

## Visual

Visual indicators provide an economical way to know at a glance when a filter element needs to be replaced. A variety of styles are available, ranging from gauges to mechanical pointers and pop-up cartridges.

Schroeder pointers use a tricolor disk to indicate the element condition. The pointer will reach the red section just before bypassing occurs.

In the case of a mechanical magnetic cartridge, a highly visible orange disk springs, or “pops up”, at the pre-defined setting. Once activated, the orange signal continues to indicate a bypass or clogged condition, even following equipment shutdown, until it is manually reset. The pop-up indicator is interchangeable with other cartridge style indicators (electrical and electrical visual) available from Schroeder. A high pressure (>6000 psi working pressure) of the pop-up indicator is available and is noted below.



D—Tricolor Pointer Dirt Alarm®  
P/N 7619323 for plastic pointer only.  
For internal linkage and name plate, contact factory.



D5—Red Pop Up Visual Indicator  
D5S\*—D5 with Protective Shroud  
\*To order Protective Shroud only, use SAP #7642053  
D5C—Same as D5 but mounted in cap  
D5R—Same as D5 but mounted on opposite side of standard location  
D9—Stainless Steel version of D5  
D9C—Stainless Steel version of D5 mounted in cap



Y—Vacuum Gauge mounted in porting head  
P/N 7631068  
YR—Same as Y but mounted on opposite side of standard location P/N 7631068



Y2—Back mounted 1/8" NPT Tricolor Glycerin-filled Gauge (0-60 psi) P/N 7627463 (0-100 psi) P/N 7631048  
Y2R—Same as Y2 but mounted on opposite side of standard location P/N 7627463  
Y2C—Bottom mounted 1/8" NPT Tricolor Gauge (0-60 psi) located in cap P/N 7626647  
Y5—Same as Y2 but located in cap P/N 7627463



LF-4209 (G2213): 0 - 30 psid; P/N 7626589



DPG—Standard Differential Pressure Gauge  
P/N 7628635 or 7626554

The thermal lockout feature prevents activation of the indicator below temperatures of 90°F (32°C). This is a welcome feature in mobile applications where fluid temperatures may be well below 90°F at equipment start-up, and will prevent the indicator from showing a premature need to change the element.



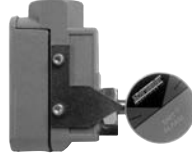
D8—Orange Pop Up Visual Indicator with Thermal Lock-out  
D8C—Same as D8 but mounted in cap  
D8R—Same as D8 but mounted on opposite side of standard location

## Visual with Thermal Lockout

## Electrical Visual

In addition to providing an electrical signal to provide a desired action, Schroeder electrical visual indicators also provide a visual indication of when an element needs to be changed. In the case of the MS and MS2 switches, the visual indicator is a color-coded disk, whereas the MS13 and MS14 dirt alarms provide a light.

MS—Cam operated electrical switch P/N 7627458 for switch only.  
For cam, color-coded disk, and mounting bracket, order P/N 7604908.  
For internal linkage, contact factory.



Code	Type of Contact	Electrical Rating	Connection
MS	SPDT	15 Amps @ 125/250 vac, 0.5 Amp @ 125 VDC	½" conduit, female

## Electrical

The electrical indicators (MS Series) provide an electrical signal for activating various electric alarm systems or complete machine shutdown. These cartridge-style indicators are available on most Schroeder pressure, return line, and medium pressure filters and can be used for working pressures up to 6000 psi (415 bar) and cyclic conditions up to 4000 psi (276 bar).

- The design is modular; all electrical indicators consist of an MS10 indicator with the corresponding mating connector added to convert the MS10 to a MS5, MS11 etc.
- The standard micro switch for high current indicators is good for both AC and DC use. A separate micro switch with "gold" contacts is used for low current applications. This means that specification of AC or DC is no longer required (except for MS13 and MS14) in the indicator code or part number.
- Housings of all electrical indicators are made of aluminum.
- The indicator model tag includes the electrical wiring diagram.
- All of our indicators, with the exception of MS16, have a "ground" terminal.
- We are now able to offer the thermal lockout option to high current indicators.
- All indicators can be installed in a filter cap as the wiring harness can be disconnected at the "DIN" connector in order to remove the filter cap.
- All MS indicators have achieved the NEMA4X and IP65 ratings.

Information on these indicators, including drawing, circuit diagram, and photograph is provided on the following pages.

A different set of electrical pressure switches is available for Schroeder tank-mounted filters, along with heavy duty versions.

Schroeder suction filters (ST and models that house the SKB magnetic suction strainer) can be equipped with a vacuum switch.

VS—Vacuum Switch (1/8" NPT, normally open)  
P/N 7601947

VSR—Same as VS but mounted on opposite side of standard location P/N 7601947

ES—Standard electrical pressure switch (1/8" NPT, normally open) for tank-mounted filters  
P/N 7601943 (40 psi bypass)

ESC—Electrical pressure switch (MTA & MTB only)  
P/N 7601943

ESR—Same as ES but mounted on opposite side of standard location  
P/N 7601943

ES1—Heavy duty electrical pressure switch (1/8" NPT) with conduit connection (25psi bypass) P/N 7626636 (cracking over 25 psi) P/N 7626640 (43 psi bypass) P/N 7626640 (Black = common; Red = N.O.; Blue = N.C.)

ES1R—Same as ES1 but mounted on opposite side of standard location P/N 7626636

VS1—Heavy Duty Vacuum Switch (1/8" NPT)  
P/N 7623755, LF Pressure Switch

ES2— Super duty electric switch (1/8"NPT, normally closed) with thermal lockout P/N 7626564

ES3—Electric pressure switch (1/8"NPT) with DIN connector P/N 7626592 (Black = common; Red = N.O.; Blue = N.C.)



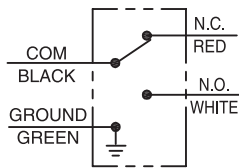
Code	Type of Contact	Electrical Rating	Connection
ES	SPST	8 Amps @ 12 VDC, 1 Amp @ 120 VAC 4 Amps @ 24 VDC, 0.5 Amp @ 240 VAC	Screw Terminal with Rubber Boot
ES1	SPDT	10 Amps @ 115 VAC 50mA-5A @ 24 VDC	½" Conduit, Male

Electrical and  
Electrical with  
Thermal Lockout

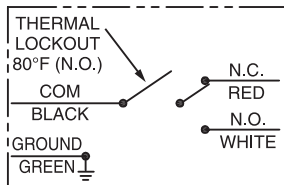


MS5  
MS5LC  
MS5T  
MS5LCT

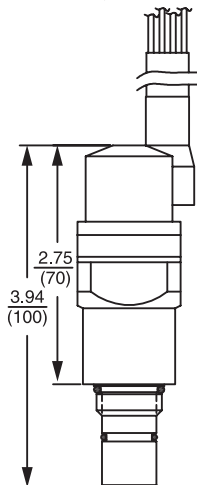
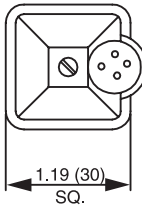
Supplied with 12 inch long  
18 gauge 4-conductor cable



MS5/MS5LC

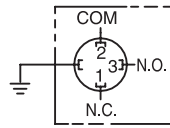


MS5T/MS5LCT

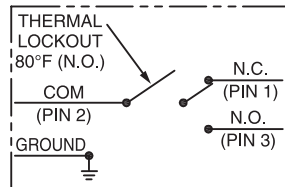


MS10  
MS10LC  
MS10T  
MS10LCT

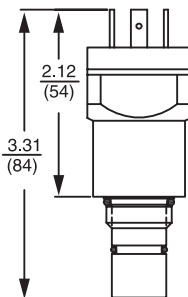
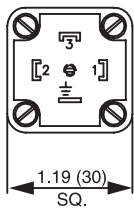
Supplied with DIN connector  
(male end only)  
(conforming to DIN 43650)



MS10/MS10LC



MS10T/MS10LCT

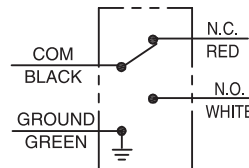


Model Codes of MSHA Version of MS10  
are MS10DCM and MS10DCCM (DC only;  
second C designates cap). For electrical  
and dimensional drawings, contact factory.

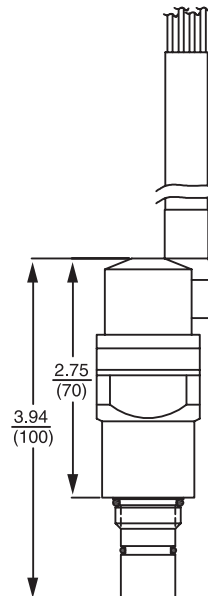
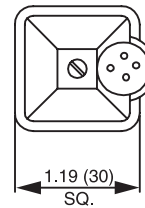


MS11

Supplied with 12 inch long  
18 gauge 4-conductor cable



MS11



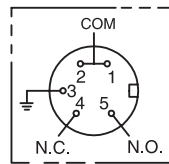
# Appendix A Filter Dirt Alarm® Selection

Electrical and  
Electrical with  
Thermal Lockout  
(cont'd.)

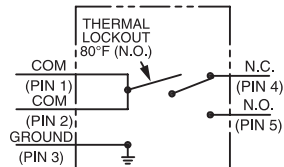


MS12  
MS12LC  
MS12T  
MS12LCT

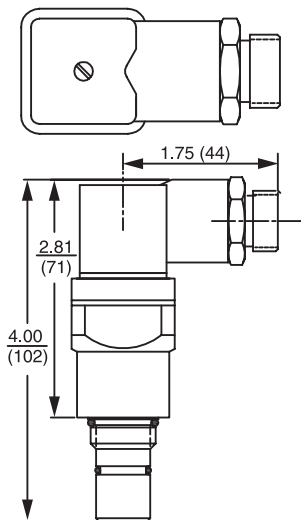
Supplied with 5 pin  
Brad Harrison connector  
(male end only)



MS12/MS12LC

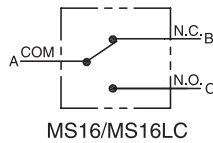


MS12T/MS12LCT

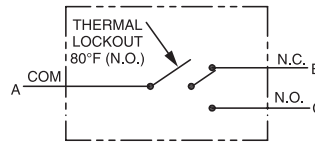


MS16  
MS16LC  
MS16T  
MS16LCT

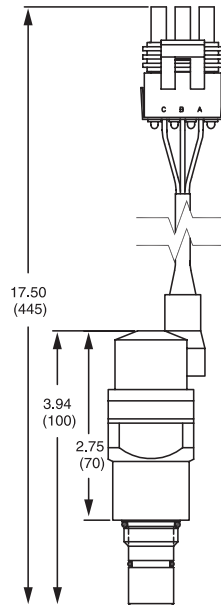
Supplied with a female  
(3) contact weather-packed  
sealed connector supplied with  
DIN connector (male end only)  
(conforming to DIN 43650)



MS16/MS16LC

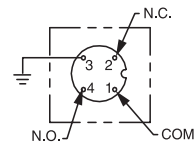


MS16T/MS16LCT

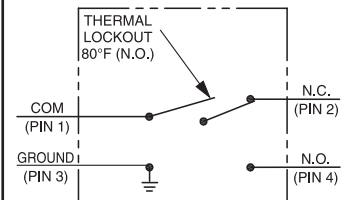


MS17LC  
MS17LCT

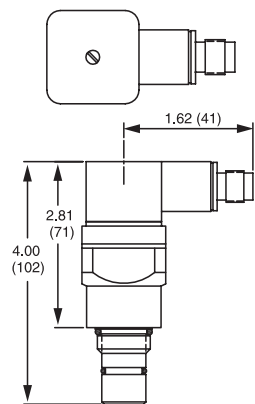
Supplied with a 4 pin  
Brad Harrison "micro" connector  
(male end only)



MS17LC



MS17LCT



Model Codes of MSHA Version of MS12  
are MS12DCM and MS12DCCM (DC only;  
second C designates cap). For electrical and  
dimensional drawings, contact factory.

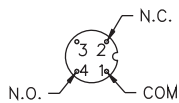
Electrical and  
Electrical with  
Thermal Lockout  
(cont'd.)



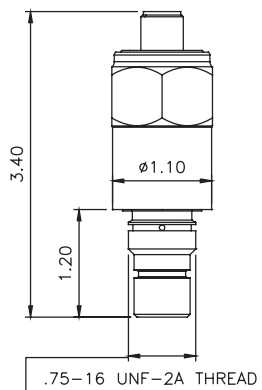
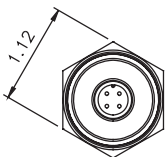
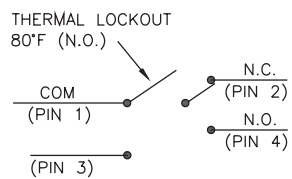
MS17  
MS17T

Supplied with a 4 pin  
M12 "micro" connector  
(male end only)  
(confirming to IEC 60947-5-2)

NORMAL OPERATING PRESSURE  
ELECTRICAL SCHEMATIC



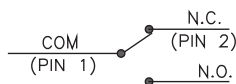
WITH THERMAL LOCKOUT



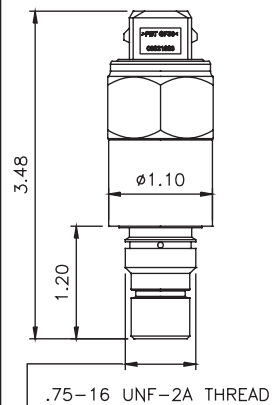
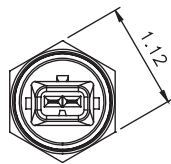
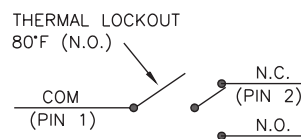
MS18  
MS18LC  
MS18T  
MS18LCT

Supplied with a 2 pin amp junior  
power timer connector (male end  
only)  
(must designate N.O. or N.C.)

NORMAL OPERATING PRESSURE  
ELECTRICAL SCHEMATIC



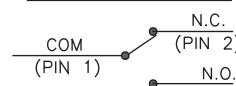
WITH THERMAL LOCKOUT



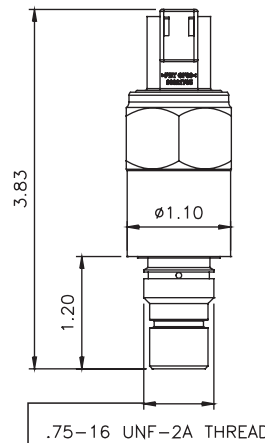
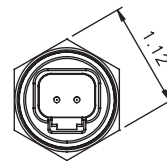
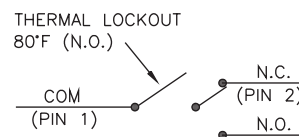
MS19  
MS19LC  
MS19T  
MS19LCT

Supplied with a 2 pin deutsch  
connector (D04-2-P, male end  
only) (must designate N.O. or  
N.C.)

NORMAL OPERATING PRESSURE  
ELECTRICAL SCHEMATIC



WITH THERMAL LOCKOUT



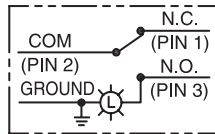
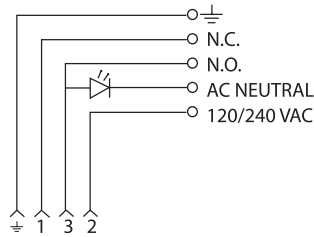
# Appendix A Filter Dirt Alarm® Selection

Electrical Visual  
and  
Electrical Visual  
with  
Thermal Lockout

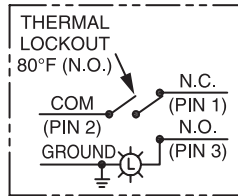


MS13DC, MS13DCLC  
MS13DCT, MS13DCLCT

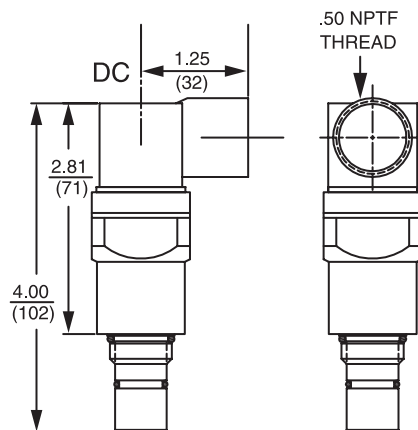
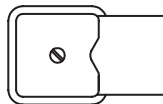
Supplied with  
threaded connector  
with light



MS13DC / MS13DCLC

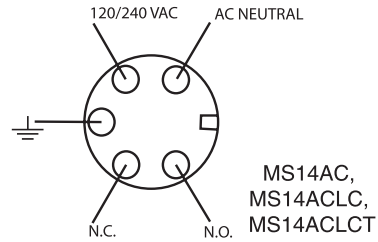


MS13DCT / MS13DCLCT

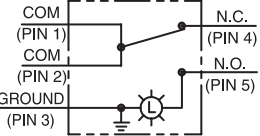
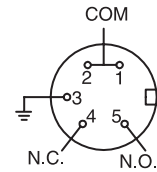


MS14AC, MS14ACL, MS14ACLCT  
MS14DC, MS14DCLC  
MS14DCT, MS14DCLCT

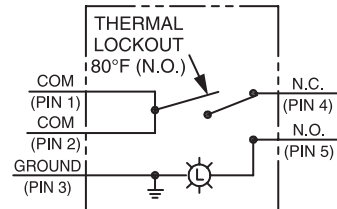
Supplied with  
5 pin  
Brad Harrison connector  
with light  
(male end only)



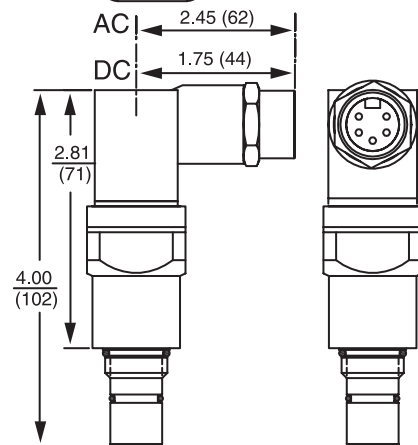
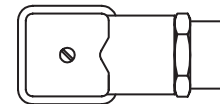
MS14AC,  
MS14ACL,  
MS14ACLCT



MS14DC / MS14DCLC



MS14DCT / MS14DCLCT



**CHART 5 Electrical Ratings: Electrical Cartridge Indicators Without Thermal Lockout**

Voltage	Voltage Volts@ Amps	Current Range (amps)	MS5	MS5LC	MS10	MS10LC	MS11	MS12	MS12LC	MS13DC	MS13DCLC	MS14DC	MS14DCLC	MS15DC	MS16	MS16LC	MS17	MS17LC	MS14AC	MS14ACL	MS18	MS18LC	MS19	MS19LC
AC	240 @ 3	0.02 to 3	✓		✓		✓	✓										✓						
AC	220 @ 0.05	0.005 to 0.05		✓		✓			✓													✓		✓
AC	120 @ 5	0.02 to 5	✓		✓		✓	✓																
AC	120 @ 0.05	0.005 to 0.05		✓		✓			✓											✓		✓		✓
AC	24 @ 0.10	0.005 to 0.010		✓		✓			✓											✓		✓		
AC	12 @ 0.25	0.005 to 0.025		✓		✓			✓											✓				
AC	120 @ 4	0.05 to 4																	✓					
AC	115 @ 0.05	0.01 to 0.05															✓				✓		✓	
DC	110 @ 0.3	0.02 to 0.3	✓		✓		✓	✓							✓		✓				✓		✓	
DC	110 @ 0.05	0.005 to 0.05		✓		✓			✓							✓		✓				✓		✓
DC	24 @ 3	0.01 to 3																			✓		✓	
DC	24 @ 2	0.02 to 2	✓		✓		✓	✓		✓		✓			✓									
DC	24 @ 1	0.01 to 1															✓							
DC	24 @ 0.20	0.0 to 0.20												✓										
DC	24 @ 0.10	0.005 to 0.10		✓		✓			✓		✓		✓			✓		✓				✓		✓
DC	12 @ 5	0.01 to 5																			✓		✓	
DC	12 @ 2	0.02 to 2	✓		✓		✓	✓		✓		✓			✓									
DC	12 @ 1	0.01 to 1															✓							
DC	12 @ 0.25	0.005 to 0.25		✓		✓			✓		✓		✓			✓		✓				✓		✓

**CHART 6 Electrical Ratings: Electrical Cartridge Indicators With Thermal Lockout\***

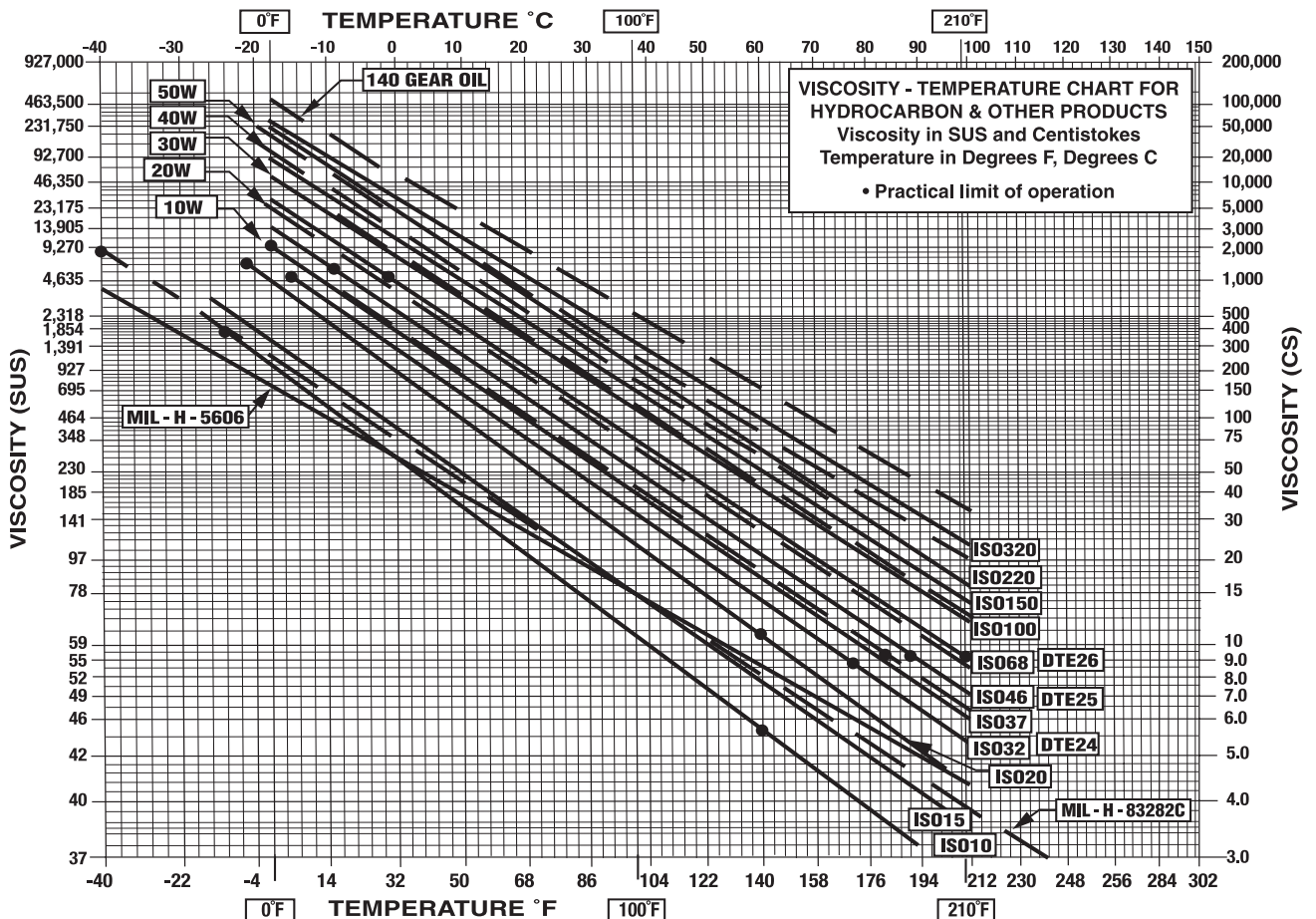
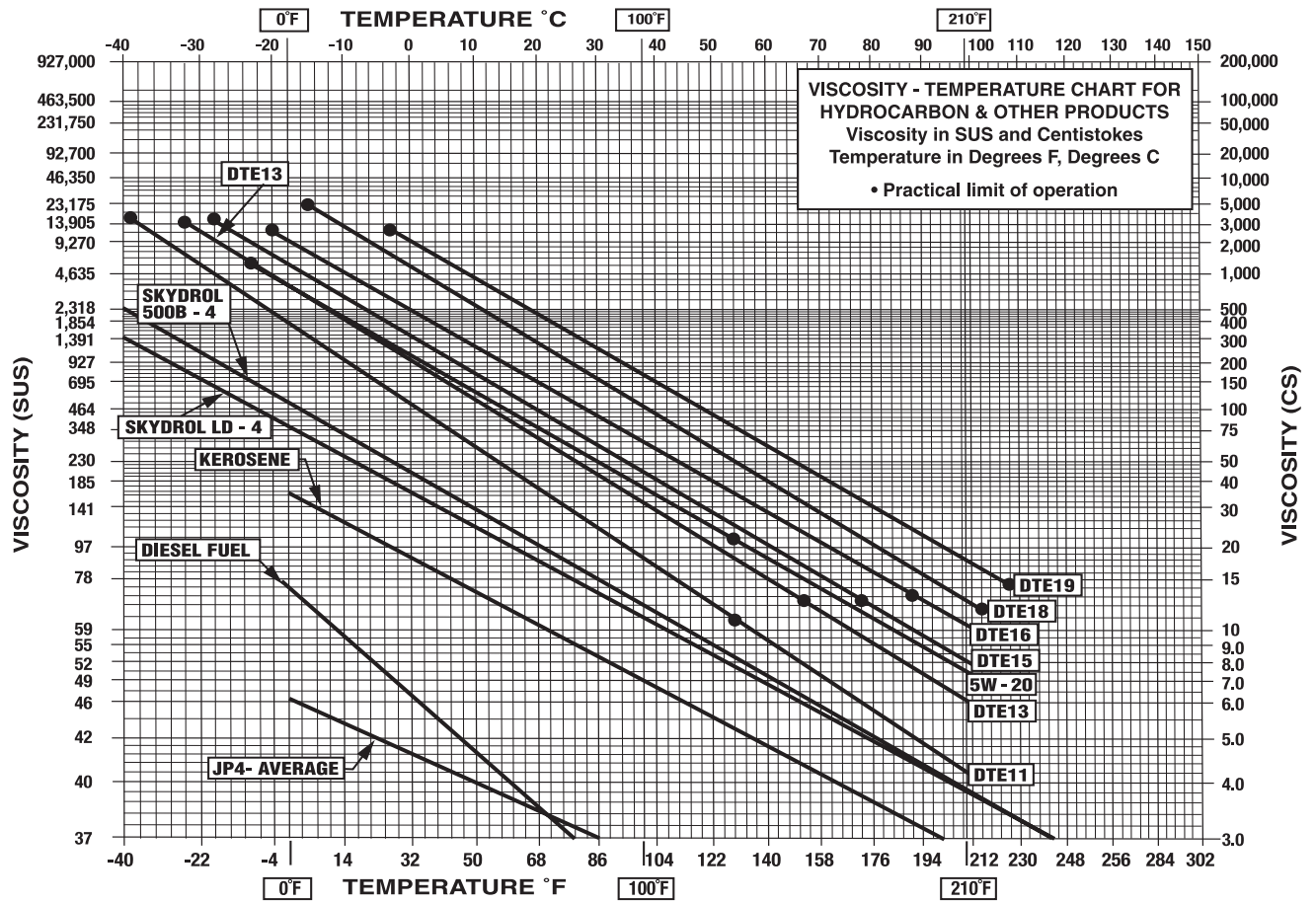
Voltage	Voltage Volts @ Amps	Current Range (amps)	MS5T	MS5LCT	MS10T	MS10LCT	MS12T	MS12LCT	MS13DCT	MS13DCLCT	MS14DCT	MS14DCLCT	MS16T	MS16LCT	MS17	MS17T	MS17LCT	MS14ACT	MS14ACLCT	MS18	MS18T	MS18LCT	MS19	MS19T	MS19LCT
AC	120 @ 5	0.02 to 5	✓		✓		✓																		
AC	220 @ 0.05	0.005 to 0.05		✓		✓		✓											✓			✓			✓
AC	120 @ 5	0.05 to 4																✓							
AC	115 @ 0.05	0.01 to 0.05													✓						✓			✓	
DC	24 @ 2	0.02 to 2	✓		✓		✓		✓		✓		✓			✓					✓			✓	
DC	24 @ 0.10	0.005 to 0.10		✓		✓		✓		✓		✓		✓			✓					✓		✓	
DC	12 @ 2	0.02 to 2	✓		✓		✓		✓		✓		✓			✓					✓			✓	
DC	12 @ 0.25	0.005 to 0.25		✓		✓		✓		✓		✓		✓			✓					✓		✓	

\*Thermal lockout prevents activation below 80°

Note: All indicators in Charts 4 and 5 above, meet NEMA4X and IP65 specifications.



# Appendix B Viscosity Charts





# Glossary of Standard Terms

**ABSOLUTE FILTRATION RATING:** The diameter of the largest hard spherical particle that will pass through a filter under specified test condition. This is an indication of the largest opening in the filter element. It does not indicate the largest particle that will pass through the element, since particles of greater length than diameter may pass.

**CAVITATION:** A localized condition within a liquid stream causing the rapid implosion of a gaseous bubble.

**CELSIUS:** A temperature scale. 0 Celsius (or 0 Centigrade) is the freezing point of water (32° F).

**CENTIPOISE:** A unit of absolute (dynamic) viscosity.

**CENTISTOKE:** A unit of kinematic viscosity.

**CLEANLINESS LEVEL:** The analog of contamination level.

**COLLAPSE PRESSURE:** The outside-in differential pressure that causes structural failure.

**CONTAMINATION LEVEL:** A quantitative term specifying the degree of contamination.

**CONTAMINANT:** Any material or substance which is unwanted or adversely affects the fluid power system or components, or both.

**CONTAMINANT, BUILT-IN:** Initial residual contamination in a component, fluid, or system. Typical built-in contaminants are burrs, chips, flash, dirt, dust, fiber, sand, moisture, pipe dope, weld spatter, paints and solvents, flushing solutions, incompatible fluids, and operating fluid impurities.

**DEPTH (FILTER):** A filter medium which primarily retains contaminant within tortuous passages.

**DIRT CAPACITY (DUST CAPACITY) (CONTAMINANT CAPACITY):** The weight of a specified artificial contaminant which must be added to the fluid to produce a given differential pressure across a filter at specified conditions. Used as an indication of relative service life.

**EFFICIENCY (FILTER):** The ability, expressed as a percent, of a filter to remove specified artificial contaminant at a given contaminant concentration under specified test conditions.

**ELEMENT (CARTRIDGE):** The porous device which performs the actual process of filtration.

**FLOW, LAMINAR (STREAMLINE):** A flow situation in which fluid moves in parallel lamina or layers. (See Reynold's number.)

**FLOW, TURBULENT:** A flow situation in which the fluid particles move in a random manner. (See Reynold's number.)

**FLUID:** A liquid, gas, or combination thereof.

**FLUID POWER SYSTEM:** A system that transmits and controls power through use of a pressurized fluid within an enclosed circuit.

**INDICATOR:** A device which provides external visual evidence of sensed phenomena.

**INDICATOR, BY-PASS:** An indicator which signals that an alternate flow path is being used.

**INDICATOR, DIFFERENTIAL PRESSURE:** An indicator which signals the difference in pressure between two points.

**MICROMETER (MICRON)\*:** A unit of measurement one millionth of a meter long, or approximately 0.00003937 inch expressed in English Units. \*Deprecated.

**MIGRATION:** Contaminant released downstream.

**PRESSURE, CRACKING:** The pressure at which a pressure-operated valve begins to pass fluid.

**PRESSURE, DIFFERENTIAL (PRESSURE DROP):** The difference in pressure between any two points of a system or a component.

**PRESSURE, OPERATING:** The pressure at which a system is operated.

**PRESSURE, RATED FATIGUE:** A pressure that a pressure-containing component is represented to sustain 10 million times without failure.

**RATED FLOW:** The maximum flow that the power supply system is capable of maintaining at a specific operating pressure.

**REYNOLD'S NUMBER:** A numerical ratio of the dynamic forces of mass flow to the shear stress due to viscosity. Flow usually changes from laminar to turbulent between Reynold's numbers 2,000 and 4,000.

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## Filter CONFIGURATIONS

**Top-Ported Filter:** Also known as a T-Ported or In-Line filter. All porting, the bypass valve, and indicators are located in the head. The head is permanently attached to the plumbing and the element is accessed by removing the bowl.

**Base-Ported Filter:** All porting, the bypass valve, and indicators are located in the base. The base is permanently attached to the plumbing and the element is removed through a cap, instead of removing the entire bowl.

**Manifold Mounted Filter:** Also known as a Sub-Plate filter. Most Base-Ported filters come with a manifold mount option. In some cases, a Top-Ported filter can also have a manifold mounting option. This allows the filter to be mounted directly onto a manifold, eliminating the need for hoses and fittings.

**Cartridge Filter:** Can be inserted directly into the manifold, eliminating the need for a separate housing or plumbing. Element is removed through a plug on the manifold.

**Sandwich Filter:** Is designed to be placed in between and directly interface with a manifold and stacked valves. Eliminates the need for hoses and fittings.

**Duplex Filter:** Made up of two or more filter assemblies. A valve allows the user to switch from one chamber to another. When one element is fully loaded, fluid is redirected through the second element. The loaded element can be changed without an interruption in flow. In the center position, the valve allows the oil to flow through both filters.

## Filter CLASSIFICATIONS Types

**Low Pressure Filter\*:** Filter pressure range from 0 to 500 psi. Mostly applied in return line filtration where system pressure is at a low point.

**Medium Pressure Filter\*:** Filter pressure range from 500 to 1500 psi. Often used in hydrostatic charge pressure applications.

**High Pressure Filter\*:** Filter pressure range is 1500 psi and above. Mostly applied on the pressure side of the system where pressure is highest.

**High Pressure Hydrostatic Filter:** Used in high pressure hydrostatic closed loop systems. Allows for reverse flow through the system.

**Bypass vs. Non-Bypass:** The pressure rises as an element becomes loaded with contaminants. Standard filters are equipped with a bypass valve that redirects hydraulic fluid when the pressure drop reaches a predetermined level, so the element does not lose its structural integrity. The filter element is bypassed and fluid continues on through the system.

In non-bypass filters bypass is not optional. They are used to protect expensive components that are more sensitive to contaminants, and cannot be exposed to unfiltered fluid. The element is exposed to higher pressures, as there is no bypass. For that reason this type of filter requires a high crush element to guarantee its structural integrity.

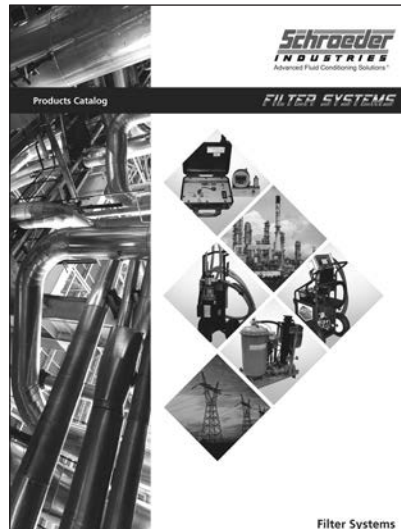
**Air Breather:** Filters air that is drawn into a reservoir when the fluid level changes.

**Desiccant Air Breather:** In addition to filtering out particle contaminants, this breather also removes water vapor.

Schroeder Industries LLC wishes to thank both the National Fluid Power Association and Penton Publishing for the use of certain generic terms shown in this glossary. Excerpts taken from ANSI B93.2-1986/NFPA T3.10.3. 1967(R1980) and Penton Publishing's Fluid Power Handbook & Directory (2006-2007).

\*These ranges have been determined to provide a quick reference for the purpose of creating our catalog. This is currently no industry standard terminology. These ranges are subject to change.

# Other Product Line Catalogs



Filter Systems

The Filter Systems Catalog is designed to take the reader from the basic foundations of the principles of hydraulics found in the H&L catalog, to the tools required for troubleshooting and addressing the cleanliness or performance demands of any fluid system. We produce portable and permanent-mount pressure, flow and temperature evaluation instruments, oil cleanliness analysis devices, particle monitors and water-in-oil identification tools. We also produce a wide array of fluid conditioning tools — from standard in-line hydraulic filters, to sophisticated microprocessor-based instruments incorporating SMART® technology.



Fuel Filtration

The products contained in the Fuels Catalog, address issues relating to mobile and stationary equipment working in some of the toughest conditions all over the world. Schroeder's Fuel Filtration line ensures the smooth running of equipment and protects both the engine and the whole drive system from damage, which addresses both onboard and bulk tank requirements.



Process Filtration

The keystone product of Schroeder Process Filtration is the RF3 automatic self-cleaning backflush filter. This filter along with bag filters, cartridge filters and custom designed systems allows Schroeder to offer you complete solutions to your process filtration needs. Our process filters are used to remove solid contamination from fluids and protect the integrity of high grade components that depend on low viscosity water or water-based fluids and emulsions. Schroeder offers high performance filters for all industrial sectors. Improvements in operational efficiency, reduced downtime, lower maintenance costs and reduce environmental impact can all be expected.

To view the full version of our catalogs visit our website: [www.schroederindustries.com](http://www.schroederindustries.com)



