm/min
H^2	11.6	0.00322	0.0876	168	1.27	0.0127	1.69
He	17.6	0.00479	0.131	250	1.89	0.0189	2.52
Neon	38.7	0.0108	0.293	561	4.25	0.0425	5.66
Nat. Gas	34.8	0.00966	0.263	505	3.82	0.0382	5.09
N_2	43.2	0.0120	0.326	626	4.73	0.0472	6.31
CO	43.0	0.0119	0.325	623	4.71	0.0471	6.28
Air	43.8	0.0122	0.331	636	4.81	0.0481	6.41
Ethane	42.2	0.0117	0.319	611	4.62	0.0462	6.16
O_2	46.0	0.0128	0.348	667	5.04	0.0504	6.72
Argon	54.6	0.0152	0.413	792	5.99	0.0599	7.99
CO_2	52.4	0.0145	0.396	759	5.74	0.0574	7.65
N_2O	52.7	0.0146	0.398	764	5.77	0.0577	7.70
SO_2	62.0	0.0175	0.476	914	6.91	0.0691	9.21
Freon-12	83.2	0.0231	0.629	1210	9.12	0.0912	12.2
Xe	97.6	0.0271	0.738	1415.6	10.7	0.1070	14.24

GRAVIMETRIC EXAMPLE:

If a Lohm rate is being calculated for an Argon application using pounds per hour and bar as the flow and pressure units, the unit constant is 792.

EXAMPLE: A restrictor must flow 8.20 SLPM of helium at room temperature (70°F), with an inlet pressure of 1500 kPa, discharging to atmosphere. What Lohm rate is required?

$K = 112$ (see pages J31-J32)
$T_1 = 70°F$, $f_T = 1.00$ (see page J30)
$P_1 = 1500$ kPa, $P_2 = 101$ kPa
$P_1/P_2 = 14.9$ (sonic)
$Q = 8.20$ SLPM

$$L = \frac{112 \times 1{,}500 \times 1.00}{8.20} = 20{,}500 \text{ Lohms}$$

EXAMPLE: A restrictor must flow 0.0015 lb_m/s of oxygen at room temperature (70°F), with an inlet pressure of 1200 psia, discharging to 850 psia. What Lohm rate is required?

$K = 0.0128$ (see pages J31-J33)
$T_1 = 70°F$, $f_T = 1.00$
$P_1 = 1200$ psia, $P_2 = 850$ psia
$P_1/P_2 = 1.41$ (subsonic)
$\Delta P = 350$ psid
$w = 0.0015\ lb_m/s$

$$L = \frac{2 \times 0.0128 \times 1.00 \times \sqrt{350 \times 850}}{0.0015} = 9300 \text{ Lohms}$$

GAS FLOW CHARACTERISTICS

When selecting components for use in a gas system, certain factors must be considered which arise only because of the compressibility of gases. The nature of this compressibility is defined by the following two rules.

Boyle's Law: The pressure and specific volume of a gas are inversely proportional to each other under conditions of constant temperature.

Charles' Law: The pressure and temperature of a gas are directly proportional to each other when the volume is held constant, and the volume and temperature are directly proportional when the pressure is held constant.

Thus, a gas will expand to fill any container, and pressure and temperature will adjust to values consistent with the above rules. Gas flowing through valves and restrictors will be subject to an increasing specific volume as pressure drops take place, and temperatures will change as determined by the Joule-Thomson effect.

The combination of the above rules forms the basis for the “Equation of State” for perfect gases. This allows either pressure, temperature, or volume to be calculated for a known quantity of gas when the other two variables are known.

$$pV = mRT$$

(For values of the gas constant R see page J51)

In general, the following comments apply to gas flow:

1. Gas flow at high pressure ratios ($P_1/P_2 > 1.9$) is directly proportional to the upstream absolute pressure.
2. Gas flow at moderate pressure ratios ($P_1/P_2 < 1.9$) is proportional to the downstream absolute pressure, and to the pressure differential (see page J29).
3. Gas flow at low pressure ratios ($P_1/P_2 < 1.1$) is proportional to the pressure differential, similar to hydraulic flow.
4. When restrictors appear in series, the most downstream restrictor dominates in the determination of flow rate.
5. When the absolute pressure ratio across a restrictor is above 1.9, the gas velocity will reach the speed of sound (sonic flow) in the restrictor's throat. When restrictors appear in series, the overall pressure ratio must be higher to achieve sonic flow.
6. When equal restrictors appear in series, sonic flow can only occur in the most downstream restrictor.
7. The velocity of a gas stream cannot exceed the speed of sound in either a constant area duct or a converging section.

The Rule of Forbidden Signals:

"The effect of pressure changes produced by a body moving at a speed faster than the speed of sound cannot reach points ahead of the body." (Von Karman, 1947).

This rule can be applied to pneumatic flow restrictors where the body is not moving but the flow velocity relative to the body can reach or exceed the speed of sound. Whenever the downstream pressure is low enough to produce Mach 1 at the restrictor throat, any effect of changes in the downstream pressure cannot reach points upstream of the throat. Thus, the flow rate will be independent of downstream pressure. This situation applies to a single orifice restrictor flowing air when the overall pressure ratio exceeds 1.89/1.

Source Cited: Von Karman, T. (1947). Supersonic Aerodynamics - Principles and Applications, The Tenth Wright Brothers Lecture. *Journal of the Aeronautical Sciences*, 14(7), 373-402.

ABSOLUTE PRESSURE MEASUREMENT

Gas flow is a function of upstream absolute pressure, and of the ratio of upstream to downstream pressures. Lohm testing done at The Lee Company is performed at an upstream pressure that is high enough so that downstream pressure does not affect the flow rate. To accurately determine the upstream absolute pressure, it is necessary to measure atmospheric pressure with a suitable barometer. This measurement will normally be in units of in Hg, while the gauge pressure reading is in units of psig. Thus, the barometer reading must be converted to psia, and added to the gauge reading to get the value of pressure in psia.

$$\text{Pres. (psia)} = \text{Pres. (psig)} + 0.4912 \times \text{Pres. (in Hg)}$$

EXAMPLE: What single-orifice restriction will permit a flow of 2.00 SLPM of nitrogen at 70°F, with supply pressure at 10 psig, discharging to an atmospheric pressure of 29.5 in Hg?

K = 276 (see pages J31-J32)
T_1 = 70°F, $f_T = 1.00$ (see page J30)
P_2 = 0.4912 x 29.5 = 14.5 psia
P_1 = 10.0 + 14.5 = 24.5 psia
P_1/P_2 = 24.5/14.5 = 1.69 (subsonic)
ΔP = 24.5 - 14.5 = 10.0 psid
Q = 2.00 SLPM

$$L = \frac{2\,(276)\,1.0\,\sqrt{10.0\,(14.5)}}{2.00} = 3320 \text{ Lohms}$$

ACFM TO SCFM CONVERSION

It is frequently convenient to express gas flow in terms of flow at standard conditions. This is useful for calculation purposes or for the application of flow measuring instruments.

However, since most applications are not occurring under standard conditions, it may be necessary to convert the actual conditions to standard. The following formula can be used to convert the actual flow rate to the standard flow rate in cubic feet per minute. The flow rate in other units can be determined by converting them into cubic feet per minute before and after using the formula:

$$SCFM = ACFM \left(\frac{P}{14.7}\right) \left(\frac{519}{460 + T}\right)$$

Where:

T = Gas temperature (˚F)
P = Gas pressure (psia)
ACFM = Gas flow (actual cubic feet/minute)
SCFM = Gas flow (standard cubic feet/minute)

EXAMPLE: What is SCFM corresponding to 0.032 ACFM at 300 psia and at 240˚F?

Solution:

$$SCFM = 0.032 \left(\frac{300}{14.7}\right) \left(\frac{519}{700}\right) = 0.48$$

GAS FLOW FACTOR f_M (MULTI-ORIFICE)

When multiple orifices appear in series, or when a restrictor has several stages, there is a non-uniform distribution of the overall pressure drop through the restrictor.

The effect of the above flow behavior is that the gas flow rate of a multi-orifice device is higher than would be expected from a single-orifice device of the same Lohm rate, and at the same pressure conditions. This characteristic is reflected in the flow factor, "f_M", which reaches a maximum value of 1.3 at a pressure ratio of 3/1. See the graph on page J39 for values of f_M at any pressure ratio for multi-orifice flow restrictors.

SONIC CONDITION:

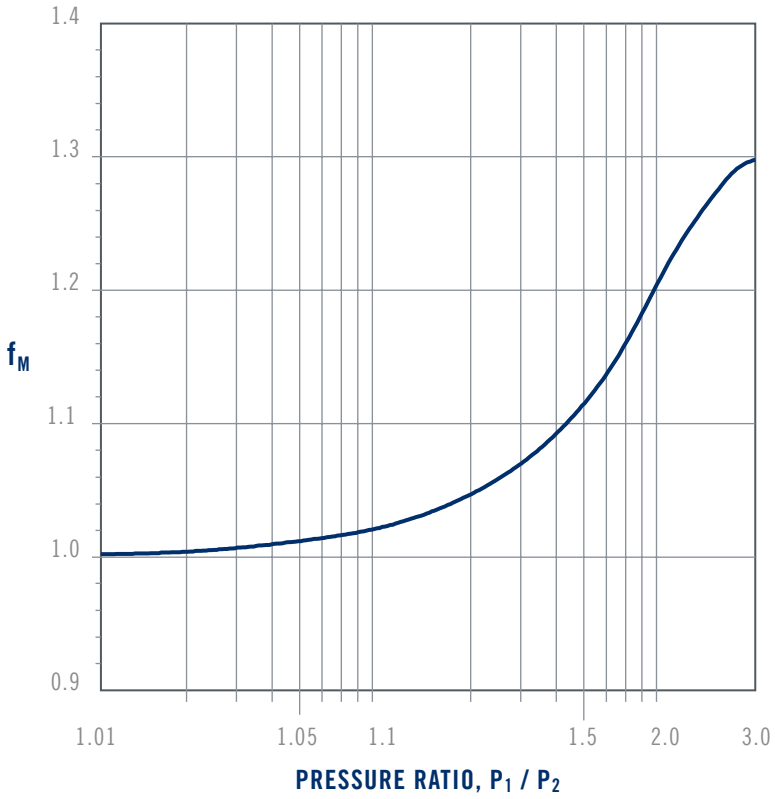
$$\text{Lohms} = \frac{K\, f_T\, f_M\, P_1}{Q}$$

EXAMPLE: What multi-orifice restriction will permit a flow of 0.5 std L/min. of hydrogen at 70°F, with supply pressure at 40 psig, discharging to atmosphere?

K = 1030 (see tables on pages J31-J32)
T_1 = 70°F, f_T = 1.0 (see graph on page J30)
P_1 = 40.0 + 14.7 = 54.7 psia
P_2 = 14.7 psia
P_1 / P_2 = 54.7 / 14.7 = 3.72
f_M = 1.30 (see graph on page J39)
Q = 0.50 std L/min

$$L = \frac{1030 \times 1.0 \times 1.30 \times 54.7}{0.50} = 146{,}000 \text{ Lohms}$$

FLOW FACTOR f_M (MULTI-ORIFICE)



SONIC FLOW:

for $P_1 / P_2 > 3$, use $f_M = 1.3$

RESTRICTORS IN SERIES OR PARALLEL

RESTRICTORS IN SERIES

When gas flow passes through **restrictors in series**, the pressure drops are not evenly distributed. This is caused by the compressibility of the gas and generally results in higher pressure drops at the downstream restrictors. Thus, it becomes difficult to calculate the intermediate pressure between series restrictors flowing gas without using a trial-and-error-process. To simplify this calculation, the chart below may be used when the Lohm rates of the applicable restrictors are known.

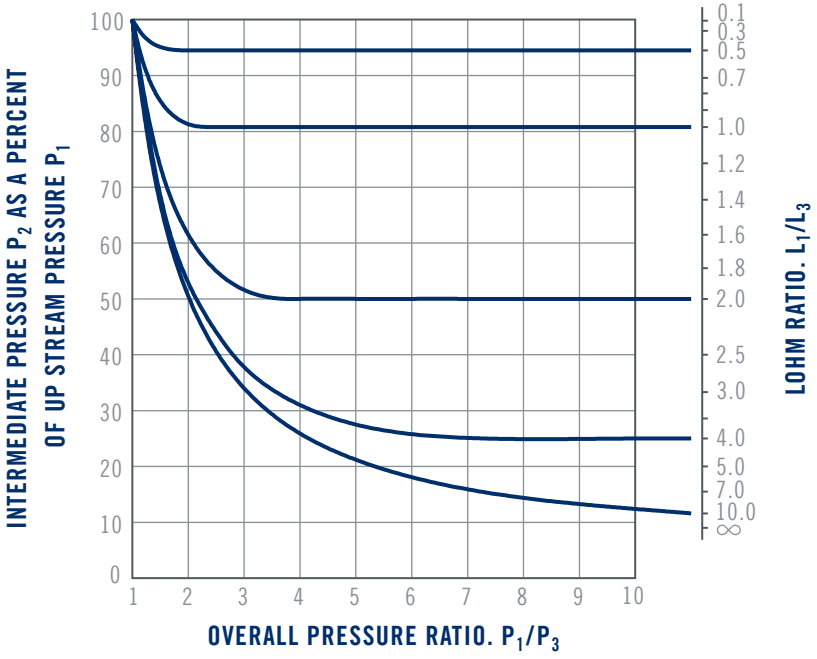
The chart below solves for the absolute pressure between two restrictors as a percentage of the supply pressure. To solve a problem, simply follow the graph line corresponding to the Lohm ratio, L_1/L_2, until it crosses the overall pressure ratio, P_1/P_3. Then read horizontally across to the left-hand scale to obtain the value of P_2 as a percentage of the upstream absolute pressure, P_1.

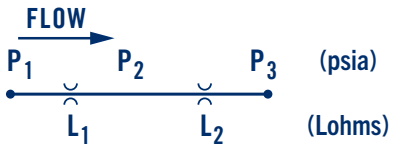
The following will allow solutions to be obtained for series restrictor problems even when Lohm or pressure ratios are off-scale:

1. When the Lohm ratio is less than 0.1, then $P_2 = P_1$.
2. When the Lohm ratio is less than 8.0, then the solution for a pressure ratio greater than 10 is the same as at 10.
3. When the Lohm ratio is greater than 1.5, then the solution at high values of the pressure ratio is such that the ratio P_2 / P_1 is equal to the reciprocal of the Lohm ratio.

RESTRICTORS IN SERIES OR PARALLEL (CONTINUED)

ABSOLUTE PRESSURE BETWEEN TWO RESTRICTORS AS A PERCENTAGE OF THE SUPPLY PRESSURE





EXAMPLE: Find the intermediate pressure between two restrictors with an upstream pressure 72 psia, exhausting to atmosphere at 14.7 psia.

L_1 = 2000 Lohms

L_2 = 500 Lohms

Calculate the Lohm ratio: $L_1/L_2 = 2000/500 = 4.0$

Calculate the overall pressure ratio: $P_1/P_3 = 72.0/14.7 = 4.9$

Read 28% from left hand scale of graph.

The upstream pressure is known, thus:

$P_2 = 0.28 \times 72.0 = 20$ psia

RESTRICTORS IN SERIES OR PARALLEL (CONTINUED)

The following formulas provide solutions to series gas flow problems which must be solved with more precision than can be obtained by using the graph above. In each case, the graph can first be used to approximate the pressures upstream and downstream of each restriction, which can then be used to estimate whether the restrictions are creating sonic ($P_1/P_2 \geq 1.9$) or subsonic ($P_1/P_2 < 1.9$) flow conditions.

1.) L_1 and L_2 are both sonic $L_1 > L_2$:

$$P_2 = P_1 \times \frac{L_2}{L_1}$$

2.) L_1 is subsonic, and L_2 is sonic and $L_1 \neq L_2$:

$$P_2 = \frac{4\, P_1\, L_2^2}{L_1^2 + 4\, L_2^2}$$

3.) L_1 is subsonic, and L_2 is sonic and $L_1 = L_2$:

$$P_2 = 0.8 \times P_1$$

4.) L_1 is sonic, and L_2 is subsonic and $L_1 > L_2$:

$$P_2 = P_3 + \frac{P_1^2\, L_2^2}{4\, P_3\, L_1^2}$$

5.) L_1 is subsonic, and L_2 is subsonic and $L_1 \neq L_2$:

$$P_2 = \frac{1}{2}\left[P_1 - A + \sqrt{(P_1 - A)^2 + 4\, P_3\, A}\right]$$

Where:

$$A = P_3 \left(\frac{L_1}{L_2}\right)^2$$

6.) L_1 is subsonic and L_2 is subsonic and ($L_1 = L_2$):

$$P_2 = \frac{\Delta P_{1-3} + \sqrt{\Delta P_{1-3}{}^2 + 4\, P_3{}^2}}{2}$$

EXAMPLE: Find the intermediate pressure in the example problem given above using the more precise equations 1-6 above.

L_1 = 2000 Lohms, L_2 = 500 Lohms
P_1 = 72 psia, P_2 = 20 psia, P_3 = 14.7 psia
P_1/P_2 = 72 / 20 = 3.60 (sonic)
P_2/P_3 = 20 / 14.7 = 1.36 (subsonic)

$$P_2 = P_3 + \frac{P_1^2\, L_2^2}{4\, P_3\, L_1^2} = 14.7 + \frac{72^2 \times 500^2}{4 \times 14.7 \times 2000^2} = 20.2 \text{ psia}$$

RESTRICTORS IN SERIES OR PARALLEL (CONTINUED)

EXAMPLE:
Find the intermediate pressure between two restrictors with an upstream pressure of 30 psia, exhausting to atmosphere at 14.7 psia.

L_1 = 1500 Lohms

L_2 = 1500 Lohms

Use the solution procedure given above to determine the approximate value. This value can then be used to solve for the more precise intermediate pressure value, P_2:

$L_1 / L_2 = 1500 / 1500 = 1.0$, $P_1 / P_3 = 30.0 / 14.7 = 2.04$

$P_2 = 0.81 \times 30.0 = 24$ psia. (approx.)

$P_1 / P_2 = 30.0 / 24.0 = 1.25$, $P_2 / P_3 = 24.0 / 14.7 = 1.63$

(L_1 and L_2 are, therefore, both subsonic)

$$P_2 = \frac{\Delta P_{1-3} + \sqrt{\Delta P^2_{1-3} + 4\, P_3^2}}{2} = \frac{15.3 + \sqrt{15.3^2 + 4 \times 14.7^2}}{2}$$

P_2 = 24.2 psia

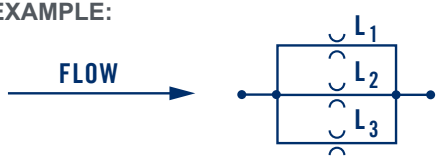
RESTRICTORS IN PARALLEL

For parallel flow, the total Lohm rating is:

$$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \ldots + \frac{1}{L_N}$$

Note that this relationship is identical to that for liquid flow, and the electrical equation.

EXAMPLE:



L_1 = 2000 Lohms

L_2 = 3000 Lohms

L_3 = 5000 Lohms

$$\frac{1}{L_T} = \frac{1}{2000} + \frac{1}{3000} + \frac{1}{5000} = 0.00103$$

Therefore, L_T = 970 Lohms

MOMENTUM FORCES – GAS FLOW

When a flowing stream of gas is subject to a change in velocity (either speed or direction), forces arise which are the reaction to the change in momentum of the stream. This is particularly important in valve design where the position of a moving element may be affected.

The direction in which the momentum force acts is always opposite to the acceleration which is imparted to the flow stream. The magnitude of the force may be calculated by using the momentum Lohm Laws, which apply to air at near room temperature.

SONIC FLOW

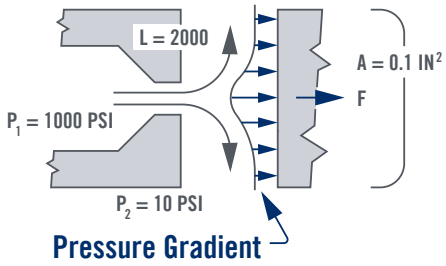
$$F = \frac{0.42 \times P_1}{L} \qquad F = \frac{Q}{645}$$

L = Orifice Lohm rate (Lohms)

Q = Flow rate (SLPM)

EXAMPLE: Where a gas changes direction.

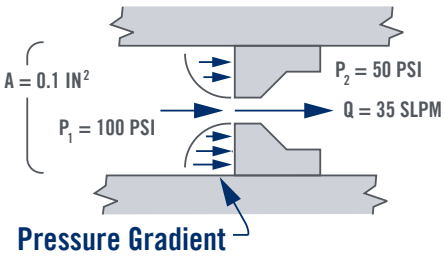
$$F = \frac{0.42 \times P_1}{L} = \frac{0.42 \times 1000}{2000} = 0.21\ lb_f$$



The momentum force of 0.21 of a pound in this example must be added to the force produced by static pressure on the plate (0.1 in^2 x 10 psi = 1 lb) to give the total force on the plate.

EXAMPLE: Where a gas changes speed.

$$F = \frac{Q}{645} = \frac{35}{645} = 0.05\ lb_f$$



The momentum force of 0.05 of a pound in this example must be subtracted from the force produced by static pressure on the plate (0.1 in^2 x [100-50] = 5 lbs) to give the total force on the piston.

TRANSIENT GAS FLOW

This type of flow normally concerns the charging of a volume through a fixed resistance such as an orifice. Use of the Lohm system simplifies the calculation of the time required to blow down or charge up a vessel.

The first step is to calculate system time constant, τ, which takes into consideration the volume of the pressure vessel, the absolute temperature, and the Lohm rate of the orifice. The system time constant is given by:

$$\tau = \frac{4 f_T V L}{K}$$

WHERE:

- K = Volumetric units correction factor
- L = Orifice Lohm rate (Lohms)
- f_T = Temperature factor
- V = Pressure vessel volume
- τ = System time constant (s)

Note: Select "K" from the appropriate "psia" column of the table of volumetric flow units on page J31. Keep the units of pressure vessel volume "V" consistent with the volumetric flow units.

The larger the value of τ, the more sluggish the system.

Once τ has been calculated, the ratio of upstream pressure to downstream pressure for both the initial and final conditions must be computed. Then, from the pressure–ratio graph, initial and final values for "N" can be found. "N" is the number of system time constants required for the system to reach equilibrium.

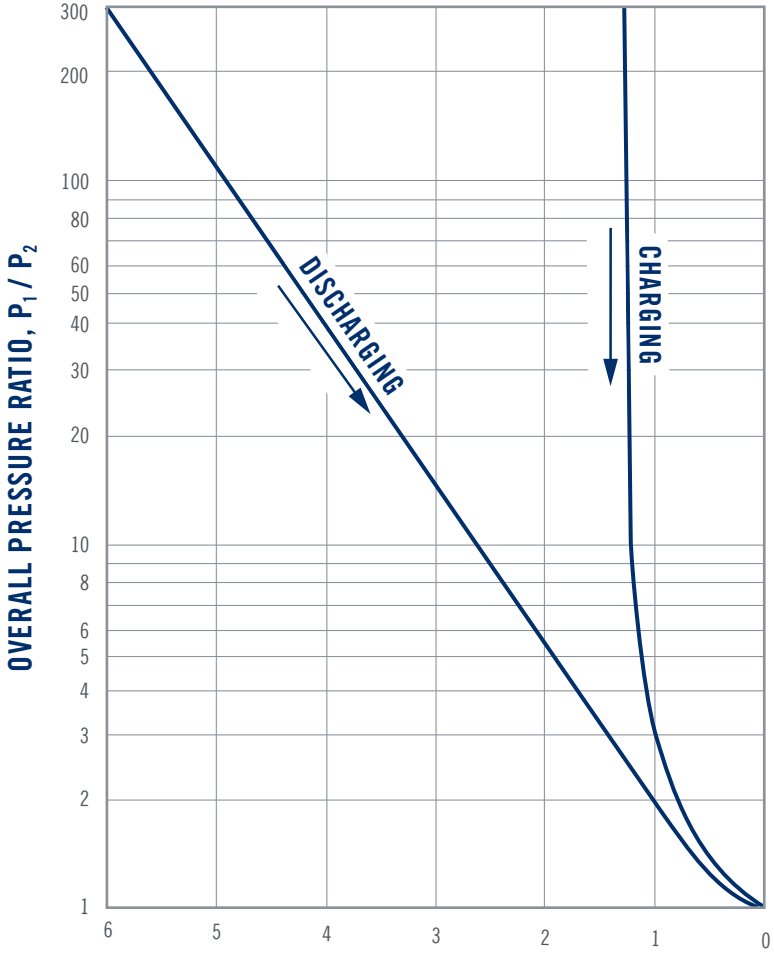
If the final condition is equilibrium, where upstream and downstream pressures are equal, the final pressure ratio is 1 and the final value of "N" is 0. With these values, the time for the system to blow down or charge up can be calculated from:

$$t = \tau \left(N_i - N_f \right)$$

WHERE:

- N_i = Initial number of system time constants
- N_f = Final number of system time constants
- P_1 = Upstream gas pressure
- P_2 = Downstream gas pressure
- t = Time to charge up or blow down a pressure vessel

TRANSIENT GAS FLOW



TEMPERATURE CHANGE IN GAS FLOW

When gas flows through an orifice it is subject to a throttling process. This results in the gas temperature changing to an extent determined by the pressure drop. Many of the common gasses will be chilled by throttling, although some gasses will increase in temperature.

A positive Joule – Thomson coefficient, which is a function of both temperature and pressure, will produce cooling of the gas. This is only the case below the “inversion” temperature. At the inversion temperature, the Joule – Thomson coefficient is zero, so no heating or cooling occurs.

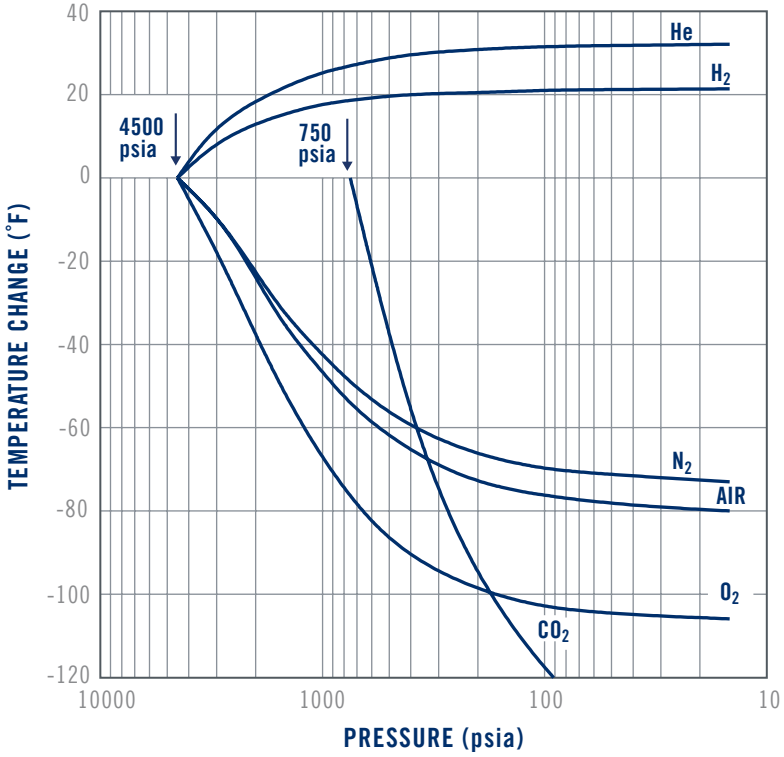
The following graph allows the downstream temperature to be found when starting from an upstream pressure of 4500 psia or 750 psia for CO_2. Solutions may be obtained for other upstream pressures by shifting the graph lines left or right so that the starting temperature (zero temperature change) point of the curve corresponds to the actual upstream pressure.

The graph is entered on the zero temperature change line at the point corresponding to the actual upstream pressure. Then the graph line, or a parallel line, for the applicable gas is followed to the right. When the value of the downstream pressure (read on the X-axis) is reached, the temperature change can be read on the Y-axis.

The graph works for a wide range of initial temperatures but is most accurate when the initial temperature is close to 70°F.

Note that the actual downstream temperature will not normally be as extreme as calculated due to heat transfer to or from the piping.

TEMPERATURE CHANGE IN GAS FLOW



EXAMPLE:

A Lee flow restrictor is used in a 4500 psia helium gas system to obtain a pressure drop down to 300 psia starting with an upstream temperature of 80˚F. What downstream gas temperature will result?

Enter the graph at the 4500 psia point and follow the helium line to a pressure of 300 psia. Then read the temperature change on the left hand scale. This value is +30˚F; thus, the calculated downstream temperature is 110˚F.

PNEUMATIC POWER

A gas flowing through an orifice is throttled (causing turbulence and heating) and expanded (causing cooling). Therefore, it is subject to energy conversions that reduce the amount of energy available to do work. The rate at which available energy is lost can be termed the pneumatic power — a function of the pressures, the Lohm rate of the orifice, and the flow. The graph on the next page shows the relationship for nitrogen.

The power consumption can be determined from the graph when the flow rate and the pressure ratio are known. If the flow rate is not known, it can be calculated from the Lohm rate using the gas Lohm Law. Plot a point on the graph at the appropriate pressure ratio (X-axis) and follow the vertical line to the point of intersection corresponding to the applicable flow rate. The resulting power may be read via the horizontal line intersecting the Y-axis. Note that the pressure ratio is the ratio of the absolute pressures.

The following formula may be used for nitrogen or air for more precise calculations or to extend the range of the pneumatic power graph.

$$HP = \frac{2.2\,P_1}{L}\left[\left(P_1 / P_2\right)^{1/4} - 1\right]$$

WHERE:

HP = Pneumatic power (Horsepower)

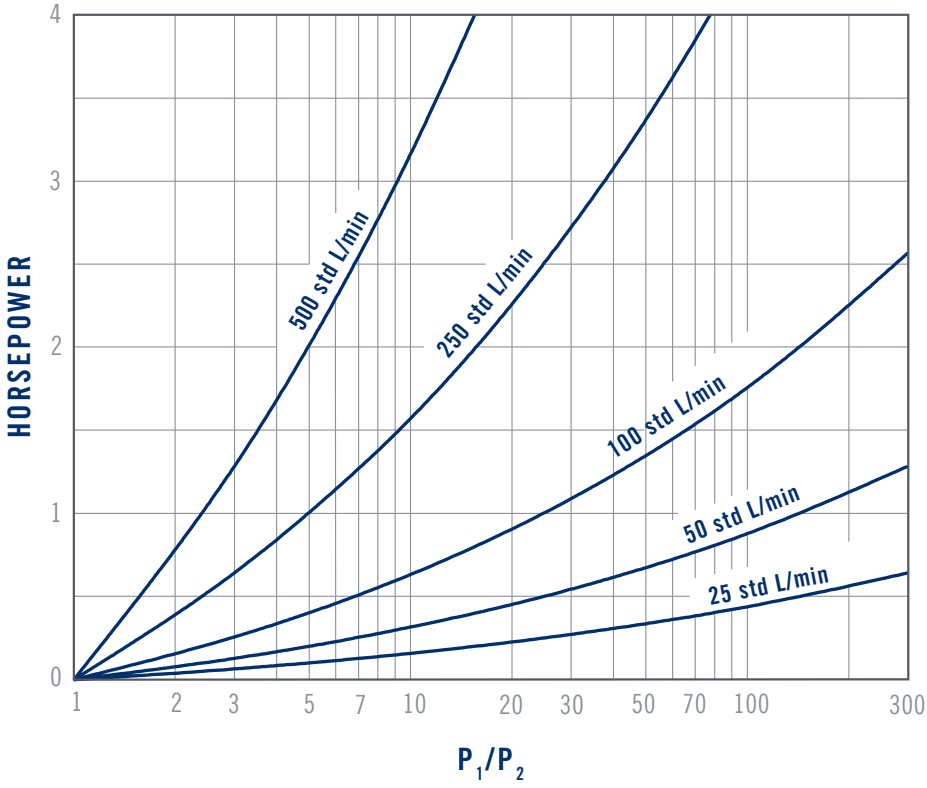
P_1 = Absolute pressure upstream of orifice (psia)

P_2 = Absolute pressure downstream of orifice (psia)

L = Lohm rate of orifice (Lohms)

Due to compressor inefficiencies, more power will be needed to compress the gas than will be expended when it flows through an orifice.

POWER LOSS FOR NITROGEN



GAS PROPERTIES

FLUID MECHANICS FOR GASES

GAS	k	R ft-lb/lb° R	DENSITY		C_P* Btu/lb° R	C_v* Btu/lb° R
			lb_m/ft^3	lb_m/std L		
H_2	1.40	766.6	0.00532	0.000188	3.420	2.435
He	1.66	386.1	0.01056	0.000373	1.250	0.754
Neon	1.66	76.6	0.0533	0.00188	0.248	0.150
Nat. Gas	1.22	79.2	0.0516	0.00182	0.560	0.45
N_2	1.40	55.2	0.0739	0.00261	0.247	0.17
CO	1.41	55.2	0.0739	0.00261	0.243	0.172
Air	1.40	53.3	0.0764	0.00270	0.241	0.173
Ethane	1.21	51.4	0.0793	0.00280	0.386	0.320
O_2	1.40	48.3	0.0845	0.00298	0.217	0.155
Argon	1.67	38.7	0.1053	0.00372	0.124	0.074
CO_2	1.28	35.1	0.1162	0.00410	0.205	0.160
N_2O	1.26	35.1	0.1162	0.00410	0.221	0.176
SO_2	1.25	24.1	0.1691	0.00597	0.154	0.123
Freon-12	1.13	12.8	0.319	0.01127	0.145	0.129
Xe	1.68	11.74	0.3427	0.0121	0.0383	0.0228

*Values at 68°F and 14.7 psia

C_P = Specific heat at constant pressure

C_V = Specific heat at constant volume

k = Ratio of specific heats: $\frac{C_P}{C_V}$

R_O = Universal gas constant

R = Gas constant: $\frac{R_O}{\text{Molecular Weight}}$

ROB NUMBER - A RATING SYSTEM FOR SAFETY SCREENS

DEFINITION

The ROB Number is a system of rating the relative resistance to blockage of safety screens. It was developed to minimize the guesswork and expensive testing previously employed in screen selection.

The ROB Number helps system designers choose the optimum screen for their conditions relative to other available screen options. It is not used to predict absolute screen life.

The ROB Number system is based on the following assumptions:

- The same contamination level applies to all screen options.
- Fluid contamination level is not impacted by the presence of a safety screen in the system.
- Particles block different-sized holes, in essentially the same way.
- Particle distribution follows a log-log^2 distribution.
- Best results are achieved when the screen options are of similar geometry and filtration media type.

A fluid contamination level per MIL-STD-1246 Class 200 was chosen as the basis of comparison with the ROB Number and is defined as the following:

$$ROB = \frac{N}{63.25\ n}$$

WHERE:

$n = 10^{(4.9029 - 0.926 \log^2 d)}$
d = hole size (µ)
N = Number of holes in a screen

A master screen of ROB = 1 is, therefore, defined as having 1000 holes — all 100 µ in size.

Table A, shown on next page, lists the ROB Number for single holes of a given diameter.

To determine the ROB Number for a screen, multiply the single hole value by the number of holes in the screen:

Screen ROB Number = Single Orifice ROB Number x Number of holes

TABLE A

HOLE SIZE		SINGLE ORIFICE ROB NUMBER
INCHES	MICRONS	
0.0010	25	0.0000133
0.0015	30	0.0000408
0.0020	51	0.0000979
0.0025	64	0.000202
0.0030	76	0.000376
0.0035	89	0.000650
0.0040	102	0.00106
0.0045	114	0.00165
0.0050	127	0.00248
0.0055	140	0.00361
0.0060	152	0.00511
0.0065	165	0.0079
0.0070	178	0.00963
0.0075	191	0.0129
0.0080	203	0.0169
0.0085	216	0.0220
0.0090	229	0.0281
0.0095	241	0.0357
0.010	254	0.0448
0.011	279	0.0687
0.012	305	0.1023
0.013	330	0.1482
0.014	356	0.210
0.015	381	0.291
0.016	406	0.397
0.017	432	0.533
0.018	457	0.706
0.019	483	0.922
0.020	508	1.19
0.021	533	1.52

HOLE SIZE		SINGLE ORIFICE ROB NUMBER
INCHES	MICRONS	
0.022	559	1.93
0.023	584	2.42
0.024	610	3.01
0.025	635	3.72
0.026	660	4.56
0.027	686	5.56
0.028	711	6.73
0.029	737	8.10
0.030	762	9.71
0.031	787	11.6
0.032	813	13.7
0.033	838	16.2
0.034	864	19.1
0.035	889	22.3
0.036	914	26.0
0.037	940	30.3
0.038	965	35.1
0.039	991	40.5
0.040	1016	46.6
0.041	1041	53.5
0.042	1067	61.2
0.043	1092	69.9
0.044	1118	79.5
0.045	1143	90.3
0.046	1168	102
0.047	1194	116
0.048	1219	130
0.049	1245	147
0.050	1270	165
0.051	1295	185

The screen safety factor is defined as the ratio of the screen ROB Number to the ROB Number of the orifice it is protecting. It is recommended to choose a screen that provides the highest practical safety factor. The following is an example of selecting the proper screen:

EXAMPLE:
Which of the following two safety screens is the better choice to protect a 0.030″ diameter orifice: screen 1, a 0.008 of an inch hole sized screen with 850 holes, or screen 2, a 0.015 of an inch hole sized screen with 450 holes?

Solution:
Table A indicates that a single orifice of 0.030 of an inch in diameter has a ROB Number of 9.7. Table B shows that screen 1 has a safety factor of 1.5 (screen ROB Number 14.4/orifice ROB Number 9.7) while screen 2, with a safety factor of 13.5 (screen ROB Number 131/orifice ROB Number 9.7), is the better choice.

TABLE B

	HOLE SIZE		NUMBER OF HOLES	ROB NUMBER	SAFETY FACTOR
	INCHES	MICRONS			
Orifice	0.030	762	1	9.7	1
Screen 1	0.008	203	850	14.4	1.5
Screen 2	0.015	381	450	131	13.5

CONTAMINATION CONTROL

Contamination can cause a wide range of problems, including damage to valves or pumps, clogging, or complete system failure. The source of contamination can originate from many places, such as dirty fluid, manufacturing debris, or even defective components during operation. Maintaining fluidic system performance requires cleanliness and tight control of potential contamination.

SYSTEM CLEANLINESS

Fluidic systems are typically comprised of components that have varying degrees of sensitivity to contamination, mostly determined by the minimum passage size and clearances throughout the flow path. Several attributes of contamination must be considered beyond just size, such as the shape, length, texture, and hardness of a particulate. Some critical steps to consider are:

1. Working in a clean environment.
2. Properly flushing components before system assembly.
3. Incorporating proper system level filtration.

The first step ensures the system is free from manufacturing debris prior to installing components. The second step removes contamination to protect individual components and extend their operational life. However, since contamination can also originate from within the system due to the normal wear of components, step three of incorporating safety screen filters immediately upstream from components is a prudent design practice. The added benefit of using safety screens is to protect the components during any maintenance of the system.

CONTAMINATION LEVEL CORRELATION

There is a direct correlation between fluid cleanliness and the level of filtration required in your system. Fluid contamination can be described using different techniques:

- **The Gravimetric Method:** The contaminant level is expressed as the mass of contaminant per unit volume of fluid.
- **Parts Per Million:** The degree of contamination is based on mass or volume per million units (e.g. grams/10^6 grams).

The above techniques describe bulk or total contamination but give little information regarding the size of the contaminant. For example, unless the size and density of the contaminating particles is known, no conclusions may be drawn relative to the number of particles.

Other techniques look at the number of particles, describing contamination in terms of its size and concentration. These may be an interval concentration, for example, the number of contaminant particles (per unit volume) between 5 and 15 microns in size. Additionally, contamination may be expressed as a cumulative concentration. In this case, contamination levels are described by the total number of particles per unit volume above a given size. For example, the number of particles above 25 microns in size per 100 mL.

The more common cleanliness specifications are based on the number of particles rather than gravimetric techniques. However, particle distributions which were determined to be representative of service distributions (e.g., NAS 1638 distributions) correlate reasonably with those obtained gravimetrically with AC test dust. The table below (from An Encyclopedia of Fluid Contamination Control by E.C. Fitch) provides a correlation of some different cleanliness specifications.

NAS 1638 TABLE

NAS* 1638	NUMBER OF PARTICLES PER 100 mL MICRON RANGE					ISO 4406
CLASS	5-15 µ	15-25 µ	25-50 µ	50-100 µ	>100 µ	CLASS
00	125	22	4	1	—	8/5
0	250	44	8	2	—	9/6
1	500	89	16	3	1	10/7
2	1000	178	32	6	1	11/8
3	2000	356	63	11	2	12/9
4	4000	712	126	22	4	13/10
5	8000	1425	253	45	8	14/11
6	16,000	2850	506	90	16	15/12
7	32,000	5700	1012	180	32	16/13
8	64,000	11,400	2025	360	64	17/14
9	128,000	22,800	4050	720	128	18/15
10	256,000	45,600	8100	1440	256	19/16
11	512,000	91,200	16,200	2880	512	20/17
12	1,024,000	182,400	32,400	5760	1024	21/18

*SAE standard AS 4059 also applies and lists fluid particulate contamination cumulatively for 5 ranges for contamination classes from 00 to 12 (>2 µ; >5 µ; >15 µ; >25 µ; >50 µ).

CONTAMINATION CONTROL

ISO 4406 TABLE

ISO 4406 CODE	PARTICLES PER mL >10 µ	ACFTD GRAVIMETRIC, LEVEL mg/L	MIL-STD 1246 LEVEL	NAS 1638 CLASS
26/23	140,000	1000		
25/23	85,000		1000	
23/20	14,000	100	700	
21/18	4500			12
20/18	2400		500	
20/17	2300			11
20/16	1400	10		
19/16	1200			10
18/15	580			9
17/14	280		300	8
16/13	140	1		7
15/12	70			6
14/12	40		200	
14/11	35			5
13/10	14	.1		4
12/9	9			3
18/8	5			2
10/8	3		100	
10/7	2.3			1
10/6	1.4	0.01		
9/6	1.2			0
8/5	0.6			00
7/5	0.3		50	
6/3	0.14	0.001		
5/2	0.04		25	
2/.8	0.01		10	

CONTAMINATION CONTROL

PARTICLE SIZE COMPARISON

SIZES OF FAMILIAR OBJECTS		
SUBSTANCE	MICRONS	INCHES
Grain of Table Salt	100	0.0039
Human Hair	70	0.0028
Lower Limit of Visibility	40	0.0016
White Blood Cells	25	0.0010
Talcum Powder	10	0.0004
Red Blood Cells	8	0.0003
Bacteria (Average)	2	0.00008

SCREEN SIZES		
U.S. SIEVE NUMBER	OPENING IN INCHES	OPENING IN MICRONS
50	0.0117	297
60	0.0090	228
70	0.0083	210
100	0.0059	149
140	0.0041	105
200	0.0029	74
270	0.0021	53
325	0.0017	44
Paper	0.00039	10
Paper	0.00020	5

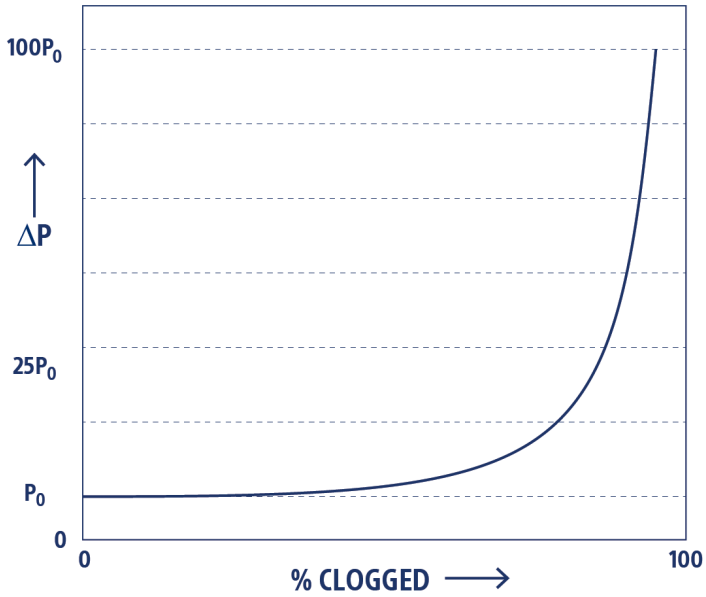
CLOGGING

As a safety screen accumulates particles, the pressure drop will slowly increase until the screen is almost fully clogged. Then the pressure drop increases dramatically. For example, consider a clean safety screen in a 3000 psi hydraulic system. At its normal flow rate the screen pressure drop is 6 psi. That same screen will see a pressure drop of only 150 psi when 80% clogged. However, at 95% clogged, the differential pressure jumps to 2500 psi. This phenomenon is represented by the following formula:

% CLOGGED VS. ΔP

$$\Delta P = \frac{\Delta P_O}{(1 - \%\ \text{clogged})^2}$$

Where ΔP_O is the pressure drop across the screen when it is clean.



Ensuring you have the proper filtration in place is the key to controlling contamination and extending product life.

Please contact your local Lee Sales Engineer for any assistance required in determining the recommended level of filtration for a specific component.

PRIMARY/EXACT STANDARDS & EXACT/DERIVED CONVERSIONS

PRIMARY STANDARDS*

Meter Length equal to 1,650,763.73 wavelengths in vacuum of the radiation corresponding to the transition between the levels 2 p_{10} and 5 d_5 of the krypton-86 atom.

Kilogram Mass equal to the mass of the international prototype of the kilogram. This is a particular cylinder of platinum-iridium alloy that is preserved in a vault at Sèvres, France by the International Bureau of Weights and Measures.

Second Time duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom.

DERIVED STANDARD

Newton The force that gives to a mass of 1 kilogram an acceleration of 1 meter per sec. per sec.

EXACT CONVERSIONS*

1 pascal	=	1 newton/meter^2
1 atmosphere	=	101,325 pascals
1 bar	=	100,000 pascals
1 centipoise	=	0.001 of a newton-second/meter^2
1 centistoke	=	1 x 10^{-6} meter^2 /second
1 fluid ounce (U.S.)	=	2.95735295625 x 10^{-5} meter^3
1 foot	=	0.3048 of a meter
1 gallon (U.S.)	=	3.785411784 x 10^{-3} meter^3
1 gram	=	0.001 of a kilogram
1 inch	=	0.0254 of a meter
1 kilogram force	=	9.80665 newtons
1 liter	=	0.001 of a meter^3
1 micron	=	1 x 10^{-6} meter
1 milliliter	=	1 x 10^{-6} meter^3
1 ounce mass (avdp)	=	0.028349523125 of a kilogram
1 pound force (avdp)	=	4.4482216152605 newtons
1 pound mass (avdp)	=	0.45359237 of a kilogram

* Exact by National Bureau of Standards definition

PRIMARY/EXACT STANDARDS & EXACT/DERIVED CONVERSIONS

DERIVED CONVERSIONS:

1 foot of H_2O at 4°C = 2988.98 pascals
1 gram/centimeter^3 = 1000 kilograms/meter^3
1 inch of H_2O at 4°C = 249.082 pascals
1 inch of Hg at 0˚C = 3386.389 pascals
1 pound$_F$ / inch^2 = 6894.7572 pascals
1 pound$_M$ / inch^3 = 27,679.905 kilograms/meter^3
1 quart (U.S.) = 9.4635295 x 10^{-4} meter^3
1 drop = 50 microliters
1 bar = 14.503774 pound$_F$ /inch^2

MASS CONVERSION FACTORS

MASS

TO CONVERT ↓ / INTO →	lb_m (avdp)	oz_m (avdp)	SLUG	gram	kg_m
lb_m (avdp)	—	16.00	3.108 x 10^{-2}	453.6	0.4536
oz_m (avdp)	6.250 x 10^{-2}	—	1.943 x 10^{-3}	28.35	2.835 x 10^{-2}
SLUG	32.17	514.8	—	1.459 x 10^4	14.59
gram	2.205 x 10^{-3}	3.527 x 10^{-2}	6.852 x 10^{-5}	—	1.000 x 10^{-3}
kg_m	2.205	35.27	6.852 x 10^{-2}	1000	—

MULTIPLY BY

VOLUME CONVERSION FACTORS

VOLUME

VOLUME

TO CONVERT \ INTO	ft^3	in^3	gal (U.S.)	quart (U.S.)	fl oz (U.S.)	LITER	mL	m^3
ft^3	—	1728	7.481	29.92	957.5	28.32	2.832×10^{-4}	2.832×10^{-2}
in^3	5.787×10^{-4}	—	4.329×10^{-3}	1.732×10^{-2}	0.5541	1.639×10^{-2}	16.39	1.639×10^{-5}
gal (U.S.)	0.1337	231.0	—	4.000	128.0	3.785	3785	3.785×10^{-3}
quart (U.S.)	3.342×10^{-2}	57.75	0.2500	—	32.00	0.9464	946.4	9.464×10^{-4}
fl oz (U.S.)	1.044×10^{-3}	1.805	7.813×10^{-3}	3.125×10^{-2}	—	2.957×10^{-2}	29.57	2.957×10^{-5}
LITER	3.531×10^{-2}	61.02	0.2642	1.057	33.81	—	1000	1000×10^{-3}
mL	3.531×10^{-5}	61.02×10^{-2}	2.642×10^{-4}	1.057×10^{-3}	3.381×10^{-2}	1.000×10^{-3}	—	1.000×10^{-6}
m^3	35.31	6.102×10^{4}	264.2	1057	3.381×10^{-4}	1000	1.000×10^{-6}	—

MULTIPLY BY

PRESSURE CONVERSION FACTORS

PRESSURE

TO CONVERT \ INTO	$\frac{lb}{in^2}$	in Hg at 0°C	in H_2O at 4°C	ft H_2O at 4°C	ATM	$\frac{kg_f}{cm^2}$	$\frac{kg_f}{m^2}$	kPa
$\frac{lb}{in^2}$	—	2.036	27.68	2.307	6.805×10^{-2}	7.032×10^{-2}	703.1	6.895
in HG at 0°C	0.4912	—	13.60	1.133	3.342×10^{-2}	3.453×10^{-2}	345.3	3.386
in H_2O at 4°C	3.613×100^{-2}	7.355×100^{-2}	—	8.333×100^{-2}	2.458×100^{-3}	2.540×100^{-3}	25.40	0.2491
ft H_2O at 4°C	0.4335	0.8826	12.00	—	2.950×10^{-2}	3.048×10^{-2}	304.8	2.989
ATM	14.70	29.92	406.8	33.90	—	1.033	1.033×10^{4}	101.3
$\frac{kg_f}{cm^2}$	14.22	28.96	393.7	32.81	0.9678	—	1.000×10^{4}	98.07
$\frac{kg_f}{m^2}$	1.422×10^{-3}	2.896×10^{-3}	3.937×10^{-2}	3.281×10^{-3}	9.678×10^{-5}	1.000×10^{-4}	—	9.807×10^{-3}
kPa	0.1450	0.2953	4.015	0.3346	9.869×10^{-3}	1.020×10^{-2}	102.0	—

MULTIPLY BY ↑

CONVERSION FACTORS - VOLUME TO MASS OF WATER AT 39.2°F (4°C)

MASS

TO CONVERT \ INTO	lb_m (avdp)	oz_m (avdp)	SLUG	gram	kg_m
ft^3	62.43	998.8	1.940	2.832×10^4	28.32
in^3	3.613×10^{-2}	0.5780	1.123×10^{-3}	16.39	1.639×10^{-2}
gal (U.S.)	8.345	133.5	0.2594	3785	3.785
qt (U.S.)	2.086	33.38	6.484×10^{-2}	946.3	0.9463
fl oz (U.S.)	6.520×10^{-2}	1.043	2.026×10^{-3}	29.57	2.957×10^{-2}
LITER	2.205	35.27	6.852×10^{-2}	1000	1.000
mL	2.205×10^{-3}	3.527×10^{-2}	6.852×10^{-5}	1.000	1.000×10^{-3}
m^3	2205	3.527×10^4	68.52	1.000×10^6	1000

VOLUME

MULTIPLY BY

NOTE: To apply these factors to fluids with specific gravity other than 1.0, these factors must be multiplied by the actual specific gravity.

EXAMPLE:
Determine the flow rate in PPH, which is equivalent to 430 mL/min. The fluid is MIL-H-5606 (the specific gravity is 0.84).

$$430 \frac{mL}{min} \times 2.20 \times 10^{-3} \frac{lb}{mL} \times 0.84 \times \frac{60\ min}{1\ hr} = 47.8 \frac{lb_m}{hr}$$

CONVERSION FACTORS - MASS TO VOLUME OF WATER AT 39.2°F (4°C)

MASS

TO CONVERT → / INTO ↓	lb_m (avdp)	oz_m (avdp)	SLUG	gram	kg_m
ft^3	1.602×10^{-2}	1.001×10^{-3}	0.5154	3.532×10^{-5}	3.532×10^{-2}
in^3	27.68	1.730	890.6	6.103×10^{-2}	61.03
gal (U.S.)	0.1198	7.489×10^{-3}	3.855	2.642×10^{-4}	0.2642
qt (U.S.)	0.4793	2.996×10^{-2}	15.42	9.464×10^{-4}	0.9464
fl oz (U.S.)	15.34	0.9586	493.5	3.381×10^{-2}	33.81
LITER	0.4536	2.835×10^{-2}	14.59	1.000×10^{-3}	1.000
mL	453.6	28.35	1.459×10^{4}	1.000	1,000
m^3	4.536×10^{-4}	2.835×10^{-5}	1.459×10^{-2}	1.000×10^{-6}	1.000×10^{-3}

VOLUME

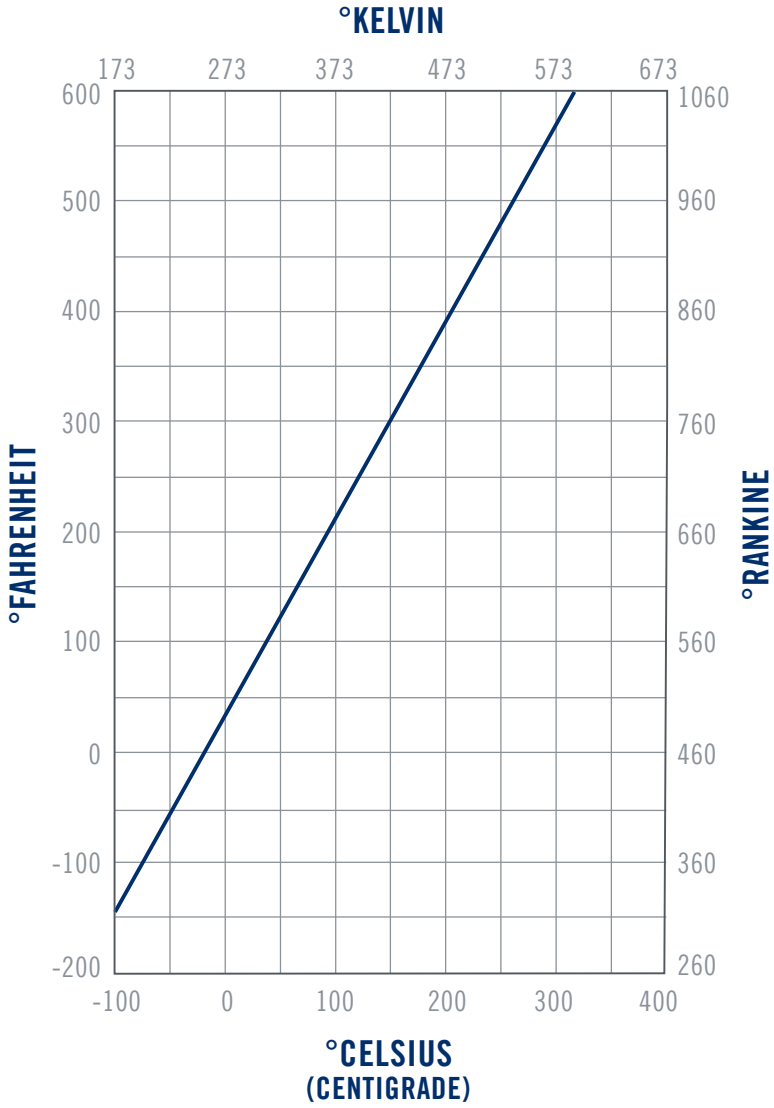
MULTIPLY BY ↑

NOTE: To apply these factors to fluids with a specific gravity other than 1.0, these factors must be divided by the actual specific gravity.

EXAMPLE:
Determine the volume in gallons which would be occupied by 3.0 kg of sea water (specific gravity is 1.02).

$$3.0 \text{ kg} \times \frac{0.2642}{1.02} \frac{\text{gal}}{\text{kg}} = 0.78 \text{ gal}$$

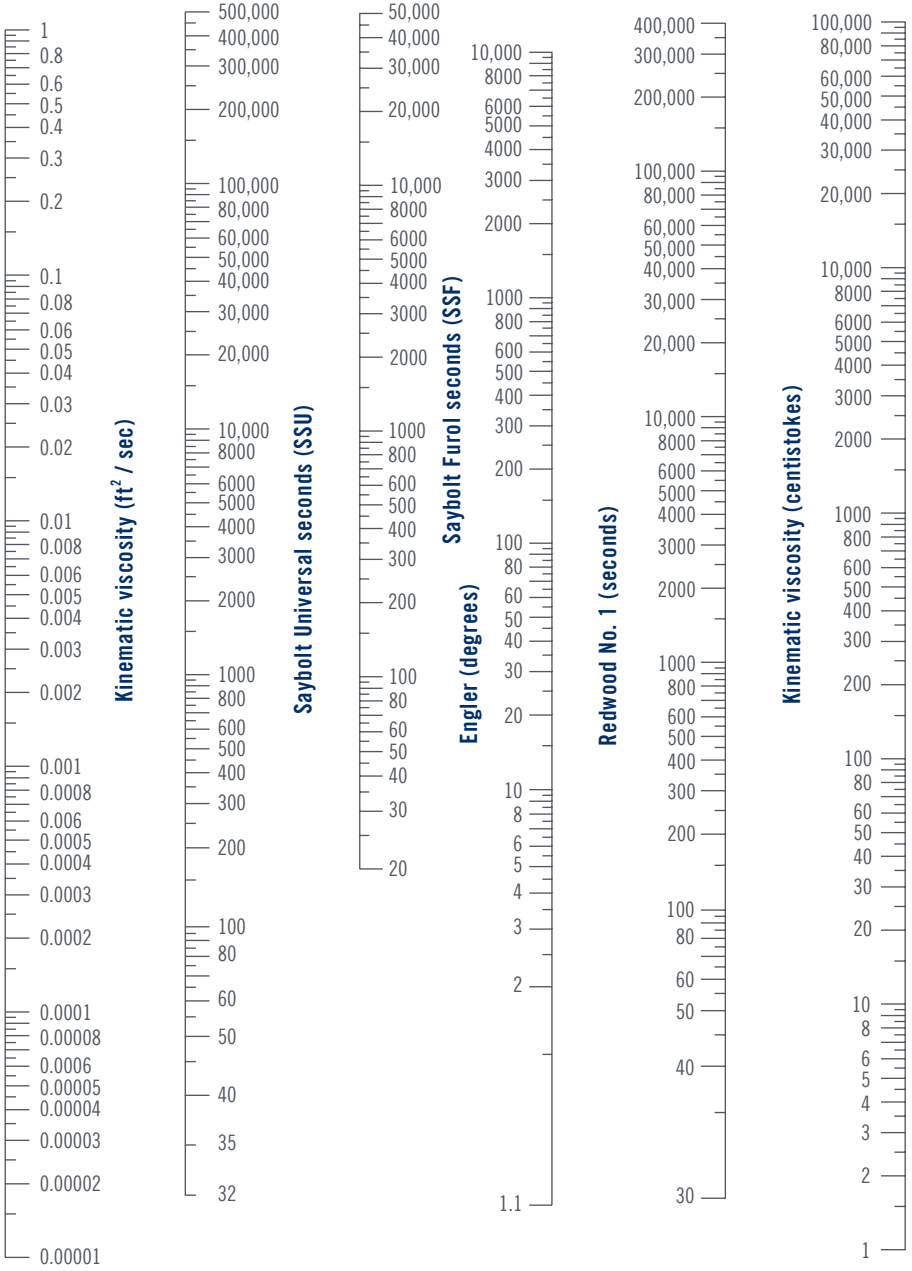
TEMPERATURE CONVERSION



TEMPERATURE CONVERSION EQUATIONS:

°F = °C (9/5) + 32
°C = (°F - 32) (5/9)
°R = °F + 460
°K = °C + 273
°K = °R (5/9)

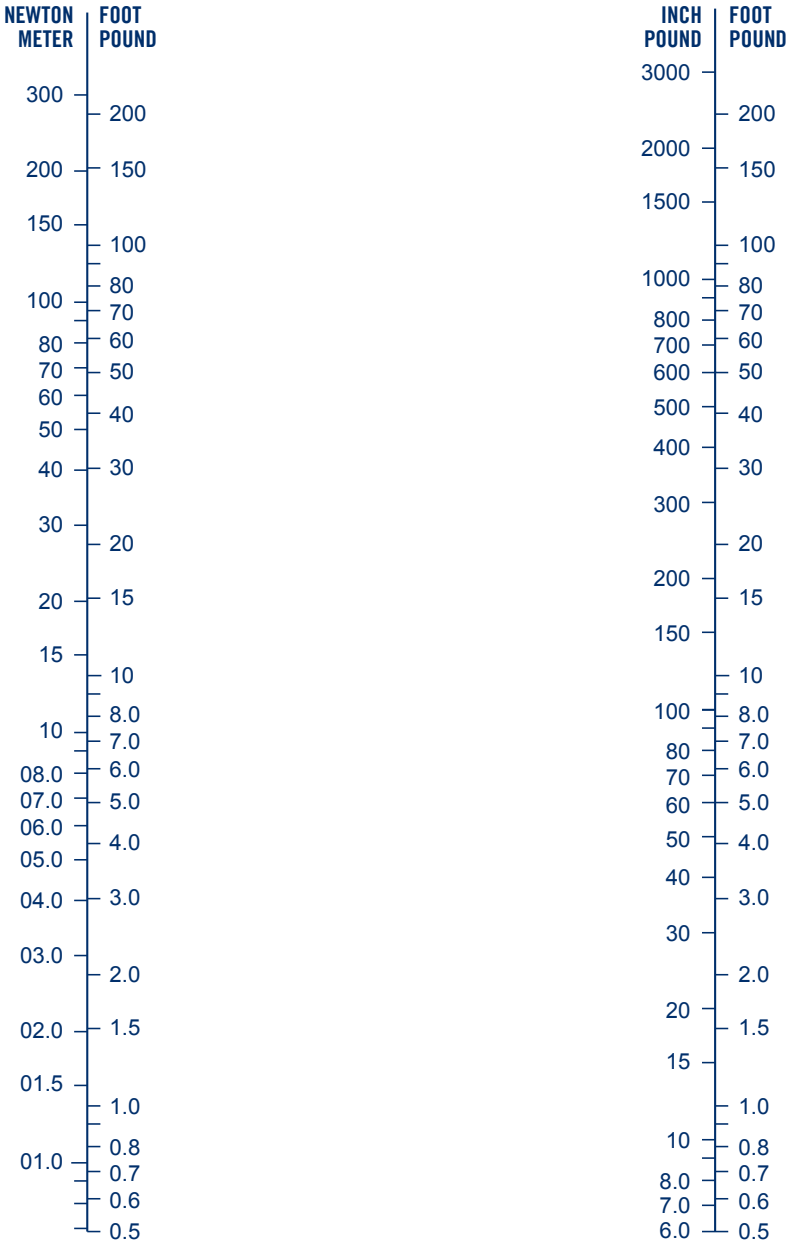
VISCOSITY CONVERSIONS



To convert between different viscosity units, simply connect horizontally across the chart.

PRESSURE AND TORQUE CONVERSIONS

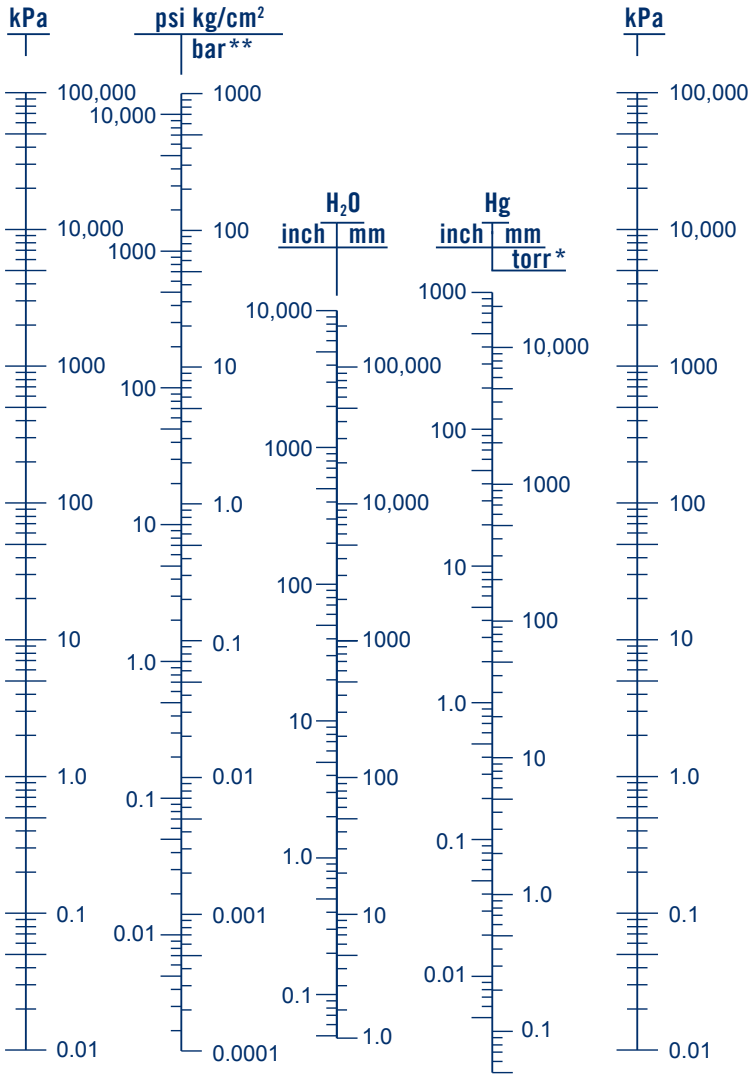
TORQUE CONVERSION CHART



To convert torque units, simply draw a line horizontally at your current value and read the units you want to convert to.

PRESSURE AND TORQUE CONVERSIONS

PRESSURE CONVERSION CHART



NOTE:

*1 torr = 1 mm Hg = 0.535 inch H_2O

**1 bar = 1.02 kg/cm^2 = 14.5 psi

1 psi = 6.895 kPa = 0.07031 kg/cm^2

To convert pressure units, simply draw a line horizontally at your current value and read the units you want to convert to.

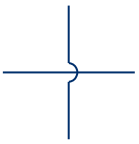
SYMBOLS FOR HYDRAULICS AND PNEUMATICS

HIGH PRESSURE FLUID FLOW LINE

HIGH PRESSURE PILOT LINE

RETURN LINE

SUCTION LINE

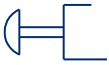

LINES CROSSING


LINES JOINING


FLEXIBLE HOSE


CAPPED LINE


SPRING FOR VALVE CONTROL


PUSH BUTTON


LEVER


PEDAL


DETENT

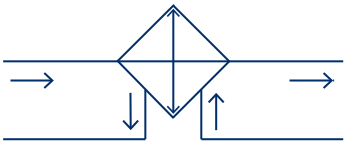

SOLENOID OPERATED


PILOT OPERATED

SYMBOLS FOR HYDRAULICS AND PNEUMATICS



HYDROPNEUMATIC ACCUMULATOR



HEAT EXCHANGER



SPRING ENERGIZED ACCUMULATOR



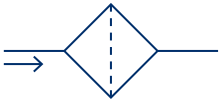
DOUBLE ACTING CYLINDER



GAS STORAGE (BOTTLE)



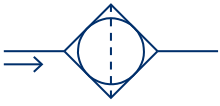
SINGLE ACTING WITH SPRING RETURN



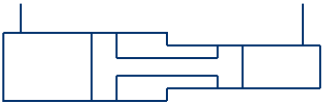
FILTER OR SCREEN



DOUBLE ENDED CYLINDER

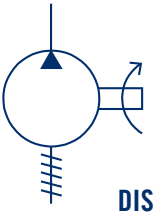


FILTER WITH REMOVABLE ELEMENT

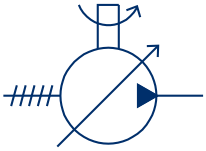


PRESSURE INTENSIFIER

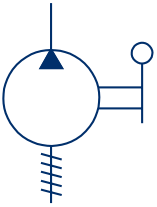
SYMBOLS FOR HYDRAULICS AND PNEUMATICS



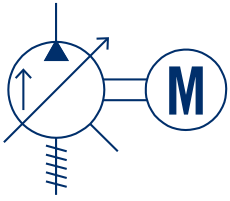
FIXED DISPLACEMENT PUMP



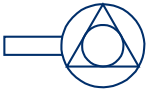
VARIABLE DISPLACEMENT PUMP



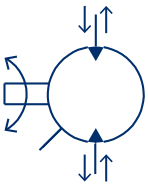
HAND PUMP



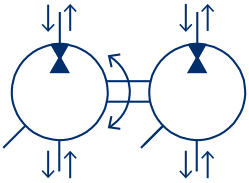
MOTOR-DRIVEN PUMP



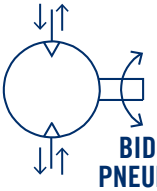
RAM AIR TURBINE



FIXED DISPLACEMENT BIDIRECTIONAL HYDRAULIC MOTOR



POWER TRANSFER UNIT



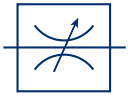
BIDIRECTIONAL PNEUMATIC MOTOR



SCREENED TWO-WAY RESTRICTOR

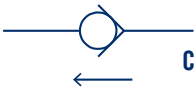


SCREENED ONE-WAY RESTRICTOR



FLOW REGULATING VALVE

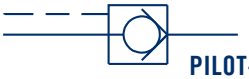
SYMBOLS FOR HYDRAULICS AND PNEUMATICS



CHECK VALVE



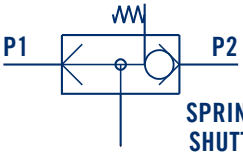
PILOT-TO-OPEN CHECK VALVE



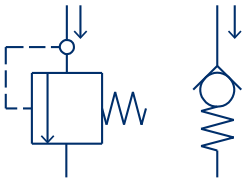
PILOT-TO-CLOSE CHECK VALVE



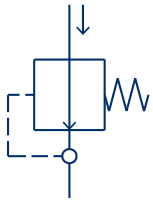
QUICK DISCONNECT



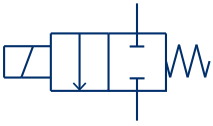
SPRING-BIASED SHUTTLE VALVE



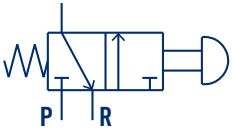
RELIEF VALVE



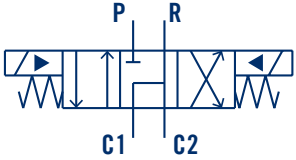
PRESSURE REDUCING VALVE



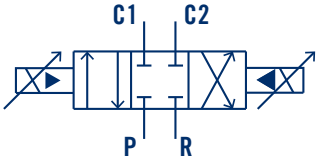
2-PORT, 2-POSITION SHUT-OFF VALVE



3-PORT, 2-POSITION MECHANICALLY-OPERATED VALVE



4-PORT, 3-POSITION SELECTOR VALVE



ELECTROHYDRAULIC SERVOVALVE



PRESSURE SWITCH



PRESSURE TRANSDUCER



ΔP INDICATOR

VISCOSITY DEFINITIONS

Absolute viscosity: the ratio of the shear stress in a fluid to the rate of shearing strain.

Unit of absolute viscosity in the metric system:

poise and centipoise:

1 poise = 1 gram / (cm) (sec) and
1 centipoise = 1 / 100 poise

Unit of absolute viscosity in the imperial system:

slug / (ft) (sec):

1 slug / (ft) (sec) = 1 / 0.002089 poise

Kinematic viscosity: the absolute viscosity divided by density.

Unit of kinematic viscosity: in the metric system and commonly used in the countries using the imperial system:

stoke and centistoke:

1 stoke = 1 poise / density (gm / mL)
1 centistoke = 1 / 100 stoke

Other units of kinematic viscosity: in the imperial system, the most practical unit for making calculations is ft^2 / sec:

1 ft^2 / sec = 92,903 centistoke and
1 centistoke = 1.076×10^{-5} ft^2 / sec

Saybolt Universal Seconds (SSU): the kinematic viscosity as determined by the time in seconds required for 60 cc of fluid to flow through a standard orifice.

Saybolt-Furol (SSF): utilizes a larger orifice and is used for very viscous fluids. Time of efflux is approximately 1/10 that of Universal.

Engler degrees: obtained by dividing the outflow time of a specified amount of fluid through a specified orifice by the outflow time of water at 68°F. The method is used predominantly in European countries.

Viscosity Index: an empirical number indicating the effect of temperature change on viscosity. Fluids with the same viscosity at a given temperature do not necessarily have the same viscosity index.

SAE Viscosity Numbers: a means of classifying crankcase lubricating oils in terms of viscosity. Other factors are not considered.

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NOTES

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CHECK VALVES EXPANSION PLUGS
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PRESSURE RELIEF VALVES VENT VALVES
SAFETY SCREENS FLOW METERING VALVES
EXPANSION PLUGS CHECK VALVES
SAFETY SCREENS EXPANSION PLUGS
EXPANSION PLUGS VENT VALVES
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