Schroeder
INDUSTRIES
Advanced Fluid Conditioning Solutions ®

Products Catalog

FILTER SYSTEMS

Filter Systems

Vision Mission Value Quality Statement:

Vision:

We design solutions for industry and for the success of our customers by:

- Optimizing the use of technology with applications
- Using an efficient, timely customized process to fill specific customer needs
- Increasing capacity and streamlining operations.
- Preserving our reputation for reliability
- Expanding globally to support our customers and stay current with new technologies
- Leveraging and sharing our knowledge to meet challenges openly
- Nurturing a creative, cooperative culture committed to the individual and to providing the best solutions for the customers

Mission Statement:

Partnerships

Innovating products, processes and services to improve performance and efficiency in our industry.

Schroeder Industries Core | Shared Values:

Honesty

Day-to-Day Behaviors:

- Tell the truth at all times, in all matters
- Have open lines of communication and share timely, accurate and thorough information with internal and external customers
- Do not steal and respect each other's and the Company's property

Teamwork

Day-to-Day Behaviors:

- Work as a team
- Cooperate within and between departments
- Coach and mentor; listen and share knowledge, experience and ideas
- Treat others with respect and consideration in all circumstances
- Invest in the development and growth of all team members
- Keep our work areas safe and clean

Leadership

Day-to-Day Behaviors:

- Recognize that we are empowered to act as leaders and participate in the decision making process
- Take responsibility for and have pride in our work
- Set goals and celebrate the efforts and accomplishments of our teammates
- Value our greater community and take leadership roles in our neighborhoods and for the environment

Ingenuity | Innovation

Day-to-Day Behaviors:

- Value innovative thinking and the generation and implementation of new ideas to solve customer (internal & external) problems
- Be flexible and adapt to new ideas and different ways of doing things
- Utilize available resources for new designs and innovations

Quality Policy:

Continuous improvement in our business to ensure a quality product, shipped on time, without compromise.

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The products described herein, including without limitation, product features, specifications, design, availability and pricing are subject to change at any time without notice.

Leetsdale Facility

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Product Guide by Part Number

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Overview of Schroeder's Approach to Advanced Fluid Conditioning Solutions®

Contamination and degraded fluid quality cause inefficient operation, component wear, and eventually failures in all hydraulic and lubrication systems. The products in this catalog are the tools that are needed to prevent such occurrences. Schroeder recommends a three step approach to controlling contamination in any system:

Assess the fluid system's health

Start by gathering complete information on the system.

This includes:

- A list of the most critical components
- The manufacturer's recommended ISO class for each component
- The type of oil being used
- Flow rate & operating pressure
- Fluid temperature & ambient temperature
- System's operational characteristics
- Details on all current filters in the system
- Solid contamination levels (ISO class)
- Water content levels

AMFS

Recommend and implement Advanced Fluid Conditioning Solutions®

Next, specify your recommendations for upgrading the current filtration, and adding supplementary filtration:

- Pressure filters
- Return line filters
- Manifold cartridge/circuit protector filters
- Element micron rating
- Reservoir breathers or filler breathers
- Strainer baskets
- Addition of offline filtration loop
- Use of portable filters for filling/temporary offline loops
- Sufficient water removal protection
- Proper fluid monitoring devices

X-Skids

Monitor, maintain, and extend the service life

Finally, use reliable methods for continuous monitoring of the fluid conditions including:

- Solid contamination
- Water content
- Additive depletion
- Element clogging
- Periodic detailed analysis of actual fluid samples
- Portable filters for correcting unacceptable levels

Fluid Care Center: Multi-Pass Test Stand

Overview of Schroeder's Approach to Advanced Fluid Conditioning Solutions®

Savings Realized by Proper Contamination Control

The money invested in contamination control can easily be justified when the resulting machine availability increases significantly. The graph below illustrates that there is a range in which this investment really pays off.
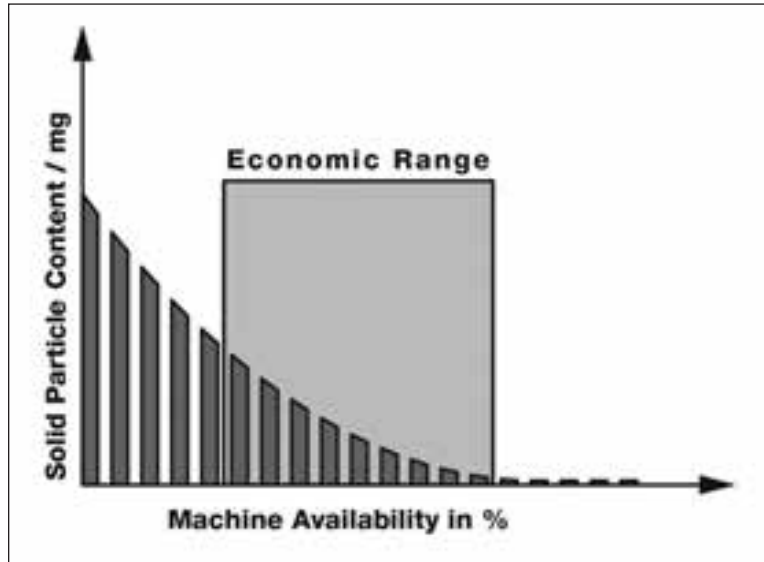
Figure 1. Savings Optimization

Savings Calculation Example

This example demonstrates how to calculate the potential savings that will be realized by implementing a proper fluid service program.

	Example	Your Data
Number of Machines	50	**a**
Operating Hours per year	5,000	**b**
Current Availability	92%	**c**
Downtime Costs per hour	$60	**d**
Total Downtime Costs	$1,200,000	**e = [a x b x (100-c) x d]**
Downtime costs due to:		**100**
Mechanical/electrical failures (65%)	$780,000	**f (e x .65)**
Hydraulic failures (35%) of which:	$420,000	**g (e x .35)**
70% is due to the fluid	$294,000	**h (g x .70)**
30% is caused by other faults	$126,000	**i (g x .30)**
Total	$264,600	**j (h x .90)**

Schroeder Fluid Service can return 90% of the fluid related downtime costs

Overview of Schroeder's Approach to Advanced Fluid Conditioning Solutions®

Cleanliness levels are defined by three numbers divided by slashes (/.) These numbers correspond to 4, 6, and 14 micron, in that order. Each number refers to an ISO Range Code, which is determined by the number of particles for that size (4,6, & 14µm) and larger present in 1 ml of fluid. Each range is double the range below. Refer to Figure 2 to see the actual ranges.

ISO 4406 Code

Example

larger than 4 µm	=	22,340
larger than 6 µm	=	1,950
larger than 14 µm	=	43

ISO Code = 22/18/13
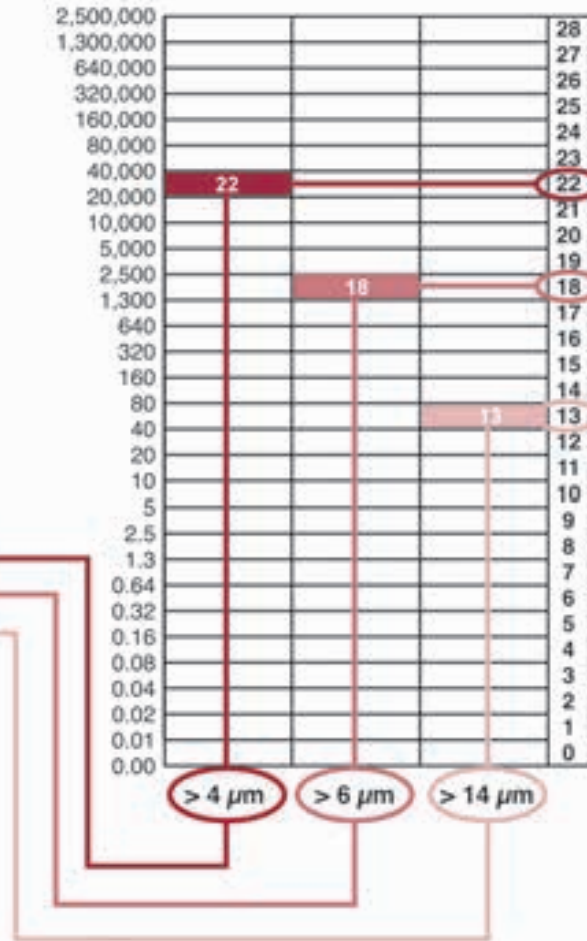
Figure 2. ISO 4406 Codes

The only way to achieve and maintain the appropriate cleanliness level in a hydraulic or lubrication system is to implement a comprehensive filtration program. Schroeder offers all of the products that are needed to do just that! They include:

Achieving the Appropriate Cleanliness Level in a System

Solid Contamination
- Pressure filters
- Return line filters
- Offline filtration loops
- Oil transfer units for pre-cleaning of new oil
- Portable and online contamination monitors
- Reservoir breathers and filler/breathers

Water Content
- Water content sensors
- Reservoir breathers with silica gel desiccant
- Vacuum dehydration water removal units
- Water removal elements

Fluid Analysis
- Bottle sampling kits
- Complete analysis kits

14/12/9

17/15/12

20/18/15

23/21/18
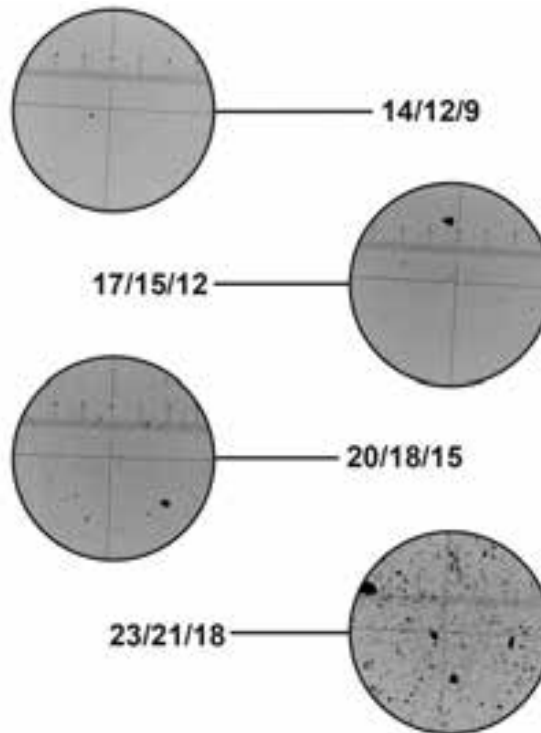
Figure 3. Microscopic Particulate Comparison

Overview of Schroeder's Approach to Advanced Fluid Conditioning Solutions®

1. Starting at the left hand column, select the most sensitive component used in the system.
2. Move right to the column that describes the system pressure and conditions.
3. Here you will find the recommended ISO class level, and recommended element micron rating.

	Low/Medium Pressure Under 2000 psi (moderate conditions)		High Pressure 2000 to 2999 psi (low/medium with severe conditions[1])		Very High Pressure 3000 psi and over (high pressure with severe conditions[1])	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
Pumps						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	N/A	N/A
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3
Valves						
Check Valve	20/18/15	20	20/18/5	20	19/17/14	10
Directional (solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow Control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3^2
Servo Valve	16/14/11	3^2	16/14/11	3^2	15/13/10	3^2
Actuators						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3^2	15/13/10	3^2
Test Stands	15/13/10	3	15/13/10	3^2	15/13/10	3^2
Bearings						
Journal Bearings	17/15/12	3	N/A	N/A	N/A	N/A
Industrial Gearboxes	17/15/12	3	N/A	N/A	N/A	N/A
Ball Bearings	15/13/10	3^2	N/A	N/A	N/A	N/A
Roller Bearings	16/14/11	3^2	N/A	N/A	N/A	N/A

1. Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use, or the presence of water

2. Two or more system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level.

Fluid Contamination Management Basics

Various types of contamination occur in fluid power systems: gaseous (e.g. air), liquid (e.g. water) and solid contaminants. An overview of the various contamination types is shown in the following diagram (Figure 4).

Solid contamination is subdivided into three groups: extremely hard, hard and soft particles (see Figure 4). Extremely hard particles can cause substantial damage in fluid power systems if they are not removed as quickly as possible. Preventive measures can reduce the ingress of contaminants in systems.

Figure 4. Types of Contamination

Hard particles are frequently listed separately in specifications. Maximum values are specified for the longest dimension these hard particles may have, e.g. largest abrasive particle: max. 200 µm or 200 x 90 µm or number of particles > 200 µm.

Not only do the hardness of contamination particles play a role but also their number and size distribution do as well.

The particle size distribution in new systems is different from that of systems that have been in operation for a number of hours. In new systems, there is an accumulation of coarse contaminants up to several millimeters long, which are then increasingly reduced in size in the course of operation or eliminated by filtration. After several hours of operation most particles are so small that they are no longer visible to the naked eye.

When commissioning fluid power systems there is additional particulate contamination by virtue of abrasive wear in which rough edges are worn away through running-in. Contamination management can't prevent this ingress of contaminants; however, if basic contamination is lower, there is less abrasion during system startup.

Definition of Fluid Contamination Management and the Technical Cleanliness Process

Fluid Power System
A power transmission system that uses fluids to transmit power

Basic Contamination
Quantity of contamination present subsequent to assembly

Ingress Contamination
Particulate ingressed during operation of a fluid power system

Initial Damage | "Start-Up"
Damage to component surfaces caused during function testing/commissioning/assembly of systems

Fluid Contamination Monitoring
Analysis of a fluid power system measures ingressed particulate levels

Online Measurement (Real Time Monitoring)
Measurement process which the sample to be analyzed is process fed to a measurement device directly from the system

Offline Measurement
Measurement process in which the sample is taken from the process system and analyzed elsewhere, e.g. taking an oil sample and sending it in to a laboratory

Contamination Management and Technical Cleanliness
Monitoring and optimization of cleanliness, from component design to the component assembly, to the assembly and operation of the system

Technical Cleanliness

As Figure 5 shows, the level of contamination without using the Technical Cleanliness Process is higher throughout system operation as compared to a system in which the Technical Cleanliness Process is employed, the result being that more initial damage may be caused to surfaces.
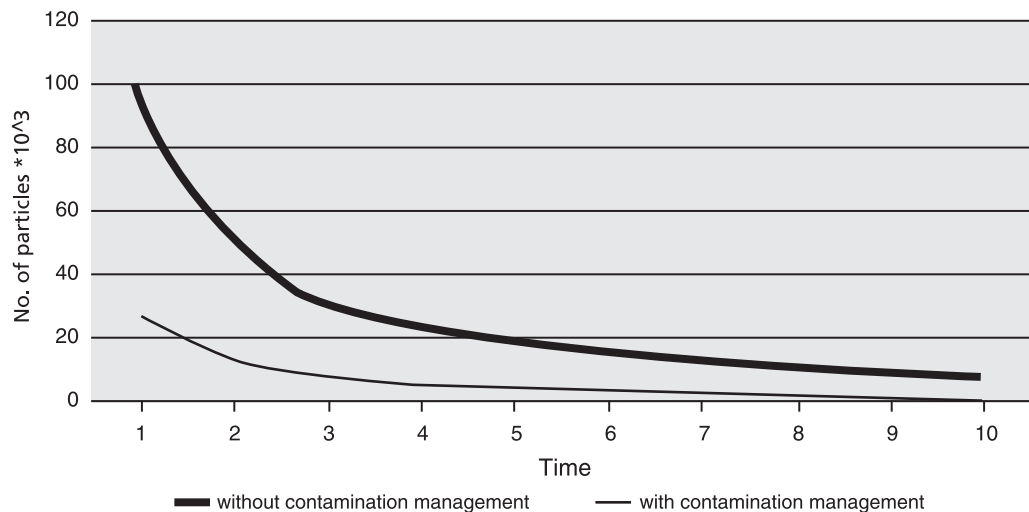
Figure 5. Cleaning of a Fluid Power System With and Without Contamination Management

Microscope images show typical particle samples, containing fine particles, as they occur in fluid power systems. (Figure 6)

An average healthy human eye can see items down to approximately 40 μm in size. Particle analyses are conducted using a microscope or particle counters in fluid power systems employing the light extinction principle. (Figure 7)

Figure 6. Typical Particle Samples

Technical Cleanliness and Contamination Management Basics
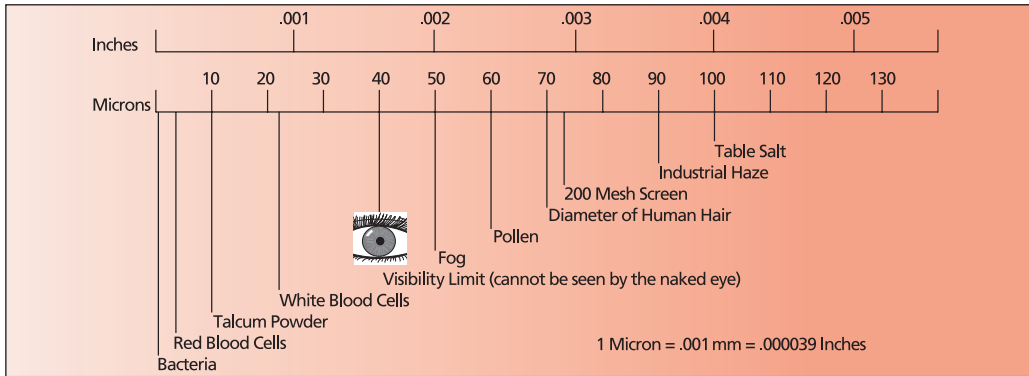
Figure 7. Sizes of Known Particles in Inches and Microns

Particulate contaminants circulating in fluid power systems cause surface degradation through general mechanical wear (abrasion, erosion, and surface fatigue).

This wear causes increasing numbers of particles to be formed, the result being that wear increases if the "chain reaction of wear" is not properly contained (by reducing contamination).

Gaps grow larger, leakage oil flows increase in size, and operating efficiency (e.g. of pumps) decreases. Metering edges are worn away, thus resulting in control inaccuracies. In some cases, blockage of control ducts or nozzle bores occurs.

The chain reaction of wear during the everyday operation of hydraulic systems has to be interrupted by properly designed and dimensioned filter systems. However, the measure of security afforded the user is deceptive as highly damaging contaminants seep in during component and system assembly and system installation. This ingress of contaminants not only can cause preliminary damage to system components but also premature failure as well.

Figure 8. Factors Affecting Roller Bearing Life
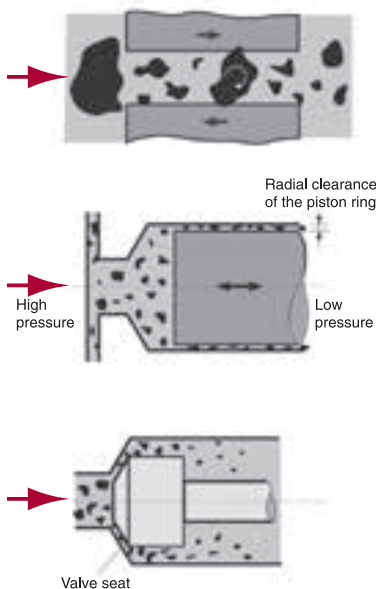
Figure 9. Examples of Wear to Movable Surfaces

Generally speaking, integrated system filtration concepts are not designed to adequately deal with large quantities of dirt as incurred with these operations:

- Component machining
- Commissioning
- System assembly
- System repair work
- System filling

A study conducted by the University of Hanover describes the factors impacting the fatigue life of roller bearings as follows: *"The quantity of contamination in the lubricant is described by the particle quantity and size. Combining this with particle hardness and geometry results in the type and extent of damage to raceways, with the extent also being affected by the elasto-plastic behavior of the material. The amount of damage is 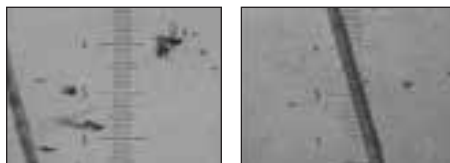determined by the quantity of particles in the lubrication gap and the rollover frequency. Continued rollover leads to cracking, which in the form of fatigue damage (pitting) leads to roller bearing damage (bearing failure)."*

In practice ball bearings with their punctiform contact are shown in most cases to be less sensitive to particulate contamination than roller bearings with their linear contact. Friction bearings with their larger lubrication gaps are the least sensitive to particulate contamination.

Technical Cleanliness and Contamination Management Basics

Figure 10 provides an overview of the most common gap sizes illustrated in Figure 11. Comprehensive studies of particle distributions on components and in hydraulic systems have shown that at the beginning of a system's life, i.e. during assembly and commissioning, the particles are larger than during subsequent operation.

These large particles – up to several millimeters in size – can cause spontaneous outages, valve blockages, substantial preliminary damage to pumps, and destruction of seals and gaskets followed by leakage.

Active contamination management enables this rate of damage to be reduced and subsequent costs accordingly cut, i.e.:

- Costs caused by production stops
- Costs caused by delays in commissioning systems
- Warranty costs
- Reworking costs
- Costs incurred by longer testing periods since a flushing cycle is required to remove integral contamination

Contamination management counters the situation as follows: In new systems the individual components are brought to a uniform cleanliness level, the filling fluid is kept at a defined cleanliness level, as is the fluid during system operation.

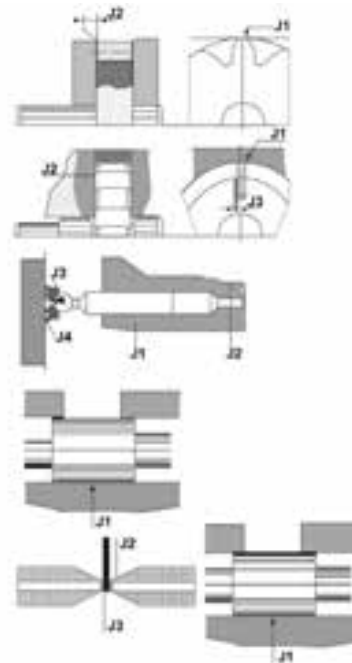| Component	Typical Critical Clearance (µm)
1. Gear Pump (J1, J2)	0.5 - 5
2. Vane-cell Pump (J1)	0.5 - 5
3. Piston Pump (J2)	0.5 - 1
4. Control Valve (J1)	5 - 25
5. Servo Valve (J1)	5 - 8

Figure 10. Common Gap Sizes

Figure 11. Common Gaps Illustrated

Figure 12. Destroyed raceway of a ball bearing caused by particulate contamination

Figure 13. Contaminate embedded in the surface of a friction bearing

Classification of Particulate Contamination in Fluids and Parts Cleanliness Measurement Using Gravimetric Analysis

The objective of the procedures described below is to enable a reproducible classification of particulate contaminants in fluids.

Currently there are four procedures for classifying particulate contaminants in fluids: ISO 4405, ISO 4406:1999, NAS 1638, SAE AS 4059(D) (see chart below)

Standard	ISO 4405	ISO 4406:1999	NAS 1638	SAE AS 4059(D)
Application	Highly contaminated media, e.g. washing media, machining fluids	Hydraulic fluids Lubrication oils	Hydraulic fluids Lubrication oils	Hydraulic fluids Lubrication oils
Parameters	(mg/liters of fluid)	Number of particles > 4 µm(c) > 6 µm(c) > 14 µm(c)	Number of particles 5 - 15 µm 5 - 25 µm 25 - 50 µm 50 - 100 µm > 100 µm	Number of particles > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c) > 38 µm(c) > 70 µm(c)

Analysis Methods	In this lab method, a known volume of the fluid undergoing analysis is filtered through a prepared membrane, which is then weighed	1. *Manual evaluation:*
		   The fluid undergoing analysis is filtered through a prepared membrane and the cleanliness class (contamination rating) estimated or counted by hand using a microscope.
		2. *Automated particle counting:*
		   The fluid undergoing analysis is conducted through a particle counter, which tallies the particle fractions.		

Remarks	Very time-consuming method	1. *Manual evaluation:*
		   Very time-consuming, not very exact.
		2. *Automated particle counting:*
		   Result available almost immediately.		

Gravimetric Analysis Methods

This international standard describes the gravimetric method for determining the particulate contamination of hydraulic fluids.

Basic Principle

A known volume of fluid is filtered through one or two filter disks using vacuum action and the weight differential of the filter disks (upstream and downstream of filtration) measured. The second membrane is used for evaluating accuracy.

In order to determine the gravimetric contamination of the fluid, a representative sample has to be taken from the system. ISO 4405 describes the cleaning procedure for the equipment being used. It also describes the preparatory procedures for the analysis membranes.

The membranes are flushed with isopropanol prior to use, dried in a drying oven until they achieve a constant weight, and then cooled in a defined dry environment. It is important that cooling takes place in a defined dry environment, otherwise the membrane absorbs moisture from the surroundings, thus skewing the final result.

Afterwards the membrane is weighed and this value recorded as m(T).

The membranes are then fixed in the membrane retainer and the fluid undergoing analysis is filtered. This is followed by flushing off the contaminant on the membrane using filtered solvent to completely remove the contaminant. When analyzing oil-laden fluids it is important that the remaining oil is completely flushed off the membrane.

This is followed by drying the membrane, cooling, and weighing it (as described above). The measured value is now recorded as m(E).

Gravimetric contamination is calculated as follows: M(G) = m(E) – m(T)

ISO 4405
"Hydraulic Fluid Power – Fluid Contamination – Determining Particulate Contamination Employing Gravimetric Analysis Methods"

ISO 4406 Particle Counting in Fluid Systems

In ISO 4406, particle counts are determined cumulatively, i.e. > 4 µm(c), > 6 µm(c) and > 14 µm(c) (manually by filtering the fluid through an analysis membrane or automatically using particle counters) and allocated to measurement references.

The goal of allocating particle counts to references is to facilitate the assessment of fluid cleanliness ratings.
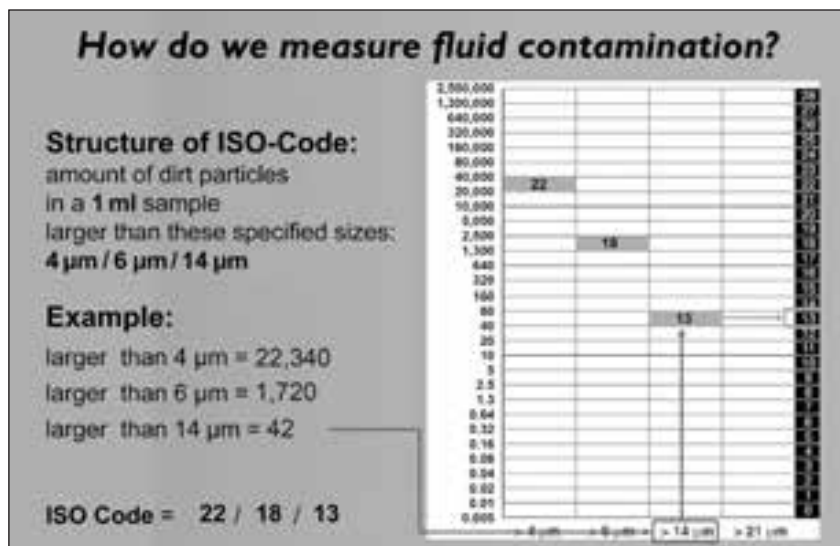
Figure 14. Microscopic Examination of an Oil Sample Magnification 100x (ISO 18/15/11)

Note: increasing the measurement reference by 1 causes the particle count to double.

Example: ISO class 18 / 15 / 11 says that the following are found in 1 ml of analyzed sample:

1,300 - 2,500 particles	> 4 µm(c)
160 - 320 particles	> 6 µm(c)
10 - 20 particles	>14 µm(c)

Recommended Cleanliness Levels (ISO Codes) for Fluid Power Components

Components	Cleanliness Levels (ISO Code) 4 µ(c)/6 µ(c)/14 µ(c)
Gear Pump	19/17/14
Piston Pump/Motor	18/16/13
Vane Pump	19/17/14
Directional Control Valve	19/17/14
Proportional Control Valve	18/16/13
Servo Valve	16/14/11

The above is based on data shown in various hydraulic component manufacturers' catalogs. Contact Schroeder for recommendations for your specific system needs.

Allocation of Particle Counts to Cleanliness Classes

No. of Particles/ml		Cleanliness Class
Over	Up to	
1,300,000	2,500,000	> 28
640,000	1,300,000	> 27
320,000	640,000	> 26
160,000	320,000	> 25
80,000	160,000	> 24
40,000	80,000	> 23
20,000	40,000	> 22
10,000	20,000	> 21
5,000	10,000	> 20
2,500	5,000	> 19
1,300	**2,500**	> 18
640	1,300	> 17
320	640	> 16
160	**320**	> 15
80	160	> 14
40	80	> 13
20	40	> 12
10	**20**	> 11
5	10	> 10
2.5	5	> 9
1.3	2.5	> 8

NAS 1638 Particle Counting in Fluid Systems

Like ISO 4406, NAS 1638 describes particle concentrations in liquids. The analysis methods can be applied in the same manner as ISO 4406:1987.

In contrast to ISO 4406, certain particle ranges are counted in NAS 1638 and attributed to measurement references.

The following table shows the cleanliness classes in relation to the particle concentration analyzed.

	Particle Size (µm)				
	5-15	15-25	25-50	50-100	>100
	No. of Particles in 100 ml Sample				
00	125	22	4	1	0
0	250	44	8	2	0
1	500	89	16	3	1
2	1,000	178	32	6	1
3	2,000	356	63	11	2
4	4,000	712	126	22	4
5	8,000	1,425	253	45	8
6	16,000	1,850	506	90	16
7	32,000	5,700	1,012	180	32
8	64,000	11,600	2,025	360	64
9	128,000	22,800	4,050	720	128
10	**256,000**	**45,600**	**8,100**	**1,440**	**256**
11	512,000	91,200	16,200	2,880	512
12	1,024, 000	182,400	32,400	5,760	1,024

(Cleanliness Class)

Increasing the class by 1 causes the particle count to double on average.

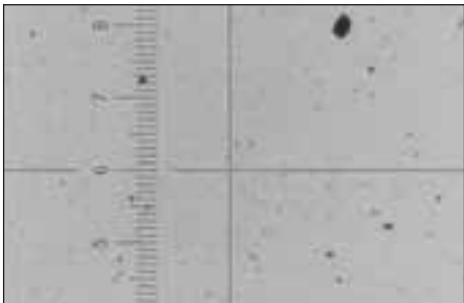The particle counts of class 10 are bold-faced in the above table.

Figure 15. Microscopic Examination of an Oil Sample Magnification 100x (NAS 10)

SAE AS 4059(D) Particle Counting in Fluid Systems

Like ISO 4406 and NAS 1638, SAE AS 4059(D) describes particle concentrations in liquids. The analysis methods can be applied in the same manner as ISO 4406:1999 and NAS 1638.

The SAE cleanliness classes are based on particle size, number and distribution. The particle size determined depends on the measurement process and calibration; consequently the particle sizes are labeled with letters (A - F).

The SAE cleanliness classes can be represented as follows:

1. Absolute particle count larger than a defined particle size
   Example: **Cleanliness class according to AS 4059:6**
   The maximum permissible particle count in the individual size ranges is shown in the table in boldface.
   Cleanliness class according to AS 4059:6 B
   Size B particles may not exceed the maximum number indicated for class 6.
   6 B = max. 19,500 particles of a size of 5 μm or 6 μm (c)

2. Specifying a cleanliness class for each particle size
   Example: **Cleanliness class according to AS 4059: 7 B / 6 C / 5 D**
   Size B (5 μm or 6 μm(c)): 38,900 particles / 100 ml
   Size C (15 μm or 14 μm(c)): 3,460 particles / 100 ml
   Size D (25 μm or 21 μm(c)): 306 particles / 100 ml

3. Specifying the highest cleanliness class measured
   Example: **Cleanliness class according to AS 4059:6 B – F**
   The 6 B – F specification requires a particle count in size ranges B – F. The respective particle concentration of cleanliness class 6 may not be exceeded in any of these ranges.

Maximum Particle Concentration* (particles / 100 ml)

Size ISO 4402 Calibration or Visual Counting	> 1 μm	> 5 μm	> 15 μm	> 25 μm	> 50 μm	> 100 μm
Size ISO 11171, Calibration or Electron Microscope**	> 4 μm$_{(C)}$	> 6 μm$_{(C)}$	> 14 μm$_{(C)}$	> 21 μm$_{(C)}$	> 38 μm$_{(C)}$	> 70 μm$_{(C)}$
Size Coding	A	B	C	D	E	F
000	195	76	14	3	1	0
00	390	152	27	5	1	0
0	780	304	54	10	2	0
1	1,560	609	109	20	4	1
2	3,120	1,220	217	39	7	1
3	6,250	2,430	432	76	13	2
4	12,500	4,860	864	152	26	4
5	25,000	9,730	1,730	306	53	8
6	**50,000**	**19,500**	**3,460**	**612**	**106**	**16**
7	100,000	38,900	6,920	1,220	212	32
8	200,000	77,900	13,900	2,450	424	64
9	400,000	156,000	27,700	4,900	848	128
10	800,000	311,000	55,400	9,800	1,700	256
11	1,600,000	623,000	111,000	19,600	3,390	1,020
12	3,200,000	1,250,000	222,000	39,200	6,780	

Table shows the cleanliness classes in relation to the particle concentration determined.
 *Particle sizes measured according to the longest dimension.
**Particle sizes determined according to the diameter of the projected area-equivalent circle.

Fluid Condition Field Analysis Tools

A representative sample is taken of the fluid and analyzed as follows:

1. Manual procedure according to ISO 4407 (Hydraulic fluid power – Fluid contamination – Determination of particulate contamination by the counting method using a microscope).

ISO 4407 contains a description of a microscopic counting method for membranes. 100 ml of the sample undergoing analysis is filtered through an analysis membrane featuring an average pore size of < 1 µm and square markings.

The standard also describes the cleaning procedure and maximum particle count of the negative control.

After the analysis membranes are dried, 10, 20 or 50 squares are counted depending on the size of the particles, followed by adding the values and extrapolating to the membrane diameter. See figure 16.

The manual count of the particles is done in the "old" levels of > 5 µm and > 15 µm since the longest dimension of a particle is counted in ISO 4407 yet the diameter of the area-equivalent circle is counted in the "new" ISO 4406:1999. As described above, the reference values obtained for this count correspond to the reference values of the "new" evaluation.

This counting method can only be used for very clean samples. Generally speaking, the cleanliness classes are estimated on the basis of reference photographs or the samples are automatically counted.
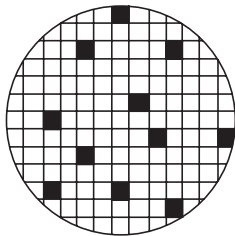
Figure 16.

Figure 17.

2. Automated particle counting

Below follows a description of how common particle counters employing the light extinction principle function.

Figure 17 shows a simplified rendering of the measurement principle employed in the light extinction principle.

The light source transmits the light (monochromatic light for the most part) onto an optical sensor, which emits a specific electrical signal.

A shadow is created on the photodiode if a particle (black) comes between the light source and the photodetector. This shadow causes the electric signal emitted by the sensor to change. This change can be used to determine the size of the shadow cast by this particle and thus the particle size.

This procedure enables the cleanliness classes according to ISO 4406:1987, ISO 4406:1999, NAS 1638 and SAE AS 4059(D) to be accurately determined.

The "noise" involved in this measurement principle is extraneous liquids and gases which cause the light beam to be interrupted and thus be counted as particles.

The particle counter should be calibrated according to ISO 11943 (for ISO 4406:1999).

| TCM | TPM | TIM | TMU | FS | AMFS | CTU |

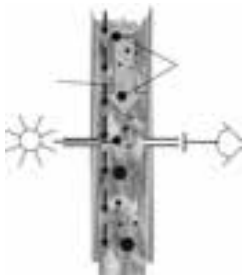**Figure 18.** Schroeder Industries offers seven products (see Figure 18) that include particle monitoring services: TPM TestMate® Particle Counter, TIM TestMate® In-Line Counter, TCM TestMate® Contamination Monitor, TMU TestMate® Monitoring Unit, CTU TestMate® Contamination Test Unit, the FS Filtration Station® and Asset Management Filtration System®. Product information for all of these is included in this catalog.

Determining the Residual Dirt Quantity of Components and Technical Cleanliness

Determining the residual dirt quantities present on components can be done by employing quantitative and qualitative factors.

Quantitative:
- mg/component
- mg/surface unit (oil-wetted surface)
- mg/kg component weight no. of particles > x µm/component
- no. of particles > x µm/surface unit (oil-wetted surface)

Qualitative:
- Length of largest particle (subdivision into hard/soft)

Components with easily accessible surfaces are components in which only the outer surface is of interest for the most part when performing residual dirt analyses. *There are exceptions e.g. transmission and pump housings, as the internal surface is of interest. These components belong to group 1 and their surfaces are not easily accessible in most cases.*

Components in which the inner surfaces are examined or *pre-assembled assemblies* belong to group 2.

There are two methods that can be used to determine the residual dirt of group 1 components.

Ultrasonic Method

The ultrasound method involves submitting the components to an ultrasonic bath, exposing them for a defined period of time at a defined ultrasonic setting and bath temperature. The particulate contamination is loosened by the exposure and then flushed off the component using a suitable liquid.

The particle dispersion in the flushing liquid obtained in this manner is analyzed according to specified evaluation methods.

The ultrasonic energy setting and the duration of exposure have to be indicated in reporting the result. The ultrasonic procedure is particularly suitable for small components in which all surfaces have to be examined. *Cast components and elastomers should not be subjected to ultrasonic washing if possible. A risk is posed here by the carbon inclusions in the cast piece being dissolved, thus skewing the results.* These effects have to be evaluated prior to performing an ultrasonic analysis.
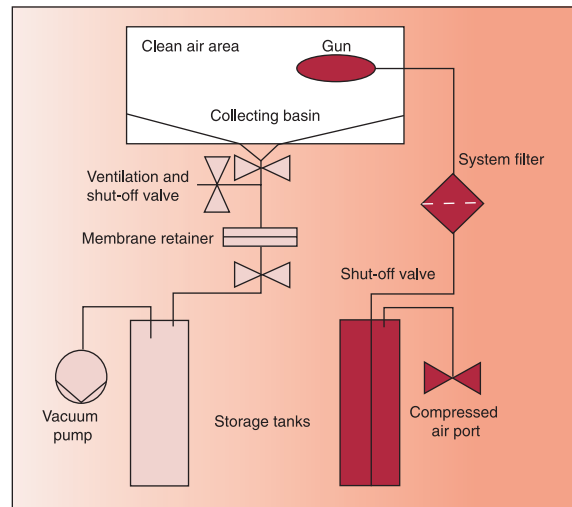
Figure 19

Flushing Method

Components with easily accessible surfaces or components in which only surface parts have to be examined are analyzed using the flushing method. This method involves flushing the surface undergoing analysis in a defined clean environment using an analysis fluid, which also has a defined cleanliness. A "negative control" or basic contamination control is performed prior to analysis in which all the surfaces of the environment, e.g. the collecting basin, are flushed and the value obtained reported as the basic contamination of the analysis equipment. The flushing fluid is then analyzed using the specified evaluation methods.

The darker areas in Figure 19 are the flushing areas; those to the left and lighter are the designated analysis area. In reality these two circuits are configured using suitable valves in such a manner that switchover can be done between the two storage tanks. The figure represents a simplified circuit diagram. The analysis fluid is subjected to a pressure of *approximately 58 – 87 psi (4 – 6 bar)* and conveyed through the system filter and the spray gun into the analysis chamber. The system filter ensures that the analysis fluid sprayed on the surface being examined has a defined cleanliness. The particle-loaded fluid *collects in the collecting basin* and is filtered through the analysis membrane via vacuum action. The membrane is then evaluated according to the analysis methods described on the following pages.

Shaking Method

The shaking method is very rarely used, as it is very difficult to reproduce manually. However, results are reproducible when automatic shakers such as those used in chemical laboratories are employed. The analyzed components are components subject to wear whose inner surfaces are to be analyzed (e.g. pipes, tanks). The important thing is that the particles are flushed out of the inside of the components after being shaken.

The table on the following page shows a comparison of the various methods for analyzing components and assemblies.

Testing Methods Comparison

	Flushing Method	Ultrasonic Method
How Performed	Components are flushed with the analysis fluid in a defined clean environment.	Components are exposed to an ultrasonic bath and are then flushed with the analysis fluid.
Applications	Components in which only surface parts have to be examined and components in which ultrasound may damage the surfaces. Components with a simple design and with easily accessible surfaces.	Small components and components in which all surfaces are to be analyzed (the component size depends on the ultrasonic bath).
Pros	Analysis can be performed quickly	Reproducibility
Cons	Reproducibility Standards are not yet available (currently in preparation)	Analysis takes a long time The energy acts on the surface undergoing analysis The surface has to be flushed No valid standards

Evaluating particle-laden flushing fluids can be done according to various criteria. Gravimetric analysis is useful for heavily contaminated components, whereas particle counts in various size ranges are useful for very clean components.

The following table provides an overview of the individual evaluation methods.

	Manual Methods		Automated Methods	
	Gravimetric method [mg/m^2]	Counting of particles on the analysis membrane [no. of particles > x µm/m^2]*	Counting of particles on the analysis membrane [no. of particles > x µm/m^2]*	Counting of particles on the analysis membrane [no. of particles > x µm/m^2]*
How Performed	The particle-laden fluid is filtered through a prepared analysis membrane			The particles on the particle-laden fluid are counted using an automatic particle counter
	The analysis membrane is weighed before and after analysis and the gravimetry computed on the basis of the difference between the measured values	The number of particles in the individual size ranges are estimated or counted < 100 µm estimated > 100 µm counted	The analysis membrane is placed under a microscope and evaluated using a software tool. This software records the light-dark contrasts on the membrane and interrupts them as particles.	
Applications	Samples exhibiting contamination >10 mg	Samples featuring high a content of coarse contamination. Often combined with gravimetric evaluation.	Samples featuring a low contamination content < 5 mg	Preferred for very clean components. When high dirt content is involved, the sample has to be diluted in order to perform counting.
Standard	ISO 4405	ISO 4407		ISO 11500
Advantages	Material types can also be analyzed. An overview can be quickly obtained of the largest particles. Air and extraneous liquids do not pose a problem (as long as no deposits form on the membrane). Can be used for large particle quantities			Analysis can be performed quickly, can be integrated in process chain as on-line method, detection of small quantities of particles possible, measurement range selectable (2-400µm). Accurate measurement method
Disadvantages	Takes a long time (min. 1 h) Lab Method	Takes a long time No. of particles <100 µm estimated Lab Method	Depending on the analysis accuracy this method can take a very long time. Light particles are not interrupted. Light-Dark contrast is manually selected in cases. The diameter of the area-equivalent circle is measured (=> result is not identical to visual appearance)	The sample has to be prepared (e.g. the sample might have to be diluted). Generally speaking, this is a statistical method providing for sufficient accuracy.
Application	Lab Method Used as a control for indirect measurement techniques (e.g. off-line process control in test stations)		Lab Method	On-line process control in manufacturing and assembly. Can also be used in labs

Evaluation Methods

The following table provides an overview of applications of the analysis and evaluation methods.

Evaluation		Gravimetry		Particle Counting		
Analysis Method		Flushing	Ultrasonic Method	Flushing	Ultrasonic Method	Function Testing
Simple Components	easy-to-access surfaces; gears	U	U	U	U	NU
Components	internal surfaces pipes, tanks	U	NU	U	NU	CU*
Complex Components	components featuring various bore holes or ducts; control plates	CU*	NU	CU*	NU	U
Simple Systems	surface is to be analyzed immersed sensors	U	U	U	U	NU
Systems	internal surfaces rails of common rail systems	CU*	NU	CU*	NU	U
Complex Systems	valves, pumps	CU*	NU	CU*	NU	U

* Must be ensured that the particles dislodged from the component can be flushed away.

U = Usable
CU = Conditionally usable
NU = Not usable

Patch Test Kit

Schroeder's EPK Patch Test Kit (shown to the right) provides the tools needed to pull contaminated fluid through a patch and compare the resulting patch under a microscope to representative photos of various contamination levels to determine the fluid's ISO level.

Advanced Technology

The Asset Management Filtration Station® (AMFS) is a complete fluid management system designed to manage fluid cleanliness, so that the greatest return of that asset is achieved. The AMFS is an all-in one system that monitors your fluid condition, filters out contaminants and tracks all the necessary data needed for trend analysis and record keeping by asset number or name.

Contamination Monitoring

The reliability of hydraulic systems can be impacted heavily by particulate contamination during the running-in phase. The risk of outages during the first minutes or hours of operation is particularly high as the foreign particles introduced or created during the assembly process are still relatively large and can thus cause sudden outages. During continued operation, these large particles are ground into smaller ones, the result being that damage can be caused to the surfaces of system components during this crushing process. The consequences are leakage, degraded output and efficiency, or a shortening of the component's service life. In many cases, microfiltering is used to quickly clean the system fluid during commissioning.

This is where contamination monitoring is key in the manufacture and assembly of these systems. By implementing contamination management a major portion of particulate contamination introduced during manufacture and assembly can be removed. The result is cost savings by virtue of smaller performance deviations on test stands caused by the sudden clogging of particles in sensitive system components plus lower costs associated with warranty and non-warranty courtesy work. *For more information, refer to page 31.*

Below follows a description of the goal, design and performance of a process audit.

Contamination monitoring extends to checking the cleanliness status of all manufacturing and assembly processes considered relevant in this connection. Proper preparation and informing all those involved are key in contamination monitoring.
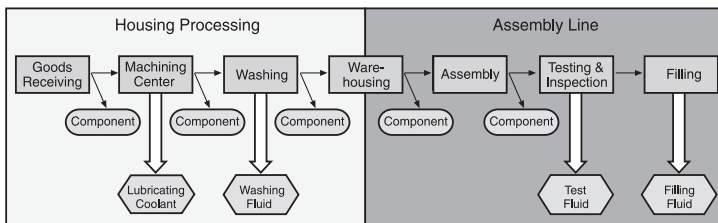

Figure 20. Schematic Excerpt of a Manufacturing Line

Planning and Design

First, the objective of contamination monitoring is specified, e.g.

- Determining the current situation
- Checking fluctuations between batches
- Checking washing processes
- Comparing the target with the actual situation
- Determining the sampling point

During the planning and design phase, the sampling points for components and taking liquid samples are determined using a production plan or operation sheet. The employees to be involved in contamination monitoring are informed of the objectives and procedures.

NOTE:

Manufacturing has to continue in the same manner, meaning that no additional cleanliness levels, etc. are to be integrated. The purpose of contamination monitoring is not to check the quality produced by the employees but rather determining the causes and sources of contamination.

Figure 20 above shows the manufacturing processes and the corresponding sampling points. However, in actuality sampling is more comprehensive, i.e. the description includes the number of the Minimess fittings at which sampling is done, for example.

How Sampling is Done

A representative sampling is taken of the fluids and components; the samples are stored so as to prevent any further contamination. Special sampling bottles are used for the fluid samples; the components are stored in defined clean packaging.

The analysis is performed in accordance with the methods specified on page 18 and the findings recorded.

Inspection of the Manufacturing and Assembly Line

Properly trained or experienced individuals while inspecting the manufacturing and assembly line can detect some sources of contamination. That is why such an inspection is conducted during the audit. The findings made during inspection are then compared with the results on hand.

Analyzing the Data

The contamination monitoring results describe the condition at the time the sampling is done. The findings might look like this:
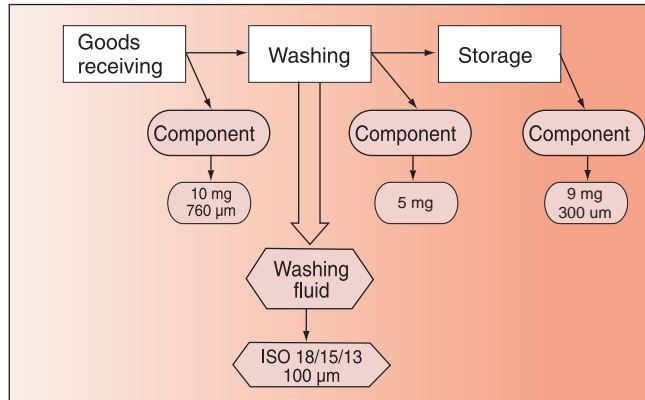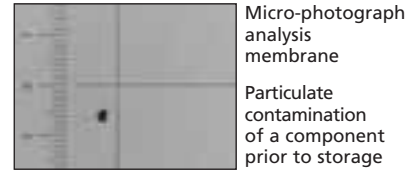

Figure 21. Housing Processing

Micro-photograph analysis membrane

Particulate contamination of a component prior to storage

Figure 22.

Micro-photograph analysis membrane

Particulate contamination of a component *after* being in storage for 2 weeks
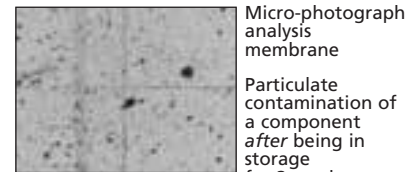
Figure 23.

This chart shows an excerpt of the housing manufacturing process. The component samples are taken upstream and downstream of the washing station. The findings show that the washing station performs well and that it is well positioned. Subsequent storage is not being done properly as the particulate contamination is almost double.

Drafting a Cleanliness Specification

By applying a cleanliness specification to components and the system it can be ensured that as-supplied quality is constant.

The following should be kept in mind when drafting a cleanliness specification:

- State of the art
- Benchmarking – what do others do?
- Inclusion of previous experience – if available
- Defining and implementing contamination management as an "official project"
- Inclusion of all hierarchy levels
- Accurate documentation of how the specification was developed
- Developing clear-cut definitions

Next, it has to be determined which components in the system are the most sensitive. Frequently, it is not possible to achieve the same level of cleanliness throughout the system during assembly.

If suitable, filtration takes place upstream of the sensitive components. An area of low-contamination-sensitive components can be defined upstream of this filtration and an area of highly contamination-sensitive components downstream of the filter.

These individual components or system areas should be subdivided into sensitivity areas.

Category	Designation	Description
A	Low particle-sensitivity	For the most part low-pressure systems with large gap tolerances
B	Particle-sensitive	Low-pressure systems with small gap tolerances
C	High particle sensitivity	High-pressure systems with small gap tolerances and with exacting demands made of safety and security systems

A maximum particulate contamination value is specified for each of these cleanliness categories.

A car motor illustrates this subdivision below:

Category	Motor Area
A	Air / Coolant water circuit
B	Low-pressure oil circuit
C	Diesel direct injection / High-pressure oil circuit

In addition, the fluid cleanliness ratings of the individual system and process fluids are defined.

Analyzing the Data

The following parameters are defined in the cleanliness specifications for the components:

1. Goal of the cleanliness specification

2. Applicability (system designation)

3. Extent of inspection and testing; inspection and testing cycles

4. Sampling

5. Analysis method

6. Evaluation method

7. Accuracy

8. Analysis fluids to be used

9. Documentation

10. Limit values

This specification has to be made for each individual system; consequently a few things are discussed which have to be borne in mind.

Work instructions concerning sampling, analysis and evaluation methods should be described in detail so as to ensure that sampling is always done in a uniform manner. In addition, the analysis results depend on the analysis fluid and method, particularly when it comes to component analysis. Documentation should be done using forms so that all the results are readily accessible.

Contamination Management			
System	Power Steering	Analysis date	Jan. 31, 2001
Component analysis			
Component	Rack	Sampling point	After washing 1
Part No.	Xx1235	Sample taken by	Joe Smith
Batch size	1	Sampling date	Jan. 30, 2001
Analysis method	Ultrasonic	Lot designation	01-2001
Analysis fluid	COLD-02	Analysis fluid vol.	1,500 ml
Negative value	.02 mg	Membrane filter rating	7 μm
Evaluation method			
In-line particle counting	Automated particle counting of the analysis fluid	Automated particle counting of the membrane	Manual particle counting
			x
	x		
Gravimetry	8	mg/component	
Largest abrasive particle	350	μm	
	No. of particles / component		
	> 50 μm	> 100 μm	> 200 μm
Actual value	100	10	3
Limit			0
System Fluid			
System	Washing 1		
Sampling point	Flushing bath		
Sample taken by	Joe Smith		
Sampling date	Jan. 30, 2001		
Measurement method			
In-line particle counting	Automated particle counting of the analysis fluid	Automated particle counting of the membrane	Manual particle counting
			x
ISO 4406	22/20/18	NAS 1638	
Largest abrasive particle	300 μm		
Signature:		Date:	

Example of a form for entering findings

1. Goal of the cleanliness specification
The goal in implementing this cleanliness specification is to achieve a constant level of cleanliness for system X.

2. Applicability (system designation)
This specification applies to system X including its series A, B, and C. It extends to all components whether sourced or manufactured in house. It also specifies the system fluids of system X with regard to their cleanliness.

3. Extent of inspection & testing; inspection & testing cycles
5 samples a month of each component are to be taken and analyzed. If the supplier parts achieve a constant cleanliness value after 6 months, the sampling cycle can be extended to every 2 or 3 months. An analysis of the entire (assembled) system is to be done at least once a week prior to delivery. Checking of the fluid cleanliness should be done on a continuous basis.

4. Sampling
Sampling of components is to be done at receiving and is to be representative. Samples should be packed in a dust-tight manner and sent into the laboratory. The fluid samples are to be taken at the sampling points indicated in the inspection and testing plan.

Analyzing the Data

5. Analysis method

The flushing method should be used for component analysis. The surfaces of the component are flushed in a clean environment using x ml of the test fluid (XY) which has a cleanliness of xx, under a pressure of z psi as specified by the inspection and testing plan. The flushed-off particulate contamination is collected on an analysis membrane and subjected to gravimetric analysis. Representative samples are taken of the system fluids at the specified sampling points. All testing parameters are specified; the duration of testing, what is tested, the pressures, and speeds. When conducting static inspection and testing make sure that a flushing effect is present so that the cleanliness of these components can be determined, (the static pressure test has to be followed by a dynamic flushing process in order to analyze the actual quantity of particles which is flushed out of the component.)

6. Evaluation method

In the component analyses the analysis membrane is dried until it achieves a constant weight, and then cooled in a defined dry environment and weighed. This procedure is repeated subsequent to filtration. The weight differential indicates the "gravimetric contamination" of the component. This is followed by visually examining the analysis membranes through a microscope and measuring the longest particles. Evaluation of the fluid samples is done in accordance with ISO 4405, ISO 4407, ISO 4406:1999 or NAS 1638.

7. Accuracy

The analysis equipment has to be brought to a residual dirt content of 0.2 mg prior to conducting the analysis so that the measurements taken of the component samples are sufficiently accurate. This is determined by performing a negative control, i.e. flushing the equipment without testing. When the result of the analysis drops below 0.5 mg, the batch size is to be increased and thus a mean value of the results computed.

8. Analysis fluids to be used

The following analysis fluid should be used for the component analyses: ABC-XX, with a cleanliness class of 14 / 12 / 9 and no particles > 40 µm.

9. Documentation

The documentation of the results is done using a result sheet.

10. Limit values

The components are subdivided into 3 cleanliness classes:

Category	Designation	Description
A	Low particle-sensitivity	For the most part low-pressure systems with large gap tolerances
B	Particle-sensitive	Low-pressure systems with small gap tolerances
C	High particle sensitivity	High-pressure systems with small gap tolerances and exacting demands

The following cleanliness specifications apply to each of these classes (fictitious example).

Category	Gravimetry	Particle Sizes
A	20 mg / component	Max. 4 particles > 500 µm Max. size: 400 µm No fiber bundles
B	10 mg / component	Max. 4 particles > 400 µm Max. size: 800 µm Fibers up to 4 mm
C	5 mg / component	Max. 4 particles > 200 µm Max. size: 1,000 µm Fibers up to 2 mm

The transmission components are subdivided into the individual categories.
Group A: crankcase sump.
Group B: intermediate housing, transmission housing, coupling flange
Group C: valve plate, valve housing, centering plate

Fluid samples:
At the end of the test run, the transmission fluid may not fall short a cleanliness rating of 17 / 15 / 13 (c) according to ISO 4406:1999. The system is to be operated using a cleanliness rating of 18 / 16 / 14 (c) according to ISO 4406:1999.

11. Procedure to be followed in the event that the specification is not adhered to

The supplier components are to be returned to the supplier in the event that the specification is not adhered to. If this procedure results in production delays, the components will be cleaned and analyzed by us at the supplier's expense.

Sources of Contamination in the Manufacturing and Assembly of Hydraulic Systems

Particulate contamination can enter a fluid power system in various ways. The main sources of ingression are shown in the following diagram. Some of these sources of contamination can be eliminated in a simple, cost-effective manner.
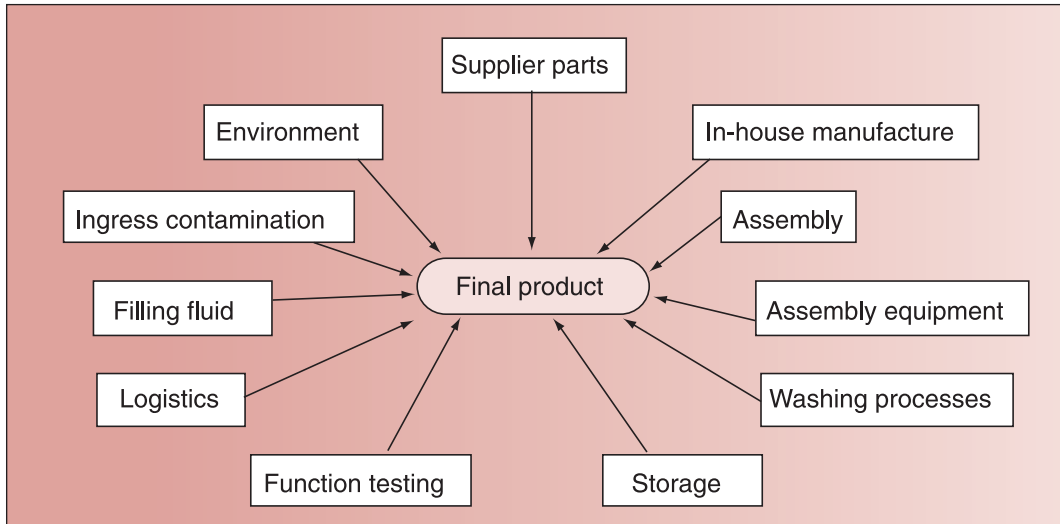

Figure 24. Sources of Contamination in the Manufacturing of Hydraulic Systems

The ingression of contamination in the manufacturing and assembly of hydraulic systems can be eliminated in a cost-effective manner in various process steps.

Storage and Logistics

When storing and transporting the components and systems care has to be exercised to make sure that they are properly sealed shut or well packed. Transportation and storage packing has to be in keeping with the cleanliness status of the individual components.

Assembly of Systems and Subassemblies

The assembly of these systems is to be done in accordance with system requirements. This means that the assembly and mechanical fabrication areas have to be separated if necessary in order to prevent the ingress of contamination. The assembly stations have to be kept clean to a defined cleanliness and those working in these areas have to wear special, lint-free clothing. The assembly equipment has to be properly cleaned so as to prevent the ingress of dirt here, too.

Raising the Awareness of Employees

In order to achieve the objective of "defined cleanliness of components and systems" it is important that employees at all levels be involved in this process. Frequently, a considerable savings potential is contained in the employees' wealth of ideas and experience — particularly those working at assembly lines and in fabrication.

Experience has shown that when employees are able to identify with the objective being striven for, they are more able to help in implementing it quickly and effectively.

Environment — Air Cleanliness

In some cases it will be necessary to set up a clean room for the final assembly of very contamination-sensitive systems, e.g. fuel systems, brakes shock absorbers, etc. This has to be decided on a case-by-case basis. However, in many cases performing the measures described here suffices.

Generally speaking, particulate contamination is removed from a hydraulic system via filtration. Various types of filters are used depending on the amount and type of contamination.

Belt filter systems or bag filters are used when large quantities of contaminants are involved. These filters have the job of removing the major portion of contaminants from the system. These filter types are also used for pre-filtration purposes.

In most cases, these coarse filters do their job of *"removing a lot of dirt from the system"* very well. However, microfiltering also has to be done if a constant defined high level of cleanliness of the system fluid is to be ensured.

Whereas microfiltration ensures quality, the job of coarse filtration is to control the quantity of contamination.

Removal of Particulate Contamination

Cleaning System

Individual components are freed of clinging contamination in cleaning systems (particles, remainder of machining or corrosion protection fluids, etc.). Cleaning can be done by employing various mechanical methods (e.g. spraying, flooding, ultrasonic methods) using various cleaning fluids (aqueous solutions or organic solvents). The temperature and duration of cleaning also have a decisive effect on the cleaning effect. These factors have to be carefully matched and optimally tuned in order for a favorable cleaning effect to be achieved in an economical amount of time.
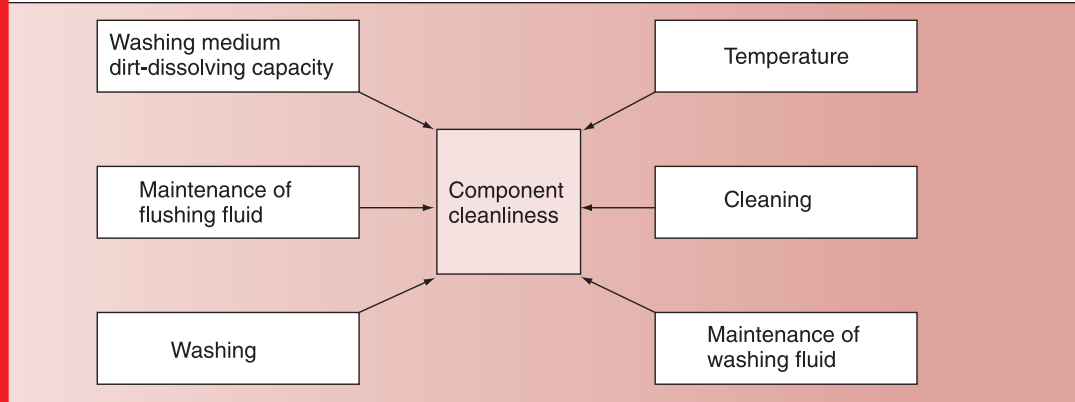

Figure 25. Cleaning Techniques

Various studies of washing processes have shown that some of these for the most part cost-intensive processes aren't worthy of the name. Some people refer to washing processes as "particle distribution processes". This "property" was detected in examinations of components sampled upstream and downstream of a washing process.

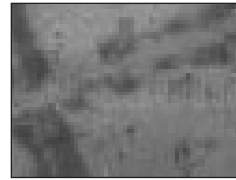**Figure 26.** Micro-photograph Analysis Membrane: Pipe has been washed and sawed

Figure 27. Micro-photograph Analysis Membrane: After sawing and washing, the pipe is bent and flushed

There are two possible responses in a case like this:

1. Discontinue the washing process when component cleanliness becomes worse after washing than before.

Advantage: temporary cost savings

The best alternative:

2. Optimize the process. The following should particularly be borne in mind when optimizing washing processes: cleanliness of the washing, flushing and corrosion protection fluid, mechanical aspects, suitability of the washing process for the components undergoing washing and filtration of the washing and flushing fluid.

When purchasing washing systems, make sure to specify the component cleanliness to be achieved and the maximum contamination load of the washing fluid in terms of *mg/l* or a cleanliness class.

Washing systems used to be subdivided into micro and micronic washing. This was a very imprecise definition of the cleaning performance to be achieved. Nowadays the permissible residual dirt quantity of the cleaned components is defined.

Specifying these residual dirt quantities is done as follows: mg/component, mg/kg component, mg/surface units or particle concentrations in various size ranges. In addition, the maximum sizes of the particles are defined which can be on the washed component, e.g. max. 3 particles > 200 µm, no particles > 400 µm.

These values cannot be achieved unless the factors indicated above are matched and fine-tuned. The following factors additionally have to be borne in mind: environmental protection and labor safety, local situation relating to space and power available, and the target throughput rate.

The cleanliness of the washing and flushing fluids also has a decisive impact on the cleaning performance of the washing machine. However, we are concerned here only with the maintenance of the washing and flushing fluids.

Removal of Particulate Contamination

Cleaning Method	Solid Contamination	Liquid, Non-Dissolved Contamination (emulsion)	Liquid, Dissolved Contamination (emulsion)
Filtration			
Belt-type Filter	X		
Bag/Backflush Filter	X		
Micronic Filter (tube/disk filters)	X		
Ultrafiltration	X	X	
Distillation	X	X (for high boiling point differences)	X
Separator	X	X (density difference)	
Oil Separator		X	
Coalescer		X	

The type and composition of the cleaning medium is to be taken into account in selecting the fluid maintenance options indicated above. When using ultrafiltration, it has to be known that separating out the cleaning substances cannot be avoided in certain cases. In addition, ultrafiltration can only be used for pre-cleaned washing media since the performance of the separating membranes is degraded when they are loaded with particulate contamination.

Using Filtration as Fluid Maintenance for Separating out Particulate Contamination

Bag and backflush filters in various microfilter ratings are the standard equipment used in the maintenance of the fluid of washing systems. Although these filters are suitable for removing large quantities of contamination from a system, they are not suitable in most cases for maintaining defined cleanliness classes. Owing to their design, they do not offer much resistance, (the counterpressure built up across the filter is very low), below 15 psi for the most part. That is why this filter type is frequently used in the full flow when feeding cleaning fluid into the washing or flushing chamber. The filter housings are equipped with pressure gauges for monitoring the proper functioning of the filter.

Bag filters pose the risk that overloading can cause the bag to be destroyed and large contaminant quantities released. That is why it is advisable to additionally define minimum change intervals and to regularly monitor the cleanliness of the washing fluid in addition to the standard parameters like pH value or microbial count.

Residual dirt values of cleaned components are increasingly being defined and specified as an acceptance criterion for the cleaning system. It is of paramount importance that constant adherence be maintained to these values. It is also imperative that the quality of the cleaning fluid be maintained at a high, constant level.

This can be achieved by use of the targeted microfilters, featuring a constant and absolute separation rate. In most applications, tube filters or disk filters are used. The advantage of these filter types as compared to standard hydraulic filter elements is their high contaminant retention rate owing to their depth effect.

The high contaminant separation rate offered by these filter types removes a high amount of contamination from the washing fluid. This causes the filters to become quickly exhausted and blocked. A sufficiently long service life coupled with high washing fluid cleanliness can be achieved by combining filters for removing the main portion of contaminants from the system with absolute microfilters.

Example: At a leading automotive supplier, the camshafts were to be cleaned to a defined cleanliness of 9 mg / component. Point of departure:

Technical Specifications of the Washing Machine Present on Site

Tank Volume:	21 gal. (80 l)
Pump Delivery Rate:	66 gpm (250 l/min) (centrifugal pump)
Washing Agent:	Ardox 6478 – Chemetall Group
Concentration:	2.3 – 3%
Bath Temperature:	ca. 122°F (50°C)
Filtration:	Backflush filter downstream of pump, 50 µm filter rating

Process Data

Bath Change Frequency:	1 time/week
Throughput:	3,000 - 4,000
Wash Cycle:	15 s/component

Challenge: Clogging of the tank, Quality no longer sufficient after 2-3 days, Fluctuation in the contamination content of the components upstream of the line: 30 – 50 mg. Cleaning costs could not be allowed to increase, although quality still had to be improved.

Removal of Particulate Contamination

Goal of Optimizing the Cleaning Line

- Achieve a residual contaminant value of a maximum of 9 mg/camshaft
- Cleanliness of washing fluid of < 30 mg/liter
- Extend the service life of washing fluid, i.e. save costs associated with changing the fluid
- Prevent clogging of the tank, e.g. save cleaning time
- For process reliability reasons, a low-maintenance cleaning system was added to the result which enabled the camshafts to be cleaned to a residual contaminant content of 9 mg/component, this to be done cost-effectively

Result of Optimization

The service life of the cleaning fluid was extended from 1 week to 8 weeks. There was no more clogging of the tank. Changing the bath fluid was done on account of the increased chloride content, not on account of contamination.

The residual contaminant values of max. 9 mg/camshaft and max. 30 mg/liter of bath fluid (when using a 5μm membrane for analysis) were achieved and maintained at this level.

By optimizing the fluid maintenance of this washing line, an improvement in quality was achieved at no added cost and without comprising process reliability.

This example shows that prior to any such optimization or in new facilities the cleanliness of the components upstream of the system, throughput, technical details, targets have to be known and defined, for only in this way can the success of such an endeavor be ensured.

Economic Efficiency Analysis

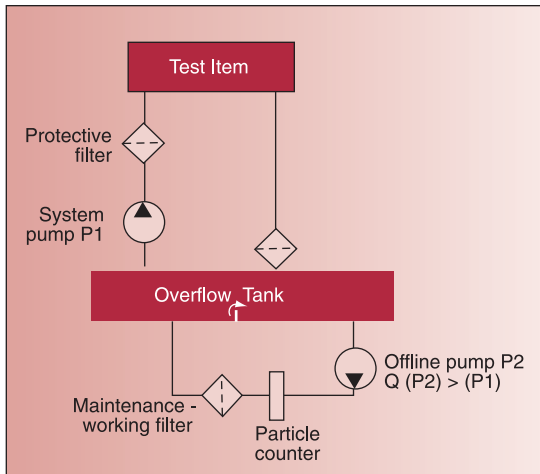|	Investment ($)	Recurring Costs ($)	Savings/Year ($)
Off-line Filtration	**5,000.00**		
Filtration Costs		**7,500.00**	
Extension of the Service Life of the Bath			**10,000.00**
Lower Reworking Costs			These costs can't be quoted.
Down Time of the Washing Machine for Cleaning			These costs can't be quoted.

Functional Testing

Figure 28. Schematic illustrates the basic setup of most test stands

Most systems come into contact with the hydraulic fluid during initial system filling or function testing. This process affords the manufacturer a substantial opportunity to impact the final cleanliness of the entire system. By using suitable filtration of the filling and test fluids, system cleanliness can be quickly optimized upon delivery or commissioning.

The cleanliness of the final product can be controlled via function testing in the same way as by a washing machine. Some companies have the following motto: *"The test stand is our last washing machine."*

This statement might be true, however it is an expensive approach in practice. Yet when performing process reliability measures for supplying systems with a defined cleanliness, this is the first approach.

On a function test stand not only function testing is performed but the components and systems are run in as well. A frequent side effect of this is the flushing effect of the system undergoing testing. By employing targeted fluid maintenance and cleanliness monitoring, this flushing effect can be used to ensure that systems possess a defined, constant cleanliness status upon delivery.

Cleanliness monitoring provides information on the process stability of the upstream fabrication and cleaning steps. Frequently, continuous monitoring of test fluid cleanliness results in the cleanliness of the entire system as supplied being documented. This approach is used in mobile hydraulics, turbines or paper machinery upon delivery or during commissioning in order to demonstrate to the final customer that his system is being supplied with the specified cleanliness.

Example: The following study illustrates the cleaning process of a pump during commissioning:

The cleanliness of the test fluid upstream of the test item is maintained at a cleanliness rating of 16 / 14 / 11 (c). After 5 minutes of testing the pump speed is briefly increased to the maximum speed. The test run is concluded after 10 minutes.

In this case, the dirt content of the test item amounted to 1 *mg/kg* component weight upon the conclusion of the test run.

As the schematic below shows, the particle concentration continuously drops during the first 4 minutes of the test run. The particle concentration jumps when the pumps are turned up to full speed after 5 minutes. The next 5 minutes are again used for cleaning the system. Now the following can be asked: "How clean are the valves that leave this test stand?"

The flushing procedure can be monitored by occasionally disassembling the valves in a defined clean environment and evaluating the dirt content of the individual components.
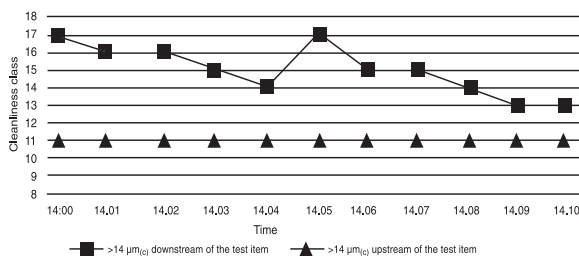

Figure 29. Pump commissioning Particle Count

Preventing Contamination

Figure 30. Valve Test Stand with 5 µm Filtration

Figure 31. Cleanliness Class Achieved by the Test Fluid: NAS 3

Storage, Logistics and Ambient Conditions

Unfortunately, improper component storage is not uncommon. Seals and gaskets which arrive at the assembly line clean and packed in bags are unpacked and filled into containers which are dirty for the most part as this involves less work and effort.

In most cases, these factors are not taken into consideration and substantial savings potential that could be easily utilized through improved packaging and storage is overlooked.

Supplier Parts and Components Manufactured In-house

Suitable cleanliness specifications for internally produced and sourced parts enable the ingress of contamination into systems to be minimized right from the beginning.

Commissioning Flushing

Commissioning flushing is most frequently chosen for large systems in order to minimize wear during commissioning.

The filtration of the flushing stand has to be designed so that during subsequent analysis the contaminants flushed out of the system undergoing testing are removed and other measurements aren't skewed. As an alternative, cleanliness can be measured and recorded upstream and downstream of the test item during the entire measurement sequence.

— NAS 25-50 µm   — NAS >50 µm
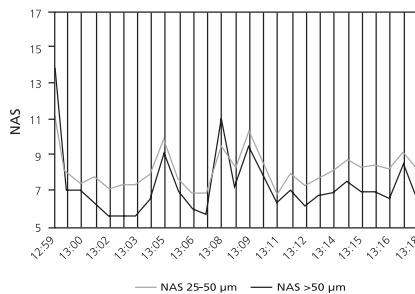
Figure 32. Examination of the Hydraulic System of a Mobile Crane

In a mobile crane application, a specified sampling point was located directly downstream of the pump and an online particle counter connected.

The crane jib was extended after 6, 8 and 10 minutes. The graph clearly shows that every time a new area was brought on line contaminant sediments were flushed out.

When a system's characteristic curve/behavior is known, cleanliness testing can be performed at the end of function testing and, thus, system cleanliness described subsequent to commissioning. This method enables process control to be implemented quickly and reliably during series testing/commissioning. The cleaning curve plotted over time is an indication of the ingress of contaminants during assembly.
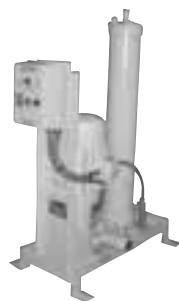
X-Series Flushing Skid

Why Contamination Control is Important

- The core aspects of contamination management are a cost analysis and efficiency review. The following costs are considered in the cost analysis:
- Warranty and non-warranty courtesy work
- Energy costs (e.g. cooling and reheating of washing machines during fluid changes)
- Test stand costs (test item time)
- Costs of the tools and dies of machine tools (increased wear due to high particle concentrations)
- Fluid costs (washing machines, test stations, machine tools)
- Labor costs (reworking, cleaning of washing machines, machine tools, etc.)
- Filter costs

	One-Time Investment	Recurring Costs / Year
Function Test Stands (5)	6,500 x 5 = 32,500	7,500 x 5 = 35,000
Storage Conditions	2,500	
Coverings for the Pallets		
Washing Machine for Cleaning the Pallets	50,000	25,000
Machining Process		2,000 x 7 = 14,000
Manpower/Cleaning	750 x 7 = 5,250	
Filtration	1,250 x 7 = 8,750	
Consulting Expenses	10,000	1,750
Total	109,000	75,750

The economic efficiency analysis (above) describes the success of contamination management as illustrated by a manufacturing line in the automotive industry with an output of 3,000 systems/day. Manufacturing is done 260 days/year (3,000 x 260 = 780,000 systems/year). A contamination review showed that the cleanliness of the function test stand fluid, the intermediate storage conditions and a machining process had to be optimized.

The next step involved forwarding the cleanliness specifications to the suppliers, who received orientation training and are periodically monitored.

The results of optimization:

- Less tool wear in surface machining
- Longer service life of the machining fluid
- Enhanced effectiveness of the downstream washing processes as less dirt had to be removed thanks to optimized storage and machining
- Longer intervals between changing the washing and flushing fluids, consequently "Saturday shifts" could be dispensed with
- Fewer outages at the test stand, i.e. the system is checked up to 3 times when performance deviations occur. These "idle cycles" were reduced by 90%, thus resulting in increased productivity.
- Drop in warranty and non-warranty courtesy work by 50% as the main reason for the outages turned out to be particulate contamination, which resulted in leakage and imprecise control in the system.
- Shortening of the test stand time.

Unfortunately we were not permitted to publish the detailed data behind these savings. Following from an economic efficiency analysis conducted by the customer in-house, savings of **$0.60** per system were achieved.

Cost Savings Per Year	780,000 systems x $0.60 = $468,000
Amortization of One-Time Investment Over 3-Years (109,000 / 3-Years)	$36,333
Recurring Costs Per Year	$75,750
Total Savings Per Year (for first 3-years)	**$355,917**

This economic efficiency analysis also includes the expenses associated with contamination management (seminars, consulting fees, analysis costs).

Contamination Management in Practice

In the previous pages we discussed the impacts of particulate contamination on the service life and reliability of hydraulic systems, how the cleanliness of fluids on components can be specified, and how contamination monitoring is performed. Deploying contamination management results in the following tasks for all participants in the production process:

Suppliers: Ensuring the defined as-supplied condition of products. Selecting the packaging of products to be supplied so that no additional contamination occurs during transportation and storage.

System vendors and manufacturers: Careful transportation, handling, storage and unpacking of products. Keep products clean after they are unpacked or after seals/plugs have been removed. Assemble/install the components in a suitably clean environment.

The following example shows how these individual parts can be combined in contamination management.

Description of the Point of Departure

System X has been successfully manufactured and marketed for years. During the past few years, System X has been developed further and a new generation, System Y was created. Y features improved performance properties, is more compact than X, and operates at higher system pressures than X. The result is that System Y is somewhat more sensitive to particulate contamination.

This is reflected in increased performance deviations during function testing. This deviation no longer occurs when Y is passed through the test stand a second or third time. An investigation of the matter has shown that this unwanted behavior is the result of coarse particulate contamination.

The goal of contamination management is now to improve the degree of cleanliness so that this undesirable behavior no longer occurs on the test stand and the associated costs of warranty and non-warranty courtesy work are reduced.

Step 1: Analysis of the Test Fluid

The cleanliness of the test fluid is determined. The analyses show that the test fluid cleanliness upstream of the test item amounts to a cleanliness rating of 22 / 20 / 18 according to ISO 4406, the largest metallic particles are 400 µm in size, and the largest fibers measure 3,000 µm.

Step 2: Optimizing the Function Test Stand

By additionally integrating bypass microfiltration, which maintains test fluid cleanliness at 15 / 13 / 10, 95% of the performance deviations can be prevented. This also results in a drop in warranty and non-warranty courtesy work.

Step 3: Lowering the Filter Costs at the Test Stands

By performing a contamination monitoring audit, it might be determined a large amount of particulate contamination is being transported into the system by the manufacturing processes and sourced components. This particulate contamination has to be removed from the system at the function test stand, which functions here as the last washing operation. This results in costs that could otherwise be avoided.

A concept is developed in which the washing, machining processes, and intermediate storage are optimized.

A cleanliness specification along with a test plan for system fluids is drafted. This specification is forwarded to external as well as internal suppliers and the components supplied with a defined, constant cleanliness.

Step 4: Integrating Particle Counting in Quality Assurance

A particle sensor is integrated in the function test stand for the purpose of continuous quality control of the as-supplied quality of System Y. A limit is defined for the maximum contamination of the test fluid in the return line. Intervention can be done immediately if this value is exceeded, thus ensuring that no contaminated systems leave the factory. Random sampling is done to check the supplier quality and non-conformant components returned to suppliers or washed in-house at the supplier's expense.

Step 5: Economic Efficiency Analysis

Contamination management started off with analyzing the costs associated with warranty and non-warranty courtesy work as the result of increased malfunction at the test stands. These costs are reanalyzed after optimization and compared. The savings achieved through optimization are briefly described in Economic Efficiency Analysis. The cost savings in that case amounted to *ca. e 355,917/year* (close to half a million dollars). This optimization process lasted *ca. 2 years.*

Step 6: Documentation and New Projects

The contamination management findings are collected in a database and used in the development of new systems. The defined maximum residual dirt content becomes standard in new systems in the same way that dimensions, surface grades and tolerances have been. This residual dirt content is primarily in reference to the specification that applies to System Y.

The specification is adapted in keeping with the experience gained with the prototypes. Cleanliness and cleaning costs are primarily determined by the design of new systems.

DIAGNOSTIC PRODUCTS
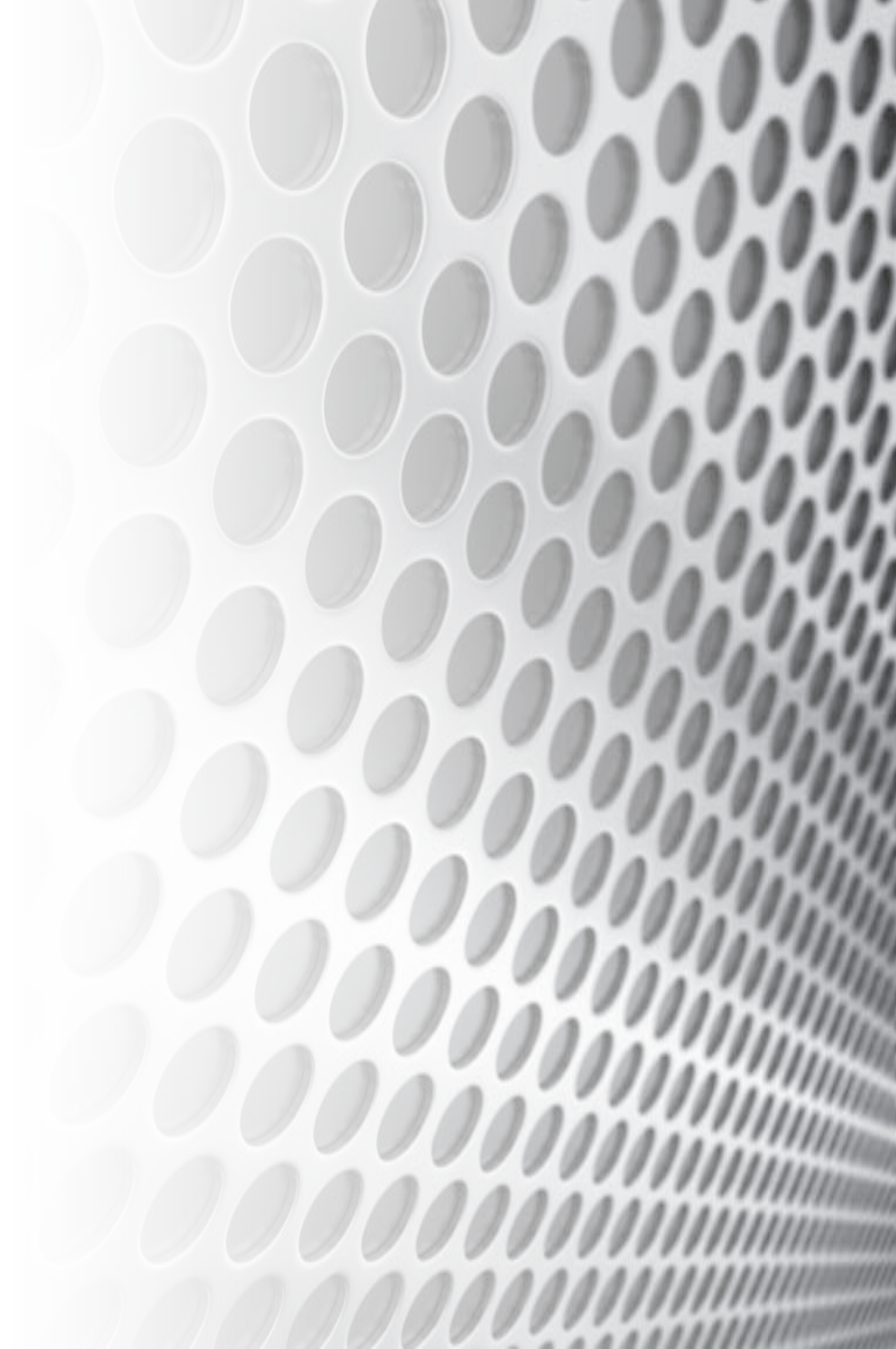
CS 1000 Contaminiation Sensor

Formally Known as "TCM - TestMate Series"

FluMoS MOBILE

■ Usable with FluMoS Mobile App when connected to the CSI-C-11

CSI-C-11 Compatible Product

Includes: Unit, FluMoS Software, Operation Manual and Calibration Certificate

Features and Benefits

■ Measures Particles in Four Sizes: >4, >6, >14 and >21 microns

■ In-line or Manifold Mounting

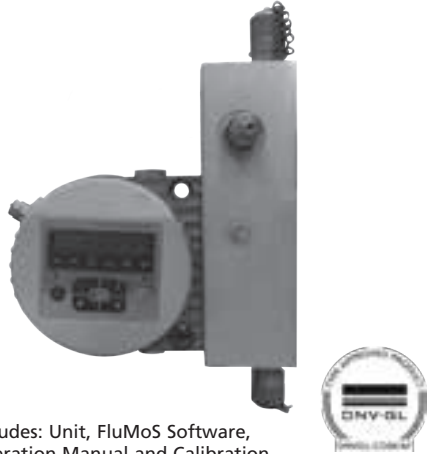■ ISO or SAE codes can be output in 4-20 mA analog signal

■ Compatible with Standard Mineral Fluids & Phosphate Esters

■ Display and Keypad can be rotated (up to 270°)

■ Inlet and Outlet Ports are Interchangeable (bidirectional) (without manifold only)

■ Recommended recalibration: Only every 2 years

Description

The Contamination Sensor 1000 (CS 1000) continuously measures solid contamination in hydraulic fluid. Enclosed in a 4-inch diameter case, the CS 1000 utilizes an optical sensor and measures particles in four sizes: >4, >6, >14 and >21 microns. Measurement results can be output as a contamination code according to ISO 4406:1999 or SAE AS 4059(D).

The CS 1000 is designed for connection to hydraulic and lubrication lines with pressures up to 5075 psi (350 bar) and viscosities up to 4635 SUS (1000 cSt). The unit requires that a small flow of oil (between 30 mL/min and 500 mL/min) is diverted for measurement purposes.

The CS 1000 provides the user with a smaller, tougher, and more versatile stationary sensor. It provides instantaneous readings and is able to self-diagnose continuously with error indication via the status LED. The attractive cost-to-performance ratio makes it especially applicable for OEM applications. Online, real-time condition monitoring allows you to have total predictive maintenance.

Specifications

Measuring Range:	Display ISO ranges between 9/8/7 and 25/24/23 Calibration within the range ISO 13/11/10 to 23/21/18
Contamination Output Code:	**Standard:** ISO 4406:1999 or SAE AS 4059(D) **Optional:** ISO 4406:1987; NAS 1638 and ISO 4406:1999; SAE AS 4059(D)
Self-Diagnosis:	Continuously with error indication via status LED
Inlet/Outlet:	5075 psi (350 bar) max
Connections:	Inlet: ISO 228 G1/4 Threaded Outlet: ISO 228 G1/4 Threaded
Sensor Flow Rate:	30 to 500 mL/min
Permissible Viscosity Range:	32 to 4635 SUS (1 to 1,000 cSt)
Fluid Temperature Range:	32°F to 185°F (0°C to +85°C)
Power Supply Voltage:	9 to 36 VDC residual ripple <10%
Accuracy:	+/- ½ ISO class in the calibrated range
Power Consumption:	3 Watt max
Electrical Outputs:	4 to 20mA Analog; 2 to 10 V Analog (option) RS485
Electrical Specifications:	4 to 20 mA Analog output (max burden 330Ω); 2 to 10 V output (min. load resistor 820Ω) Limit switching output (Power MOSFET): max current 1.5A
Ambient Temperature Range:	-22°F to 176°F (-30°C to +80°C)
Storage Temperature Range:	-40°F to 176°F (-40°C to +80°C)
Relative Humidity:	95%, non-condensing max
Seal Material:	Mineral Oil: Viton® Phosphate Ester: EPR
Electrical Safety Class:	III (low voltage protection)
IP Class:	IP67
Weight:	2.9 lbs (1.3 kg)
Mounting Position:	Recommended vertical installation with direction of flow south to north through CS 1000 or manifold block

NOTES:

All Models feature an analog electrical output. Additionally, an electrical switching output can be configured to alert the operator about rising falling contamination level.

Viton® is registered trademark of DuPoint Dow Elastomers.

Contamiation Sensor CS 1000

Formally Known as "TCM - TestMate Series"

Features

■ Enables the user to transfer data from CS 1000 to PC

■ Enables user to change CS 1000 settings

■ Enables user to have real time monitoring & data storage

What's Included

Converter box, 115 VAC to 24 VDC adapter, USB driver, FluMoS software, communication & power cables, case

Features

■ For WLAN or LAN transmission of data.

■ Addition of data stage capabilities.

Communication cable and power adapter can be ordered individually.

Communication Kit Description:
CSI-D-5
7632013

CSI-C-11 Sensor Interface Module
P/N 4066011

Description: Power Adaptor (PS5)
P/N 7600801

Schroeder Check
TestPoint Options for CS 1000

NOTES:
In-line version of CS.
In-line version cannot be mounted on manifolds

Microflex Hose
Options for CS 1000

G Thread	Sealing System	Description	Part Number
1/4" BSPP	WD Seal Viton	SP1620G14WDM	7622704

1620 Thread

ISO 228 G 1/4   Thread
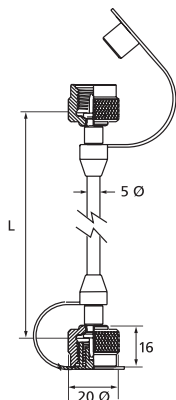
Length inches (mm)	ΔP (max) psi (bar)	Description	Part Number
6 (152)	6,500 (450)	SM4-1620-006	7612174
35 (889)	6,500 (450)	SM4-1620-035	7612175

5 Ø

L

16

20 Ø

CS with Optional CS Block Kit

φ.35 [9] THRU
C'BORE φ.59 [15]
X .31 [8] DEEP
(2) PLACES

(OPTIONAL)
AS1008 – C – 000
SATURATION &
TEMPERATURE
SENSOR

SP1620UN716VM
TEST POINT
(2) PLACES

2.50 [64]

2.03 [52]

.55 [14]

3.27 [83]

1.54 [39]

6.50 [165]

1.54 [39]

7/16—20 UNF—2B
SAE S4 PORTS PLUGGED
(2) PLACES

2.03 [52]

3.85 [98]

4.13 [105]

5.60 [142]

Metric dimensions in ( ).

Model Number Selection

How to Build a Valid Model Number for a Schroeder CS 1000:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	BOX 10	BOX 11
CS										

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	BOX 10	BOX 11
CS	1	2	2	0	A	0	0	0	0	000

= CS1220-A-0-0-0-0 /-000
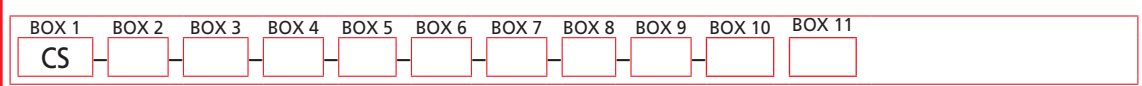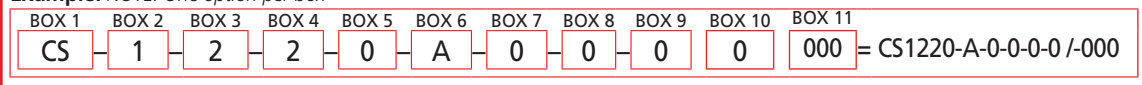
BOX 1	BOX 2	BOX 3
Indicator Code	**Resolution**	**Indicator Code**
CS = Contamination Sensor	1 = 4 Particle Size Channels	2 = ISO 4406:1990 or SAE AS 4059(D) > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21µm(c) 3 = ISO 4406:1987 NAS 1638 > 2 µm > 5 µm > 15 µm > 25 µm ISO 4406:1999 SAE AS 4059(D) > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c)

BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
Options	**Fluids**	**Analog Interfaces**	**Switching Output**	**Digital Interfaces**
1 = without Display 2 = with Display	0 = Hydraulic/Mineral 1 = Phosphate Esters	A = 4 to 20 mA B = 2 to 10 V	0 = Limit Switching Output	0 = RS485

BOX 9	BOX 10	BOX 11
Electrical Connection	**Mounting**	**Modification Number**
0 = Plug M12x1, 8 Pole (Connection Cable Not Included)	0 = Inline Version 1 = Flanged Version	000 = Standard K = CS Block Kit without AS Sensor KAS = CS Block Kit with A1000 Sensor KASD = CS Block Kit with AS3008 Sensor

NOTE:
CS 1000 Block Kit

Includes: CS and AS Sensor Connection Cables, 2 Test Points, 2 Microflex hoses, FluMoS Light Software
The Contamination Sensor Block KIT *(CS 1000 Block KIT)* combines two condition monitoring products, the CS 1000 series *(Contamination Sensor)* into one plug and play unit. It serves as an on-line measurement
of solid contamination and water in hydraulic and lube systems.
Note: Flow control is necessary when utilizing the CS 1000 sensor. Flow must be maintained through the sensor module to ensure accurate readings. Utilization of the CS Block KIT is required to maintain Sensor flow rate range as described int he Technical Specifications *(at the left)*.

Contamination Sensor CS 1939

Features and Benefits

- Critical machine conditions are identified in early stages
- Continuous monitoring of oil conditions
- Condition-based maintenance planning

Market Applications

- Industrial hydraulic and lubrication systems
- Mobile hydraulics

- Compatible with:

FluMoS MOBILE

FluMoS LIGHT

FluMoS PROFESSIONAL

Description

The Contamination Sensor CS 1939 is an online fluid sensor for permanent monitoring of particle contamination in fluids.

The cleanliness results are presented according to ISO/SAE classifications.

This instrument combines the latest materials and technologies with proven engineering and provides the user with a compact and robust stationary sensor.

The attractive price/performance ratio makes it particularly advantageous for OEM applications for Condition Monitoring.

Specifications

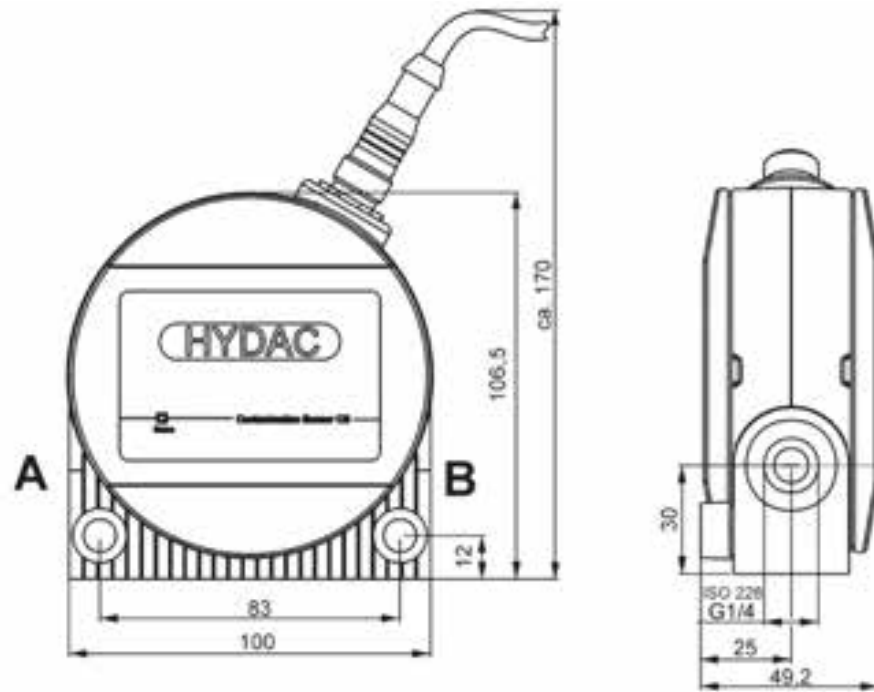|	
Self-diagnosis:	Continuous with error display via status LED
Measured variables:	ISO 4406 SAE AS 4059
Service parameters:	Flow (status) Drive (%) Temp (°F) and (°C)
Installation position:	Recommended: vertical direction flow
Ambient temperature:	-22°F to 176°F (-30°C to 80°C)
Storage temperature range:	-40°F to 176°F (-40°C to 80°C)
Relative humidity:	max. 95%, non-condensing
Seal Material:	FPM for CS1939-0 / EPDM for CS1939-1
Protection class:	III (safety extra-low voltage)
Weight:	2.9 lb (1.3 kg)
Measuring range:	Sensor measures from Class ISO 9/8/7 (MIN) to Class ISO 25/24/23 (MAX) Calibrated in the range ISO 13/11/10 to 23/21/18
Accuracy:	+/-½ ISO class in the calibrated range
Operating pressure:	max. 5075 psi / 350 bar
Hydraulic connection:	Inline or hose connection (A,B): thread G1/4, ISO 228 or flange connection (C,D): DN 4
Permitted measurement flow rate:	30 to 500 mL/min
Permitted viscosity range:	32 to 4635 SUS (1 to 1000 cSt)
Fluid temperature range:	32°F to 185°F (32°C to 85°C)
Connection, male:	M12x1, 5-pole, to DIN VDE 0627 or IEC61984
Supply voltage:	9 to 36 VDC, residual ripple < 10%
Power consumption:	3 watts max.
CAN interface:	2-wire, half duplex SAE CAN J1939 protocol
HSI (Sensor Interface):	1 wire, half duplex

Dimensions CS 1939 without display

ca. 170

106.5

12

A

B

HYDAC

83

100

30

ISO 228
G1/4

25

49.2

Bottom view
Pipe or hose connection
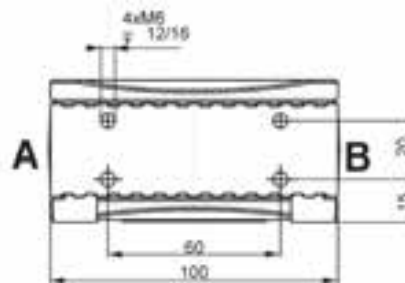
4xM6
12/16

A

B

20

15

60

100

Flange connection

O-ring

4xM6
12/16

C

D

25

20

15

40

60

100
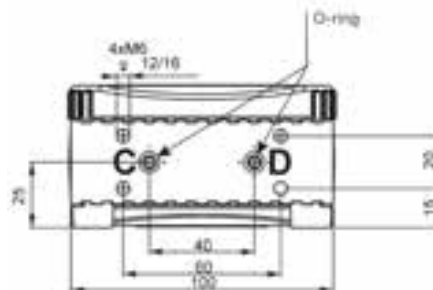
Metric dimensions in ( ).

CS 1939 with Block Kit (Requires minimum flow of 0.3 L/min., and minimum pressure of 6 bar)

Dimensions (cont.)

Ø .35[9] thru hole,
C'Bore Ø .59[15] x .31[8]
Deep, Typ. 2 PLCS.

2.50
[63.56]

.50
[13.90]

3.27
[83]

6.50
[165.10]

Pressure-compensated
flow control valve

6.61
[167.76]

2.03
[51.56]

RETURN

5/16-20UNF-2B
SAE-04 Ports,
1 on each end

2.03
[51.56]

3.85
[97.72]

.28
[7.11]

4.13
[104.83]

RETURN

PRESSURE

5/16-20UNF-2B SAE-04
Ports Plugged, 2 Places

.43
[11]

6.50
[165.10]

Metric dimensions in ( ).

CS 1939 Contamination Sensor

Model Number Selection

How to Build a Valid Model Number for a Schroeder CS 1939:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
CS				

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	
CS	1939	0	0	000	**= CS1939-0-0/-000**
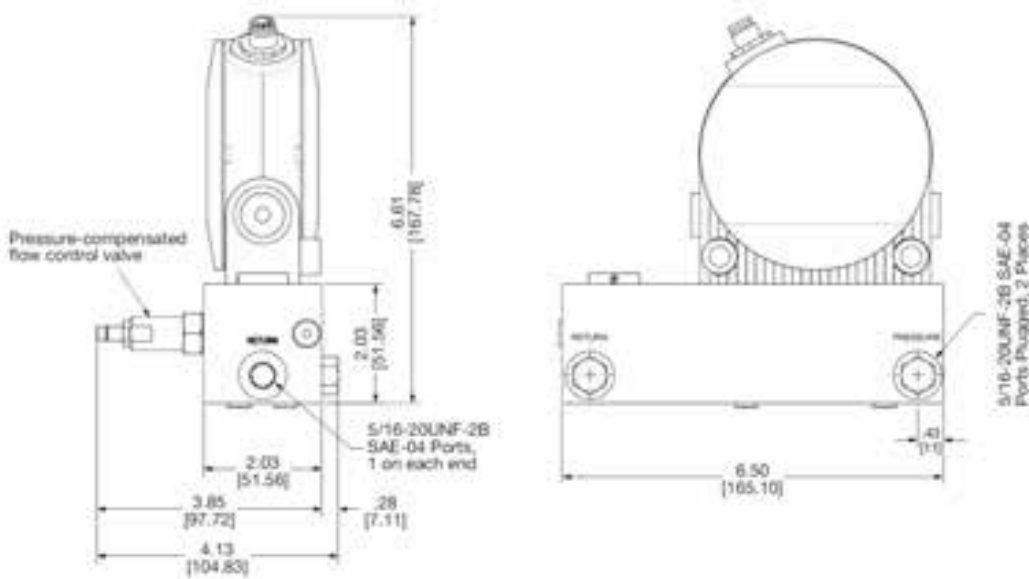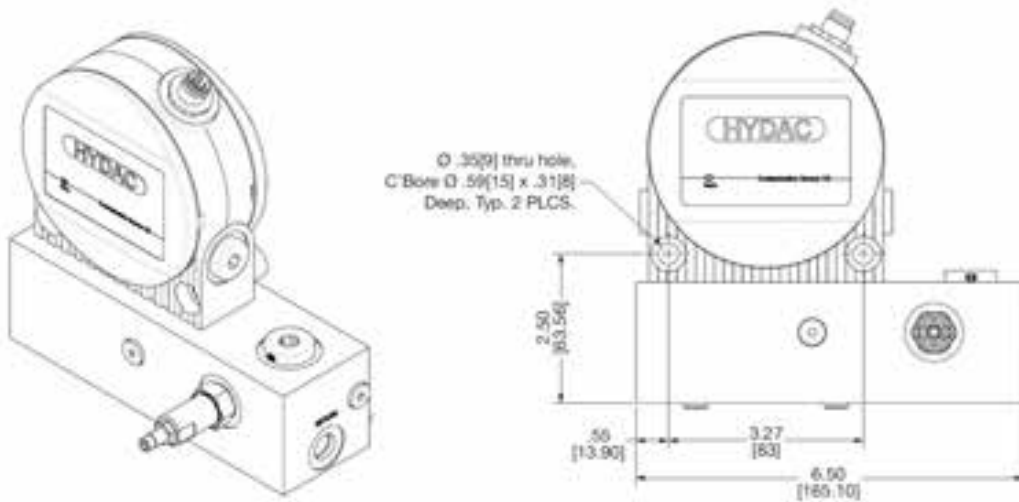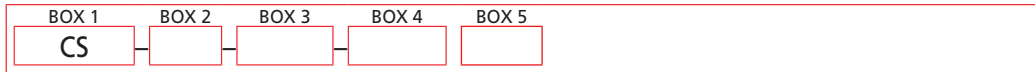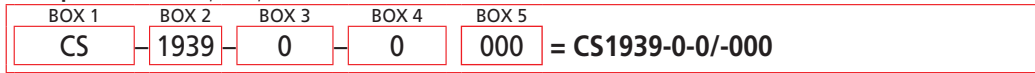
BOX 1	BOX 2
Type	**Indicator Code**
CS	1939 = Contamination Codes ISO 4406; SAE 4059 (D) / > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c) Interface/protocol: CAN/CAN SAE J1939 without Display (Electrical connection Plug M12x1, 5-pole)

BOX 3	BOX 4	BOX 5
Fluids	**Mounting**	**Modification Number**
0 = based on Mineral Oil	0 = Inline or hose connection	000 = Standard
1 = Phosphate Esters	1 = Flanged connection	K = CS Block Kit *(requires mounting option 1)*

Scope of Delivery

- Contamination Sensor

- 2 x O-Ring
(only for flange connection version)

- Calibration Certificate

- CD with FluMoS Light Software and manual

- CD with detailed operating and maintenance instructions
in different languages (PDF viewer software required)

Accessories

Designation	Part-No.
Supply voltage	
Female connector with 5 m cable, screened, 5-pole, M12x1	3527626
Female connector with 10 m cable, screened, 5-pole, M12x1	3527627
Extension cable 5 m, female connector 5-pole, M12x1 / Male connector 5-pole, M12x1	6040852
Female connector with screw terminal, 5-pole, M12x1	6049128
CSI-D-5 Contamination sensor interface	3249563
FluMoS Professional Software (CD)	3371637

Pressure - Viscosity Range
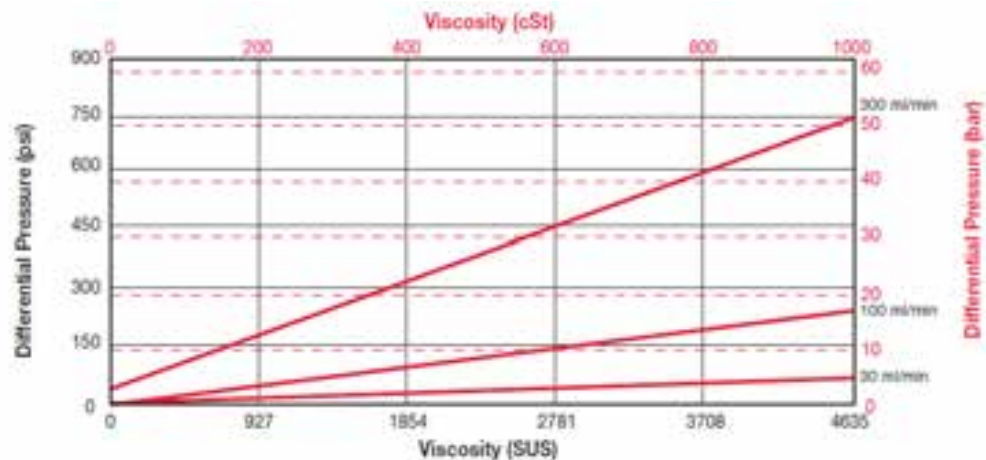
ConditionSensor Interface CSI-C-11

Features and Benefits

- Ability to view in real-time measured contamination results via Wireless Connection or *Bluetooth*® wireless technology with the FluMoS Mobile App
- Storage of the measured data directly on the CSI-C-11
- Easily interface digital sensors into existing LAN network
- Direct connection of up to two (2) SMART sensors via M12x1 connectors
- Integral bracket allows for easy installation on existing machines
- Due to high protection class of IP66, no switch cabinet for installation is required

- Usable with FluMoS Mobile App

Market Applications

- Construction Equipment
- Agricultural Machinery
- Test Benches
- Industrial Hydraulic Systems

- Combination with Filter Unit
- Power Units
- Any hydraulic system that requires on-line monitoring
- Mobile and Stationary Mining Equipment

Description

The ConditionSensor Interface CSI-C-11 is used to transmit digital sensor signals into a network protocol (HSI TCP/IP or Modbus® TCP), which can be transmitted to a stationary or mobile device via network cable (LAN) or wireless connection (W-LAN). Moreover, the CSI-C-11 is equipped with an internal memory and can be used as a data logger.

At the interface module, up to two sensors can be connected via M12 connector and supplied with power. In addition, the CSI-C-11 is equipped with an Ethernet connector (M12x1 socket), which allows the integration of connected sensors into company networks and control systems (PLC).

Specifications

HSI Interface:	Schroeder Sensor Interface for digital coupling of sensors
Ethernet 10 Base-T / 100 Base-TX W-LAN (HSI only) 2,4 GHz, IEEE 802.11 b/g/n:	Protocol: HSI TCP/IP (Port 49322) Modbus® TCP (Port 502)
Operating temp. range:	-13 to 185°F (-25 to 85°C)
Storage temp. range:	-22 to 185°F (-30 to 85°C)
Relative humidity:	0 … 70 %, non-condensing
CE marked:	EN 61000-6-2, EN 61000-6-4
Protection class according to DIN 40050:	IP 66
Supply Voltage:	12 … 24 V DC ± 10 %
Current requirement (module):	100 mA (plus the consumption of the connected sensors)
Sensor supply:	12 … 24 V DC (looped through)
Electrical connection:	Supply voltage: Connector, M12, 5-pole, male SMART Sensor 1: Connector, M12, 8-pole, female SMART Sensor 2: Connector, M12, 5-pole, female LAN: Connector, M12, 4-pole, coding D (according to IEC61076-2-101), female W-LAN antenna: Connector, RP-SMA socket, female
Parameterisation:	via connector M12x1, 5-pole acc. to DIN VDE 0627 or W-LAN (FluMoS mobile)
Dimensions:	5.2" x 3.1" x 1.4" (131 x 77.5 x 35.5 mm)
Housing:	die cast aluminium
Weight:	0.79 lb. (≈ 360 g)
Size:	64 mB

CSI-C-11 ConditionSensor Interface

Model Number Selection

How to Build a Valid Model Number for a Schroeder CSI-C-11:

BOX 1	BOX 2	BOX 3	BOX 4
CSI			

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	
CSI	C	11	000	= CSIC11000

BOX 1	BOX 2	BOX 3	BOX 4
Type	**Housing**	**Output Type**	**Modification**
CSI	C = Aluminum Housing	11 = HSI Ethernet / W-LAN	000 = Standard

Accessories

Designation	Part-No.
Supply voltage	
PS5 power supply 100 – 240V AC, 50-60 Hz, 1,1 A, IP40; connector M12, 5-pole, female	3399939
ZBE-43-05 connecting cable, connector 5-pole with cable, length = 16.4 ft. (5 m)	3281240
ZBE-43-10 connecting cable, connector 5-pole with cable, length = 32.8 ft. (10 m)	3519768
Sensor connection cable for CSM-E	
ZBE43-005 connecting cable CSI-C-11, coupling / plug 8-pole, length = 1.6 ft. (0.5 m)	4193544
ZBE30-005 connecting cable CSI-C-11, coupling / plug 5-pole, length = 1.6 Ft. (0.5 m)	4193586
Network cable (LAN)	
ZBE 45-05 network cable (Patch), connector 4-pole, coding D / connector RJ45, length = 16.4 ft. (5 m)	3346100
ZBE 45-10 network cable (Patch), connector 4-pole, coding D / connector RJ45, length = 32.8 ft. (10 m)	3346101

Dimensions

Metric dimensions in ( ).

ConditionSensor Interface **CSI-C-11**

CS 1000

CS 1939

CSI-C-11

HY-TRAX®

RBSA

CSM

FCU

MCS

AS

SMU

CTU

EPK

Trouble
Check Plus

HMG2500

HMG4000

ET-100-6

HTB

RFSA

HFS-BC

HFS-15

MFD-BC

MFS, MFD

HY-TRAX®
Retrofit System

MFD-MV

MFS-HV

AMS, AMD

FS

AMFS

KLS, KLD

MCO

AKS, AKD

LSN, LSA, LSW

X Series

OLF Compact

OLF

OLF-P

NxTM

VEU

IXU

Triton-A

Triton-E

NAV

SVD01

SVD

OXS

Appendix

**Predictive
Maintenance**

Predictive Maintenance 4.0

CSI-C-11   ConditionSensor Interface

Plug Pin Assignment

| Pin	Signal	Description	
1.1	Vin 12 … 24 V DC	Device (CSI-C-11)	Power supply +
1.2	---	Device (CSI-C-11	n.a.
1.3	GND	Device (CSI-C-11)	Power supply GND
1.4	---	Device (CSI-C-11)	n.a.
1.5	HIS	Device (CSI-C-11)	Parameterisation
2.1	S1 12 … 24 V DC	Sensor 1	Power supply +
2.1	---	Sensor 1	n.a.
2.3	S1 GND	Sensor 1	Power supply GND
2.4	---	Sensor 1	n.a.
2.5	S1 HIS	Sensor 1	HSI signal
2.6	---	Sensor 1	n.a.
2.7	---	Sensor 1	n.a.
2.8	---	Sensor 1	n.a.
3.1	S2 12 … 24 V DC	Sensor 2	Power supply +
3.2	---	Sensor 2	n.a.
3.3	S2 GND	Sensor 2	Power supply GND
3.4	---	Sensor 2	n.a.
3.5	S2 HIS	Sensor 2	HSI signal
4.1	ETH TX+	Network (LAN)	Ethernet port data transmission +
4.2	ETH RX+	Network (LAN)	Ethernet port data receive +
4.3	ETH TX-	Network (LAN)	Ethernet port data transmission -
4.4	ETH RX-	Network (LAN)	Ethernet port data receive -
5.1	ANT	Network (W-LAN)	RP-SMA-socket W-LAN-antenna

Manually Controlled Fluid Sampling System

Patent pending

Features and Benefits

- Provides Local Visibility to the Fluid Condition of Critical Systems.
- Integrated micro VSD, (Variable Speed Drive), pump/motor provides optimal flow for accurate sensor readings in variable conditions.
- The HY-TRAX® Manually Controlled Fluid Sampling System allows a user to retrieve ISO cleanliness levels from a reservoir tank or a low-pressure line (<50 psi max).
- The compact design allows for installations with tight space constraints.
- The Manual rheostat VSD pump controller is housed in a compact IP 40 enclosure and allows the user to adjust the pump flow for optimal sensor readings.
- Optional AC adapter allows the unit to operate on 115 VAC 60 Hz. 24 VDC is standard.
- Rugged design for field use.
- Viton® seals.
- Fluid viscosities up to 350 cSt.
- Flow control valve providing optimal pressure for accurate sensor readings.

HY-TRAX®
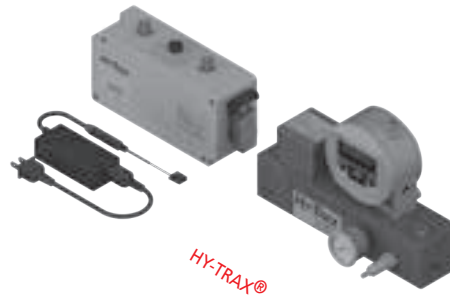
Applications

- Mobile Equipment Technology
- Surface Mining
- Construction
- Monitoring of Oil Cleanliness in Storage Tanks
- Fleet Services
- Rail

- TestMate® Contamination Monitor (TCM)
- Machined, 6061-T651 aluminum alloy manifold block with anodized surface treatment.
- Specially designed fitting for mating to pump/motor.
- Viton® seals.
- Plugged water sensor port (G3/8)
- VSD (Variable Speed Drive) Motor Power Supply and Control Cable
- Water Sensor (TWS-D) Power Supply and Signal Cable (only supplied with optional water sensor (TWS-D))
- Contamination Monitor (TCM) output signal, USB-B Female Port for use with Windows-Based Computer and FluMoS Software, located on Control Enclosure
- Contamination Monitor (TCM), output signal, M12x1, 8 pole, Male Port, located on Control Enclosure, for use with PLC or RS485 Communication, analog or digital, 4 - 20 mA is standard, 2 to 10 V is optional

- Flow control valve
- VSD (Variable Speed Drive) pump/motor
- Manual rheostat pump controller
- IP 40 enclosure
- Fluid Inlet/Outlet Porting (SAE Size 04 ORB)
- 24 VDC Power Supply (NC3MP Female Connector)
- Optional 115 VAC Power Supply with Cord
- Contamination Monitor (TCM) Power and Signal Cable
- Water Sensor (TWS-D) M12x1, 5 pole Signal Output Connection, Male Port, located on Control Enclosure
- Contamination monitor (TCM) power connection, female M12x1, 8 pole located on control enclosure
- Water sensor (TWS-D) power connection, M12x1, 5 pole Female located on control enclosure

Manually Controlled Fluid Sampling System

What's Included

Specifications

Measuring Range:	Display ISO ranges between 25/24/23 and 9/8/7 Calibration within the range ISO 13/11/10 to 23/21/18
Contamination Output Code:	**Standard:** ISO 4406:1999 or SAE AS 4059(D) **Optional:** ISO 4406:1987; NAS 1638 and ISO 4406:1999
Self-Diagnosis:	Continuously with error indication via status LED
Pressure Rating:	50 psi (3.4 bar) max
Fluid Inlet/Outlet:	SAE ORB, Size 4
Seal Material:	Viton®
Pump Speed:	500-5000 rpm (adjustable)
Optimal Sampling Pump Flow Rate:	0.008-0.079 gpm (30-300 mL/min)
Fluid Temperature Range:	32°F to 185°F (0°C to +85°C)
Ambient Temperature Range:	-22°F to 176°F (-30°C to 80°)
Max Viscosity:	1622 SUS (350 cSt)
Pump Type:	Gear Pump
Power Supply Voltage:	24 VDC +/- 10%, Residual Ripple <10%
Max Power/Current Consumption:	100 Watt/ 4 amp
Electric Output:	4-20 mA analog output; 2 to 10 V analog (option for contamination monitor (TCM)) RS485 for communication with FluMoS Software
Electrical Specifications:	4 - 20 mA analog output (max burden 330 Ω)
	2 to 10 V output (min load resistor 82 Ω)
	Limit switching output (Power MOSFET): max current 1.5A
TestMate® Contamination Monitor (TCM) Signal Output Connections Located on Control Enclosure:	USB-B Female Port for use with Windows-based computer and FluMoS Software
	M12x1, 8 pole, Male Port, Analog or Digital, for use with PLC or RS485 Communication, (4 - 20 mA is standard). 2 to 10 V is optional, must specify when ordering TestMate® Contamination Monitor (TCM)
Water Sensor (TWS-D) Signal Output Connection Located on Control Enclosure:	Water sensor (TWS-D) M12x1, 5 pole Signal Output 5 pole Male Port, located on Control Enclosure
Electrical Safety Class:	III (low voltage protection)
Enclosure Ratings:	IP 40 enclosure

Weight and Dimensions			
Communications Module Control TestMate® Sensor	Fluid Sampling System Manifold w/ TCM & VSD Pump/Motor	HY-TRAX® Manual Control Module	Fluid Sampling Manifold w/ Communications Module & VSD Pump/ Motor
	10 lbs. (4.5 kg)	5 lbs. (2.5 kg)	15 lbs. (6.8 kg)
	10.3" x 6.8" x 4.3" (262 x 173 x 109 mm)	9.3" x 5.7" X 2.6" (236 X 145 x 65 mm)	

HY-TRAX® Manually Controlled Fluid Sampling System

Features and Benefits

- Provides Local Visibility to the Fluid Condition of Critical Systems.

- Integrated micro VSD, (Variable Speed Drive), pump/ motor provides optimal flow for accurate sensor readings invariable conditions.

- Designed to be used with Schroeder Industries TestMate® contamination monitor (TCM) and optional water sensor.

- The HY-TRAX® Manually Controlled Fluid Sampling System allows a user to retrieve ISO cleanliness levels from a reservoir tank or a low-pressure line (50 psi max).

- The compact design allows for installations with tight space constraints.

- The Manual VSD pump controller is housed in a compact IP 40 enclosure and allows the user to adjust the pump flow for optimal sensor readings.

- Optional AC adapter allows the unit to operate on 115 VAC 60 Htz.

- Rugged design for field use.

- Viton® seals.

- Fluid viscosities up to 350 cSt.

- Flow control valve providing optimal pressure for accurate sensor readings.

- Manual rheostat control adjusts VSD (Variable Speed Drive) pump speed to adjust for variances in fluid viscosities.

For Customers who have a TestMate® Contamination Monitor (TCM)

**HY-TRAX®
Fluid Sampling
System
Manifold
with Manual
Controller and
VSD Pump/
Motor**

- Machined, 6061-T651 aluminum alloy manifold block with anodized surface treatment.

- Specially designed fitting for mating to pump/motor.

- Viton® seals.

- Plugged water sensor port (G3/8)

- VSD (Variable Speed Drive) Motor Power Supply and Control Cable

- Flow control valve

- VSD (Variable Speed Drive) pump/motor

- Manual rheostat pump controller
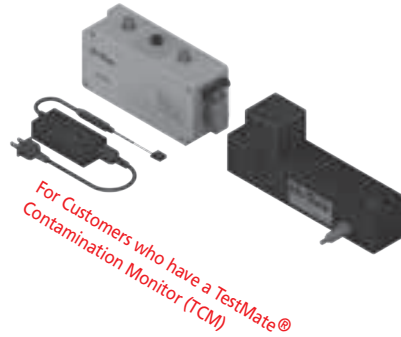
- IP 40 enclosure

- Fluid Inlet/Outlet Porting (SAE Size 04 ORB)

- 24 VDC Power Supply (NC3MP Female Connector)

- Optional 115 VAC Power Supply with Cord

- Water Sensor (TWS-D) M12x1, 5 pole Signal Output Connection, Male Port, located on control enclosure

- TestMate® Contamination monitor (TCM) power connection, female M12x1, 8 pole located on control enclosure

- Water sensor (TWS-D) power connection, M12x1, 5 pole Female located on control enclosure

**What's
Included**

Manually Controlled Fluid Sampling System

HY-TRAX®

Model Number Selection

How to Build a Valid Model Number for a Schroeder HY-TRAX® Manually Controlled Fluid Sampling System:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
HY								

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
HY		H		M					= HYHM

BOX 1
Model
HY

BOX 2
TestMate® Contamination Monitor (TCM)
Omit = TCM w/ display
ND = TCM w/ no display
NT = Manifold supplied w/ no TCM, Customer will supply TCM (manifold mount version needed)

BOX 3
Fluid Type
H = For use w/ Hydraulic & Diesel Fuel only*

BOX 4
TestMate® Contamination Monitor (TCM) Signal Output
Omit = 4-20 mA
S = 2 to 10 V analog output

BOX 5
TestMate® Contamination Monitor (TCM) Output Options
M = ISO 4406/SAE 4049
N = ISO 4406/NAS 1638

BOX 6
Water Sensor (TWS) Option
Omit = None
TWS-D = Water sensor w/ display

BOX 7
Manually Controlled Sampling System
Omit = Panel with Rheostat flow control, power and signal output for HY-TRAX® sampling system

BOX 8
Power Options
Omit = 24 VDC
P = 115 VAC

BOX 9
Air Suppression Loop
Omit = None
L = Looped hose and fitting

*Note: Off-road diesel contains dye. High concentrations of dye may interfere with particle count results. Please contact factory to review application.

HY-TRAX®

Telematic Communications Module with Remote Controlled Sampling System

Patent pending

HY

CS 1000
CS 1939
CSI-C-11
Communications Module with Remote Controlled Sampling System
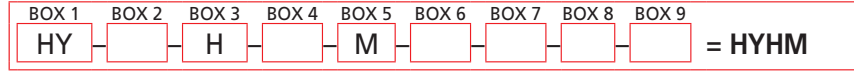HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

Features and Benefits

- Provides Remote Visibility to the Fluid Condition of Critical Systems.

- Integrated micro VSD, (Variable Speed Drive), pump/motor provides optimal flow for accurate sensor readings in variable conditions.

- This HY-TRAX® Remote Oil Contamination Sensor Package allows remote access via the Internet and smart devices to fluid particle counts, temperature, and percent water saturation levels (optional) displayed on a customizable dashboard. The fluid sampling system collects data and the communications module transmits this data via GSM cellular at scheduled intervals. Users can receive alerts via email when a fluid's ISO contamination code or water saturation level (optional) reaches user defined critical levels. The unit can sample fluid directly from a fluid reservoir or low pressure line (<50 psi).

- The Communications Module automatically controls fluid flow to compensate for viscosity changes due to temperature or fluid type. All data is transmitted through a secure VPN and archived in a protected database in the cloud to allow real-time and historical analysis.

- The HY-TRAX® Communications Module will provide maintenance managers with the visibility and vital information necessary to pro-actively schedule preventative maintenance on local and remote equipment. Maintenance decisions can now be based on accurate and real-time data.

- The communications module components are mounted and housed in a rugged IP 40 enclosure.

- Fluid sampling system standard with Viton® seals.

- Fluid viscosities up to 350 cSt.

- 50 psi (max.) working pressure.

- Flow control valve providing optimal pressure for accurate sensor readings.

- VSD, (Variable Speed Drive), pump/motor providing optimal flow for accurate sensor readings.

Applications

- Mobile Equipment Technology
- Surface Mining
- Construction
- Monitoring of Oil Cleanliness in Storage Tanks
- Fleet Services
- Rail

What's Included

- TestMate® Contamination monitor (TCM)
- Flow Control Valve
- GSM cellular communications
- VSD pump/motor
- Machined, 6061-T651 aluminum alloy manifold block with anodized surface treatment
- TestMate® Contamination Monitor (TCM) Communications/Power Cable
- Specially designed fitting for mating to pump/motor

- Plugged water sensor port (G3/8)
- IP 40 enclosure
- Water sensor (optional)
- 24 volts DC standard with optional 115 VAC Power Supply
- Optional Water Sensor (TWS-D) Communication/Power Cable
- Fluid Inlet/Outlet Porting (SAE Size 04 ORB)

Telematic Communications Module with Remote Controlled Sampling System

HY-TRAX®

Specifications

Measuring Range:	Display ISO ranges between 25/24/23 and 9/8/7 Calibration within the range ISO 13/11/10 to 23/21/18
Contamination Output Code:	**Standard:** ISO 4406:1999 or SAE AS 4059(D) **Optional:** ISO4406:1987; NAS 1638 and ISO 4406:1999
Self-Diagnosis:	Continuously with error indication via status LED
Pressure Rating:	50 psi (3.4 bar) max
Fluid Inlet/Outlet:	SAE ORB, Size 4
Seal Material:	Viton®
Pump Speed:	500-5000 rpm (adjustable)
Optimal Sampling Pump Flow Rate:	0.008-0.079 gpm (30-300 mL/min)
Fluid Temperature Range:	32°F to 185°F (0°C to +85°C)
Ambient Temperature Range:	-22°F to 176°F (-30°C to 80°)
Max Viscosity:	1622 SUS (350 cSt)
Pump Type:	Gear Pump
Power Supply:	24 volts DC
Power Consumption:	4A
Communications Module Signal Output:	GSM cellular Communication to monitoring website
Electrical Safety Class:	III (low voltage protection), IP 40 enclosure
Cellular Communications:	AT&T Quad Band GSM (850, 900, 1800, 1900 MHz)

Weight and Dimensions

Communications Module Control TestMate® Sensor	Fluid Sampling System Manifold w/ TCM & VSD Pump/Motor	HY-TRAX® Communications Module	Fluid Sampling Manifold w/ Communications Module & VSD Pump/Motor
	10 lbs. (4.5 kg)	10 lbs. (4.5 kg)	20 lbs. (9.1 kg)
	10.4" x 6.8" x 4.3" (264 x 173 x 109 mm)	14.7" x 11.3" x 5.25" (374 x 287 x 133 mm)	

HY-TRAX®

Telematic Communications Module with Remote Controlled Sampling System

Features and Benefits

- Integrated micro VFC, (Variable Speed Drive), pump/motor provides optimal flow for accurate sensor readings in variable conditions
- Rugged design for field use
- Fluid viscosities up to 350 cSt
- 50 psi (max.) working pressure
- Flow control valve providing optimal pressure for accurate sensor readings
- Designed to be used with Schroeder Industries' communications module and optional water sensor

What's Included

- Machined, 6061-T651 aluminum alloy manifold block with anodized surface treatment.
- Specially designed fitting for mating to pump/motor.
- Viton® seals.
- Plugged water sensor port (G3/8)
- Flow control valve
- Contamination Monitor
- Micro VSD pump/motor
- Fluid Inlet/Outlet Porting (SAE Size 04 ORB)

HY-TRAX® Fluid Sampling System Manifold with Contamination Sensor and VSD Pump/Motor

Features and Benefits

- Provides Remote Visibility to the Fluid Condition of Critical Systems.
- Integrated micro VSD, (Variable Speed Drive), pump/motor provides optimal flow for accurate sensor readings in variable conditions.
- Designed to be used with Schroeder Industries contamination monitor (TCM - manifold mount version only) and optional water sensor.
- This HY-TRAX® Remote Oil Contamination Sensor Package allows remote access via the Internet and smart devices to fluid particle counts, temperature, and percent water saturation levels (optional) displayed on a customizable dashboard. The fluid sampling system collects data and the communications module transmits this data via GSM cellular at scheduled intervals or on demand. Users can receive alerts via email when a fluid's ISO contamination code or water saturation level (optional) reaches user defined critical levels. The unit can sample fluid directly from a fluid reservoir or low pressure line (<50psi).
- The Communications Module automatically controls fluid flow to compensate for viscosity changes due to temperature or fluid type. All data is transmitted through a secure VPN and archived in a protected database in the cloud to allow real-time and historical analysis.
- The HY-TRAX® Communications Module will provide maintenance managers with the visibility and vital information necessary to pro-actively schedule preventative maintenance on local and remote equipment. Maintenance decisions can now be based on accurate and real-time data.
- The communications module components are mounted and housed in a rugged weatherproof IP 40 enclosure.
- Fluid sampling system standard with Viton® seals.
- Fluid viscosities up to 350 cSt.
- 50 psi (max.) working pressure.
- Flow control valve providing optimal pressure for accurate sensor readings.
- VSD, (Variable Speed Drive), pump/motor providing optimal flow for accurate sensor readings.

For Customers who have a TestMate® Contamination Monitor (CS) (CS must be 4-20 mA output)

What's Included

- Flow Control Valve
- GSM cellular communications
- VSD pump/motor
- Machined, 6061-T651 aluminum alloy manifold block with anodized surface treatment
- Specially designed fitting for mating to pump/motor
- IP 40 enclosure
- Plugged water sensor port (G3/8)
- Fluid Inlet/Outlet Porting (SAE Size 04 ORB)

HY-TRAX® Fluid Sampling Manifold with Communications Module and VSD Pump/Motor

HY-TRAX® Telematics Communications Module only operates with TCM's operating on Firmware 3.0 and 4-20 mA outputs. Older firmware versions will not communicate proper flow rate to the telematics module. Contact factory for more details.

Telematic Communications Module
with Remote Controlled Sampling System

HY-TRAX®

HY-TRAX®
Communications
Module

HY-TRAX®
Telematics
Communications
Module can be
utilized on existing
CS installations
when the sensor
receives adequate
pressure (>120 psi)
and flow (30-150
mL/min) from the
hydraulic system.
The CS must have
4-20 mA outputs
and Firmware
version 3.0.

HY-TRAX® Communications Module Only.
*Order part # HY-COMMMOD*

What's Included

- GSM cellular communications

- IP 40 enclosure

- VSD, (Variable Speed Drive), Motor Controller

- 115 VAC Power Supply

Features and Benefits

- Provides remote visibility to the fluid condition of critical systems.

- The HY-TRAX® Remote Oil Contamination Communications Module allows remote access via the Internet and smart devices to fluid particle counts, temperature and percent water saturation levels (optional) displayed on a customizable dashboard. The Communications Module collects and transmits data via GSM cellular at scheduled intervals. Users can receive alerts via email or text when the fluid's ISO contamination code or water saturation level (optional) reaches user defined critical levels.

- The Communications Module automatically controls fluid flow to compensate for viscosity changes due to temperature or fluid type. All data is transmitted through a secure VPN and archived in a protected database in the cloud to allow real-time and historical analysis.

- The HY-TRAX® Communications Module will provide maintenance managers with the visibility and vital information necessary to pro-actively schedule preventative maintenance on local and remote equipment. Maintenance decisions can now be based on accurate and real-time data.

- The communications module components are mounted and housed in a rugged IP 40 enclosure.

HY-TRAX®

Telematic Communications Module with Remote Controlled Sampling System
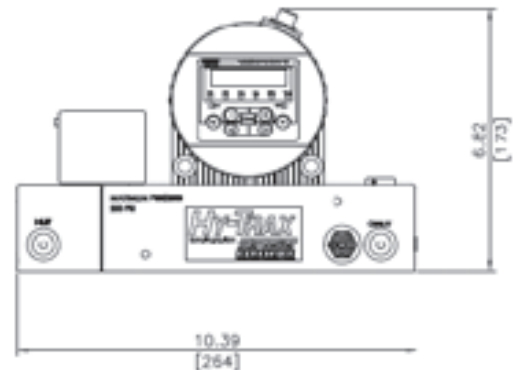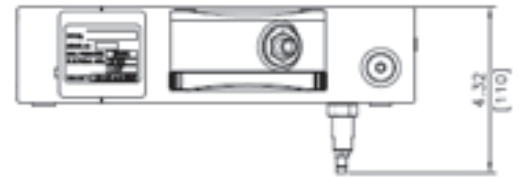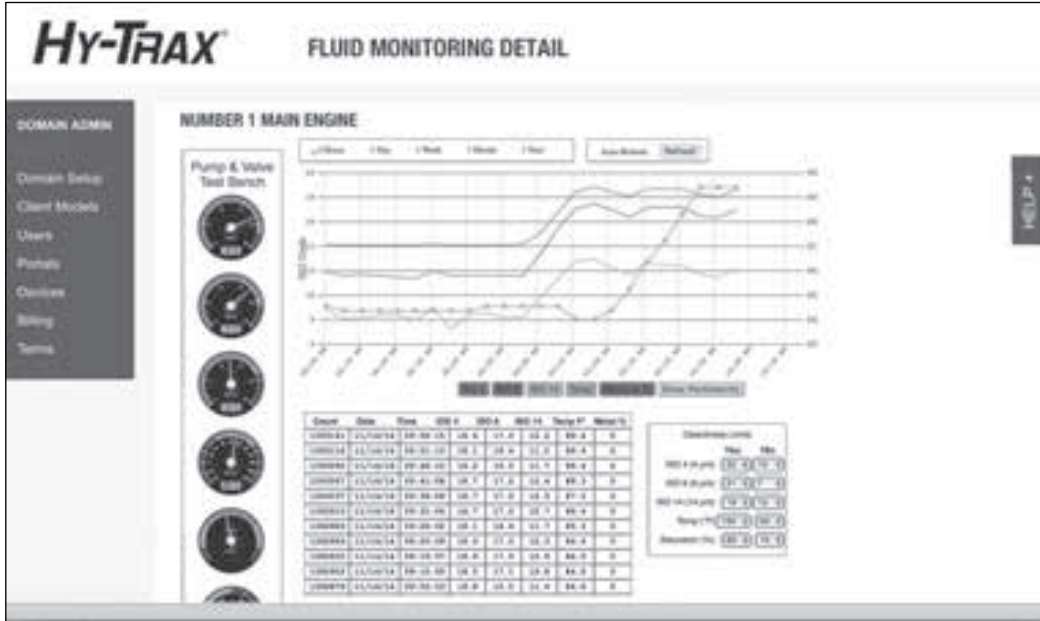
Example of HY-TRAX® Communications Modules Dashboard Contamination Chart

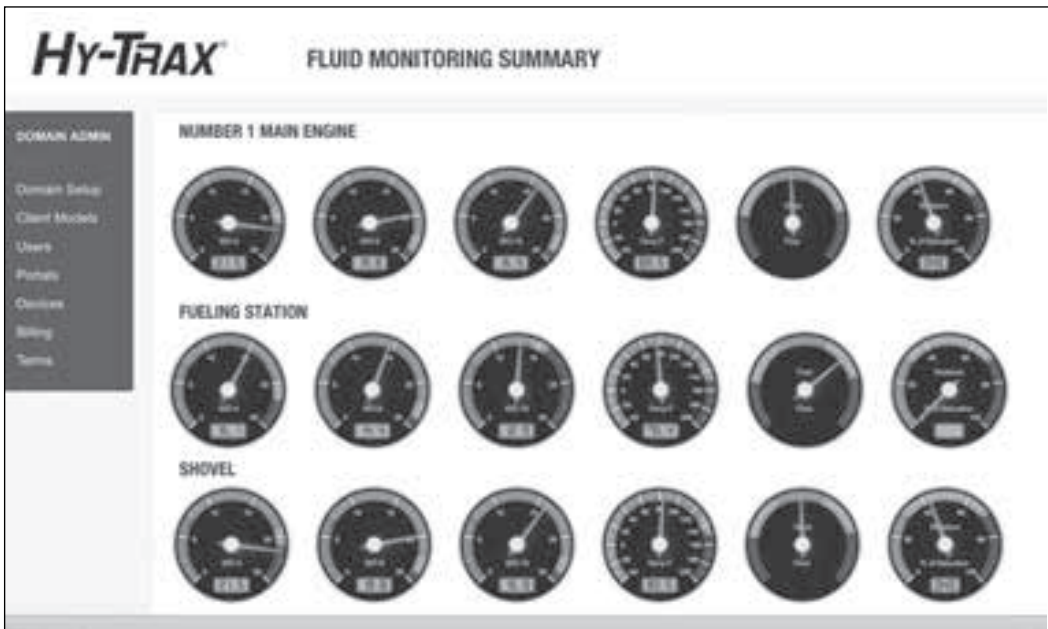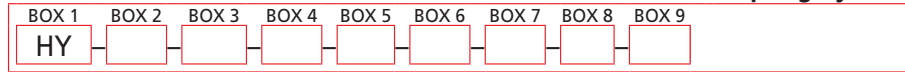**Example of HY-TRAX® Communications Modules Dashboard Gauge Panel**

Telematic Communications Module with Remote Controlled Sampling System
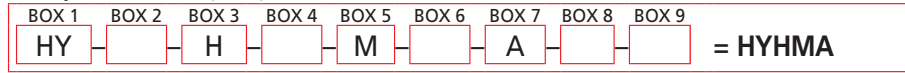
HY-TRAX®

Model Number Selection

How to Build a Valid Model Number for a Schroeder HY-TRAX® Telematic Communications Module with Remote Controlled Fluid Sampling System:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
HY								

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
HY		H		M		A			= HYHMA

HY-TRAX®
Telematics Communications Module only operates with CS's operating on Firmware V03.00. Older firmware versions will not communicate proper flow rate to the telematics module. Contact factory for additional information.

BOX 1

Model
HY

BOX 2

TestMate® Contamination Monitor (TCM)
Omit = TCM w/ display
ND = TCM w/ no display
NT = Manifold supplied w/ no TCM, Customer will supply TCM; TCM must be 4-20 mA output only

BOX 3

Fluid Type
H = For use w/ Hydraulic & Diesel Fuel only*

BOX 4

TestMate® Contamination Monitor (TCM) Signal Output
Omit = 4-20 mA
NOTE: For customers with existing TCMs w/ a 2 to 10 V analog output please see HY-TRAX® Manually Controlled Sampling System

BOX 5

TestMate® Contamination Monitor (TCM) Output Options
M = ISO 4406/SAE 4049
N = ISO 4406/NAS 1638

BOX 6

Water Sensor (TWS) Option
Omit = None
TWS-D = Water sensor w/ display

BOX 7

Communications Module w/ Remote Controlled Fluid Sampling System
A = Telematic Communications Module w/ Dashboard Data Display (GSM Cellular)
NOTE: For customers with existing TCMs w/ a 2 to 10 V analog output please see HY-TRAX® Manually Controlled Sampling System

BOX 8

Communications Module Power Options
Omit = 24 VDC
P = 115 VAC

BOX 9

Air Suppression Loop
Omit = None
L = Looped hose and fitting

*Note: Off-road diesel contains dye. High concentrations of dye may interfere with particle count results. Please contact factory to review application.

Reservoir Breather Fluid Sampling Adapter **RBSA**

Features and Benefits

- Drop-in reservoir breather retrofit for fluid sampling provides clean easy access to the reservoir through the existing breather part

- Provides easy fluid quality sampling solution for HY-TRAX® and TMU suction and return ports

- Hytrax adapter kit includes #6 & #4 JIC adapters with 6' connection hoses included

- TMU adapter includes 1620 testpoint and 3' connection hose to TMU

- 24" SS drop tubes can be cut to length

- Standard 6 bolt breather pattern

- Anodized 6061 aluminum breather

- ¾" NPT for breather element

Market Applications

- All applications with a hydraulic reservoir utilizing a 6-bolt mounting connection
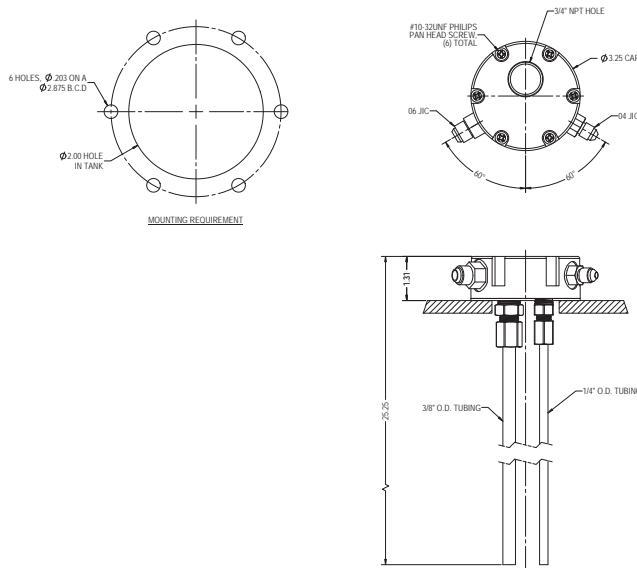
Reservoir Breather Sampling Adapter

Mounting Requirement

Specifications

Reservoir Mounting Pattern:	Fits standard 6-bolt
Supply Port Thread Size:	9/16-18 UN
Return Port Thread Size:	7/16-20 UN
Breather Port Thread Size:	¾" NPT
Fittings:	Option 1: Includes #4 & #6 JIC fittings. Optional #6 & #4 JIC fittings and 6' supply/return hoses.
	Option 2: Includes 1620 test point and TMU connection hose.
Return Tubes:	Supplied with 3/8" and ¼" return tubes. Tubes are 24" long and can be shortened if necessary. Housing constructed 6061 anodized aluminum.

RBSA   Reservoir Breather Fluid Sampling Adapter

Application Example

Parts List Drawing
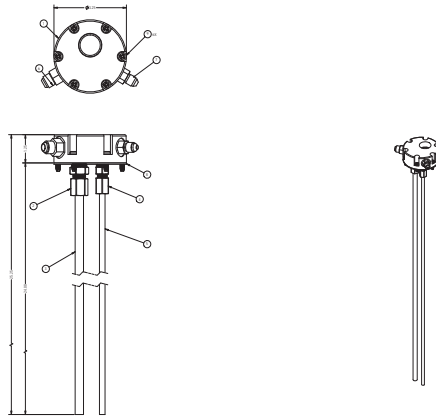
Reservoir Mounting Views

³⁄₈" return port

¹⁄₄" suction port

Breather with ¾" NPT.

RBSA 6 bolt sampling adapter with ¾" NPT breather port. Suction and return ports with ⅜" JIC and ¼" JIC connections, respectively.

24"

Reservoir

Reservoir top view 6 bolt reservoir breather mounting location.
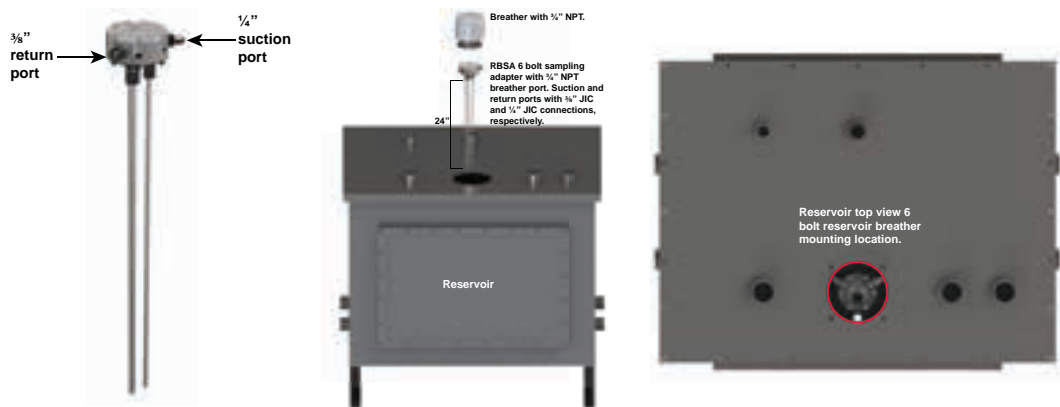
Model Number Selection

How to Build a Valid Model Number for a Schroeder Reservoir Breather Fluid Sampling Adapter RBSA:

BOX 1	BOX 2
RBSA	

Example: *NOTE: Box 2 can have multiple options.*

BOX 1	BOX 2	
RBSA	1	= RBSA-1

BOX 1	BOX 2
Model	**Options**
RBSA	1 = HY-TRAX® adapter fitting #6 & #4 JIC fittings and 6' supply/return hoses
	2 = TMU adapter (suction hose included)

Contamination Sensor Module CSM 1000

Formally Known as "TSU - TestMate® Sensor Unit"
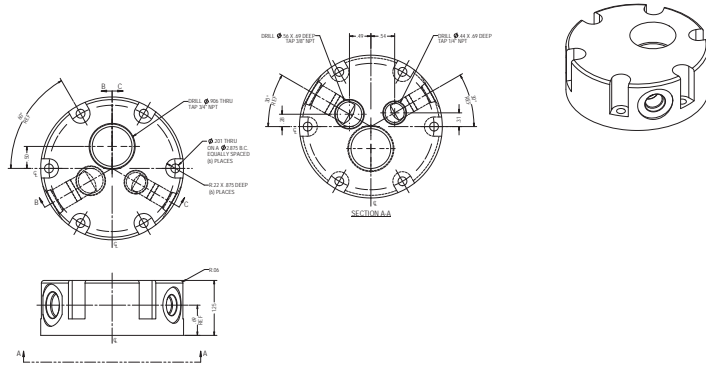
CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

Description

The Contamination Sensor Module (CSM) is an online condition monitoring system for detecting particle contamination in hydraulic and lubrication fluids containing a high proportion of air bubbles. Air bubble suppression is used to dissolve the air bubbles so that they are not detected as particles. Moreover, it is the ideal solution for analyzing the particle content of fluids, independently of the rest of the hydraulic system. As an option, other condition monitoring sensors such as the AS 1000 Series Water Sensor can be incorporated.

Applications

- Lubrication systems in paper, steel and energy sectors
- Preventive, pro-active preparation of service/intervals
- Monitoring of component cleanliness on test benches
- Monitoring of oil cleanliness in storage tanks

CSM Installation in System
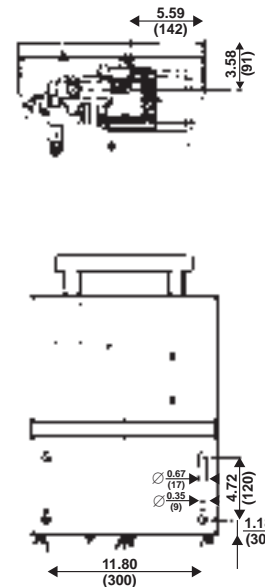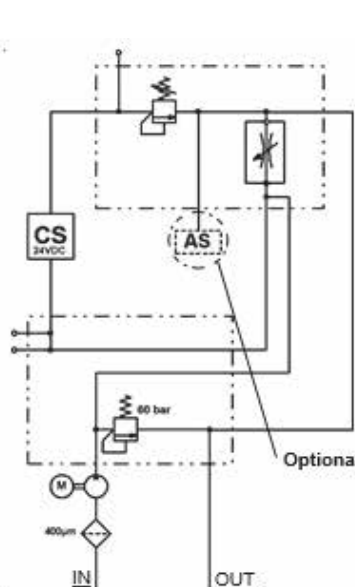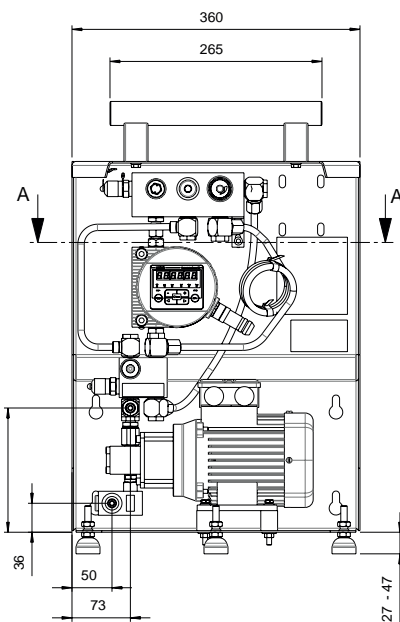
Basically there are three different possibilities for connecting the CSM to hydraulic and lubrication systems. Select the measuring point according to the type of information the customer requires from the system.

1. Measuring from tank
Indicates the overall condition of the oil. Inlet and outlet of the CSM are connected to the tank near the suction of the main pump.

2. Measuring from the pressure line before the filter
This is the normal location for taking bottle samples. By using the CSM the amount of bottle sampling can be reduced and information on the oil condition is therefore available immediately. This test point is used mostly in lube systems.

3. Measuring from pressure line after the filter
This test point is used in roll hydraulics and the reason for measuring oil after the filter is to ensure that clean oil is always available to the sensitive proportional valves and to other machine parts. Mainly used in roll hydraulics and particularly if customers have had problems with the proportional valves.

Important! The pressure should be reduced using a separate valve before the oil goes into the CSM.

CSM 1000 Contamination Sensor Module

Formally Known as "TSU - TestMate® Sensor Unit"

Specifications

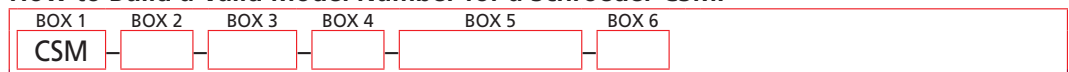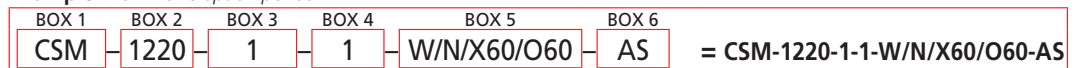|	
Pump Type:	Gear pump
Operation Pressure:	-5.8 - 7.3 psi (-0.4 to 0.5 bar) (standard pump)
P_{in} *(INLET)*:	-5.8 - 1,740 psi (-0.4 to 120 bar) (pump, pressure inlet stable)
P_{out} *(OUTLET)*:	73 psi (5 bar)
P_{out} (leakage line):	7.3 psi (0.5 bar) (pump, pressure inlet stable)
Permissible Outlet Pressure:	73 psi (5 bar max.)
Connections:	INLET: Thread G 1/4, ISO 228 OUTLET: Thread G 1/4, ISO 228
Total Flow Rate:	approx. 100 mL/min (standard pump) approx. 180 mL/min (pump, pressure inlet stable)
Permissible Visc. Range for Measuring:	10 to 1000 cSt
Permissible Fluid Temp. Range:	32°F to 158°F (0°C to 70°C)
Permissible Fluids:	Hydraulic and lubrication fluids based on mineral oil
Power Consumption: *(motor pump group)*:	0.18 kW @ 50 Hz 0.21 kW @ 60 Hz
Ambient Temperature Range:	32°F to 131°F (0°C to 55°C)
Storage Temperature Range:	-4°F to 185°F (-20°C to 85°C)
Relative Humidity:	max. 90%, not condensing
IP Class:	IP55
Weight:	approx. 40 lbs. (18 kg)

Contamination Sensor:

Self-diagnosis:	continuously with error indication via status LED
Measuring Range:	Display from class ISO 9/8/7 (MIN) up to class ISO 25/24/23 (MAX) Calibrated within the range ISO 13/11/10 to ISO 23/21/18
Power Supply Voltage:	9 to 36 VDC, residual ripple <10%
Power Consumption:	3 W max.
Electrical Outputs:	Analog output 4 to 20 mA or 0 to 10 V RS485 interface or switching output

Model Number Selection

How to Build a Valid Model Number for a Schroeder CSM:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6
CSM					

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	
CSM	1220	1	1	W/N/X60/O60	AS	= CSM-1220-1-1-W/N/X60/O60-AS

BOX 1

Model
CSM

BOX 2

Contamination Code
1220 = ISO 4406:1999; SAE AS 4059(D)
1320 = ISO 4406:1987; NAS 1638

BOX 3	BOX 4	BOX 5	BOX 6
Pump	**Output**	**Electrical Supply**	**Water Sensor**
1 = Standard gear pump	1 = 4-20 mA analog	W/N/X60/O60 = 230/460 V 60Hz 3PH 230/400 V 50Hz 3PH	Omit = None
2 = Pump, increased inlet pressure with oil leakage pipe	2 = 0-10 V analog	L60 = 120V, 60Hz, 1Ph	W = AS 1000 Water Sensor
4 = Pump, increased inlet pressure, no oil leakage line, magnetic drive			

What's Included

- CSM
- Operating and maintenance instructions
- CD with FluMoS software and manuals
- Calibration certificate contamination sensor

Fluid Control Units - Portable Models FCU

Formally Known as "TMU - TestMate® Monitoring Unit"

Features and Benefits

- Two contamination calibrations in one instrument (reversible)
- ISO 4406:1987; NAS 1638
- ISO 4406:1999; SAE AS 4059(D)
- Saturation and temperature measurement through the built-in AquaSensor (AS 1000)
- Integrated pump for measurement in pressureless reservoirs
- Operation with 24 VDC network adaptor included in scope of delivery
- Data storage capabilities
- Interfaces: 5-pole plug, Bluetooth, USB data port

Part of the Schroeder Industries 2030 Initiative

FluMoS MOBILE

- Usable with FluMos Mobile App
- Download and store measured data in real-time using FluMoS Mobile App via Bluetooth connection

Description

The FCU1310 combines the advantages of the portable contamination measurement units with the measurement technology of the Contamination Sensor (CS 1000) and AS 1000 Aqua Sensor.

The FCU is a portable service unit and is designed for measurement of solid particle contamination and water saturation in hydraulic systems. It is designed for temporary operation up to a maximum of 30 minute runtime followed by a rest period of 10 minutes and is not intended for continuous operation.

The FCU will measure contamination levels on mineral based hydraulic oils compatible with Viton® seals. The FCU is not compatible with water glycol fluids.

The integrated pump and the hoses with test point connections, which are included with the FCU, allow operation on pressureless reservoirs, control circuits, and high pressure circuits.

Specifications

General Data:		
	Self-Diagnosis:	Continuously with error indication via status LED and display
	Measured Value:	ISO code / SAE Class / NAS Class / Saturation level / Temperature
	Measuring Range:	Display from ISO code 9/8/7 (MIN) to ISO code 25/24/23 (MAX) Calibrated within the range ISO 13/11/10 to 23/21/18 Saturation level 0 to 100 % / Temperature -13°F to 212°F (–25°C to 100°C)
	Accuracy:	± 1/2 ISO class in the calibrated range / ± 2 % Full scale max.
	Material of Sealings:	FPM Viton seals
	Ambient Temperature Range:	32°F to 113°F (0°C to 45°C)
	Storage Temperature Range:	-40°F to 176°F (-40°C to +80°C)
	Dimensions (cover closed):	9" H x 16" L x 13"D
	IP Class:	IP50 in operation IP67 closed
	Weight:	Approx. 29 lbs (13 kg)
Hydraulic Data:	Operating Pressure:	IN: -7.25 to 650 psi (-0.5 to 45 bar) OUT: 0 to 7.5 psi (0 to 0.5 bar)
	with Adapter for Pressure Lines:	IN: 217 to 5000 psi (15 to 345 bar) OUT: 0 to 7.5 psi (0 to 0.5 bar)
	Pressure Max.:	5000 psi (345 bar) (using included high pressure adapter)
	Maximum Suction Height:	39 in (1 m)
	Permissible Viscosity Range:	46 to 1622 SUS (10 to 350 cSt)
	Fluid Temperature Range:	32°F to 158°F (0°C to +70°C)
Electrical Data:	Power Supply Voltage:	24 VDC ± 20%, residual ripple < 10%
	Max. Power / Current Consumption:	100 Watt / 4 A
	Interface:	Plug connection, 5-pole, male, M12x1 and USB

Fluid Control Units - Portable Models

Formally Known as "TMU - TestMate® Monitoring Unit"

Model Number Selection

How to Build a Valid Model Number for a Schroeder FCU:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
FCU				–	–	–	–	

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
FCU	1	3	1	0 –	4 –	U –	AS –	1	**= FCU 1310-4-U-AS-1**

BOX 1	BOX 2	BOX 3
Series	**Model**	**Contamination Code**
FCU = Fluid Control Unit	1000 Series, 1 = 4 particle size channelst	ISO 4406: 1987 NAS 1638 > 2 µm > 5 µm >15 µm > 25 µm 3 = ISO 4406: 1999 SAE AS 4059(D) > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c)

BOX 4	BOX 5	BOX 6	BOX 7
Housing	**Fluids**	**Options**	**Supply Voltage**
1 = for Hydraulic and lubrication fluids based on mineral oils	0 = Mineral Oil, Synthetic Esters/PAO, Quintolubric, Cosmolubric (Consult factory for other fluid types.)	4 = with Integrated Pump	U = 24 V DC
5 = Hydraulic and lubrication fluids based on mineral oils as well as diesel			

BOX 8	BOX 9
Integrated	**Power Supply Adapter**
AS = AquaSensor (AS 1000 series)	1 = 100 to 240 V AC / 50/60 Hz / 1 Phase, (Europe, USA, Canada, UK, Australia, Japan)

We do not guarantee the accuracy or completeness of this information. The information is based on average working conditions. For exceptional operating conditions, please contact our technical department. All details are subject to technical changes.

Items supplied with FCU-1310-4-U-AS-1 include:

- Fluid control Unit FCU 1000
- Power supply AC adapter with connecting cables to supply voltage for Europe, USA/Canada, UK, Australia, & Japan
- Adapter for pressure lines
- Inlet pressure hose with screw connection for 1620 test point, length = 2 meters (approx. 79 inches) in length
- Inlet suction hose, clear, open end, length = 0.3 meters (approx. 12 inches) in length
- Outlet return hose, open end, clear, length 1 meter (approx. 39 inches) in length
- Operation Manual & Calibration Certificate FluMoS Software
- USB Flash Drive

Accessories:

- Battery Pack (approx. 5 hours of use) Part No. 3504605

Metallic Contamination Sensor Series MCS

Formally Known as "TMS Metallic Contamination Sensor Series"

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

Features and Benefits

- Early detection of imminent gear unit damage
- Prevention of expensive plant downtime
- Optimal supplement to optical sensors
- Measurement of metallic particles (ferromagnetic and nonferromagnetic) > 70 µm
- Measurement result is not affected by air bubbles or liquid contamination in the liquid

Applications

- Gear boxes for wind energy
- Paper machine bearings

2.6-53 gpm
10-200 L/min

290 psi
20 bar

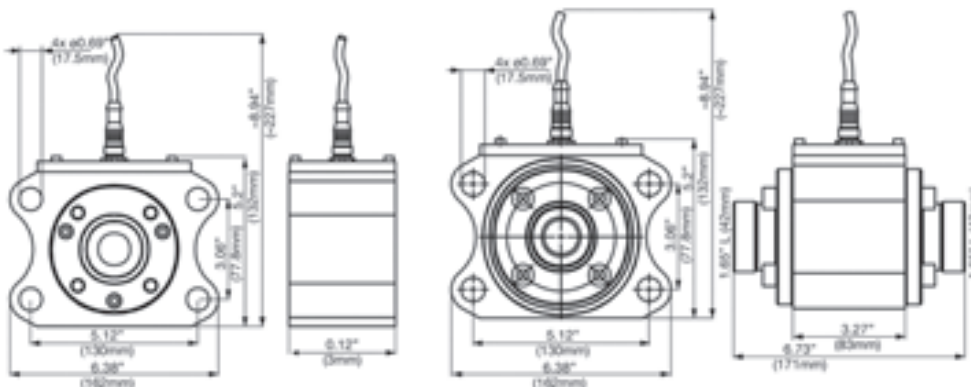- Usable with FluMoS Mobile App when connected to the CSI-C-11

Description

The Metallic Contamination Sensor MCS 1000 detects metallic solid particle contamination in lubrication fluid. The particles are determined according to the inductive measurement process, in which a coil system is the key element of the sensor. Metallic particles (ferromagnetic Fe and nonferromagnetic nFe) in the > 70 µm size range are detected.

The MCS 1000 continuously monitors the status of the system and gives information on imminent gear unit damage. This makes the sensor a reliable instrument for status-oriented maintenance.

Comparison

Technical Details	MCS 15xx	MCS 14xx	MCS 13xx
Flow Rate	2.6... 52.8 gpm (10... 200 l/min)	0.5... 10.6 gpm (2... 40 l/min)	0.1... 2.1 gpm (0.4... 8 l/min)
Diameter sensor cross-section	1" (25.4 mm)	1/2" (12.7 mm)	1/4" (6.3 mm)
Ferromagnetic (Fe) particles	> 200 µm	> 100 µm	> 70 µm
	Particle with volume equivalent to that of a sphere with given Ø		
Non-ferromagnetic (nFe) particles	> 550 µm	> 300 µm	> 200 µm
	Particle with volume equivalent to that of a sphere with given Ø		
Particle Rate	>25/s	>25/s	>25/s

Flange connection, SAE 4" according to ISO 6162-1

MCS with accessory flange adaptor set *(optional)*

Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

Metric dimensions in ( ).

CSI-C-11 Compatible Product

MCS Metallic Contamination Sensor Series

Formally Known as "TMS Metallic Contamination Sensor Series"

Specifications

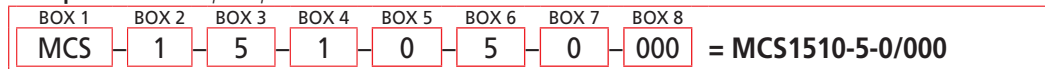| General Data:		
	Ambient Temperature:	-40°F to 158°F (-40°C to +70°C)
	Diameter Sensor Cross-section:	up to 1" (25.4 mm)
	Protection Class to DIN 40050:	IP 67
	Weight:	approx. 8 lbs. (3.5 kg)
	Dimensions (L x W x H):	3.27" x 6.38" x 5.5" (83 x 162 x 140 mm)
	Vibration: 10 - 58 Hz:	0.75 mm (amplitude)
	58 - 500 Hz:	10 g (acceleration)
	Shock:	40 g
Hydraulic Data:	Flow Rate:	2.6 to 53 gpm (10 to 200 l/min)
	Operating Pressure:	290 psi (20 bar)
	Fluid Temperature Range:	-40°F to 185°F (-40°C to +85°C)
	Inlet/Outlet:	Flange connection, SAE 4" according to ISO 6162-1
External Electrical Data:	Supply Voltage:	9 - 36 VDC, residual ripple < 10%
	Power Consumption:	5 W max.
Internal Electrical Data:	2 Configurable:	1 x Ferromagnetic particles (Fe)
	Switching:	1 x Non-ferromagnetic particles (nFe) OR
	Outputs:	1 x Ferromagnetic particles (Fe) +
	(n-switching Power	Non-ferromagnetic particles (nFe)
	MOSFET, normally-open):	1 x Status Signal
	Alarm Relays Capacity:	1.5 A max.
	RS485 Interface:	2 wire, half duplex
	HSI Interface:	1 wire, half duplex
Detection Limits:	Particle Count:	>25/s

We do not guarantee the accuracy or completeness of this information. The information is based on average working conditions. For exceptional operating conditions please contact our technical department. All details are subject to technical changes.

Model Number Selection

How to Build a Valid Model Number for a Schroeder MCS:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
MCS	–	–	–	–	–	–	

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
MCS	1	5	1	0	5	0	000	= MCS1510-5-0/000

BOX 1	BOX 2	BOX 3	BOX 4
Series	**Model**	**Contamination Code**	**Options**
MCS = Metallic and Synthetic Oils	1 = 1000 Series	3 = Particles > 70 µm	1 = Standard (Switching Ouputs/HSI)
		4 = Particles > 100 µm	2 = Modbus/RS485
		5 = Particles > 200 µm	7 = TCP/Ethernet

BOX 5	BOX 6	BOX 7
Fluids	**Hydraluics Connections**	**Electrical Installation**
0 = Mineral and synthetic oils	1 = Flange Connection, SAE ½" ISO 6162-1 (only for MSC13xx)	0 = Standard
	2 = Flange Connection, SAE ¾" ISO 6162-1 (only for MCS14xx)	**BOX 8**
	5 = Flange Connection, SAE 4" ISO 6162-1 (only for MSC15xx)	**Modification Number**
		000 = Standard

What's Included

- MCS 1000
- O-ring (47.22 x 3.53 NBR 70 Shore)
- O-ring (110.72 x 3.53 NBR 70 Shore)
- Operating and maintenance instructions

Available Accessories

- SAE 4" Flange adaptor set for pipe or hose connection, 42L according ISO 8431-1 Consisting of: 2x Flange adaptors, 2x O-rings, 8x Cylinder screws, 8x Washers, 8x Spring Washers
- Flange adaptor plate, SAE 4" - SAE 1½"
- Socket plug (female) 6.5ft. (2 m) line, shielded, 8-pole, M12x1
- Socket plug with screw clamp, M12x1, 8 pole
- Socket plug (female) 16.4ft (5 m) line, shielded, 8-pole, M12x1
- Extension cable 16.4ft (5 m), Socket plug (female) 8-pole, M12x1 / Socet plug (male) 8-pole M12x1

AquaSensor AS

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

Formally Known as "TestMate® Water Sensor"

Features and Benefits

- Compatible with hydraulic, lube oils and synthetic and natural esters
- Measures and displays saturation and temperature continuously in real-time
- Measured in saturation percentage, not ppm. This is preferable since it takes into account temperature and viscosity variations (see desired saturation level below)
- Data can be monitored to PC, PLC, etc.
- No calibration necessary for different oils
- Individual configuration (AS 3000 only)
- Flumos Mobile App compatibility (AS 1000 only)

Applications

- Hydraulic systems that are sensitive to water in oil
- Gear boxes
- Injection molding machines
- Turbines
- Transformers
- Mobile Hydraulics
- OEM

AS 1000

AS 3000

- Only the AS 1000 is Usable with FluMoS Mobile App when connected to the CSI-C-11.

Description

The AS sensors are online saturation and temperature sensors for the monitoring of hydraulic and lubrication fluids accurately and continuously. They measure the water content relative to the saturation concentration (saturation point) and outputs the degree of saturation (saturation level) in the range of 0 to 100% as a 4 to 20 mA signal. A reading of 0% would indicate the absence of water, while a reading of 100% would indicate that a fluid is free water. An integrated thermoelement on the sensor measures the temperature of the fluid in the range of -13°F to 212°F (-25°C to 100°C) and outputs it as a 4 to 20 mA signal.

The AS 3000 has a 4-digit, digital display that shows real-time measured values and allows for parameter adjustments. The digital display may also be rotated/aligned on two axes.

Desired Saturation Level

Since the effects of free and emulsified water are more harmful than those of dissolved water, water levels should remain well below the saturation point. However, even water in solution can cause damage and therefore every reasonable effort should be made to keep saturation levels as low as possible. As a guideline, we recommend maintaining saturation levels below 30% in all equipment.

If you have any questions regarding technical details or the suitability of the AS sensors for your application, please contact our sales/technical department.

Saturation level

Free water		Saturation point
100%		
75%		
50%	Dissolved water	
25%		
0%		

AS 1000

2.18 (55.3)
0.47 (12)   0.10 (2.5)
Ø1.16 (29.5)
G3/8A
Ø0.86 (21.9)
0.47 (12)
Ø1.06 (27)
1.18 (30)   2.64 (67.1)
6KT-SW27   Plug M12x1. 5 pole

Metric dimensions in ( ).

AS 3000

AS AquaSensor

Formally Known as "TestMate® Water Sensor"

Specifications

Input Data		
Measuring Range:	0 to 100% Saturation; -13°F to 212°F (25°C to 100°C)	
Operating Pressure:	-7.25 to 725 psi max (-0.5 to 50 bar)	
Burst Pressure:	9135 psi (630 bar) max	
Parts in Contact with Media:	Connection Point: Stainless Steel/Ceramic with vacuum-metalized metal Seal: Viton = Mineral Oils/Esters, EPDM = Skydrol	

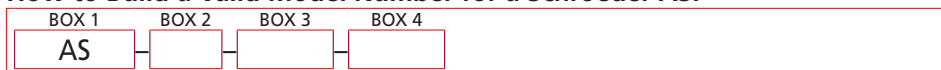| Output Data	*Humidity Measurement:*	
Output Signal (saturation level):	4 to 20 mA	
Calibrated Accuracy:	≤ ± 2% FS max	
Accuracy in Media Measurements:	≤ ± 3% FS typ.	
Pressure-dependent:	+ 0.02% FS/bar	

Output Data	*Temperature Measurement:*	
Output Signal (temperature):	4 to 20 mA	
Accuracy:	± 2% FS max	

Ambient Conditions		**AS 1000**	**AS 3000**
Nominal Temperature Range (saturation level measuring):		32°F to 194°F (0°C to 90°C)	32°F to 176°F (0°C to 80°C)
Ambient Temperature Range:		-40°F to 212°F (-40°C to 100°C)	-40°F to 176°F (-40°C to 80°C)
Viscosity Range:		32 to 23,175 SUS (1 to 5000 cSt)	
Flow Velocity:		< 16 ft/s	Maximum 16 ft/s
Media Tolerance:		Mineral oil-based fluids, natural and synthetic esters	
CE Mark:		EN 50081-1, EN 50081-2, EN 50082-1, EN 61000-6-1-1/2/3/4	
Type of Protection acc. DIN 40050:		IP 67	

Other Data			
Supply Voltage:		12 to 32 VDC	18 to 35 VDC
Residual Ripple Supply Voltage:		≤5%	
Mechanical Connection:		G3/8A DIN 3852	
Torque Rating:		18.5 ft-lbs	
Electrical Connection:		M12x1, 5 pole (DIN VDE 0627)	
Pin 1:		+Ub	Supply voltage: 18-35 VDC
Pin 2:		Signal saturation level	Analog output
Pin 3:		0V / GND	GND
Pin 4:		Signal temperature	SP1 (alarm)
Pin 5:		HSI Interface: 1 wire, half duplex	SP2 (warning)

FS (Full Scale) relative to the full measuring range

Model Number Selection

How to Build a Valid Model Number for a Schroeder AS:

BOX 1	BOX 2	BOX 3	BOX 4
AS	–	–	–

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	
AS	1	008	C	000 = AS-1-008-C-000

BOX 1	BOX 2	BOX 3	BOX 4
Model	**Sensor Types**	**Type of Medium**	**Signal Technology**
AS	1 = No Display	008 = Mineral Oil	5 = 2 Switch outputs/1 analog output *AS 3000 ONLY OPTION*
	3 = Digital Display	108 = Phosphate Ester	C = Output 1 Pin 2 saturation level (4 .. 20 mA) Output 2 Pin 4 temperature (4 .. 20 mA) *AS 1000 ONLY OPTION*

Accessories

Part Number	Description		Color Code
6006791	(5 pole) with 5m cable		Pin 1: Brown
7608409	(5 pole) with 5m screened cable		Pin 2: White
6023102	(5 pole) with 10m screened cable		Pin 3: Blue
			Pin 4: Black
			Pin 5: Grey

1.38 (35) 1.04 (26.5) Ø 0.78 (20) 1.10 (28) 1.26 (32)
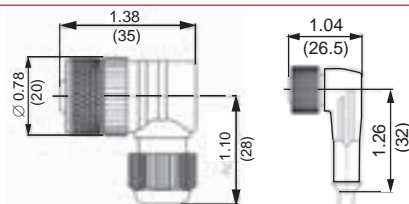
Sensor Monitoring Unit **SMU**

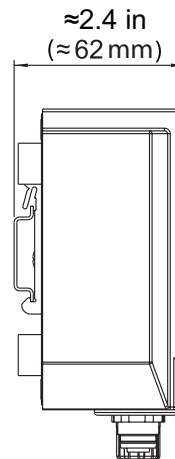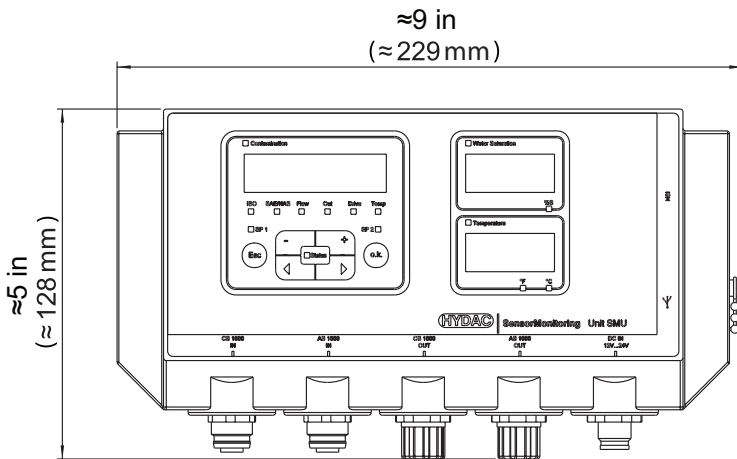## Features and Benefits

- Simple installation parallel to the customer system (Sensor Interface for SMU1200, transfer of the sensor's own analog and switching outputs) using the magnetic holder or top hat rails.

- High protection class IP67. Installation in a switch cabinet is not necessary

- Plug & Work unit including the 5m connection cable required for direct connection of the sensors (sensor connections via M12x1 male connectors, no programming necessary).

- Simple keypad operation.

- Usable with FluMoS Mobile App

- Download and store measured data in real-time using FluMoS Mobile App via Bluetooth connection

Description

The Sensor Monitoring Unit SMU1200 is a display unit for fluid sensors and is designed to display and store measured data. The following combinations of fluid sensors can be connected directly:

- Contamination Sensor TCM and water sensor TWS-C
- Metallic Contamination Sensor TMS and water sensor TWS-C

≈9 in
(≈229 mm)

≈2.4 in
(≈62 mm)

≈5 in
(≈128 mm)

Metric dimensions in ( ).

SMU Sensor Monitoring Unit
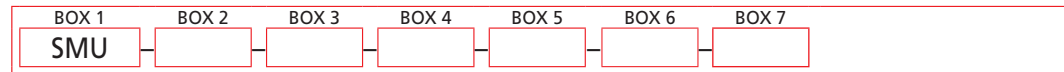
Specifications

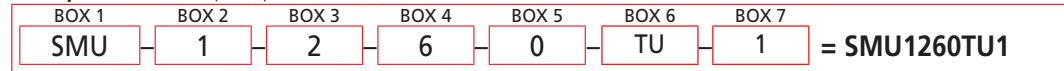|	
Ambient Temperature:	32°F to 131°F (0°C to +55°C)
Self diagnostics:	Continuously with error indication on display
Display:	LED, 6/4/4-digit, each with 17 segments
Topple (according to IEC/EN 60068-2-31):	Drop height 1 in.
Storage temperature range:	-40°F to 176°F (-40 °C to +80°C)
Relative humidity:	Maximum 95%, non-condensing
Weight:	2 lbs.
Electrical data: Supply voltage:	12 ... 24 V DC (±10%) The SMU must not be used with vehicle supply systems without load dump protection of maximum 30 V DC.
Residual ripple:	≤ 5 %
Power consumption:	15 Watt, 1.25 A max.
Accuracy of the real-time clock:	± 5 s/day / ± 0.5 h/year
Clock buffer:	≈ 20 years
Protection rating:	III (safety extra-low voltage)
Protection class:	IP 67
USB Master port:	USB Type A
HSI:	1-wire half duplex
Ethernet interface:	10 Base-T / 100 Base-Tx

We do not guarantee the accuracy or completeness of this information. The information is based on average working conditions. For exceptional operating conditions please contact our technical department. All details are subject to technical changes.

Model Number Selection

How to Build a Valid Model Number for a Schroeder SMU:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
SMU						

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	
SMU	1	2	6	0	TU	1	= SMU1260TU1

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
Model	**Model**	**Data Input**	**Interface**	**Application**
SMU	1 = 1000 Series	2 = Digital	6 = HSI + USB Master	0 = Standard

BOX 6	BOX 7
Supply Voltage	**Data Input**
TU = 12 to 24V DC	1 = TCM & TWS-C
	2 = TMS & TWS-C

What's Included

- 1 SMU 1200 series
- 1 USB memory stick
- 1 connection cable 5 pole with flying leads for power supply, L = 5m
- 2 connection cables appropriate for the sensor combination, L = 5m
- 1 FluMoS Light CD
- 1 Operating manual
- DIN rail, 7.5" long.

Available Accessories

- Power supply PS5, 100-240 V AC / 50-60 Hz / 1.1 A 24 V DC / 1000 mA, Cable length = 1.8 m, Part no.: 3399939
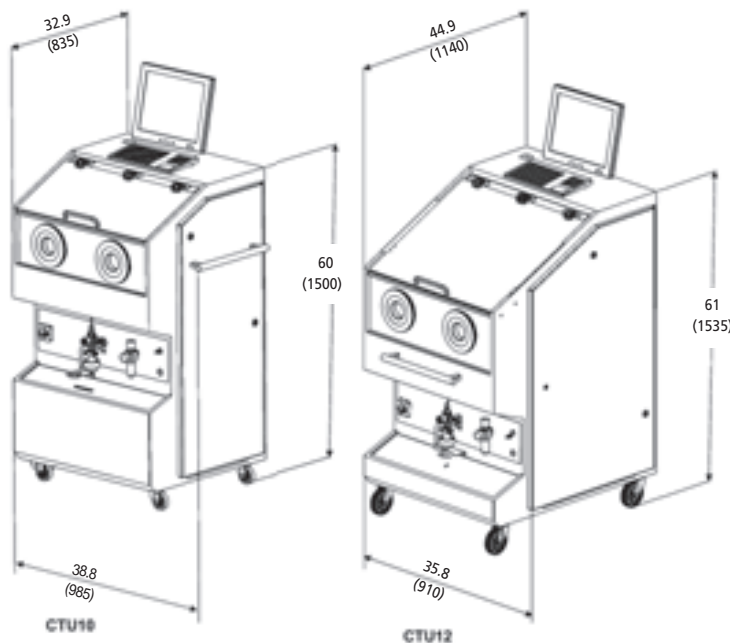
TestMate® Contamination Test Unit   CTU

Features and Benefits

- Cost reduction through lower production failure rates
- Identification and elimination of weak process steps
- Optimization of both internal and external handling processes
- Establishing of cleanliness standards, both internal and external
- Documentation of component cleanliness
- Survey of fluid cleanliness and filtration concepts

Description

The Cleanliness Test Unit (CTU 1000) is designed to determine the technical cleanliness especially present on minor contaminated components. By determining the type, size and quantity of the contamination, quality standards can be checked and documented and the necessary steps towards optimization can be taken.


```
32.9
(835)

60
(1500)

38.8
(985)

CTU10
```

```
44.9
(1140)

61
(1535)

35.8
(910)

CTU12
```

Metric dimensions in ( ).

Specifications

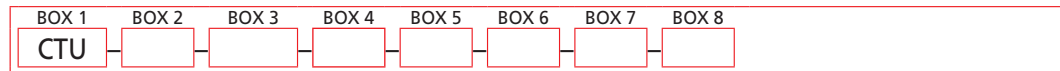|	
Overall Dimensions (H x W x L):	CTU10xx 71 in x 39 in x 35 in (1800 mm x 985 mm x 835 mm) CTU12xx 71 in x 36 in x 45 in (1800 mm x 910 mm x 1140 mm)

Weight:	CTU10xx: ≈ 595 lbs (270 kg)
	         ≈ 640 lbs (290 kg) *with ultrasonic unit*
	CTU12xx: ≈ 685 lbs (310 kg)
	         ≈ 728 lbs (330 kg) *with ultrasonic unit*

Mounting:	Mobile (mounted on casters)
Power Consumption:	600 W *(800 W with ultrasonic)*
Ambient Temperature:	59°F to 82°F (15°C to 28°C)
Cleanroom module — **Material of Cleanroom:**	Polished stainless steel
Filling with Analysis Fluid:	Via analysis cabinet
Max. Load Capacity:	CTU10xx = 105 lbs (47.5 kg) CTU12xx = 105 lbs (47.5 kg)
Control:	PC-controlled with user-friendly software, rinse options and rinsing volume programmable

CTU TestMate® Contamination Test Unit

Specifications (cont.)

Reservoir and filtration module	Membrane Holder:	for ø1.85" (47 mm) to 1.97" (50 mm) filter membranes
	Vacuum Strainer:	For quicker filtration of the analysis fluid
	Diffuser:	Distribution of analysis fluid on the membrane
	Operating Pressure:	-12 to 87 psi (-0.8 to 6 bar)
	Analysis Fluid Reservoir:	2x 5.3 gal (20 l) *(1x reservoir, 1x suction reservoir)*
	Reservoir Change-over:	Automatic
	Filtration of Analysis Fluid:	Fine filtration according ISO 4406 min. ISO 12/9
	Filter Size, Filtration Rating:	2x LF BN/HC 60, 3 µm (1xx0 series) 2x MRF-1-E/1, 1 µm (1xx1 series)
	Integrated Drip Tray:	6.6 gal (25 litre) with drainage
	Ultrasound:	100 W, 40KHz
	Dimensions:	Dimensions: 7.9" (200 mm) x 4.3" (110 mm) x 1.6" (40 mm); Mesh width: 0.16" (4 mm)
	Emission Sound Pressure Level:	L_{PA} <70 db(A)
Services to be provided by operator*	Compressed Air:	Air Filtered (min. 5µm) and dry compressed air, max. 1741 psi (6 bar) Air flow rate: 15.8 gpm (60 lpm), Supply connection: DN 7.2
*Not supplied	Power Supply:	According to order

Model Number Selection

How to Build a Valid Model Number for a Schroeder CTU:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
CTU							

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
CTU	1	2	4	0	K	Z	Z	= CTU1240KZZ

BOX 1
Series

CTU = Contamination Test Unit

BOX 2
Model

1 = Analysis Cabinet *(clean room)*

BOX 3
Installation Size

0 = Dimensions analysis cabinet: 11.8"x30.2"x14.4" *(300mm x 768mm x 365mm) (effective height x width x length)*

2 = Dimensions analysis cabinet: 18.1"x30.2"x25.6" *(460mm x 768mm x 650mm) (effective height x width x length)*

BOX 4
Analysis

3 = Version 2011 with ConTes software, 1um filtration and automatic pressure control

4 = Version 2014 – Compression closure, cleanbox – Internal extraction, cleanbox – filled via 3/2 way ball valve and filling hose – Monitor arm *(only 124x)* – Nozzles with plug-in connection *(plug-in nipple in analysis chamber)*

BOX 5
Analysis Fluid

0 = Solvent A III Class *(Flashpoint > 140°F (60°C), lower explosion limit > 0.6 Vol.%)*

1 = Water with surfactants, admissible pH-range 6 to 10, no deionized / demineralized water

BOX 6
Supply Voltage

K = 120 VAC / 60Hz / 1 Phase USA / CDN
M = 230 VAC / 50Hz / 1 Phase Europe
N = 240 VAC / 50Hz / 1 Phase UK

BOX 7
Extraction Process

Z = Spray *(medium pressure)*
U = Spray *(medium pressure)*

BOX 8
Supplementary Details

Z = Standard

R = External rinsing connections 0.24" (Ø 6mm), between the hand holes

F = Fluid connections A/B/C and R fitted with rapid quick-release fastener on outside, Control line to CTM-E modules

A = Manual change-over for filter membrane holder

Note: Analyzing Fluid not supplied with unit - G60 Analyzing Fluid, 30L; PN 03205511

This information relates to the operating conditions and applications described. For applications or operating conditions not described, please contact the relevant technical department. Subject to technical modifications.

EasyTest Patch Kit `EPK`

Features and Benefits

- User-friendly visual analysis of solid contamination
- Compatible with mineral-based hydraulic fluids and lubricants, and petroleum distillates
- Enables solid contaminant quantification and identification
- Provides on-site results in a matter of minutes

Applications

- Perform quick on-site determination of contamination levels of solid particles
- Supplement on-site laboratories
- Use as a tool to demonstrate need for solid contamination mitigation

The Schroeder EasyTest Patch Kit (EPK) provides the necessary tools to determine the level of solid particulate contamination present in a fluid sample. Using the vacuum pump contained in the kit, the fluid sample is drawn through a membrane patch. The residual particulate left on the patch is viewed under a microscope and compared to photos of known contamination levels in the **L-2711 Schroeder Contamination Handbook** (included).

Description

Model Selection + Items Supplied P/N 7640674

Schroeder:
EasyTest Patch Kit (EPK)
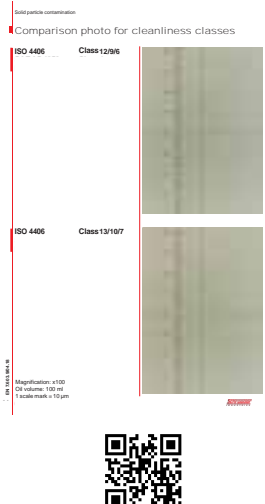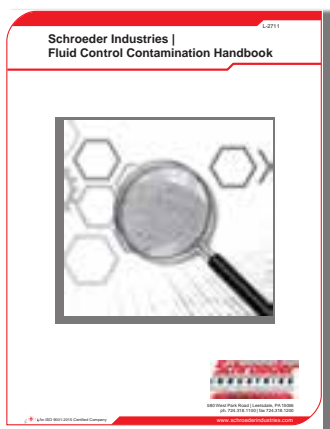
7630322

Kit as supplied includes:

Quantity	Description	P/N
1	Hand-held vacuum pump	7619502
3	Syringe, 30 mL	7626475
50	Disposable Petri Dishes	7630320
1	Forceps	7626481
1	Membrane patches, 0.45 µm, 25 mm, (100 pack)	2701997
1	Membrane patches, 0.8 µm, 25 mm, (100 pack)	2701952
1	Carrying Case	7640195
1	Microscope, 10x - 200x	7635242
1	Plastic funnel	7626479
1	Solvent dispenser bottle	7626473
1	Solvent dispenser bottle cap	7640496
3	Plastic sample bottle, 4 oz.	7626480
1	Solvent patch holder	7632471
1	Tubing, Tygon 3"	7624738
1	10' section of ¼" LDPE tubing	2701999
1	L-2711 Contamination Handbook & Instructions	7627179

NOTES:

Solvent is not supplied w/ the EPK. Recommended solvents include Heptane (99% by GLC), or Isopropyl Alcohol.

Kit contents are subject to change at the discretion of the manufacturer.

WTK WaterTest Kit

Features and Benefits

- Easily performed determination of the absolute water content
- Direct comparison with the values measured in the lab thanks to the absolute water content being output in ppm
- High resolution in the lower measuring range
- Measurement series can be recorded for trend analysis
- Battery can be recharged via USB cable
- Illuminated display

Applications

- Perform quick on-site determination of contamination levels of water
- Supplement on-site laboratories
- Use as a tool to demonstrate need for water contamination mitigation

Description

The WaterTest Kit (WTK) is used for quantitative analysis of the absolute water content in mineral-oil-based lubricating and hydraulic fluids. The absolute water content is a measure of the actual water per volume of fluid. The measurement involves adding two reagents to the contaminated oil. This causes a pressure increase in the measurement cell that is output via the digital display as water content in vol. % or ppm.

Time per measurement: only approximately 5 minutes (without sample preparation).

Specifications

General Data:	Measuring Range:	0.02 to 1%* 0.1 to 5%* 100 to 1500 ppm* (0.01 to 0.15%) 200 to 6000 ppm* (0.02 to 0.6%) *) Measurement error < + 1.8 vol. % FS (full scale)
	Measurement data memory:	10 measurement series of 10 measurements each
	Weight including carry case:	2.7 kg
	Dimensions of carry case:	34 x 28 x 13.5 cm
Hydraulic Data:	Permitted fluid:	Mineral-oil-based lubricating and hydraulic fluid
	Permitted fluid temperature:	158°F (70°C)
Electrical Data:	Power Supply Voltage:	Internal battery rechargeable via USB cable

Model Selection + Items Supplied P/N 7640674

Schroeder:
WaterTest Kit (WTK)

7640674

NOTES:

Replacement pack consisting of consumables sufficient for 50 tests can be ordered separately.

Kit as supplied includes:

Quantity	Description
1	Aluminum case
1	Measurement cell
1	Bottle containing reagent A (500 mL)
25	Sachet containing reagent B
1	Measuring beaker (100 mL)
1	Plastic tweezers
3	Agitator (in plastic case)
10	Syringe (1 mL)
3	Syringe (5 mL)
1	Test kit cleaner (250 mL)
1	Operating and maintenance manual
1	USB cable

Trouble Check Plus Fluid Analysis

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

THF Sample Report Form

Description

Schroeder's Trouble Check Plus is an easy to use fluid analysis service that can be utilized as part of any predictive maintenance program.

Schroeder offers two types of sample kits: one for hydraulic fluid (Description: THF P/N: 7624310) and one for water glycol (Description: TWG P/N: 7624741). Refer to the next section for tests performed for each of these kits. Upon receipt of order for any of these part numbers, a sample kit containing a clean sample bottle, blank form, and mailing container is shipped to the customer. After the sample has been taken, the customer simply completes the form and encloses it along with the sample in the mailing container provided. Kits are packaged and sold in lots of 10.

For each sample submitted, a lab report will be generated and forwarded directly to the user via e-mail or postal mail (per the user's request). Schroeder will maintain an electronic copy of all results for a two year period. It is strongly recommended that a MSDS (Material Safety Data Sheet) and a base line (unused) fluid sample be submitted with the initial sample to be analyzed. In addition to serving as a baseline for comparison to subsequent results, the sample of new oil will be used to determine warning limits for viscosity and TAN (total acid number).

Oil sample reports can be tracked online at: http://www.trackmysample.com/

Customers can create their own personal login and password to view all of their reports in one easy to use interface at: http://eoilreports.com/

Information gained by using this service can help identify potential problems in a hydraulic system at minimal cost to the user. Fluid analysis can provide answers to important questions such as these:

- Do I have the right filtration system in place for efficient contamination control?
- Is the fluid in my system experiencing changes that could negatively impact component life or system performance?

Part Numbers and Tests Performed

	Total Conditioning Analysis Kit (Description: THF P/N: 7624310)	Water Glycol Kit (Description: TWG P/N: 7624741)
Particle Count	✔	Patch Test
ISO 4406 Cleanliness Code	✔	Estimated
Water Content	✔	
Viscosity	✔	✔
TAN	✔	✔
Spectrographic Analysis	✔	

Explanation of Results

Particle Count and ISO Codes

Particle contamination is responsible for most of the wear in hydraulic systems. The level of contamination is determined automatically by a laser particle counter. The results are shown as the cumulative counts per milliliter of fluid according to ISO 4406:1999. (For water glycol fluids the patch test photo is used to estimate the ISO code). The current sample ISO code is displayed with the target ISO code. The target is based on the cleanliness level required for the most sensitive component in the system. An increase of 1 ISO digit is considered a caution limit and an increase of two ISO digits is critical. When the target ISO code is exceeded, improvement of the system filtration, elimination of the source of ingression or installation of auxiliary off-line filtration is required.

Water Content

High water content in oil encourages oxidation, corrosion and cavitation. The Karl Fischer Method in accordance with ASTM D 6304-04a determines the water content, which is displayed in percent (% or ppm). (Water glycol fluids normally have upper and lower limits that are set to manufacturer's specifications). Graphing results are available on-line. In general, water contents of up to 500 ppm are typically not critical for the operation of hydraulic and lubrication systems. When the water content exceeds approximately 500 ppm, the system should be protected against water penetration and measures should be introduced to extract water from the oil.

Viscosity

Maintaining the correct viscosity is important for achieving long component service life. Viscosity is reported in centistokes (cSt) @ 40° and 100°C as per ASTM D 445-04. Typically the limits are based on new oil data. Caution limits are calculated at ±10% new oil viscosity and critical limits at ±15% new oil viscosity. (Water glycol fluids can have limits set similarly but the water content should also be monitored as changes in it also affect the viscosity. The manufacturer should be consulted). Trending graphs are available on-line for all reported results. When large changes in viscosity are detected a partial drain of the affected oil and adding fresh fluid may correct the problem. However in some instances a complete oil change may be required.

Trouble Check Plus Fluid Analysis

Total Acid Number (TAN) *not applicable to Description: THF P/N: 7624310

Oxidation is the primary mechanism of oil degradation. The TAN measures the corrosive acidic by-products of oxidation. TAN results are reported in mg/g KOH (Potassium Hydroxide). Since all hydraulic fluids have some inherent acidic properties any increases in TAN must be compared to the new oil value as a baseline. Typically caution limits are set at +0.6 new oil value and critical limits are set at +1.0 new oil value. Certain application specific fluids may require limits set to manufacturer specifications. The results are graphed along with the limits to clearly show when oil oxidation has increased above acceptable levels. When the TAN has increased above the critical level, the oil should be changed immediately to prevent damage from occurring to your equipment.

Spectrographic Analysis *not applicable to Description: TWG P/N: 7624741

Additive, wear metal and contaminant levels are displayed in parts-per-million (ppm). The oil sample is analyzed for eighteen different elements. The results are also graphically displayed for easy detection of increasing or decreasing levels. The manufacturer blends additives into the oil in different forms and quantities. The additive package varies with the oil type. Wear metals indicate wear on particular components of an individual unit. These metals will indicate a wear problem on the microscopic level (< 8 microns) before the problem can be detected by conventional means. The existence of a wear problem is determined by absolute values of metals, and more importantly, by a relative increase or trend in one or more metals. Contaminants can be an indicator of internal or external contamination. The source and amount can be determined by a comparison with new oil data. Below is a list of additive types, wear metal and contaminant sources.

Additives	Function
Magnesium (Mg)	Dispersant / Detergent
Calcium (Ca)	Dispersant / Detergent
Barium (Ba)	Dispersant / Detergent
Zinc (Zn)	Anti-Wear
Molybdenum (Mo)	Anti-Wear
Phosphorous (P)	Anti-Wear

Wear Metals	Typical Source
Titanium (Ti)	Turbine Components, Bearings, Platings
Chromium (Cr)	Rings, Roller/Taper, Bearings, Rods, Platings
Iron (Fe)	Cylinders, Gears, Rings, Crankshafts, Liners, Bearings, Housings, Rust
Nickel (Ni)	Valves, Shafts, Gears, Rings, Turbine Components
Copper (Cu)	Bearings, Bushings, Bronze, Thrust-Washers, Friction Plates, Oil Cooler
Silver (Ag)	Bearings, Bushings, Platings
Aluminum (Al)	Pistons, Bearings, Pumps, Blowers, Rotors, Thrust-Washers, Dirt
Lead (Pb)	Bearing Overlays, Grease, Paint, Possible Additive in Gear Oils
Tin (Sn)	Bearings, Bushings, Piston Platings, Solder, Coolers
Vanadium	
Cadmium	

Contaminants	Typical Source
Sodium (Na)	Coolant, Sea Water, Dirt, Possible Additive
Boron (B)	Coolant, Sea Water, Possible Additive
Silicon (Si)	Dirt, Possible Additive (Anti-Foam)
Potassium (K)	

Status and Recommendations

Corrective actions are recommended when applicable. The status of the sample is rated in three categories:

- **Normal** — - System is operating within the parameters established by baseline data & prior samples.
  - System requires no immediate action.
- **Abnormal** — - System is operating outside of caution limits in one or more areas.
  - System requires scheduled maintenance.
- **Critical** — - System is operating outside of critical limits in one or more areas.
  - System requires immediate attention.

Model Code	
Description: THF P/N: 7624310	Total Conditioning Analysis Kit
Description: TWG P/N: 7624741	Water Glycol Kit

NOTES:

Sample kits sold in case lots of 10 pieces. No samples will be processed without completed paperwork supplied with kits.

Features and Benefits

- Simple and user-friendly operation
- Large, full color graphics display
- Quick and independent basic setting by use of automatic sensor recognition
- HMG 2500 can only be used with Schroeder HSI and Schroeder SMART sensors
- Up to 4 sensors and 32 measurement channels can be connected simultaneously
- Sampling rates up to 0.1 ms
- Very large data memory for archiving measurement curves
- Various measurement modes: Normal measuring, Fast curve recording, Long-term measurement
- 2 independent triggers, can be linked logically
- Simple sensor connection with M12x1 push-pull connector
- PC connection: USB and RS 232
- Convenient visualization, archiving and data processing using the HMGWIN software supplied

Description

Automated setting procedures, a simple, self-explanatory operator guide and many comprehensive functions ensure the operator is able to carry out a wide range of measurement tasks within a very short time. This makes the HMG 2500 an ideal companion for employees in maintenance, commissioning and service.

The device is designed primarily to record pressure, temperature and flow rate values, which are the standard variables in hydraulics and pneumatics. For this purpose, special sensors are available. The HMG 2500 recognizes the measured variable, measuring range and the unit of these sensors and automatically carries out the basic device settings accordingly.

In addition to this, the HMG 2500 has a digital input, e.g. for frequency or speed measurement, as well as a virtual measurement channel for the measurement of difference or performance.
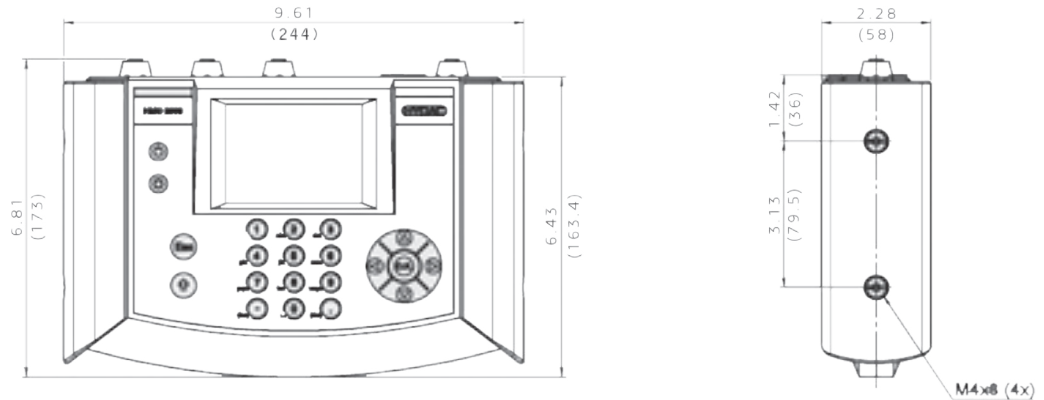
Due to the wide range of functions and its simple handling, the HMG 2500 is just as appropriate for users who take measurements only occasionally as it is for professionals for whom measuring and documentation are routine.

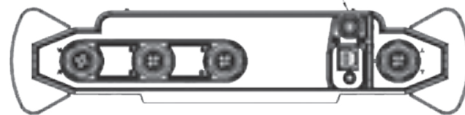The HMG 2500 is designed to accept future upgrades of the device software.

Trigger
-10V/10V

HMG 2500   TestMate® Series
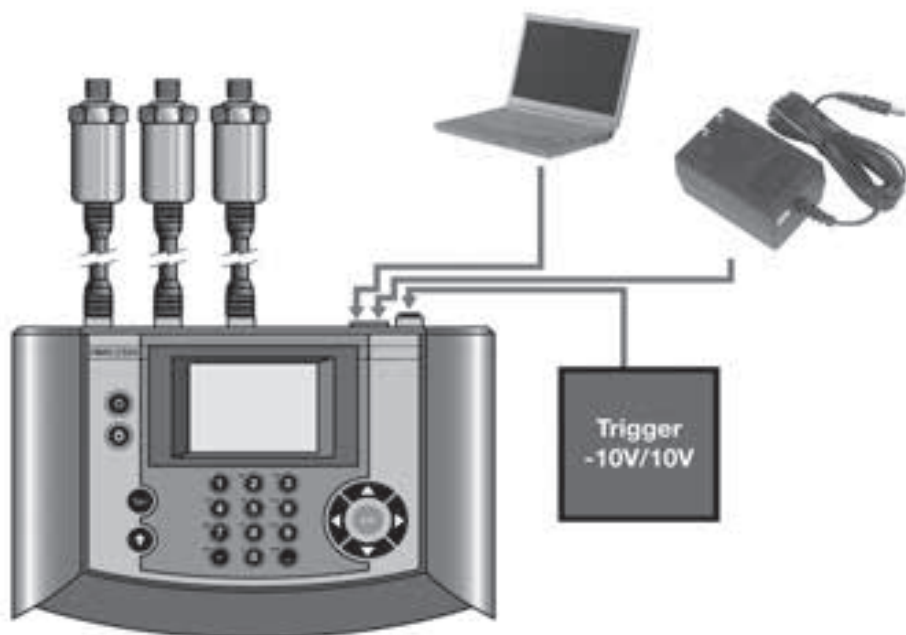
Dimensions

Shown with **protective cover open**

Function

- Clear and graphical selection menus guide the operator intuitively to all the device functions available. A navigation pad on the keypad ensures rapid operation

- The HMG 2500 can monitor signals from up to 4 **sensors simultaneously**.

- The following sensors can be connected to 3 of these input sockets:
  - 3 analogue sensors (e.g. for pressure, temperature and flow rate) with the special digital HSI interface (Sensor Interface); this means the basic device settings (measured variable, measuring range and unit of measurement) are undertaken automatically

  - 3 analogue sensors (e.g. for pressure, temperature and flow rate) with the special digital HSI interface (Sensor Interface); *reference HSI information above*

- Frequency measurements, counter functions or triggers for data logging can be implemented via the fourth input socket with one digital input

- Additionally, the HMG 2500 has a virtual measurement channel which enables a differential measurement or a performance measurement by means of the sensors connected to the measurement channels "A" & "B"

- All input channels can operate simultaneously at a **sampling rate** of 0.5 ms (1.0 ms for SMART sensors). For the recording of highly dynamic processes, a sampling rate of 0.1 ms can be achieved

- The most impressive function of the HMG 2500 is without doubt its ability to record dynamic processes as a **measurement curve** "online", i.e. in real-time, and to render them as graphs in the field

- The **data memory** for recording curves or logs can hold up to 500,000 measured values per recording. Over 100 of such data recordings in full length can be stored in an additional archiving memory

- For specific, **event-driven curves or logs**, the HMG 2500 has two independent triggers, which can be linked together logically

- User-specific device settings can be stored and re-loaded at any time as required. This means that repeat measurements can be carried out on a machine again and again using the same device settings

- Measured values, curves or texts are visualized on a **full color graphics display** in different selectable formats and display forms

- Numerous useful and easy-to-use **auxiliary functions** are available, e.g. zoom, ruler tool, differential value graph creation and individual scaling, which are particularly for use when analyzing the recorded measurement curves
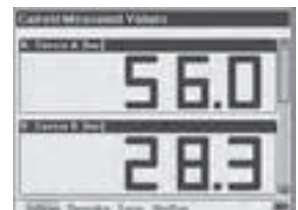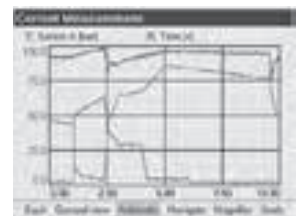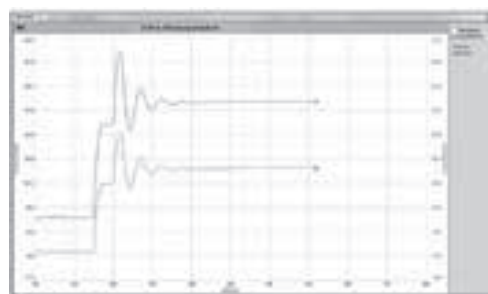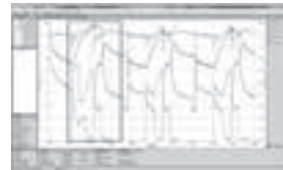
Software

The HMG 2500 communicates with a computer via a USB or RS 232 port. Schroeder offers HMGWIN 2500, the matching software for the HMG 2500, for convenient post-processing, rendering, and evaluation of measurements on a pc. It also enables the HMG 2500 to be operated directly from a computer in real time.

The HMG 2500 is equipped with specially developed software providing for fast data collection and processing. A measurement curve can comprise up to 500,000 measured values. The HMG 2500's measured value memory is capable of storing at least 100 of these curves.

The Schroeder software, CMWIN, is also supplied that allows direct communication with SMART (HSI) sensors connected to the HMG 2500 from your PC.

Some examples of the numerous useful additional functions:

■ Transfer and archiving of measurements recorded using the HMG 2500

■ Display of the measurements in graph form or as a table

■ **Zoom function:** Using the mouse, a frame is drawn around an interesting section of a measurement curve, which is then enlarged and displayed

■ **Accurate measurement** of the curves using the ruler tool (time values, amplitude values and differentials)

■ Individual **comments** and measurement information can be added to the graph

■ **Overlay** of curves, for example to document the wear of a machine (new condition/current condition)

■ Using mathematical operations (calculation functions, filter functions), new curves can be added

■ Snap-shot function: Comparable to the function of a digital camera, a picture can be taken immediately of any graph and saved as a .jpg file

■ A professional measurement report can be produced at the click of a mouse: HMGWIN has an automatic layout function. Starting with a table of contents, all recorded data, descriptions and graphics and/or tables are combined into a professional report and saved as a .pdf file

■ Online function (HMGWIN only): Starting, recording, and online display of measurements (similar to the function of an oscilloscope)

■ Change of axis assignment of the recorded measurement parameters in graph mode (e.g. to produce a p-Q graph)

Technical Data

Analog Inputs	
Input signals	HSI analogue sensors
3 channels M12x1 Ultra-Lock flange sockets (5-pin) channel A to channel C	HSI SMART sensors
Accuracy	$\leq \pm$ 0.1% FS
Digital Input	
1 channel via M12x1 Ultra-Lock flange socket Channel D	Digital status (high/low) Frequency (0.01 to 30,000 Hz)
Calculated channel	
Quantity	1 channel via virtual channel E
Sampling rate (dependent on number of active channels)	0.1 ms, max. 1 input channel 0.2 ms, max. 2 input channels 0.5 ms, all 3 input channels 1.0 ms, for SMART sensors
Resolution	12 bit
Memory	Min. 100 measurement curves, each with 500,000 measured values
Display	3.5" color display 7-segment display
Interfaces	1 USB, 1 serial interface RS 232
C€ mark	EN 61000-6-1 / 2 / 3 / 4
Safety	EN 61010
IP class	IP 40
Ambient conditions	
Operating temperature	32°F to 122°F (0°C to 50°C)
Storage temperature	-4°F to 140°F (-20°C to 60°C)
Relative humidity	70%, non-condensing max
Weight	approx. 2.43 lb (1.1 kg)

Order Details

Model Code
Description: HMG 2500 - 000 - US
P/N 925295

Operating manual and documentation
US = English

Scope of delivery
- HMG 2500
- Power supply for 90 to 230 V AC
- Operating Instructions
- Data carrier with USB drivers. HMGWIN software
- USB connector cable

Accessories
- Additional accessories, such as electrical and mechanical connection adapters, power adapters, etc. can be found in the "Accessories for HMG Series" catalog pages.

TestMate® Series HMG 4000

Features and Benefits

- Large, full graphics color display 5.7" touch screen
- Capable of recording up to 38 sensors at once, 8 analog, 2 digital sensors and 28 HSCI sensors via CAN bus
- Up to 100 measurement channels can be depicted simultaneously
- High-speed measuring rate, up to 8 sensors at 0.1 ms at a time
- Rapid and automatic basic setting of the device by means of automatic sensor detection
- Analog inputs 0.. 20 mA, 4 .. 20 mA Voltage 0 .. 50V, -10 .. 10 V
- PT 100/1000 input
- Connection to a CAN bus system (also J1939)
- Simple and user-friendly operation, intuitive menu
- Very large data memory for archiving measurement curves enables the storage of 500 measurements with up to 8 Million measured values
- Various measurement modes: Measuring, Fast curve recording, Long term measurements
- Recording of dynamic processes "online" in real time
- Event-driven measurements with several triggering options
- PC interface via USB
- USB Host connection for USB memory sticks
- Convenient visualization, archiving and data processing using the HMGWIN software

Description

The HMG 4000 hand–held measuring unit is a portable measuring and data logging device. It was mainly developed for all values measured in relation with hydraulic systems, such as pressure, temperature, flow rate and position. Moreover, it provides a very high flexibility, even when it comes to evaluating other measuring values. The main applications are servicing, maintenance or test rigs.

The HMG 4000 has a very easy-to-operate user interface due to its large 5.7" touchscreen. The operator can access all of the unit's functions and settings by means of clearly presented selection menus.

The HMG 4000 can record the signals of up to 38 sensors at once. For this purpose, Schroeder Industries offer special sensors, which are automatically detected by the HMG 4000 and whose parameters such as measurement values, measuring ranges and measuring units can be set.

On the one hand, there are the HSI Sensors (Sensor Interface) for the measurement of pressure, temperature and flow rate, for the connection of which there are 8 analog input channels. Furthermore, there is the option of connecting Schroeder SMART sensors to these inputs. SMART senors can display several different measured variables at a time.

Up to 28 special HCSI-Sensors (CAN Sensor Interface) can be connected additionally via the CAN bus Port, also supporting automatic sensor detection.

HMG 4000 can optionally be connected to an existing CAN network. This enables the recording of measured data transmitted via CAN bus (e.g. motor speed, motor pressure) in combination with the measured data from the hydraulic system.

The device also offers measurement inputs for standard sensors with current and voltage signals. The HMG 4000 rounds off the application, providing two additional digital inputs (e.g. for frequency or rpm measurements).

The most impressing feature of the HMG 4000 is its ability to record the dynamic processes of a machine in the form of a measurement curve and render them as a graph — and, moreover, online and in real-time.

Schroeder software HMGWIN which is specific to the HMG 4000, is supplied for convenient postprocessing, rendering and evaluation of measurements on your computer.

TestMate® Series

Function

- Clear and graphical selection menus intuitively guide the operator to all the device functions available and ensure fast implementation.

- HMG 4000 can detect the signals of up to **38 sensors simultaneously**. 11 Push-pull M12x1 input sockets are available as sensor interfaces. Apart from the push-pull sensor connection cable, M12x1 standard cables can also be used.

- The following sensors can be connected to 8 of these input sockets:
  - 8 analogue sensors (e.g. for pressure, temperature and flow rate) with the special digital HSI interface (Sensor Interface); this means the basic device settings (measured variable, measuring range and unit of measurement) are performed automatically.
  - 8 standard analog sensors with current and voltage signals
  - 8 condition monitoring sensors (SMART sensors), the basic device settings are also performed automatically.

- The blue input socket provides 2 digital inputs, i.e. for 1 or 2 speed sensors (2nd speed sensor connection via Y adapter). Frequency measurements, counting functions or triggers can as well be implemented for data recording.

- Different **CAN bus** functions can be utilized via the red input socket.
  - Connection of up to 28 HCSI sensors (CAN Sensor Interface) by setting up a CAN bus with HCSI sensors and the relevant connection accessories, also with automatic parameterization.
  - Connecting to a CAN bus, you have the option of evaluating up to 28 CAN messages
  - Configuration of **CAN Sensors**, the parameterization is performed by means of EDS files, which can be stored and administrated in the HMG 4000

- The yellow input socket serves as the interface for pressure, temperature or level switches with **I/OLink** as well as for the programming device HPG P1. These devices can be parameterized by means of the HMG 4000.

- The most impressive function of the HMG 4000 is its ability to record dynamic processes "online", i.e. in real-time, as a **measurement curve** and to render them as graphs. During the recording process of a measuring curve, you can zoom in the curve sections of interest using gestures on the touchscreen.

- For the purpose of recording highly dynamic processes, all 8 analog input channels can be operated simultaneously at a **measuring rate** of 0.1 ms.

- The **data memory** for the recording of curves or logs can memorize up to 8 million measured values. At least 500 of such data recordings in full length can be stored in an additional archiving memory.

- For the targeted **event-driven curve or log recording**, the HMG 4000 has two independent triggers which can be linked together logically. In addition, there is a "start/stop" condition, by means of which a measurement can be initiated or finished.

- User-specific instrument settings can be stored and re-loaded at any time as required. This means that repeat measurements can be carried out on a machine again and again using the same device settings.

- Measured values, curves or texts are visualized on a **full-graphics color display** in different selectable formats and display forms.

- Numerous useful and easy-to-use auxiliary functions are available, e.g. zoom, ruler tool, differential value graph creation and individual scaling, which are particularly for use when analyzing the recorded measurement curves.

- The communication between the HMG 4000 and a PC is performed via the built-in USB port.

- A HMG 4000 connected to your PC is recognized and depicted as a directory by the PC. You can conveniently move measured data to your PC. Optionally, data transfers can be carried out via a file manager by means of a USB memory stick.
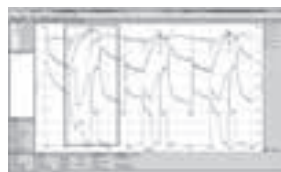
Software

The PC software HMGWIN is also supplied with the device. This software is a convenient and simple package for analyzing and archiving curves and logs which have been recorded using the HMG 4000, or for exporting the data for integration into other PC programs if required. In addition it is also possible to operate the HMG 4000 directly from the computer. Basic settings can be made, and measurements can be started online and displayed directly on the PC screen in real-time as measurement curves progress.

HMGWIN can be run on PCs with Windows 7, Windows 8.1 as well as Windows 10 operating systems.

*) SMART sensors (Condition Monitoring Sensors) are a generation of sensors which can provide a variety of different measurement variables.

Some examples of the numerous useful additional functions:

- Display of the measurements in graph form or as a table

- **Zoom function:** Using the mouse, a frame is drawn around an interesting section of a measurement curve, which is then enlarged and displayed

- **Accurate measurement** of the curves using the ruler tool (time values, amplitude values and differentials)

- Individual **comments** and measurement information can be added to the graph

- **Overlay** of curves, for example to document the wear of a machine (new condition/current condition)

- Using mathematical operations (calculation functions, filter functions), new curves can be added

- Snap-shot function: Comparable to the function of a digital camera, a picture can be taken immediately of any graph and saved as a .jpg file

- A professional measurement report can be produced at the click of a mouse: HMGWIN has an automatic layout function. Starting with a table of contents, all recorded data, descriptions and graphics and/or tables are combined into a professional report and saved as a .pdf file

- Online function (HMGWIN only): Starting, recording, and online display of measurements (similar to the function of an oscilloscope)

- Change of axis assignment of the recorded measurement parameters in graph mode (e.g. to produce a p-Q graph)

Technical Data

Analog Inputs	
Input signals	HSI analogue sensors
8 channels M12x1 Ultra-Lock flange sockets (5 pole) channel A to channel H	HSI SMART sensors Voltage signals: i.e. 0.5 .. 4.5 V, 0 .. 10 V etc. (input ranges for 0 .. 50 V, 0 .. 10 V, 0 .. 4.5 V, -10 .. 10 V) Current signals, i.e. 4 .. 20mA, 0 .. 20mA (input range 0 .. 20 mA) 1 x PT 100 / PT 1000 (on Channel H)
Accuracy dependence of the input range	$\le \pm$ 0.1% FS at HSI, voltage, current $\le \pm$ 1 % FS at PT 100 / PT 1000
Digital Inputs	
Input signals 2 channels via M12x1 Ultra-Lock flange socket (5 pole) Channel I, J	Digital status (high/low) Frequency (0.01 to 30,000 Hz) PWM duty cycle Durations (i.e. Period length)
Level	Switching threshold / switch-back threshold: 2 V/1 V Max input voltage: 50 V
Accuracy	$\le \pm$ 0.1 %
CAN	
Input signals 28 channels M12x1 Ultra-Lock flange socket (5 pole) channel K1 to K28	HCSI sensors, CAN, J1939, CANopen PDO, CANopen SDO
Baud rate	10 kbit/s to 1 Mbit/s
Accuracy	$\le \pm$ 0.1 %
Calculated channels	
Quantity	4 channels via virtual port L (channel L1 to channel L4)

HMG 4000 TestMate® Series

Technical Data

Programming interface	
For O-Link devices	1 channel via M12x1 Ultra-Lock flange socket (5 pole)
Voltage supply	
Network operation	9 to 36 V DC via standard round plug 2.1 mm
Battery	Lithium-Nickel-Kobalt-Aluminum-Oxide 3.6 V; 9300 mAh
Battery charging time	approx. 5 hours
Service Life	without sensors: approx. 11 hours with 2 sensors: approx. 9 hours with 4 sensors: approx. 7 hours with 8 sensors: approx. 4 hours
Display	
Type	TFT-LCD Touchscreen
Quantity	5.7"
Resolution	VGA 640 x 480 Pixel
Backlight	10 to 100% adjustable
Interfaces	
USB Host	
Plug-in connection	USB socket, Type A, screened
USB Standard	2.0 (USB Full speed)
Transmission rate	12 Mbit/s
Voltage supply	5 V DC
Power supply	100 mA max.
Protection	short circuit protection to GND (0 V)
USB Slave	
Plug-in connection	USB socket, Type B, screened
USB Standard	2.0 (USB High speed)
Transmission rate	480 Mbit/s
Voltage supply	5 V DC
Power supply	100 mA max.
Protection	short circuit protection to GND (0 V)
Memory	
Measured value memory	16 GB for min. 500 measurements, each containing 8 Million measured values
Technical Standards	
EMC	IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8
Safety	EN 61010
IP class	IP 40
Ambient conditions	
Operating temperature	32°F to 122°F (0°C to 50°C)
Storage temperature	-4°F to 140°F (-20°C to 60°C)
Relative humidity	70%, non-condensing max
Dimensions	approx. 11.22 x 7.44 x 3.43 in (B x H x T)
Weight	approx. 4.08 lb (1.85 kg)
Housing material	Plastic (Elastollan® R 3000 - TPU-GF)

Order Details

Additional accessories, such as electrical and mechanical connection adapters, power adapters, etc. can be found in the "Accessories for HMG Series" catalog pages.

Model Code
Description: HMG 4000 - 000 - US
P/N 925283

Scope of delivery
- HMG 4000
- Power supply for 90 to 230 V AC
- Strap

Operating manual and documentation
US = English

- Operating Instructions
- Data storage medium containing USB drivers HMGWIN and CMWIN software
- USB connector cable

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Accessories for HMG Series   HMG

■ Pressure, temperature and flow rate transmitters with HSI sensor detection as well as CAN pressure transmitters with HCSI sensor detection, see below and next page:

Pressure Transducer with HSI
(Sensor Interface)

Model Code	Description	Part No.
HDA 4748-H-0016-000	-14.5 to 130.5 psi (-1 to 9 bar)	909429
HDA 4748-H-0016	0 to 230 psi (0 to 16 bar)	909425
HDA 4748-H-0060-000	0 to 870 psi (0 to 60 bar)	909554
HDA 4748-H-0100-000	0 to 1450 psi (0 to 100 bar)	909426
HDA 4748-H-0250-000	0 to 3625 psi (0 to 250 bar)	909337
HDA 4748-H-0400-000	0 to 5800 psi (0 to 400 bar)	909427
HDA 4748-H-0600-000	0 to 8700 psi (0 to 600 bar)	909428
HDA 4778-H-0135-000	-14.5 to 135.5 psi (-1 to 9.34 bar)	920755
HDA 4778-H-0150-000	0 to 150 psi (0 to 10 bar)	920663
HDA 4778-H-1500-000	0 to 1500 psi (0 to 103 bar)	920757
HDA 4778-H-3000-000	0 to 3000 psi (0 to 207 bar)	920756
HDA 4778-H-6000-000	0 to 6000 psi (0 to 144 bar)	920664
HDA 4778-H-9000-000	0 to 9000 psi (0 to 621 bar)	920665

HCSI Pressure Measuring Transducer (HMG 4000 only CANbus)

Model Code	Description	Part No.
HDA 4748-HC-0009-000 (-1...+9 bar)	-1 ... 9 bar	925287
HDA 4748-HC-0016-000	0 ... 16 bar	925298
HDA 4748-HC-0060-000	0 ... 60 bar	925305
HDA 4748-HC-0100-000	0 ... 100 bar	925299
HDA 4748-HC-0160-000	0 ... 160 bar	925286
HDA 4748-HC-0250-000	0 ... 250 bar	925304
HDA 4748-HC-0400-000	0 ... 400 bar	925303
HDA 4748-HC-0600-000	0 ... 600 bar	925301
HDA 4748-HC-1000-000	0…1000 bar	925300

HCSI Temperature Measuring Transducer (HMG 4000 only CANbus)

Model Code	Description	Part No.
ETS 4148-HC-006-000	-13 to +212 °F	925302

Speed Sensors

Model Code	Description	Part No.
HDS 1000-002	Rpm Sensor (plug M12x1) 2M; Includes HDA 1000 Reflector Set (part no. 904812)	909436
HDS 1000 Reflector Set	Reflective foil set 25 pieces	904812
SSH 1000 (HMG 2500 only)	Sensor simulator for 2 HSI (ideal for training purposes)	909414
HSS 210-3-050-000 (HMG 4000 only)	Rpm Sensor (in connection with ZBE 46)	923193
HSS 220-3-046-000 (HMG 4000 only)	Rpm Sensor (in connection with ZBE 46)	923195

Temperature Transducer with HSI
(Sensor Interface)

Model Code	Description	Part No.
ETS-4148-H-006-000	-13° to 212°F (-25° to 100°C)	923398

NOTES:

The information in this catalog relates to the operating conditions and applications described. For applications or operating conditions not described, please contact us a filtersystemsmanger@schroederindustries.com.

Subject to technical modifications

HMG Accessories for HMG Series

Sensor Cables (HMG 4000 only)

Model Code	Description	Part No.
Push-pull connection on plug-side		
ZBE 40-02	(CABLE M12X1/5P, PUSH-PULL) 2M length	6177158
ZBE 40-05	(CABLE M12X1/5P, PUSH-PULL) 5M length	6177159
ZBE 40-10	(CABLE M12X1/5P, PUSH-PULL) 10M length	6177160
Screw connection		
ZBE 30-02	(Sensor cable M12x1, 5-pin) 2M length	6040851
ZBE 30-05	(Sensor cable M12x1, 5-pin) 5M length	6040852

Flow Sensor with HSI
(Sensor Interface)

| Model Code	Description	Part No.
Aluminum		
EVS 3108-H-0020-000	0.26 to 5.28 gpm (1.2 to 20 L/min)	909405
EVS 3108-H-0060-000	1.59 to 15.9 gpm (6 to 60 L/min)	909293
EVS 3108-H-0300-000	3.96 to 79.3 gpm (15 to 300 L/min)	909404
EVS 3108-H-0600-000	10.6 to 159 gpm (40 to 600 L/min)	909403
Stainless Steel		
EVS 3118-H-0020-000	0.26 to 5.28 gpm (1.2 to 20 L/min)	909409
EVS 3118-H-0060-000	1.59 to 15.9 gpm (6 to 60 L/min)	909406
EVS 3118-H-0300-000	3.96 to 79.3 gpm (15 to 300 L/min)	909408
EVS 3118-H-0600-000	10.6 to 159 gpm (40 to 600 L/min)	909407

Other Accessories

Model Code	Description	Part No.
Pelican Case	for HMG 2500 and accessories	2702730
Case for HMG 4000	Case for HMG 4000 and accessories	6179836
USB Cable (HMG 2500 only)	Connection to PC	6040585
ZBE 30-02 (HMG 2500 only)	cable for M12x1 - 6'	6040851
ZBE 30-05 (HMG 2500 only)	cable for M12x1 - 15'	6040851
ZBE 36 (HMG 2500 only)	TWS (TestMate® Water Sensor) Adapter	909737
Power Supply	DC Charging unit for HMG 2500	6054296
ZBE 31	Car charger for HMG Unit	909739
HCSI Y splitter	Y splitter for HCSI sensors	6178196
HCSI bus termination	Termination connector for HCSI Sensors	6178198
ZBE 46	Pin adapter HMG (for three-wire signals, AS, …)	925725
ZBE 100	Adapter for TFP 100	925726
ZBE 38	Y adapter, black for jack I/J	3224436
ZBE 26	Y adapter, blue for HLB 1000	3304374
ZBE 41	Y adapter, yellow for TCM sensor	910000
UVM 3000	Universal connection module for HMG 4000 only	909752
Hydraulic Adapter set	Adapter hose DN 2 / 1620/1620, 400 mm and 1000 mm, pressure gauge connection 1620/ G1/4, adapter 1615/ 1620, bulkhead couplings 1620/ 1620	903083

TestMate® Series ET-100-6

Features and Benefits

- Easy to use–for beginner or experienced troubleshooters

- Large meters are clearly marked with easy-to-read scales

- Scale selector switches and the load valve control knob are also large and specially designed to be easy to grip under any conditions

- All loose components are stowed in form-fitting recesses in the impact resistant plastic case that also protects the meters and circuitry

- The electronic sensor and the EasyTest fitting are the only components that see hydraulic fluid, so clean-up is limited to draining the sensor and replacing the cap on the EasyTest fitting

- The load valve allows the operator to simulate operating pressure, if required

Description
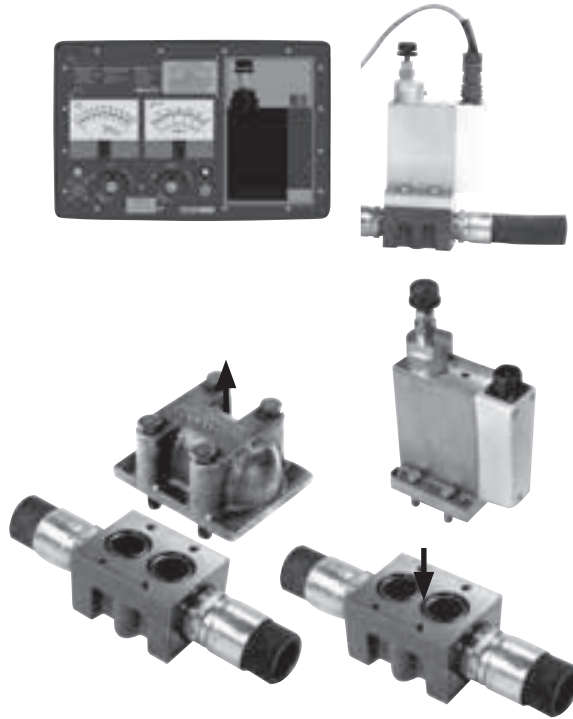
Schroeder's original TestMate® system with the patented EasyTest fitting provides the hydraulic user with a quick, convenient method to test, troubleshoot, and obtain preventive maintenance data on hydraulic systems. Flows up to 100 gpm and pressures up to 6000 psi, as well as operating temperature, are measured through an EasyTest fitting, which is permanently installed in the hydraulic system.

The sensor and EasyTest fittings are robust units designed to operate safely at any system pressure up to the maximum 6000 psi that the sensor load valve is capable of generating. Pressure bearing parts are thick section aluminum extrusions carefully chosen for their combination of high strength and light weight.
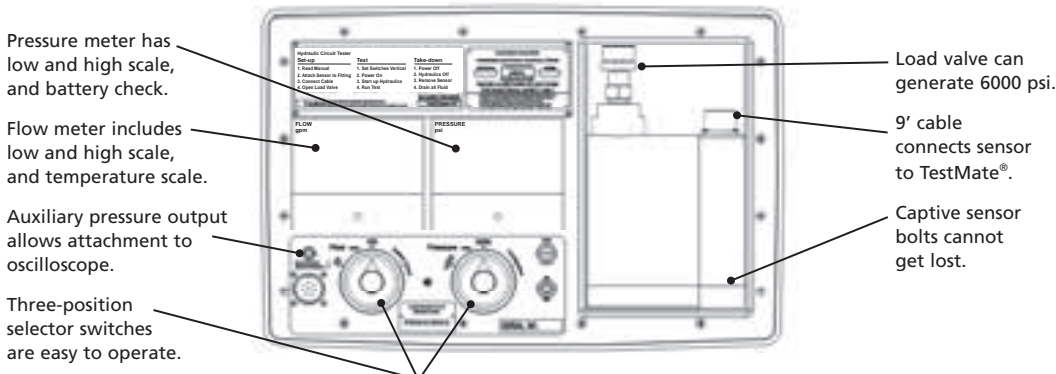
If the system's prime mover is kept at constant rpm, any drop in indicated flow will represent a loss of system efficiency at the point of test. During testing, system operation can be used to create the load, or the load can be simulated with the load valve in the sensor block.

The electronic circuitry produces data that accurately reflects system performance at each test point throughout the operating pressure range, making it possible to also determine pump and motor efficiency as well as valve and cylinder leakage.

Applications

- Check systems before and after rebuild
- Use as part of a preventive maintenance program
- Use to troubleshoot in instances of poor system performance or excessive machine downtime
- Use to check performance on a production line
- Install EasyTest fittings on prototypes to accurately evaluate hydraulic performance at any stage of development

Pressure meter has low and high scale, and battery check.

Flow meter includes low and high scale, and temperature scale.

Auxiliary pressure output allows attachment to oscilloscope.

Three-position selector switches are easy to operate.

Load valve can generate 6000 psi.

9' cable connects sensor to TestMate®.

Captive sensor bolts cannot get lost.

NOTES:

Box 2. Required for any underground coal mining application. Unit will be furnished with the required MSHA tag.

ET-100-6   TestMate® Series

Flow Meter		Type:	Electronic turbine
		Low Scale Range:	0 to 20 gpm (0 to 75.7 L/min)
		Low Scale Accuracy:	±1 gpm @ 3 to 5 gpm (11-19 L/min) ±0.2 gpm @ 6 to 20 gpm (22.7-75.7 L/min)
		High Scale Range:	0 to 100 gpm (0 to 378 L/min)
		High Scale Accuracy:	±2% of full scale
		Minimum Reading:	3 gpm (11.35 L/min)
Pressure Meter		Type:	Electronic transducer
		Low Scale Range:	0 to 1000 psi (0 to 69 bar)
		Low Scale Accuracy:	±35 psi (2.41 bar)
		High Scale Range:	0 to 6000 psi (0 to 413.8 bar)
		High Scale Accuracy:	±120 psi (8.44 bar)
	Auxiliary Pressure Output:		BNC connector - 2.5 mv @ 0.1mA per 1000 psi (68.96 bar), linear in the range 0 to 6000 psi (0 to 413.8 bar), independent of meter scale selection
	Temperature Scale:		50°F to 250°F (10°C to 121°C)
	Power Source:		8 "C" size batteries *To be furnished by customer*
	Weight:		18 lbs (8 kg)
	Case Dimensions:		19.87 x 13.93 x 4.68 in (50.4 x 35.4 x 11.9 cm)
	EasyTest Fitting Envelope Dimensions:		4.5 x 4 x 3 in (114 x 102 x 76 mm)
	EasyTest Fitting Mounting Holes:		Qty 2 - .375 to 16 UNC .75 dp.
	Clearance to Install Sensor:		11 in (280 mm) min

EasyTest Fittings

Port Type and Size	Model Numbers		Port Type and Size	Model Numbers	
	Station with Through Flow for In-Line Testing	Station with Blocked Flow for "T" Testing		Station with Through Flow for In-Line Testing	Station with Blocked Flow for "T" Testing
NPTF			**SAE 4-Bolt Boss[2]**		
0.75	A-ET-211	A-ET-197	0.75	A-ET-219	A-ET-205
1.00	A-ET-212	A-ET-198	1.00	A-ET-220	A-ET-206
1.25	A-ET-213	A-ET-199			
1.501	A-ET-256	A-ET-312			
SAE O-Ring			**BSP PL**		
1.06-12	A-ET-215	A-ET-201	0.75	A-ET-222	A-ET-314
1.3125-12	A-ET-216	A-ET-202	1.00	A-ET-223	A-ET-315
1.625-12	A-ET-217	A-ET-203	1.25	A-ET-224	A-ET-316
1.875-12[1]	A-ET-258	A-ET-313			

[1]For 3000 psi only
[2]Depth of holes not per SAE specifications

Model Number Selection

How to Build a Valid Model Number for a Schroeder Original TestMate®:

BOX 1   BOX 2

| ET-100-6 | – | |

Example: *NOTE: One option per box*

BOX 1   BOX 2

| ET-100-6 | – | | **= ET-100-6** |

BOX 1	BOX 2
Model	**Option**
ET-100-6 Original TestMate®	Omit = None C = MSHA approved

Hydraulic Test Bench **HTB**

Features and Benefits

- An ingenious universal mounting bracket makes mounting pumps and motors on the bench a simple, quick operation

- Mounting plates are furnished to accommodate flange-mounted and foot-mounted pumps or motors

- Drive adapter equipment includes inserts for keyed shafts, an insert chuck and a universal drive shaft

- Quick disconnect porting on the bench provides convenient hook-up for test components

- Two complete operating manuals are supplied with each bench

- Kits and spare parts available for upgrades and maintenance

Description
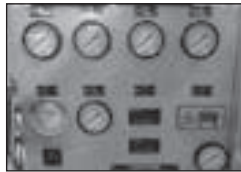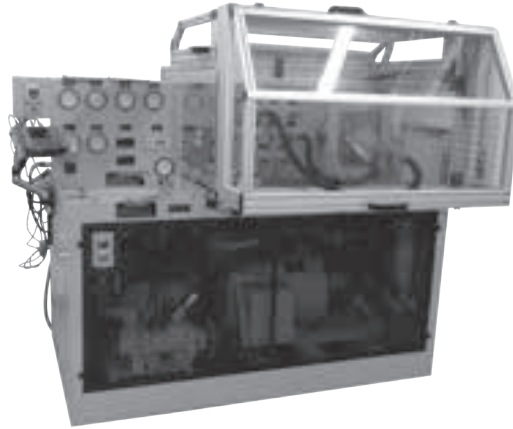
The Schroeder Model HTB hydraulic test bench is the ultimate diagnostic tool, capable of thoroughly testing a vast array of new or rebuilt components and subassemblies prior to their installation in a working system. Test bench instrumentation has been designed to make diagnosis fast and accurate, with virtually no requirement for connecting external instruments. The bench panel includes a digital flow gauge, a tachometer to measure the speed of tested pumps or motors, and a reservoir temperature gauge. Individual gauges measure pressure on the test bench main pump, the pump or motor being tested, the test bench load pump, the cylinder and valve pressure port, and the test bench super charge pump.

Every HTB includes efficient Schroeder hydraulic filters to keep the bench oil at optimum cleanliness, providing assurance that newly rebuilt components will not be subjected to harmful levels of dirt. To keep filters operating at peak efficiency, the instrument panel includes a red pilot light that signals the operator when any bench filter needs a new element.

These benches have been refined for over 50 years by Schroeder engineers, based on the comments and requests of over 1,000 test bench owners. The versatile hydraulic circuitry present in each of the three models can shorten troubleshooting time and take the guesswork out of diagnoses. Current models are powerful, compact units that pay for themselves quickly in saved maintenance time and expenses.

Accessories

- Suction and pressure hose and fittings group (contains hose connection with female quick disconnects on both ends, plus a series of separate national pipe thread, straight thread, and SAE four-bolt flange adapters, ranging in size from 3/8" through 2", equipped with male quick disconnects)
- Oil cooler
- Solenoid and pilot-operated valve test group
- Spline shaft adapter kit
- Jib Crane Group
- Digital Instrumentation Package
- Water Cooled Heat Exchanger

- Filtration Group
- Safety Enclosure Group
- High Pressure Intensifier Circuit
- Bidirectional Pump Test Circuit
- HMG Digital Electronic Group
- Air Cooled Heat Exchanger
- 25 gpm Case Drain Meter
- TCM Kit

HTB | Hydraulic Test Bench

Applications

Pumps and motors can be tested dynamically. Pump and motor testing is aided by the wide speed and torque ranges built into the bench and by the universal mounting bracket and mounting accessories that come with the bench. An open loop hydrostatic variable volume hydraulic system provides the power and speed control for the drive shaft. Motors can be dynamically tested, under load, for operating efficiency. Pumps can be tested for external leakage and volumetric efficiency in either direction, at speeds from 200 to 2400 rpm. The test bench can also be used to break-in pumps and motors to manufacturer's specifications before they are installed in a system.

Cylinder leaks are easy to find. Double-acting cylinders may be cycled, and tested for both internal and external leakage at any point of piston travel. Scored cylinder walls and defective packing are easily detected. Single-acting cylinders are tested at maximum stroke.

Valve testing time is minimized. Pressures can be set, external and internal leakage spotted, flow and pressure data can be generated and checked against operating requirements and overall valve efficiency determined. Optional electrical and pilot pressure supplies are available on the bench for testing solenoid-actuated and pilot-operated valves.
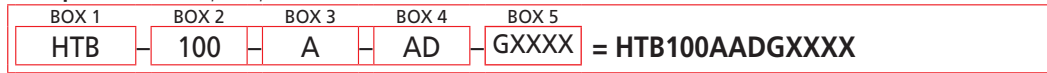
Specifications

	Model HTB-50	Model HTB-100	Model HTB-150
Speed Range *in either direction*	200 to 2400 rpm	200 to 2400 rpm	200 to 2400 rpm
Power Available *For testing pumps* *Expressed torque*	275 ft-lbs to 1200 rpm	458 ft-lbs to 1200 rpm *(decreasing proportionately to 2400 rpm)*	670 ft-lbs to 1200 rpm
Expressed in horsepower	60 hp at 1200 rpm	115 hp at 1200 rpm *(with constant hp to 2400 rpm)*	150 hp at 1200 rpm
Test Pressure	0 to 5000 psi (345 bar)	0 to 5000 psi (345 bar)	0 to 5000 psi (345 bar)
Test Motor Load *Maximum in either direction*	275 ft-lbs	458 ft-lbs	670 ft-lbs
Electrical Drive *Motor-230/460V, 1800 rpm; 3 phase, 60 hertz.* *A start-stop push button is mounted on the bench: Starter(s) is/are not included. Customer must advise type of starter(s) and service voltage to be used.*	50 hp	100 hp	100 hp and 50 hp
Hydraulics *Main Bench Pump (variable piston)*	23 gpm/5000 psi (87 L/min/345 bar)	38 gpm/5000 psi (144 L/min/345 bar)	38 gpm/5000 psi (144 L/min/345 bar)
Auxiliary Main Pump (variable piston)	N/A	N/A	23 gpm/5000 psi (87 L/min/345 bar)
Supplemental Pump	20 gpm/2000 psi (76 L/min/138 bar)	20 gpm/2000 psi (76 L/min/138 bar)	20 gpm/2000 psi (76 L/min/138 bar)
Pressure and Return Ports	1" quick disconnects	1" quick disconnects	1" quick disconnects
Suction Porting	1" & 2" quick disconnects	1" & 2" quick disconnects	1" & 2" quick disconnects
Flow Gauge Scales	Digital Readout from 0 to 100 gpm (all models)		
Reservoir Capacity	100 gallons (378 L)	100 gallons (378 L)	200 gallons (757 L)
General	Full flow 3 micron filtration maintains excellent system cleanliness level; bench includes a 30" x 30" work pan, oil level gauge, fill cap mesh strainer, digital tachometer.		
Bench Dimensions and Weight	62" H x 76" L x 43" W 4100 lbs (1860 kg)	62" H x 76" L x 43" W 4500 lbs (2041 kg)	62" H x 76" L x 55" W 6000 lbs (2722 kg) Auxiliary Power Unit 30" H x 50" L x 30" W 900 lbs (408 kg)

Hydraulic Test Bench   HTB

Model Number Selection

How to Build a Valid Model Number for a Schroeder HTB:

BOX 1	BOX 2	BOX 3	BOX 4	
HTB	–	–	–	

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	
HTB	– 100	– A	– AD	– GXXXX	= HTB100AADGXXXX

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
Model	**HP**	**Voltage**	**Options**	**Custom Groups**
HTB	50	A = 230V 60Hz	A = Water Cooled Heat Exchanger	Add G # for all custom parts & frame modifications.
	100	B = 460V 60Hz	B = Solenoid & Pilot Operated Valve Group	
	150	C = 575V 60Hz	C = Jib Crane Group	
		D = 380V 50H	D = Filtration Group (standard/included on all benches)	
		E = 415V 50Hz	E = Safety Enclosure Group	
		F = 380V 60Hz	F = High Pressure Intensifier Circuit	
		G = 208V 60Hz	G = Bidirectional Pump Test Circuit	
		H = 220V 50Hz	H = HMG Digital Electronic Group	
			I = Air Cooled Heat Exchanger	
			J = 25 gpm Case Drain Meter	
			K = Digital Gauges	
			L = TCM Kit	
			Splined Shaft Group*	
			Hose & Fitting Group*	
			* Not part of BOM structure, listed as separate line item on P.O.	

NOTES:

Box 4. May have multiple options.

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

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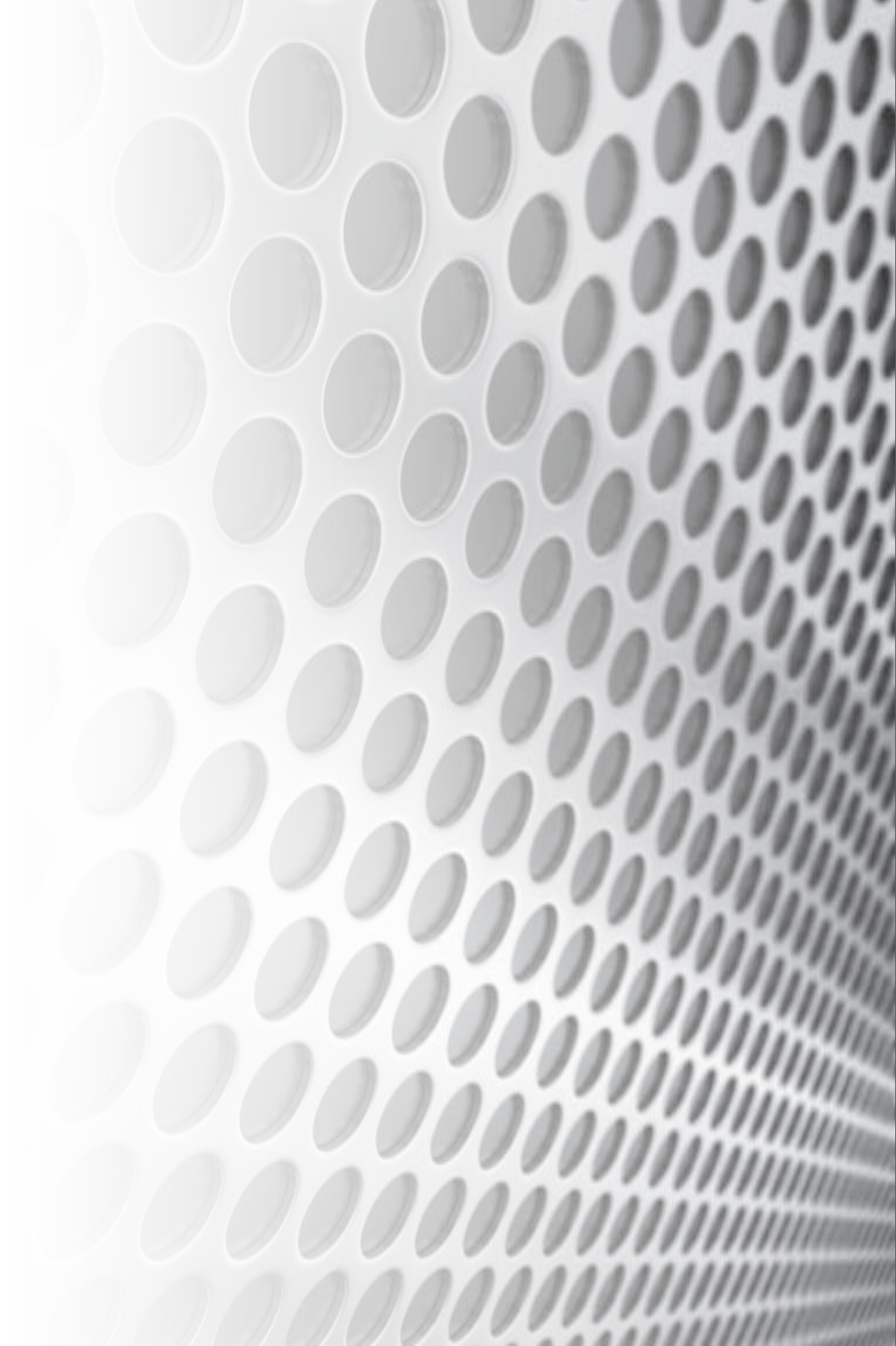
FLUID CONDITIONING PRODUCTS

RFSA Reservoir Filtration System Adapter

Reservoir Filtration System Adapter

Features and Benefits

- The RFSA is an aluminum adapter that gives a kidney loop filter access to a reservoir
- Accommodates kidney loop filtration rates up to approximately 15 gpm
- Suitable to use with many Filter Systems products including: KLS/KLD/MFS/MFD, HFS-BC, MFD-BC, MFD-MV, MFS/MFD-HV, TDS-A, AMFS, FS, MTS
- 1.25" SAE O-Ring Boss Suction Port
- 1.00" SAE O-Ring Boss Return Port
- Suction and Return downtubes included and recommended to be cut to length and bent for proper fluid turnover in a reservoir
- Optional MFS/MFD Fitting Kit can be ordered separately. This includes adapters to install CAM-GROOVE hose couplings between Suction/Return hoses/wands and additional CAM-GROOVE adapters for installation in kidney loop adapter. Dust caps and plugs included

MarketApplications

- All applications with a hydraulic reservoir utilizing a 6-bolt mounting connection

Mounting Requirement

Customer is responsible to cut an appropriately sized hole on top of their tank. This adapter has two (2) ports: one for Suction and one for Return. Also includes a breather port.

Reservoir pattern is six (6) .18" holes on a 4.94" BCD with a 4.25" diameter center hole. See Drawing S-1048.
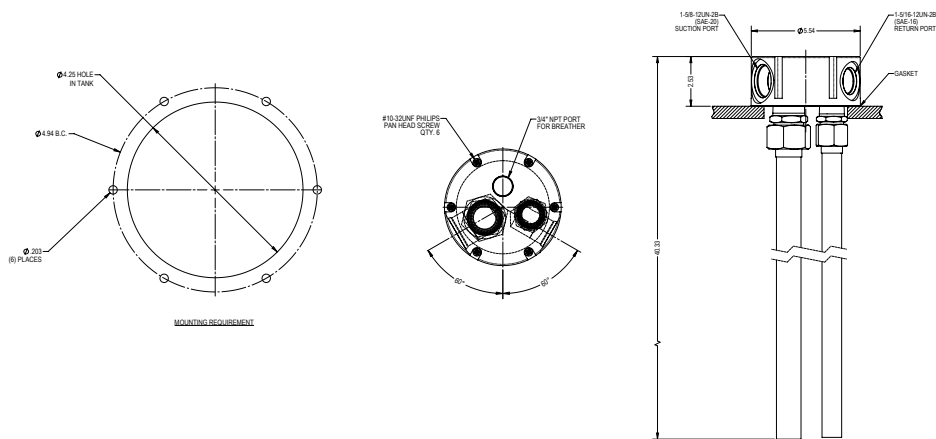
Specifications

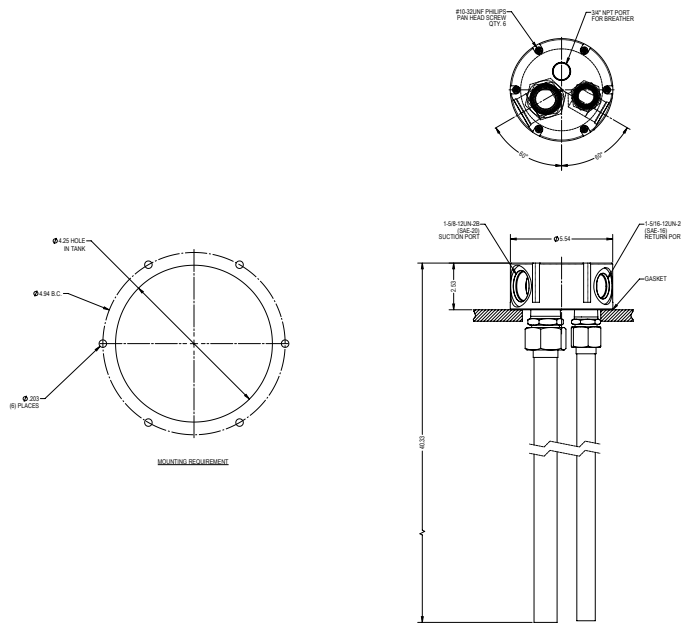|	
Reservoir Mounting Pattern:	Fits standard 6-bolt
Supply Port Thread Size:	1.25" SAE O-Ring Boss Suction Port
Return Port Thread Size:	1.00" SAE O-Ring Boss Return Port
Breather Port Thread Size:	¾" NPT
Return Tubes:	Suction and Return downtubes included and recommended to be cut to length and bent for proper fluid turnover in reservoir

Reservoir Filtration System Adapter RFSA
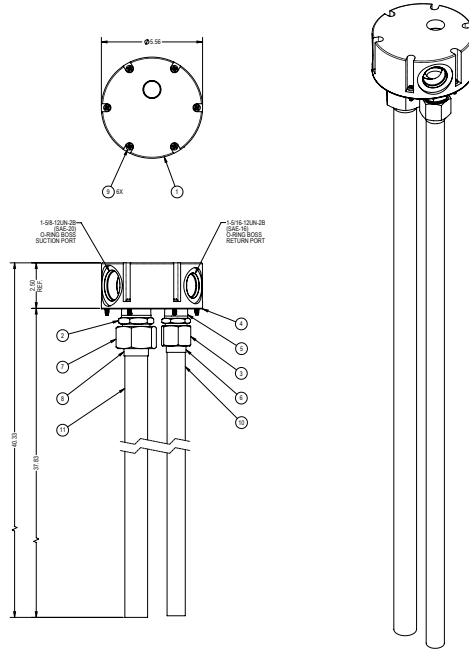
CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

Parts List Drawing

Installation Details

Model Number Selection

How to Build a Valid Model Number for a Schroeder Filtration System Adapter RFSA:

BOX 1	BOX 2
RFSA	

Example: *NOTE: Box 2 can have multiple options.*

BOX 1	BOX 2	
RFSA		= RFSA

BOX 1	BOX 2
Model	**Options**
RFSA	Omit = For use with Kidney Loop Filtration Products
	1 = Optional MFS/MFD Fitting Kit

HFS-BC Handy Filter Systems Basic Cart

Features and Benefits

- Compact size, easily transported
- Now available with 12 V DC Power Option, allowing for system power to be drawn directly from your heavy machinery
- Cartridge elements have 25% higher dirt holding capacity compared to spin-on filters
- Top-ported filter provides easy element service
- Can be used as an efficient "tank-topper" solution for drums of mineral-based fluids
- Optional Backpack Version available for ease of transport across distances

Applications

- Supplementing continuous filtration by system filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from drums to system reservoirs

Description

Schroeder's Handy Filter System Basic Cart is a compact, self-contained "light-duty" filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. It is perfect for cleaning up existing systems as well as for pre-filtering new fluids, since new fluids often have contamination levels significantly higher than that recommended for most hydraulic systems.

The filtration system's compact, lightweight design with replaceable element cartridge and reusable bowl minimizes landfill waste. Element service is easily accomplished through the top-ported filter housings. The optional dual filter assembly allows for water and particulate removal or staged particulate contamination removal.

Specifications

Flow Rating:	4 gpm (15.14 L/min) max
Maximum Viscosity:	1,600 SUS (350 cSt)
Hose Pressure Rating:	30 psig (2.0 bar) @ 150°F (65.6°C) Full vacuum @ 150°F (65.6°C)
Fluid Temperature:	25°F to 150°F (-4°C to 65°C)
Material:	Element case: Aluminum
Seal Material:	Buna N
Compatibility:	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Motor:	115 VAC single phase .25 hp
Weight:	Single housing - 40 lbs
	Dual housing - 44 lbs
	BackPack version - 39 lbs (Does not include weight of hose/wands)

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

Handy Filter Systems Basic Cart **HFS-BC**

Metric dimensions in ( ).

Model Number Selection

How to Build a Valid Model Number for a Schroeder HFS-BC:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
HFS-BC								

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
HFS-BC	A	2	09	H10	H05	B	E		= HFS-BCA209H10H05BE
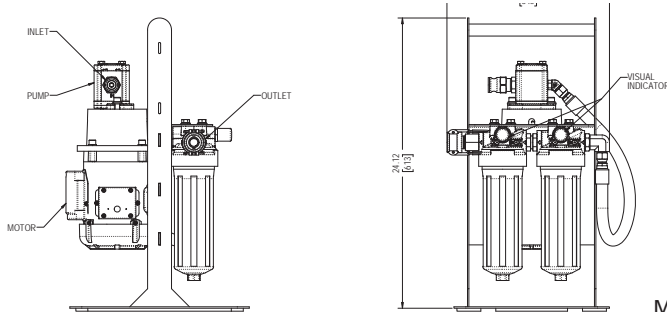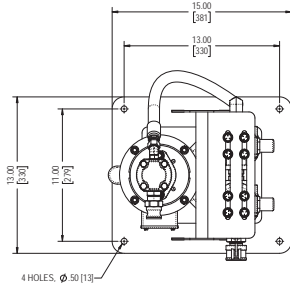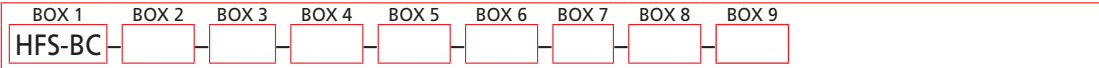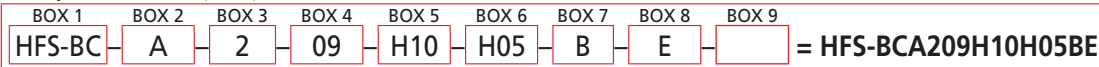
BOX 1	BOX 2	BOX 3	BOX 4
Model	**Voltage**	**Number of Filter Housings**	**Element Length**
HFS-BC	A = 120VAC / 1-Phase / 60 Hz	1 = Single	09
	T = 12 Volt DC Option	2 = Dual	

BOX 5	BOX 6
Element Media First Housing	**Element Media Second Filter (Dual Only)**
H03 = 3 µm Excellement® Z-Media® (synthetic) H05 = 5 µm Excellement® Z-Media® (synthetic) H10 = 10 µm Excellement® Z-Media® (synthetic) H25 = 25 µm Excellement® Z-Media® (synthetic) GW = Water Removal	Omit = Single housing and Backpack version H03 = 3 µm Excellement® Z-Media® (synthetic) H05 = 5 µm Excellement® Z-Media® (synthetic) H10 = 10 µm Excellement® Z-Media® (synthetic) H25 = 25 µm Excellement® Z-Media® (synthetic) GW = Water Removal

BOX 7	BOX 8	BOX 9
Seal Material	**Clogging Indicator**	**Options**
B = Buna	E = Standard Visual Indicator	BP = BackPack Version (Single Housing Only)

HFS-15 | Hand Held Portable Filter

Features and Benefits

- Improvement in service life for components and system filters
- Increased oil service life
- Increased machine availability
- Simple operation
- Compact design
- Integrated dry running protection
- Optional CS1000 | Contamination Sensor ensures continuous monitoring of oil cleanliness during cleaning

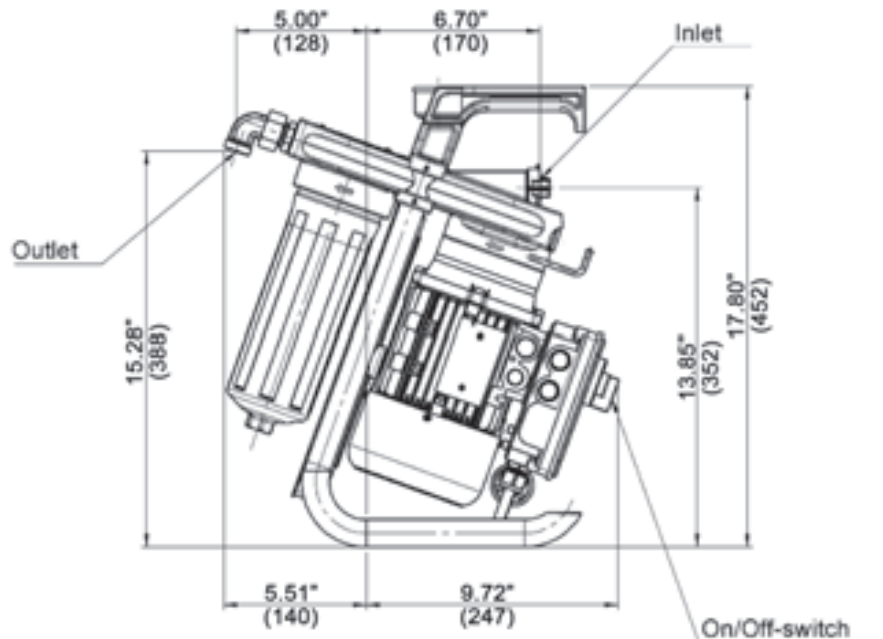Part of the Schroeder Industries 2030 Initiative

Description

The HFS-15 Hand Held Portable Filter is used as a service unit for filling and flushing hydraulic systems, as well as for cleaning in bypass flow. It can also be supplied with a CS1000 | Contamination Sensor. This allows the solid particle contamination in the oil to be monitored at the same time. The cleanliness class results are displayed according to ISO, SAE classifications.

Specifications

Flow Rating:	HFS-15-E: 4 gpm (15 L/min) HFS-15-P: 2.6 gpm (9.84 L/min)
Pump Type:	Vane pump
Maximum Operating Pressure:	58 psi (4.0 bar)
Maximum Permissible Inlet Pressure:	-5.8 to 8.7 psi (-0.4 bar to + 0.6 bar)
Viscosity Range:	HFS-15-E: 42 to 1623 SUS (5-350cSt) HFS-15-P: 42 to 927 SUS (5-200cSt)
Fluid Temperature:	14°F to 176°F (-10°C to +80°C)
Ambient Temperature:	14°F to 104°F (-10°C to +40°C)
Seal Material:	FKM (FPM, Viton®)
Weight:	HFS-15-E: 30.9 lbs. (14 kg) HFS-15-P: 36.4 lbs. (16.5 kg)

Economy

Hand Held Portable Filter   **HFS-15**

Premium

Metric dimensions in ( ).

Model Number Selection

How to Build a Valid Model Number for a Schroeder HFS-15:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
HFS	–	–	–	–	–	–	–	=

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
HFS	15	E	09	NX	10	–	E	= HFS15E9NX10E

BOX 1	BOX 2		BOX 3		BOX 4
Model	**Size**		**Type**		**Element Length**
HFS	15 =	4 gpm (15 L/min) (for type "E" only)	E =	Economy	09
	10 =	2.6 gpm (10 L/min) (for type "P" only)	P =	Premium (w/ Condition Monitoring)	

BOX 5	BOX 6
Filter Rating	**Element Media**
NX = Particulate Removal Element	01 = 1 µm Excellement® Z-Media® (synthetic)
AM = Water Removal	03 = 3 µm Excellement® Z-Media® (synthetic)
Filtration Rating = 1, 3, 5, 10, 25	05 = 5 µm Excellement® Z-Media® (synthetic)
	10 = 10 µm Excellement® Z-Media® (synthetic)
	25 = 25 µm Excellement® Z-Media® (synthetic)
	GW = Water Removal

BOX 7	BOX8
Power Supply	**Clogging Indicator**
OMIT = 120V-60Hz-1Ph (0.25kW)	E = Back-pressure indicator
M = 230V, 50Hz, 1pH (0.25kW)	

MFDBC Mobile Filter System - Basic Cart

10 gpm max
37.9 L/min

Features and Benefits
- Compact size, easily transported
- Top-ported filter provides easy element service
- D10 Auto-Reset Indicator indicates when filter elements require a change
- Hoses and connection tubes included (10' total length)
- Drip pan catches oil before it falls to the ground
- Off-line stationary system available – see Kidney Loop System

Applications
- Supplementing continuous filtration by system filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from storage tanks and drums to system reservoirs

Description

The Schroeder Mobile Filter System - Basic Cart is a compact, self-contained, "light-duty" filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. It is perfect for cleaning up existing systems as well as for prefiltering new fluids, since new fluids often have contamination levels significantly higher than that recommended for most hydraulic systems.

The filtration system's compact, lightweight design with replaceable element cartridge and reusable bowl, minimizing landfill waste. Element service is easily accomplished through the top-ported filter housings. The MFD-BC includes a drip pan to help catch any oil before it falls to the ground. The dual filter assembly allows for water and particulate removal or staged, particulate contamination removal.

Specifications

Flow Rating:	10 gpm (37.9 L/min) max
Viscosity Range:	46 - 1,000 SUS (6 - 216 cSt)
Hose Pressure Rating:	30 psig (2.0 bar) @ 150°F (65.6°C) Full vacuum @ 150°F (65.6°C)
Fluid Temperature:	25°F to 150°F (-4°C to 65°C)
Bypass Valve Setting:	Cracking: 25 psi (1.7 bar)
Material:	Element Case: Aluminum
Seal Material:	Buna N
Compatibility:	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Motor:	115 VAC Single phase 1 hp
Weight:	102 lbs. (46.3 kg)

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

Mobile Filter System - Basic Cart MFDBC

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
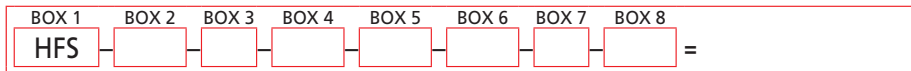OLF Compact
OLF
OLF-P
NxTM
VEU-F
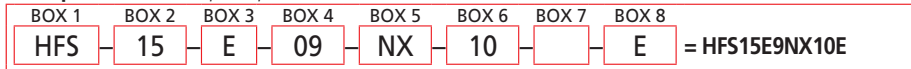VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

17.03
[433]

40.08
[1018]

16.50
[419]

Metric dimensions in ( ).

How to Build a Valid Model Number for Schroeder MFDBC:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6
MFDBC –		–	–	–	

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6
MFDBC –	1 –	09 –	H10 –	H05 –		= MFDBC109H10H05

Model Number Selection

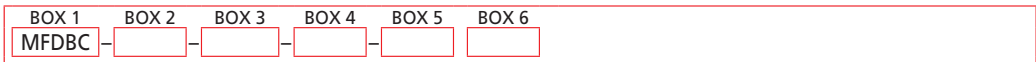| BOX 1	BOX 2	BOX 3	BOX 4
Model	**No. of Elements**	**Element Length**	**Element Media First Filter**
MFDBC	1	09	H03 = 3 µm Excellement® Z-Media® (synthetic)
			H05 = 5 µm Excellement® Z-Media® (synthetic)
			H10 = 10 µm Excellement® Z-Media® (synthetic)
			H25 = 25 µm Excellement® Z-Media® (synthetic)
			GW = Water Removal

BOX 5	BOX 6
Element Media Second Filter	**Voltage**
H03 = 3 µm Excellement® Z-Media® (synthetic)	Omit = 115 V / 60 Hz
H05 = 5 µm Excellement® Z-Media® (synthetic)	A = 220 V / 60 Hz
H10 = 10 µm Excellement® Z-Media® (synthetic)	B = 220 V / 50 Hz
H25 = 25 µm Excellement® Z-Media® (synthetic)	
GW = Water Removal	

NOTES:

Box 6. If 220V, 50 Hz option selected, flow rating is reduced to ~8-gpm and will have plug cutoff.

MFS MFD

Mobile Filtration Systems

U.S. Patents 6568919 7604738

7 or 14 gpm
26.5 or 53 L/min

FluMoS MOBILE

- Usable with FluMoS Mobile App - HY-TRAX® option only

CSI-C-11 Compatible Product

MFD

MFS
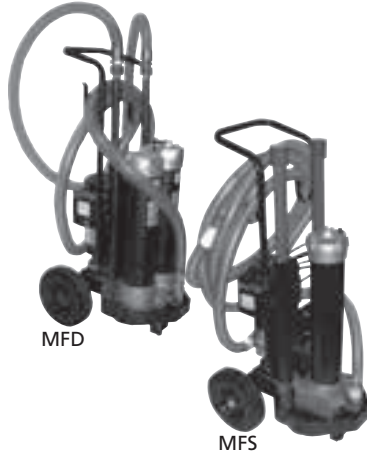
Features and Benefits

- Single, double and triple bowl length option allows the flexibility of additional dirt-holding capacity
- Modular base eliminates hoses between components and minimizes leakage
- Base-ported filter provides easy element service from the top cap
- D5 Dirt Alarm® indicates when filter element needs changed
- Integral suction strainer protects pump
- Hoses and connection tubes included (13' total length)
- Option for the addition of Contamination Sensors and WLAN/LAN Communication (CSI-C-11)

Applications

- Supplementing continuous filtration by system filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from storage tanks and drums to system reservoirs

Description

The Schroeder Mobile Filtration System is a compact, self-contained filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. It is perfect for cleaning up existing systems as well as for prefiltering new fluids, since new fluids often have contamination levels significantly higher than that recommended for most hydraulic systems.

The MFS single filtration unit can remove either water or particulate contamination. The MFD dual filtration unit can be used to remove both water and particulate contamination, or for staged particulate contaminant removal.

Contamination Sensor for Remote Visibility Options

HY-TRAX® manual fluid sampling system: Schroeder now offers the HY-TRAX® manual fluid sampling system as an additional option allowing for real-time fluid condition monitoring. ISO particle counts are visually displayed on the TCM. Users will now know when they have reached their desired ISO contamination levels. For more information, please see page 102.

CSI-C-11: Schroeder also offers the CSI-C-11 Communication Interface for WLAN or LAN transmission of data and data storage capabilities. For more information, please see page 38.

Specifications

Flow Rating:	7 gpm (26.5 L/min) max or 14 gpm (53.0 L/min) max
Viscosity Range:	40 - 1,000 SUS (4 - 216 cSt) Higher viscosity version available. Contact factory for details.
Hose Pressure Rating:	30 psig (2.0 bar) @ 150°F (65.6°C) Full vacuum @ 150°F (65.6°C)
Fluid Temperature:	25°F to 150°F (-4°C to 65°C)
Bypass Valve Setting:	Cracking: 30 psi (2 bar)
Material:	Manifold and cap: Cast aluminum Element case: Steel
Compatibility:	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Motor:	115 VAC Single phase 3/4 hp (7 gpm) or 1-1/2 hp (14 gpm)
Element Change Clearance:	8.50" (215 mm) 1K (9, 18 or 27" depending on model configuration)

Weights

gpm	MFS-1K lb (kg)	MFS-2K lb (kg)	MFS-3K lb (kg)	MFD-1K lb (kg)	MFD-2K lb (kg)	MFD-3K lb (kg)
7	170 (77)	180 (82)	190 (86)	185 (84)	203 (92)	220 (100)
14	170 (80)	187 (85)	197 (89)	192 (87)	210 (95)	227 (103)

Mobile Filtration Systems

U.S. Patents 6568919 7604738

MFS
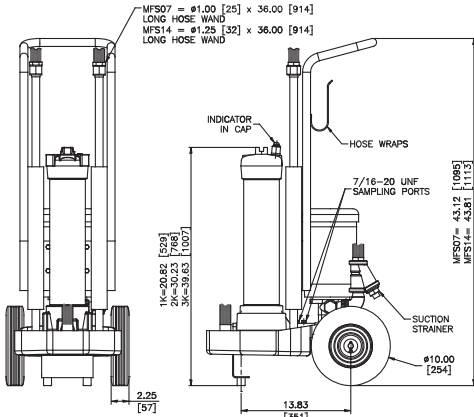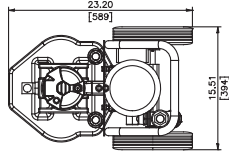
MFD
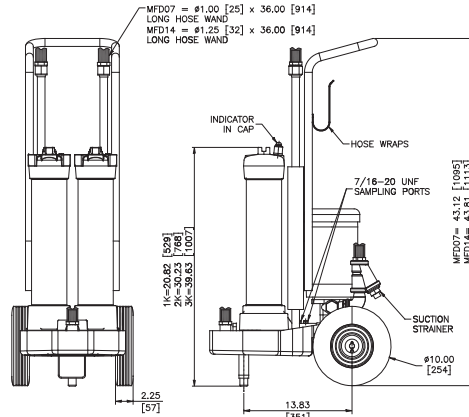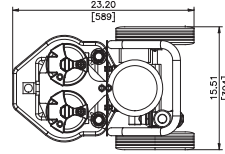
MFS07 = ⌀1.00 [25] x 36.00 [914]
LONG HOSE WAND
MFS14 = ⌀1.25 [32] x 36.00 [914]
LONG HOSE WAND
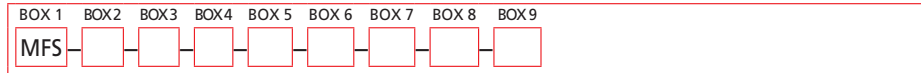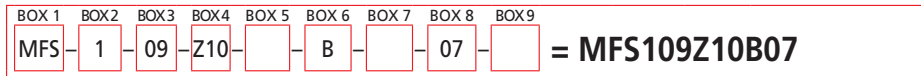
MFD07 = ⌀1.00 [25] x 36.00 [914]
MFD14 = ⌀1.25 [32] x 36.00 [914]
LONG HOSE WAND

Metric dimensions in ( ).

How to Build a Valid Model Number for a Schroeder MFS:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
MFS								

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
MFS	1	09	Z10		B		07		= MFS109Z10B07

BOX 1 / BOX 2 / BOX 3 / BOX 4

Model	No. of Elements	Element Length	Element Media First Filter
MFS	1	09	Z01 = 1 µm Excellement® Z-Media® (synthetic)
MFD	2	18	Z03 = 3 µm Excellement® Z-Media® (synthetic)
	3	27	Z05 = 5 µm Excellement® Z-Media® (synthetic)
			Z10 = 10 µm Excellement® Z-Media® (synthetic)
			Z25 = 25 µm Excellement® Z-Media® (synthetic)
			EWR = Water Removal
			G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			GWR = Water Removal w/GeoSeal®

BOX 5

Element Media Second Filter (MFD Only)

Z01 = 1 µm Excellement® Z-Media® (synthetic)
Z03 = 3 µm Excellement® Z-Media® (synthetic)
Z05 = 5 µm Excellement® Z-Media® (synthetic)
Z10 = 10 µm Excellement® Z-Media® (synthetic)

Z25 = 25 µm Excellement® Z-Media® (synthetic)
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
GWR = Water Removal w/GeoSeal®

BOX 6

Seal Material
B = Buna
V = Viton®
H.5 = Skydrol Compatibility

BOX 7

Voltage
Omit = 115 V / 60 Hz / 1-Phase
A = 230 V / 60 Hz / 3-Phase
B = 460 V / 60 Hz / 3-Phase
C = 220 V / 50 Hz / 1-Phase
D = 230 V / 60 Hz / 1-Phase

BOX 8

Pump Size (gpm)
07
14

BOX 9

Particle Counter

Omit = Without Particle Counter

P = Particle Counter

P-CSI = Particle Counter + CSI-C-11 Option

P-CSI-W = Particle Counter + CSI-C-11 + Water Sensor (No Display) Option

Model Number Selection

NOTES:

Box 2. When Box 2 is 2 or 3, Box 3 must be 09.

Box 5. If MFD is ordered, the quantity, length, and seals will be identical for both filter housings.

Box 6. H.5 seal designation may be used with 3, 5, 10, and 25µ Z (synthetic) and calls for EPR seals, stainless steel wire mesh in element(s) and Imron® epoxy coated enclosures on cart. H.5 not available with 7 gpm pump. Imron® is a registered trademark of DuPont.

Box 7. 230 & 460 Volt, 60 Hz options supplied with starters. 230 Volt, 50 Hz units will have plug cut-off from power cord and include no starters, flow ratings reduced to ~5-gpm and 11-gpm. Contact factory for high viscosity version.

Box 9. Particle counter option only available on 115VAC 60 hertz carts. Particle counter is not available with Skydrol fluids.

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

FluMoS MOBILE

■ Usable with FluMoS Mobile App when connected to the CSI-C-11

CSI-C-11 Compatible Product

Features and Benefits

■ Provides local and remote fluid condition monitoring and visibility to offline filtration systems MFS, MFD, KLS and KLD

■ Integrated micro VSD driven motor and pump provides optimal flow for accurate sensor measurement

■ Pre-assembled kit allows for quick installation onto existing applicable offline filtration systems

■ Rugged design

■ Optional TestMate® Water Sensor for relative humidity and temperature measurement

■ Optional CSI-C-11 ConditionSensor Interface module for data logging, transmission and trending

Applications

■ Offline Filtration Systems MFS, MFD, KLS and KLD

Description

Predictive maintenance has never been more convenient. The HY-TRAX® Retrofit System Assembly adds contamination monitoring abilities to our MFS, MFD, KLS and KLD Offline Filtration Systems. This kit allows for the integration of the TestMate® Contamination Monitor (TCM) and TestMate® Water Sensor (TWS) to accurately measure particle counts, relative humidity and temperature of the fluid the offline filtration system is processing. **Retrofit kit includes all necessary material to upgrade existing filter carts.**

An attractive option to this kit is the CSI-C-11 ConditionSesnor Interface module. This module adds state-of-the-art monitoring capabilities via the W-LAN signal produced by the module. This wireless capability allows data to be transmitted from the TCM and TWS (optional) to FluMoS Mobile.

What's Included

Pre-assembled HY-TRAX® Retrofit Assembly:

■ Control Panel

■ Mounting Bracket

■ HY-TRAX® Manifold Block

■ Particle Counter

■ Hydraulic Hoses (for HY-TRAX® Circuit)

■ Electrical Receptacles (one male receptacle for power supply to retrofit kit; one female receptacle for power supply to filter cart electrical motor)

■ 2x Hydraulic Fittings for integrating HY-TRAX® onto Filter Cart Manifold

■ FluMoS Light Rate of Change (ROC) Trending Software

Specifications

Measuring Range:	Display ISO ranges between 25/24/23 and 9/8/7 Calibration within the range ISO 13/11/10 to 23/21/18
Contamination Output Code:	Standard: ISO 4406:1999 or SAE AS 4059(D) Optional: ISO 4406:1987; NAS 1638 and ISO 4406:1999
Self-Diagnosis:	Continuously with error indication via status LED
Pressure Rating:	50 psi (3.4 bar) max
Fluid Inlet/Outlet:	SAE ORB, Size 4
Seal Material:	Fluorocarbon elastomer (FKM)
Pump Speed:	500-5000 rpm (adjustable)
Optimal Sampling Pump Flow Rate:	0.0008-0.079 gpm (30-300 mL/min)
Fluid Temperature Range:	32°F to 185°F (0°C to +85°C)
Ambient Temperature Range:	-22°F to 176°F (-30°C to +80°C)
Max Viscosity:	up to 350 cSt (1622 SUS)
Pump Type:	Gear Pump
Power Supply:	115 V AC/60Hz/1 PH
Electrical Safety Class:	III (low voltage protection), IP 52 enclosure

HY-TRAX

HY-TRAX® Retrofit System Assembly

HYR

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
**HY-TRAX®
Retrofit System**
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

Model Number Selection

How to Build a Valid Model Number for a Schroeder HY-TRAX® Retrofit:

BOX 1	BOX2	BOX3	BOX4	BOX 5	BOX 6	BOX 7
HYR						

Example: *NOTE: One option per box*

BOX 1	BOX2	BOX3	BOX4	BOX 5	BOX 6	BOX 7	
HYR	12	2	0				**= HYR1220**

	BOX 1		BOX 2		BOX 3		BOX 4

BOX 1

Model
HYR

BOX 2

ISO Code	
12 =	>4/>6/>14
13 =	>2/>5/>15

BOX 3

Display Option	
1 =	Without Display
2 =	With Display

BOX 4

Fluid Type
0 = Hydraulic/Mineral Oil

BOX 5

Analog Interfaces
Omit = 4-20 mA (Standard)
S = 2-10V Analog Output

BOX 6

Communications Option
Omit = None
CSI = CSI-C-11-00 ConditionSensor Interface

BOX 7

Water Sensor Option
Omit = None
W = TestMate® Water Sensor

MFD-MV Medium Viscosity Mobile Filtration Systems

6 or 10 gpm
22.7 to 37.9 L/min

MFD-MV

Features and Benefits

- Ability to filter fluids having a viscosity up to 5,000 SUS
- Top-ported filter provides easy element service
- 7' hose and extension wands included (10' total length)
- Standard 18" filter housings

Applications

- Supplementing continuous filtration by system filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from storage tanks and drums to system reservoirs

Description

The MFD-MV is a compact, self-contained filtration system equipped with high efficiency high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. It is perfect for cleaning up existing systems as well as for prefiltering new fluids, since new fluids often have contamination levels significantly higher than that recommended for most hydraulic systems. The MFD-MV dual filtration unit can be used to remove both water and particulate contamination or for staged particulate contamination removal.

Specifications

Flow Rating:	6 or 10 gpm (22.7 or 37.9 L/min) max
Maximum Viscosity:	up to 5,000 SUS (1000 cSt)
Hose Pressure Rating:	30 psig (2.0 bar) at 150°F (65.6°C) Full vacuum at 150°F (65.6°C)
Maximum Operating Temperature:	-20°F to 150°F (-29°C to 65°C)
Bypass Valve Setting:	Cracking: 30 psi (2 bar)
Material:	Manifold and cap: Cast Aluminum Element case: Steel
Compatibility:	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Motor:	1.0 hp 110 VAC/60 Hz TEFC (6 gpm) 1.5 hp 110 VAC/60 Hz TEFC (10 gpm)

Medium Viscosity Mobile Filtration Systems

MFD-MV

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

MFD-MV

21.69 [551]

40.32 [1024]

2K = 38.77 [985]

ø10.00 [ø254]

22.50 [572]

Metric dimensions in ( ).

Model Number Selection

How to Build a Valid Model Number for a Schroeder MFD-MV:

	BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
	MFD-MV						

Example: *NOTE: One option per box*

	BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	
	MFD-MV	1	18	G10	G05	V	6	= MFD-MV118G10G05V6

BOX 1	BOX 2	BOX 3	BOX 4
Model	**No. of Elements**	**Element Length**	**Element Media First Filter**
MFD-MV	1	18	G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			GWR = Water Removal w/GeoSeal®

BOX 5	BOX 6	BOX 7
Element Media Second Filter	**Seal Material**	**Pump Size(gpm)**
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®	V = Viton®	6
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®		10
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®		
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®		
GWR = Water Removal w/GeoSeal®		

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

NOTES:

Box 5. When MFD is ordered, the number of elements, element length, and seals will be identical for both filter housings.

MFS-HV MFD-HV

High Viscosity Mobile Filtration Systems

U.S. Patents 6568919 7604738

3 gpm max
7.5 L/min

MFD-HV

Features and Benefits

- Ability to filter fluids having a viscosity up to 15,000 SUS
- Flow rates up to 3 gpm
- 115 V AC single phase 1 1/2 HP motor
- Dual filtration unit, available to remove both water and particulate contamination or for staged particulate contamination removal
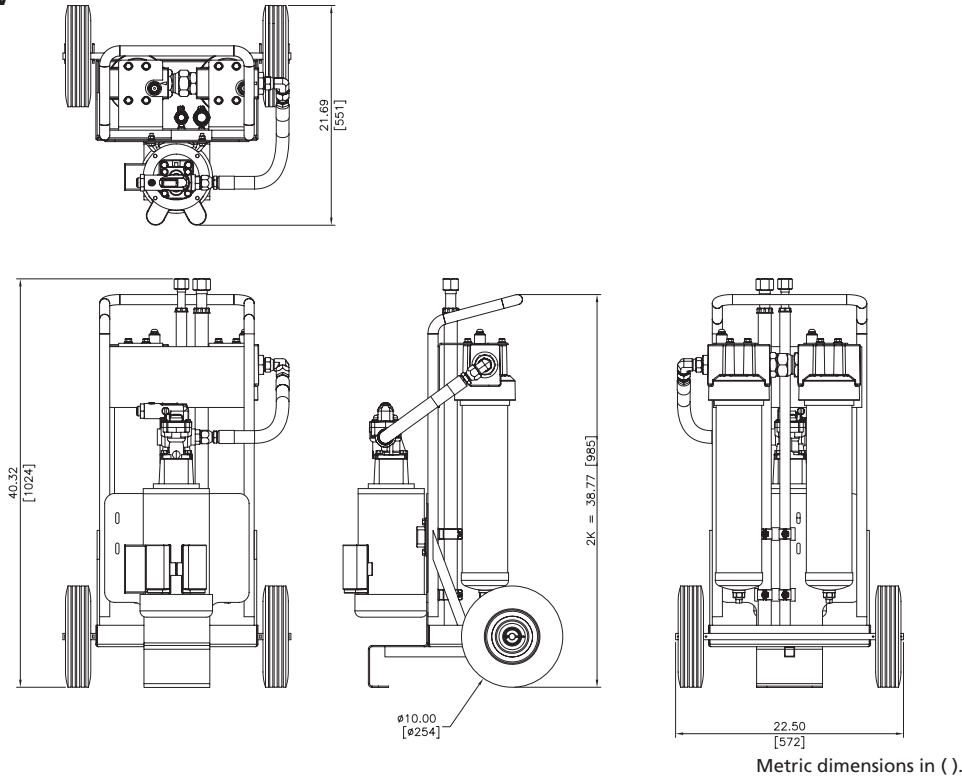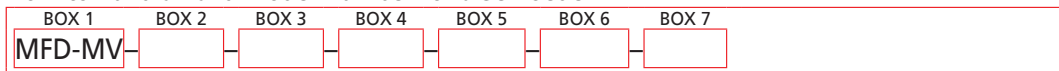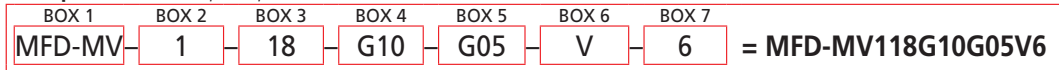- Modular base eliminates hoses between components and minimizes leakage
- Base-ported filter provides easy element service from the top cap
- Ten-foot hose and extension tubes included (13' total length)
- Drip pan catches oil before it falls to the ground
- 27-inch housing is standard
- Integrated lifting eye option

Applications

- Supplementing continuous filtration by system filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from storage tanks and drums to system reservoirs

Description

The Schroeder Mobile Filtration System for high viscosity applications is a compact, self contained filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. It is perfect for cleaning up existing systems as well as prefiltering and transferring fluids. Remember, new fluid does not mean clean fluid! Most new fluids have contamination levels significantly higher than is recommended for most hydraulic systems.

Specifications

Flow Rating:	3 gpm (7.5 L/min) max
Maximum Viscosity:	15,000 SUS (3236 cSt)
Hose Pressure Rating:	30 psig (2.0 bar) @ 150°F (65.6°C) Full vacuum @ 150°F (65.6°C)
Fluid Temperature:	25°F to 150°F (-4°C to 65°C)
Bypass Valve Setting:	Cracking: 40 psi (2.8 bar)
Material:	Manifold and cap: Cast Aluminum Element case: Steel
Compatibility:	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Motor:	115 VAC Single phase 1.5 hp
Element Change Clearance:	8.50 (215 mm) 1K (9, 18 or 27" depending on model configuration)
Weight:	MFS-HV - 230 lbs (104 kg); MFD-HV - 260 lbs (118 kg)

High Viscosity Mobile Filtration Systems
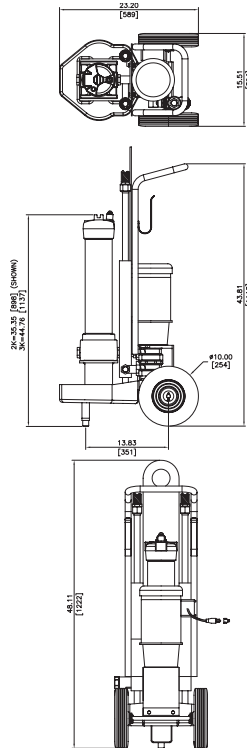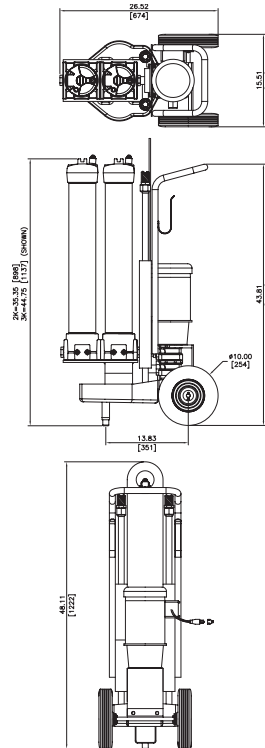
MFS-HV

MFD-HV

Metric dimensions in ( ).

Model Number Selection

How to Build a Valid Model Number for a Schroeder MFS-HV:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
MFD-HV						

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	
MFD-HV	1	27	Z10	Z05	B	03	= MFD-HV127Z10Z05B03

BOX 1	BOX 2	BOX 3
Model	**No. of Elements**	**Element Length**
MFS-HV	1	18
MFD-HV		27

BOX 4
Element Media First Filter
Z03 = 3 µm Excellement® Z-Media® (synthetic)
Z05 = 5 µm Excellement® Z-Media® (synthetic)
Z10 = 10 µm Excellement® Z-Media® (synthetic)
Z25 = 25 µm Excellement® Z-Media® (synthetic)
EWR = Water Removal
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
GWR = Water Removal w/GeoSeal®

BOX 5
Element Media Second Filter (MFD-HV Only)
Z03 = 3 µm Excellement® Z-Media® (synthetic)
Z05 = 5 µm Excellement® Z-Media® (synthetic)
Z10 = 10 µm Excellement® Z-Media® (synthetic)
Z25 = 25 µm Excellement® Z-Media® (synthetic)
EWR = Water Removal
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
GWR = Water Removal w/GeoSeal®

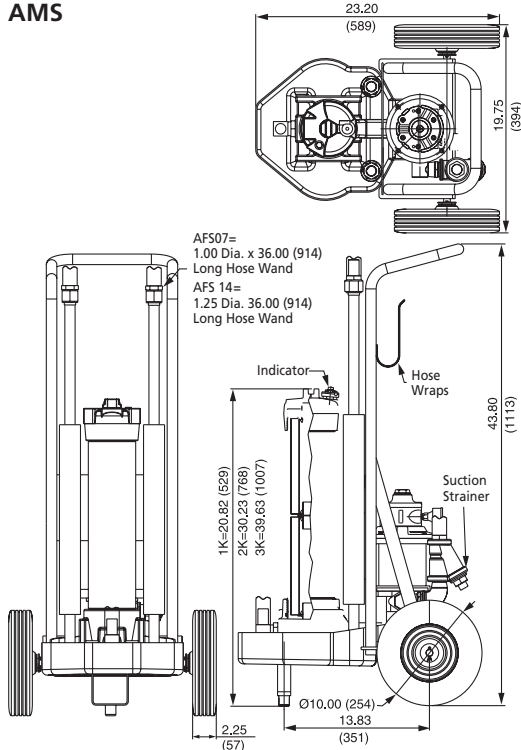| BOX 6	BOX 7
Seal Material	**Pump Size(gpm)**
B = Buna	03
V = Viton®	

NOTES:

Box 5. When MFD is ordered, the number of elements, element length, and seals will be identical for both filter housings.

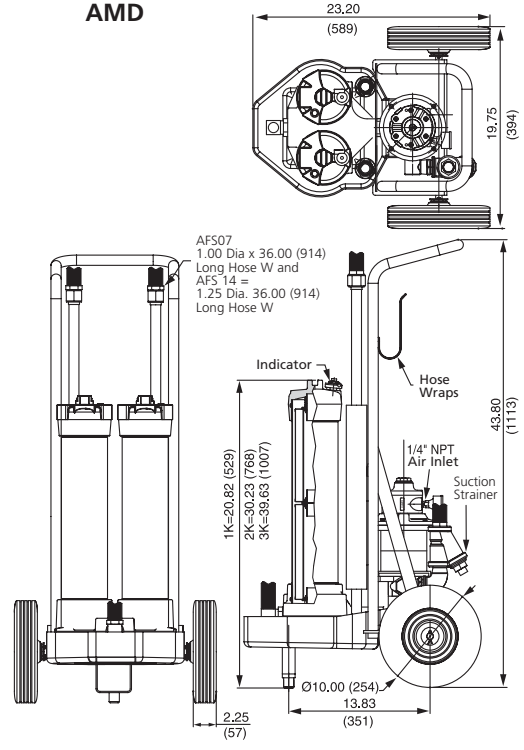For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

Air -Operated Mobile Filtration Systems

U.S. Patents 6568919 7604738

7 or 14 gpm
26.5 or 53 L/min

AMS

23.20 (589)
19.75 (394)

AFS07=
1.00 Dia. x 36.00 (914)
Long Hose Wand
AFS 14=
1.25 Dia. 36.00 (914)
Long Hose Wand

Indicator
Hose Wraps
Suction Strainer

1K=20.82 (529)
2K=30.23 (768)
3K=39.63 (1007)

43.80 (1113)

Ø10.00 (254)
13.83 (351)
2.25 (57)

AMD

23.20 (589)
19.75 (394)

AFS07
1.00 Dia x 36.00 (914)
Long Hose W and
AFS 14 =
1.25 Dia. 36.00 (914)
Long Hose W

Indicator
Hose Wraps
1/4" NPT Air Inlet
Suction Strainer

1K=20.82 (529)
2K=30.23 (768)
3K=39.63 (1007)

43.80 (1113)

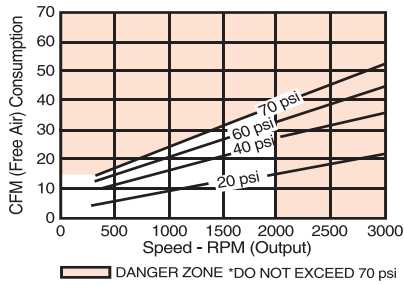Ø10.00 (254)
13.83 (351)
2.25 (57)
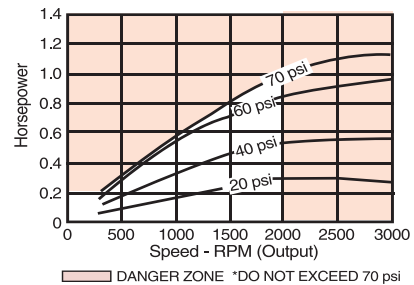
Metric dimensions in ( ).

Description

Schroeder's AMS and AMD carts feature a pneumatic motor in place of the standard electric motor. The pneumatic motor offers the same flow capability using the same components, but without the need for an electrical outlet. This provides a major advantage in the application of this unit. With no need for an electrical outlet, it is more portable than the standard electric-motored skids and carts.

Because most trucks and industrial machinery are already equipped with an air compressor, a simple connection to the 1/4" NPT port will easily power the 1.5 HP (or 4.0 HP) motor. At 70 psi, and 2000 rpm, this motor consumes less than 40 cfm (70 cfm for the 4.0 HP motor) of compressed air. Because no electricity is used, the pneumatic motor is ideal for working in hazardous environments such as mines.

7 GPM AIR MOTOR
Air Consumption vs. Speed

CFM (Free Air) Consumption vs. Speed - RPM (Output)
70 psi, 60 psi, 40 psi, 20 psi
DANGER ZONE *DO NOT EXCEED 70 psi

7 GPM AIR MOTOR
Output vs. Speed

Horsepower vs. Speed - RPM (Output)
70 psi, 60 psi, 40 psi, 20 psi
DANGER ZONE *DO NOT EXCEED 70 psi

14 GPM AIR MOTOR
Air Consumption vs. Speed

CFM (Free Air) Consumption vs. Speed - RPM (Output)
70 psi, 60 psi, 40 psi, 20 psi
DANGER ZONE *DO NOT EXCEED 70 psi

14 GPM AIR MOTOR
Output Power vs. Speed

Horsepower vs. Speed - RPM (Output)
70 psi, 60 psi, 40 psi, 20 psi
DANGER ZONE *DO NOT EXCEED 70 psi

NOTES:

Performance data represents a 4-Vane model with no exhaust restriction.

Air-Operated Mobile Filtration Systems

U.S. Patents 6568919 7604738

AMS
AMD

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

- Supplementing continuous filtration by system filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from storage tanks and drums to system reservoirs
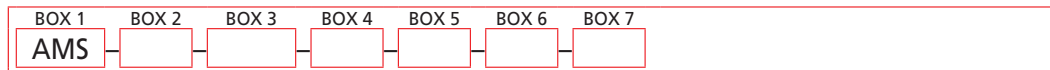- Field applications on service trucks

Applications

Specifications

Flow Rating:	7 gpm (26.5 L/min) max and 14 gpm (53.0 L/min) max
Maximum Viscosity:	1,000 SUS (216 cSt)
	Higher viscosity version available. Contact factory for details.
Housing Pressure Rating:	250 psi (17.2 bar) max operating[1]
	1,000 psi (68.9 bar) min yield
Fluid Temperature:	25°F to 150°F (-4°C to 65°C)[2]
Bypass Valve Setting:	Cracking: 30 psi (2 bar)
Material:	Manifold and cap: Cast aluminum
	Element case: Steel
Compatibility:	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Element Change Clearance:	8.50" (215 mm) 1K (9, 18 or 27" depending on model configuration)

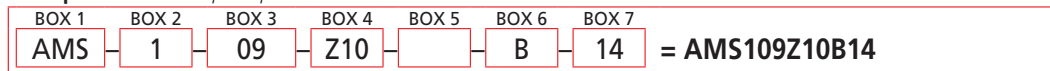[1]For higher hose pressure applications contact factory.
[2]For higher temperature applications contact factory.

Weights

	AMS-1K		AMS-2K		AMS-3K		AMD-1K		AMD-2K		AMD-3K	
gpm	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)
7	170	(77)	180	(82)	190	(86)	185	(84)	203	(92)	220	(100)
14	177	(80)	187	(85)	197	(89)	192	(87)	210	(95)	227	(103)

Model Number Selection

How to Build a Valid Model Number for Schroeder AMS:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
AMS						

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	
AMS	1	09	Z10		B	14	= AMS109Z10B14

BOX 1

Model
AMS
AMD

BOX 2

No. of Elements
1
2
3

BOX 3

Element Length
09
18
27

BOX 4

Element Media First Filter
Z01 = 1 µm Excellement® Z-Media® (synthetic)
Z03 = 3 µm Excellement® Z-Media® (synthetic)
Z05 = 5 µm Excellement® Z-Media® (synthetic)
Z10 = 10 µm Excellement® Z-Media® (synthetic)
Z25 = 25 µm Excellement® Z-Media® (synthetic)
EWR = Water Removal
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
GWR = Water Removal w/GeoSeal®

BOX 5

Element Media Second Filter (AMD Only)
Z01 = 1 µm Excellement® Z-Media® (synthetic)
Z03 = 3 µm Excellement® Z-Media® (synthetic)
Z05 = 5 µm Excellement® Z-Media® (synthetic)
Z10 = 10 µm Excellement® Z-Media® (synthetic)
Z25 = 25 µm Excellement® Z-Media® (synthetic)
EWR = Water Removal
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
GWR = Water Removal w/GeoSeal®

BOX 6

Seal Material
B = Buna

BOX 7

Pump Size(gpm)
07
14

NOTES:

Box 2 & 3. When Box 2 equals 2 or 3, Box 3 must be 09.

Box 5. When AMD is ordered, the number of elements, element length, and seal will be identical for both filter housings.

Box 7.
07 gpm - 50 CFM at 70 psi
14 gpm - 70 CFM at 70 psi

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

Filtration Station® SMART
Schroeder
TECHNOLOGY INSIDE

U.S. Patents 6979397

9 gpm or 3-8 gpm variable
34 L/min or 11-30 L/min

Features and Benefits

- Real time monitoring of ISO cleanliness classes
- Automatic shutdown when user defined ISO codes are reached
- USB port allows the ISO code data to be downloaded for further processing and/or printing
- 30 mesh suction strainer and 230 micron filter are included to protect the particle monitor from clogging
- Water sensor allows real-time water saturation of the fluid to be displayed
- Bypass valve allows cart to be used as a transfer cart
- Single lift point
- Plastic removable drip pan
- Hoses and connection tubes included (13' total length)

Applications

- In-Plant Service: Filter to desired cleanliness levels and extend component life
- Mobile Dealer Networks: Aid in certified re-builds, service maintenance contracts and total maintenance & repair programs
- Original Equipment Manufacturer: Filter to require roll-off cleanliness levels
- Lubricant Reclamation/Recycling: Clean oil to extend oil life and reduce hazardous waste

Description

The Filtration Station® (FS) is capable of flushing, filtering, and monitoring ISO cleanliness with user-defined, automatic features. The FS is designed to transfer fluid through two (2) K9 filters in series for staged particulate or water/particulate removal. The FS is always furnished with two filter housings. Both filters are top-loading and include element indicators in the cap. A particle monitor reads samples from the pump discharge and displays ISO contamination codes on the control panel. The monitor allows the user to input the desired ISO cleanliness codes for the fluid. In auto mode, the system will run until the cleanliness codes are reached. Upon reaching the codes, the pump will stop and the cycle complete light will come on. When in manual mode, the system will run continuously and display the ISO codes. The included water sensor reports the water saturation of the fluid, which is displayed on the control panel.
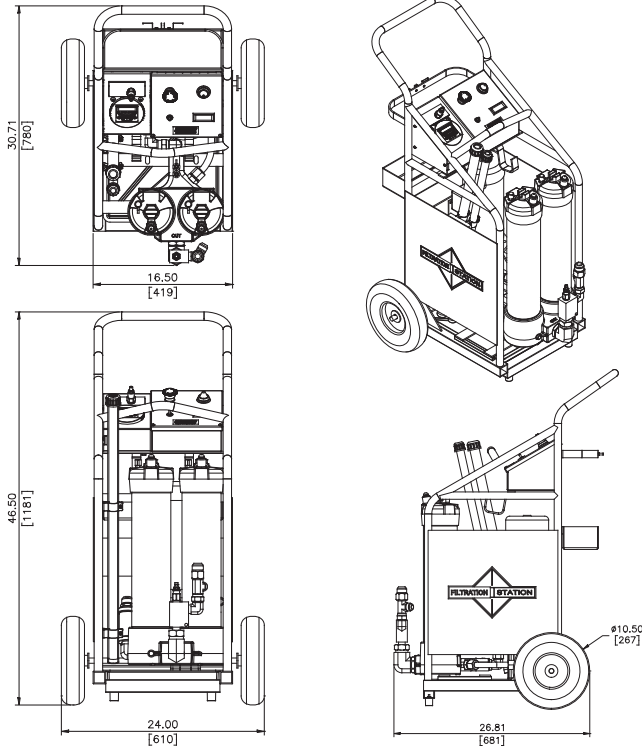
Specifications

Flow Rating:	9 gpm (34 l/min) fixed or 3-8 gpm (11-30 l/min) variable
Motor:	1.5 HP - 15 amps at 120 volts AC for fixed flow 1 HP - 10 amps at 120 volts AC for variable flow
Viscosity:	60 - 1,000 SUS (10-216 cSt)
Fluid Temperature Range:	-20°F to 150°F (-29°C to 65°C)
Bypass Valve Setting:	Cracking: 30 psi (2 bar) x 2
Compatibility:	All petroleum-based hydraulic fluid. Contact factory for use with other fluids.
Element Change Clearance:	8.50" (215 mm) 1K
Weight:	195 lbs (89 kg)
Protection Class:	IP54 (DIN 40050)

*Note: Optional front caster set PN: 7627132 includes (2) plate mount swivel casters with brake, installation hardware and mounting instructions.
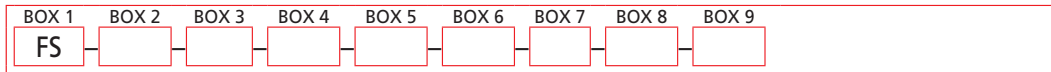
Element Performance Information

	Filtration Rating Per ISO 4572/NFPA T3.10.8.8			Filtration Rating wrt ISO 16889		
	Using automated particle counter (APC) calibrated per ISO 4402			Using APC calibrated per ISO 11171		Dirt Holding
Element	$\beta_X \geq 75$	$\beta_X \geq 100$	$\beta_X \geq 200$	$\beta_X(c) \geq 200$	$\beta_X(c) \geq 1000$	Capacity gm
KZ5/KKZ5	2.5	3.0	4.0	4.8	6.3	119 / 238
KZ10/KKZ10	7.4	8.2	10.0	8.0	10.0	108 / 216
KZ25/KKZ25	18.0	20.00	22.5	19.0	240.	93 / 186

Schroeder SMART TECHNOLOGY INSIDE Filtration Station®

U.S. Patents 6979397

30.71 [780]
16.50 [419]
46.50 [1181]
24.00 [610]
26.81 [681]
Ø10.50 [267]

Metric dimensions in ( ).

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

How to Build a Valid Model Number for a Schroeder FS:

Model Number Selection

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
FS								

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
FS	A	1	27	Z05	Z03	B	9	W	= FSA127Z05Z03B9W

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5

Model	Voltage	No. of Elements	Element Length	Element Media First Filter
FS	A = 120 V / 60 Hz	1	09	Z01 = 1 µm Excellement® Z-Media® (synthetic)
	B = 220 V / 60 Hz	2	18	Z03 = 3 µm Excellement® Z-Media® (synthetic)
	C = 220 V / 50 Hz	3	27	Z05 = 5 µm Excellement® Z-Media® (synthetic)
				Z10 = 10 µm Excellement® Z-Media® (synthetic)
				Z25 = 25 µm Excellement® Z-Media® (synthetic)
				EWR = Water Removal
				G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
				G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
				G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
				G25 = 25 µm Excellement® Z-Medi® (synthetic) w/GeoSeal®
				GWR = Water Removal w/GeoSeal®

BOX 6

Element Media Second Filter
Z01 = 1 µm Excellement® Z-Media® (synthetic)
Z03 = 3 µm Excellement® Z-Media® (synthetic)
Z05 = 5 µm Excellement® Z-Media® (synthetic)
Z10 = 10 µm Excellement® Z-Media® (synthetic)
Z25 = 25 µm Excellement® Z-Media® (synthetic)
EWR = Water Removal
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G25 = 25 µm Excellement® Z-Medi® (synthetic) w/GeoSeal®
GWR = Water Removal w/GeoSeal®

BOX 7	BOX 8	BOX 9
Seal Material	**Pump Size**	**Water Sensor**
B = Buna	9 = 9 gpm	W = TestMate® Water Sensor
V = Viton®	D = DC drive, variable flow, 3-8 gpm	

NOTES:

Box 2. A plug is not provided for options B & C in Box 2 (220 V). If C is chosen, flow rate will be reduced to 7 and 6 gpm.

Box 3 & 4. Box 3 =1, Box 4 must be either 18 or 27; when Box 3 =2 or 3, Box 4 must be 09.

Box 9. The water sensor is to be used as a reference tool for hydraulic oil analysis purposes only.

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

AMFS | Asset Management Filtration Station®

5 gpm
19 L/min

Features and Benefits

- Complete tracking of hydraulic fluid conditions by equipment name
- Provides automatic record-keeping, trending and analysis of the fluid
- Ideal for managing multiple equipment assets
- Automatically shuts down when the selected ISO cleanliness is reached
- Dual staged filters for both water and/or contaminated removal bypass valve allows cart to be used as a transfer cart
- Real Time data displays cleanliness and water saturation
- Selectable ISO target levels
- Only 3 entry fields needed to start the system and record data
- Hoses and connection tubes included (13' total length)

Applications

- In-Plant Service: Filter to desired cleanliness levels and extend component life
- Mobile Dealer Networks: Aid in certified re-builds, service maintenance contracts and total maintenance & repair programs
- Industry
- Paper Industry
- Power Generation
- Mobile Vehicles
- Steel Making

Description

The Asset Management Filtration Station® (AMFS) is a complete fluid management system designed to manage fluid cleanliness, so that the greatest return of that asset is achieved. The AMFS is an all-in one system that monitors your fluid condition, filters out contaminants and tracks all the necessary data needed for trend analysis and record keeping by asset number or name. The on-board rugged PC records the ISO code and water saturation level, provides a graphical display of the data in real time and shuts down when the selected cleanliness level is reached. Each asset file created automatically is separately labeled and summarized to quickly inform maintenance on the condition of the fluid, and each run of the fluid is logged by date and time, providing a complete history of the equipment's fluid.
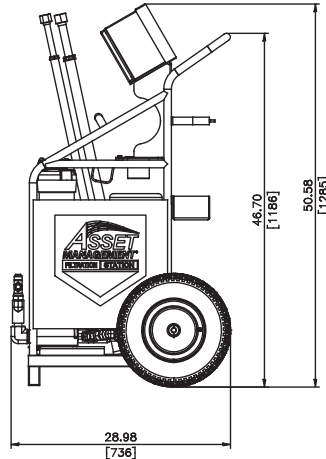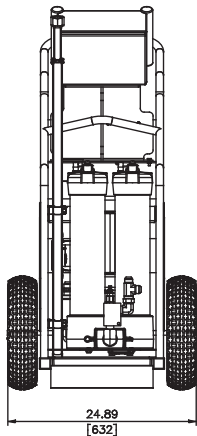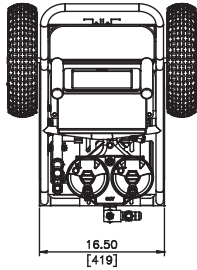
Specifications

Flow Rating:	5 gpm (19 L/min)
Motor:	1.5 HP - 15 FLA at 120 volts AC
Viscosity Range:	60 - 1,000 SUS (10 - 216 cSt)
Operating Temperature:	-20°F to 150°F (-29°C to 65°C)
Bypass Valve Setting:	Cracking: 30 psi (2 bar) x 2
Compatibility:	All petroleum-based hydraulic fluid compatible with Viton®
Element Change Clearance:	17.5" KK / 26.5" 27K
Weight:	200 lbs (440 kg) *approx.*
Dimensions:	26.6" x 25.25" x 50.0" (675 x 641 x 1270 mm)

*Note: Optional front caster set PN: 7627132 includes (2) plate mount swivel casters with brake, installation hardware and mounting instructions.

Asset Management Filtration Station® AMFS

16.50 [419]

24.89 [632]

28.98 [736]

46.70 [1186]

50.58 [1285]

Metric dimensions in ( ).

Element Performance Information

	Filtration Rating Per ISO 4572/NFPA T3.10.8.8 Using automated particle counter (APC) calibrated per ISO 4402			Filtration Rating wrt ISO 16889 Using APC calibrated per ISO 11171	
GeoSeal® Element	$\beta_X \geq 75$	$\beta_X \geq 100$	$\beta_X \geq 200$	$\beta_X(c) \geq 200$	$\beta_X(c) \geq 1000$
KKGZ3/27KGZ3	<1.0	<1.0	<2.0	4.0	4.8
KKGZ5/27KGZ5	2.5	3.0	4.0	4.8	6.3
KKGZ10/27KGZ10	7.4	8.2	10	8.0	10.0

Dirt Holding Capacity

GeoSeal® Element	DHC (gm)	GeoSeal® Element	DHC (gm)
KKGZ3V	230	27KGZ3V	345
KKGZ5V	238	27KGZ5V	357
KKGZ10V	216	27KGZ10V	324

How to Build a Valid Model Number for a Schroeder AMFS:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
AMFS				

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	
AMFS	1	27	G05	G03	= AMFS127G05G03

BOX 1	BOX 2	BOX 3	BOX 4
Model	**No. of Elements**	**Element Length**	**Element Media First Filter**
AMFS	1	18 / 27	G03 = 3 µm Excellement® Z-Media® (synthetic) w/ GeoSeal® G05 = 5 µm Excellement® Z-Media® (synthetic) w/ GeoSeal® G10 = 10 µm Excellement® Z-Media® (synthetic) w/ GeoSeal® G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal® GWR = Water Removal w/ GeoSeal®

BOX 5

Element Media Second Filter

G03 = 3 µm Excellement® Z-Media® (synthetic) w/ GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/ GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/ GeoSeal®
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
GWR = Water Removal w/ GeoSeal®

Model Number Selection

Preferred order codes designate shorter lead times and faster delivery.

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

Kidney Loop Systems

U.S. Patents 6568919 7604738

7 or 14 gpm
26.5 or 53 L/min

FluMoS
MOBILE

- Usable with FluMoS Mobile App - HY-TRAX® option only

CSI-C-11 Compatible Product

KLD

KLS

Features and Benefits

- Single, double and triple bowl length option allows the flexibility of additional dirt-holding capacity
- Modular base eliminates connections between components and minimizes leakage
- Base-ported filter provides easy element service from the top cap
- D5 Dirt Alarm® indicates when filter element needs changed
- Two 7/16 – 20 UNF sampling port included on all models (upstream)
- Suction strainers to protect pump
- Optional CSI-C-11 Communication Interface for WLAN or LAN transmission of data and data storage capabilities

Applications

- Supplementing in-line filtration by system filters when adequate turnover cannot be attained
- Large volume systems requiring multiple filters in different locations
- Cleaning up a hydraulic system following component replacement

Description

Schroeder's off-line Kidney Loop System is a stationary version of the Mobile Filtration System. It is a compact, self-contained filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. This off-line system can be used to supplement in-line filters when adequate turnover cannot be achieved in the system. It is also ideal for free water removal. Like the Mobile Filtration System, the Kidney Loop System operates at a surprisingly low noise level. Its modular base eliminates hoses and fittings between components. The KLS single filtration unit can remove either water or particulate contamination. The KLD dual filtration unit can be used to remove both water and particulate contamination, or for staged particulate contaminant removal.

Contamination Sensor for Remote Visbility Options

HY-TRAX® manual fluid sampling system: Schroeder now offers the HY-TRAX® manual fluid sampling system as an additional option allowing for real-time fluid condition monitoring. ISO particle counts are visually displayed on the TCM. Users will now know when they have reached their desired ISO contamination levels. For more information, please see page 102.

CSI-C-11: Schroeder also offers the CSI-C-11 Communication Interface for WLAN or LAN transmission of data and data storage capabilities. For more information, please see page 38.

Specifications

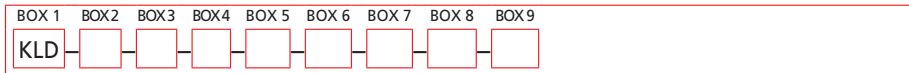|	
Flow Rating:	7 gpm (26.5 L/min) max and 14 gpm (53.0 L/min) max
Viscosity Range:	40 - 1,000 SUS (4 - 216 cSt) Higher viscosity version available. Contact factory for details.
Fluid Temperature:	25°F to 150°F (-4°C to 65°C)
Bypass Valve Setting:	Cracking: 30 psi (2 bar)
Material:	Manifold and cap: Cast aluminum Element case: Steel
Compatibility:	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Motor:	115 VAC single phase 3/4 hp (7 gpm), 1-1/2 hp (14 gpm), or 230 and 460 VAC 3 phase power optional
Weight:	**KLS-1:** 101 lb (45.9 kg) **KLD-1:** 117 lb (53.2 kg) **KLS-2:** 112 lb (50.9 kg) **KLD-2:** 139 lb (63.2 kg) **KLS-3:** 123 lb (55.9 kg) **KLD-3:** 161 lb (73.2 kg)
Element Change Clearance	8.50" (215 mm) 1K

Kidney Loop Systems
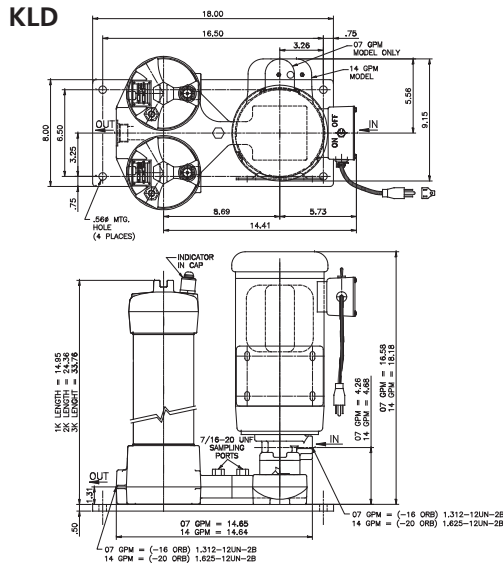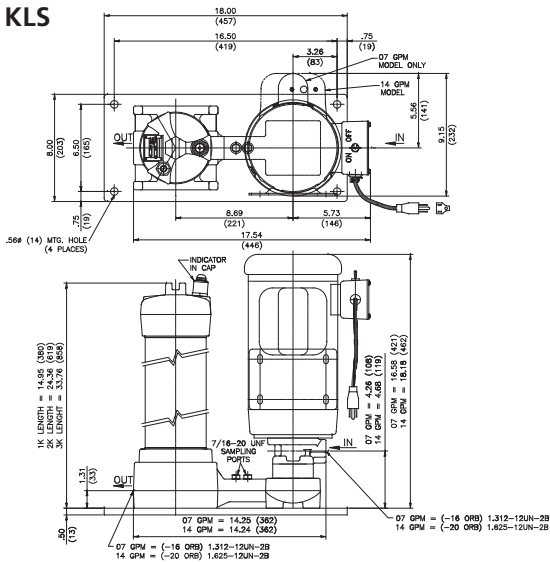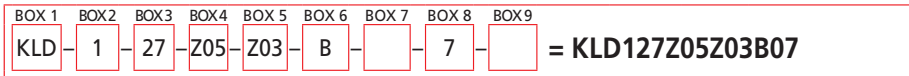
U.S. Patents 6568919 7604738

KLS

KLD

Metric dimensions in ( ).

How to Build a Valid Model Number for a Schroeder KLD:

BOX 1	BOX2	BOX3	BOX4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
KLD								

Example: *NOTE: One option per box*

BOX 1	BOX2	BOX3	BOX4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
KLD	1	27	Z05	Z03	B		7		= KLD127Z05Z03B07

BOX 1	BOX 2	BOX 3	BOX 4
Model	**No. of Elements**	**Element Length**	**Element Media First Filter**
KLS	1	09	Z01 = 1 µm Excellement® Z-Media® (synthetic)
	2	18	Z03 = 3 µm Excellement® Z-Media® (synthetic)
KLD	3	27	Z05 = 5 µm Excellement® Z-Media® (synthetic)
			Z10 = 10 µm Excellement® Z-Media® (synthetic)
			Z25 = 25 µm Excellement® Z-Media® (synthetic)
			EWR = Water Removal
			G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			GWR = Water Removal w/GeoSeal®

BOX 5
Element Media Second Filter (KLD only)
Z01 = 1 µm Excellement® Z-Media® (synthetic)
Z03 = 3 µm Excellement® Z-Media® (synthetic)
Z05 = 5 µm Excellement® Z-Media® (synthetic)
Z10 = 10 µm Excellement® Z-Media® (synthetic)
Z25 = 25 µm Excellement® Z-Media® (synthetic)
EWR = Water Removal
G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
GWR = Water Removal w/GeoSeal®

BOX 6
Seal Material
B = Buna
V = Viton®

BOX 7
Voltage
Omit = 115 V / 60 Hz / 1-Phase
A = 230 V / 60 Hz / 3-Phase
B = 460 V / 60 Hz / 3-Phase
C = 220 V / 50 Hz / 1-Phase
D = 230 V / 60 Hz / 1-Phase

BOX 8
Pump Size
07
14

BOX 9
Particle Counter
Omit = Without Particle Counter
P = Particle Counter
P-CSI = Particle Counter + CSI-C-11 Option
P-CSI-W = Particle Counter + CSI-C-11 + Water Sensor (No Display) Option

Model Number Selection

Preferred order codes designate shorter lead times and faster delivery.

NOTES:

Box 2 & 3 . When Box 2 equals 2 or 3, Box 3 must be 09.

Box 5 . When KLD is ordered, the number of elements, element length, and seals will be identical for both filter housings.

Box 7. Motor starter is included with 3-Phase options A and B.

Box 9.
Particle counter option only available on 115 V / 60 Hz units. Particle counter is not available with Skydrol fluids.

Contact factory if EPR seals are required. Contact factory for high viscosity version.

For replacement element P/Ns, please see "Appendix Section - Replacement Elements" of this catalog.

Fail-Safe In-Line Mechanical Clean Oil Dispenser
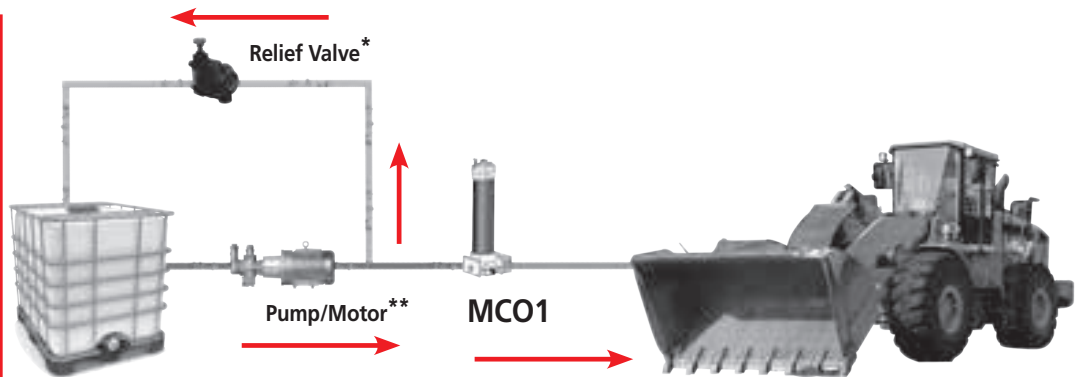
U.S. Patent 7,604,738 for connecting end cap

Product Description

- Fail-safe In-Line Mechanical Clean Oil Dispensing Filter rated for 900 psi and 30 gpm
- Ideal for dispensing applications where clean fluid delivery is a <u>must</u>
- Dispensed fluid is filtered or it is returned to the tank
- Field proven to deliver ISO cleanliness levels of 18/15/13 or better in a single pass
- Series filtration with MCO2 and MCO3 filters

Technology

- Housings incorporate a non-bypassing but <u>low cost</u> 150 psi ßeta X $\geq$ 1000 rated element
- Low element cost is achieved through the use of a <u>unique proportional valve that, when used with an external relief valve, redirects the flow back to the tank as element DP increases</u>
- As the element loads, the element service life indicator, located on the housing, **indicates** that service is required before the fluid flow begins to return to tank. Unfiltered "dirty" oil cannot pass the filter even if the service life indicator is ignored.
- Fluid Cleanliness Sampling Ports provided for proof of filtration into the system being filled
- Easy to install and designed with top service for easy element service
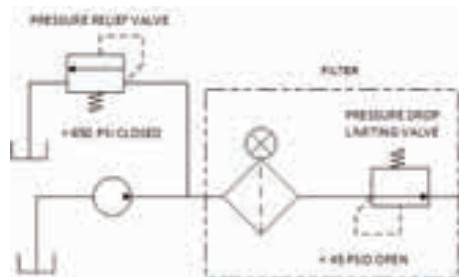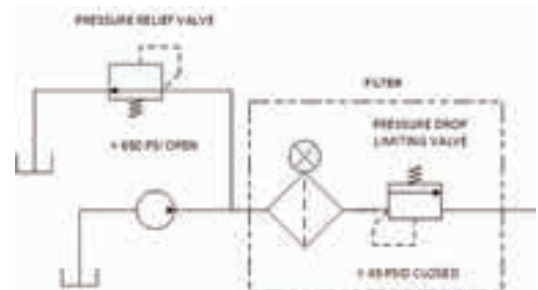- Push button bleed valves located on each filter housing

Application Circuit

Relief Valve*

Pump/Motor* **MCO1**

* Product not included in base model pricing.
** Product is customer supplied.

Schematics

Normal Operation

"Bypass" Operation

Fail-Safe In-Line Mechanical Clean Oil Dispenser

MCO

U.S. Patent 7,604,738 for connecting end cap

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

Filter Housing Specifications

Flow Rating:	Up to 30 gpm (113 L/min) for 150 SUS (32 cSt) fluids
Max. Operating Pressure:	900 psi (60 bar)
Min. Yield Pressure:	3200 psi (220 bar), per NFPA T2.6.1
Rated Fatigue Pressure:	750 psi (52 bar) per NFPA T2.6.1-R1-2005
Temp. Range:	-20°F to 225°F (-29°C to 107°C)
Bypass Setting:	Non-Bypassing System
Porting Head & Cap:	Cast Aluminum
Element Case:	Steel
Weight of MCO-1K:	21 lbs. (9.5 kg)
Weight of MCO-2K:	32 lbs. (14.5 kg)
Weight of MCO-3K:	43 lbs. (19.5 kg)
Element Change Clearance:	17.50" (445 mm) for KK; 26.5" (673 mm) for 27K

Model Number Selection

How to Build a Valid Model Number for a Schroeder MCO:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	BOX 10
MCO	–	–	–	–	–	–	–	–	–

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	BOX 10	
MCO	3	27	G05	G03	G03	V	S	D5	RV	= MCO327G05G03G03VSD5RV

BOX 1	BOX 2	BOX 3
Model	**No. of Housings**	**Element Length**
MCO	1 2 3	27

BOX 4

Element Micron Rating First Filter (MCO1, MCO2, MCO3)

G01 = 1 µm Z-Media® (synthetic)
G03 = 3 µm Z-Media® (synthetic)
G05 = 5 µm Z-Media® (synthetic)
G10 = 10 µm Z-Media® (synthetic)
G25 = 25 µm Z-Media® (synthetic)

BOX 5

Element Micron Rating Second Filter (MCO2, MCO3)

G01 = 1 µm Z-Media® (synthetic)
G03 = 3 µm Z-Media® (synthetic)
G05 = 5 µm Z-Media® (synthetic)
G10 = 10 µm Z-Media® (synthetic)
G25 = 25 µm Z-Media® (synthetic)

BOX 6

Element Micron Rating Third Filter (MCO3 Only)

G01 = 1 µm Z-Media® (synthetic)
G03 = 3 µm Z-Media® (synthetic)
G05 = 5 µm Z-Media® (synthetic)
G10 = 10 µm Z-Media® (synthetic)
G25 = 25 µm Z-Media® (synthetic)

BOX 7

Seal Material
V = Viton®

BOX 8

Porting
S = SAE 20
P = 1 ¼ NPTF

BOX 9

Indicator Options (Only for outlet block)

D5 = Visual Pop-up

MS10 = Electrical with DIN Connector (male end only)

MS11 = Electrical with 12ft. 4-conductor wire

MS14 = Supplied with 5-pin Brad Harrison make connector and light (male end)

BOX 10

Relief Valve
Omit = Customer Supplied
RV = Schroeder Relief Valve (set at 650 psi)*

*The "RV" option is supplied as a loose item. Users have to install the relief valve within their Hydraulic System.

NOTES:

Box 10. An upstream pressure relief valve must be used. Should be no greater than 650 psi.
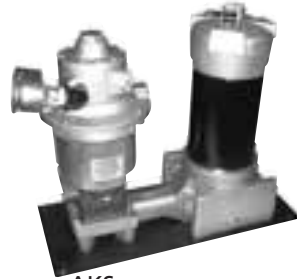
AKS AKD

Air-Operated Kidney Loop Systems

U.S. Patents 6568919 7604738

7 or 14 gpm
26.5 or 53 L/min

AKD

AKS

Features and Benefits
- Modular base eliminates connections between components and minimizes leakage
- Base-ported filter provides easy element service from the top cap
- Single, double and triple bowl length option allows the flexibility of additional dirt-holding capacity
- D5 Dirt Alarm® indicates when filter element needs changed
- Two 7/16 – 20 UNF sampling port included on all models (upstream)
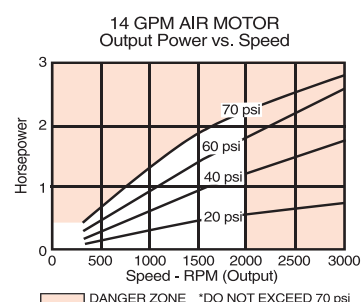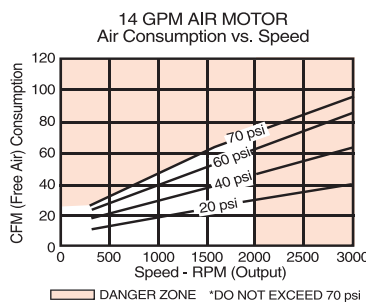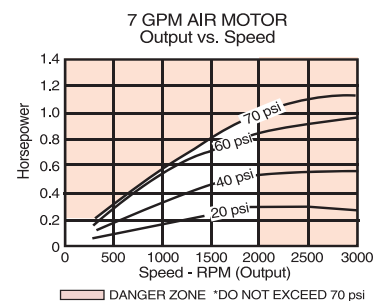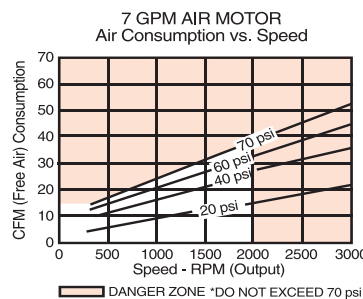- Suction strainers to protect pump

Applications
- Supplementing in-line filtration by system filters when adequate turnover cannot be attained
- Large volume systems requiring multiple filters in different locations
- Cleaning up a hydraulic system following component replacement
- Ideal location for water removal
- Field applications on service trucks

Description

Schroeder offers a kidney loop filtration system with a pneumatic motor in place of the standard electric motor. The pneumatic motor offers the same flow capability using the same components, but without the need for an electrical outlet. This provides a major advantage in the application of this unit. With no need for an electrical outlet, it is more portable than the standard electric-motored skids and carts.

Because most trucks and industrial machinery are already equipped with an air compressor, a simple connection to the 1/4" NPT port will easily power the 1.5 HP (or 4.0 HP) motor. At 70 psi, and 2000 rpm, this motor consumes less than 40 cfm (70 cfm for the 4.0HP motor) of compressed air. Because no electricity is used, the pneumatic motor is ideal for working in hazardous environments such as mines.

7 GPM AIR MOTOR
Air Consumption vs. Speed

7 GPM AIR MOTOR
Output vs. Speed

14 GPM AIR MOTOR
Air Consumption vs. Speed

14 GPM AIR MOTOR
Output Power vs. Speed

Note: Performance data represents a 4-vane model with no exhaust restriction.

Air-Operated Kidney Loop Systems

U.S. Patents 6568919 7604738

AKS
AKD

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
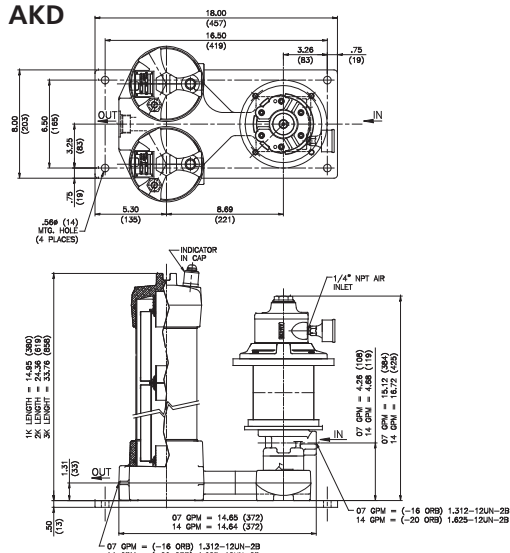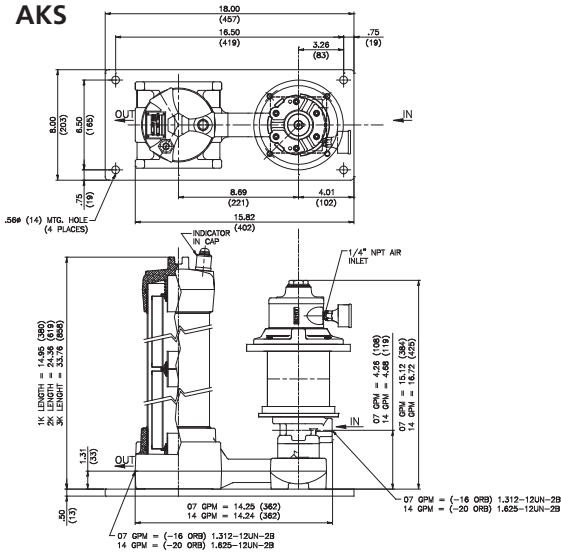OLF Compact
OLF
OLF-P
NxTM
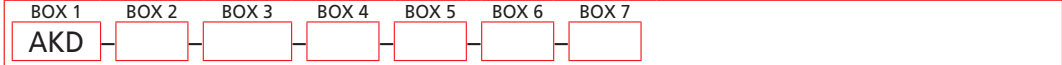VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

AKS

AKD

Metric dimensions in ( ).

Specifications
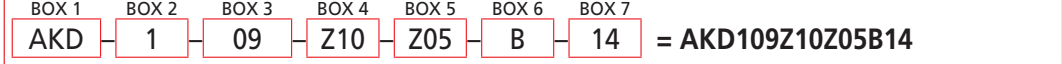
Flow Rating:	7 gpm (26.5 L/min) max and 14 gpm (53.0 L/min) max
Maximum Viscosity:	1,000 SUS (216 cSt)
	Higher viscosity version available. Contact factory for details.
Fluid Temperature:	25°F to 150°F (-4°C to 65°C)
	For higher temperature applications contact factory.
Bypass Valve Setting:	Cracking: 30 psi (2 bar)
Material:	Manifold and cap: Cast aluminum
	Element case: Steel
Compatibility:	All petroleum based hydraulic fluid.
	Contact factory for use with other fluids.
Element Change Clearance:	8.50" (215 mm) 1K
Weight:	AKS1 = 86 lbs. (39 kg.) AKD1 = 98 lbs. (44 kg.)
	AKS2 = 98 lbs. (44 kg.) AKD2 = 120 lbs. (54 kg.)
	AKS3 = 108 lbs. (49 kg.) AKD3 = 142 lbs. (64 kg.)

Model Number Selection

How to Build a Valid Model Number for Schroeder AKS:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
AKD						

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	
AKD	1	09	Z10	Z05	B	14	= AKD109Z10Z05B14

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
Model	**No. of Elements**	**Element Length**	**Element Media First Filter**	**Element Media Second Filter (AKD Only)**
AKS	1	09	Z01 = 1 µm Excellement® Z-Media® (synthetic)	Z01 = 1 µm Excellement® Z-Media® (synthetic)
	2	18	Z03 = 3 µm Excellement® Z-Media® (synthetic)	Z03 = 3 µm Excellement® Z-Media® (synthetic)
AKD	3	27	Z05 = 5 µm Excellement® Z-Media® (synthetic)	Z05 = 5 µm Excellement® Z-Media® (synthetic)
			Z10 = 10 µm Excellement® Z-Media® (synthetic)	Z10 = 10 µm Excellement® Z-Media® (synthetic)
			Z25 = 25 µm Excellement® Z-Media® (synthetic)	Z25 = 25 µm Excellement® Z-Media® (synthetic)
			EWR = Water Removal	EWR = Water Removal
			G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®	G03 = 3 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®	G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®	G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®	G25 = 25 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
			GWR = Water Removal w/GeoSeal®	GWR = Water Removal w/GeoSeal®

| BOX 6	BOX 7
Seal Material	**Pump Size(gpm)**
B = Buna	07
	14

NOTES:

Box 2 & 3. When Box 2 equals 2 or 3, Box 3 must be 09.

Box 5. When AKD is ordered, the number of elements, element length, and seal will be identical for both filter housings.

Box 7.
07 gpm - 50 CFM at 70 psi
14 gpm - 70 CFM at 70 psi

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

X Series Filter Skids Schroeder SMART
TECHNOLOGY INSIDE
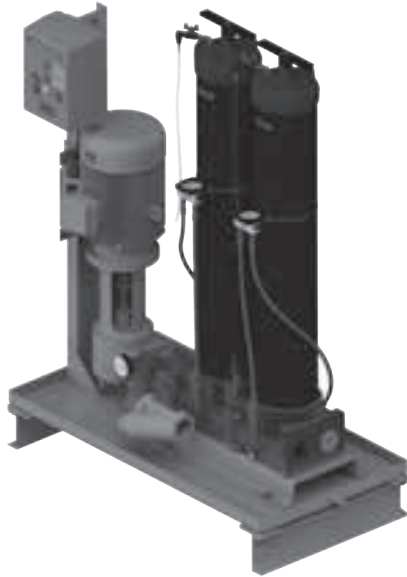
Features and Benefits

- Clean fluid to protect and extend the life of expensive components
- Minimizes downtime and maintenance costs
- Designed to handle high viscosity oils up to 25,000 SUS (see Skid Selection; next page)
- Many component combinations and variable starter options allow the flexibility to match specific user needs
- Four wheel cart option provides product portability
- Integral drip pan with drain plug protects oil from spilling on the ground
- 1620 Testpoints provided at filter base for fluid sampling
- Market leading Schroeder Excellement® synthetic filtering media provides for quick, efficient clean up with maximum element life

Part of the Schroeder Industries 2030 Initiative

Description

Schroeder's X Series filtration skids are compact, self-contained filtration systems equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly and economically. They supplement in-line filters whenever the existing filtration is incapable of obtaining the desired ISO cleanliness level.

It is not uncommon for viscosity to be overlooked when specifying an off-line filtration unit. The results of this oversight can severely affect system efficiency and longevity, and render the filtration system useless when high viscosity fluid causes the filter to be in constant bypass. Schroeder considers maximum fluid viscosity, (at the minimum operating temperature) in conjunction with flow to properly size the pump and motor.

Standard X Series skids (X2, X3 and X7) include a hydraulic pump, electric motor, and a QF5 housing. Standard X Series Skids (X5, X6 and X8) include a hydraulic pump, electric motor, and dual K9 or QF5 housings. Many different component combinations provide the flexibility to match specific system viscosity, flow, and cleanliness requirements.

Schroeder's high viscosity X Series skids (X7 and X8) are designed to handle fluids that have a viscosity as high as 25,000 SUS. The skids have 39" long QF5 filters to efficiently clean the viscous fluids. The filters have a high dirt-holding capacity, capable of holding almost 1000 grams of dirt depending on the element. X7 and X8 skids include a pump, motor, QF5 filter, suction strainer, and dirt indicator. Various options can account for specific user needs.

Skid Selection

Series	Viscosity Range	Filter Housing(s)	Maximum Flow
X2	100 - 2000 SUS	(1) QF5	82 gpm (310 L/min)
X3	100 - 5000 SUS	(1) QF5	37 gpm (140 L/min)
X5	100 - 2000 SUS	(2) QF5 or K9 in series	82 gpm (310 L/min)
X6	100 - 5000 SUS	(2) QF5 or K9 in series	37 gpm (140 L/min)
X7	100 - 25,000 SUS	(1) QF5	6 gpm (23 L/min)
X8	100 - 25,000 SUS	(2) QF5 in parallel	30 gpm (114 L/min)

Dual K9 Filter Version (Series X5 & X6)
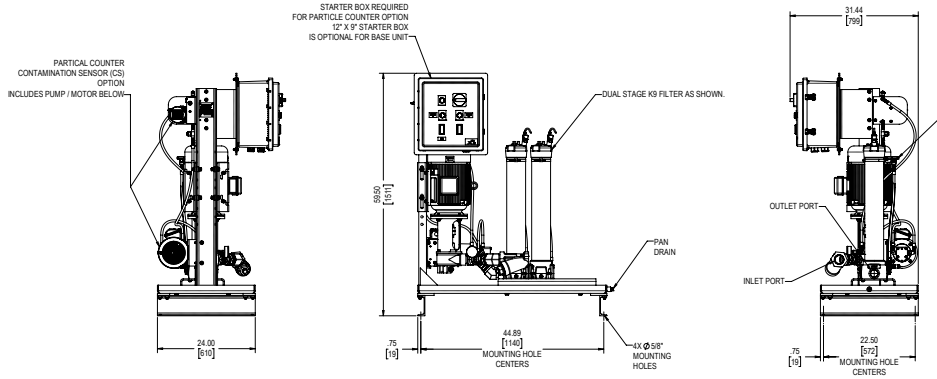
Dual QF5 Filter Version (Series X5 & X6)
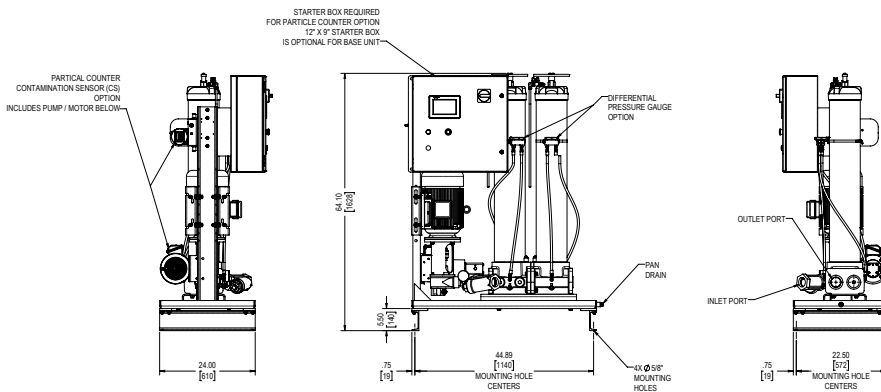
Single QF5 Filter Version (X7); For High Viscosity (up to 25,000 SUS)
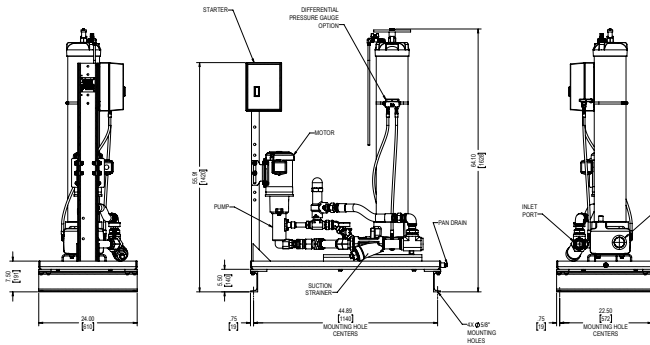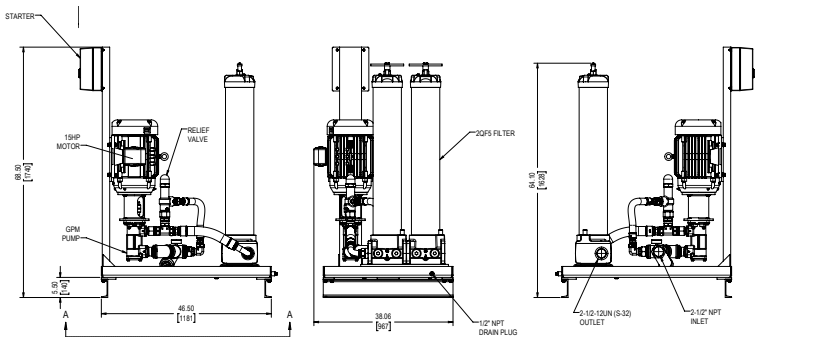

Dual QF5 Filter Version (X8); For High Viscosity (up to 25,000 SUS)

Metric dimensions in ( ).

X Series Filter Skids *Schroeder* SMART
TECHNOLOGY INSIDE

Specifications

Flow Rating:	Up to 82 gpm (310 L/min)
Temp. Range:	0°F to 180°F (-17°C to 82°C)
Bypass Valve Setting:	50 psi (3.5 bar) for skid series X2, X3, X5, X7, and X8 40 psi (2.8 bar) for skid series X6
Fluid Viscosity:	Up to 25,000 SUS (see Skid Selection; previous page)
Compatibility:	All petroleum based hydraulic fluids. Contact Schroeder for use with other fluids, including ester and skydrol.
Pump:	**X2-X6:** Continuous duty gear pump with integral 150 psi relief. Flow dependent on skid series and motor. Refer to table below. **X7-X8:** Positive displacement rotary screw pumps
Motor:	Horsepower dependent on skid series and flow. Refer to table below.
Porting:	Dependent on flow. Refer to table below.

Pump and Motor Data

Skid Series	Flow (gpm)	Motor (hp)	Skid Series	Flow (gpm)	Motor (hp)
X2	17 37 60 82	3 5 10 10	X6	17 37	5 10
X3	17 37	5 10	X7	06	2
X5	17 37 60 82	5 10 10 15	X8	30	15

Porting Data

Model	Flow (gpm)	Inlet Port Sizes	Outlet Port Sizes with K9 Filters	Outlet Port Sizes with Q39 Filters
X2	17	1.50" NPT	-	#32 SAE (2")
X2	37	2" NPT	-	#32 SAE (2")
X2	60	2" NPT	-	#32 SAE (2")
X2	82	2" NPT	-	#32 SAE (2")
X3	17	2" NPT	-	#32 SAE (2")
X3	37	2" NPT	-	#32 SAE (2")
X5	17	1.50" NPT	#24 SAE (1.50")	#32 SAE (2")
X5	37	2" NPT	#24 SAE (1.50")	#32 SAE (2")
X5	60	2" NPT	#24 SAE (1.50")	#32 SAE (2")
X5	82	2" NPT	-	#32 SAE (2")
X6	17	2" NPT	#24 SAE (1.50")	#32 SAE (2")
X6	37	2" NPT	#24 SAE (1.50")	#32 SAE (2")
X7	06	1.50" NPT	-	#32 SAE (2")
X8	30	**2.50" NPT**	-	#32 SAE (2")

Weight Data

Skid Series	Flow (gpm)	Weight (lb)*	Skid Series	Flow (gpm)	Weight (lb)*
X2	17 37 60 82	311-504 348-577 Contact factory 597-705	X6	17 37	370-659 502-607
X3	17 37	340-580 461-566	X7	06	Contact factory
X5	17 37 60 82	396-684 497-849 Contact factory 947-1054	X8	30	Contact factory

*Weight dependent on options chosen.

How to Build a Valid Model Number for a Schroeder X Series Filter Skid:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	BOX 10	BOX 11

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	BOX 10	BOX 11
X5	17	3Q	D	C	B	N	N	B	M	N

= X5173QDCBNNBMN

BOX 1 / BOX 2 / BOX 3

Model (BOX 1)	Flow (gpm) (BOX 2)	K9 Filter 3K (BOX 3)	QF5 Filter 39Q (BOX 3)
X2	17		3Q
	37		3Q
	60		3Q
	82		3Q
X3	17		3Q
	37		3Q
X5	17	3K	3Q
	37	3K	3Q
	60		3Q
	82		3Q
X6	17	3K	3Q
	37	3K	3Q
X7	06		3Q
X8	30		3Q

BOX 4 — Element Media 1st Filter

- A = 1 Z Micron
- B = 3 Z Micron
- C = 5 Z Micron
- D = 10 Z Micron
- E = 25 Z Micron
- M = QPMLZ1
- P = QPMLZ3
- R = QPMLZ5
- S = QPMLZ10
- T = QPMLZ25
- W = W

BOX 5 — Element Media 2nd Filter (omit for X2, X3, and X7 skids)

- N = NA
- A = Z1 (K or Q)
- B = Z3 (K or Q)
- C = Z5 (K or Q)
- D = Z10 (K or Q)
- E = Z25 (K or Q)
- M = QPMLZ1
- P = QPMLZ3
- R = QPMLZ5
- S = QPMLZ10
- T = QPMLZ25
- W = W

Deeper Pleats

Water Removal

BOX 6 — Seal Material

- B = Buna (Standard)
- H = EPR
- V = Viton®

BOX 7 — Power

- N = 230/ 460 VAC 3 PH.
- E = 575 VAC 3 PH.

BOX 8 — Motor Frame

- N = TEFC
- W = Washdown (NEMA Design B)

BOX 9 — Starter Control Options

- N = None
- A = 230 VAC
- B = 460 VAC
- E = 575 VAC

BOX 10 — Dirt Alarm®

- N = D5 Indicator on Filter Cap
- G = Differential Pressure Gauge
- M = MS11 Electric Cartridge
- C = Differential Pressure Gauge with Electric Switch

BOX 11 — Miscellaneous Options

- N = None
- C = Mobile
- B = Continuous Bleed
- P = Particle Counter

Note: Vacuum gauge and suction strainer comes standard on all available models.

*VFD available upon request
For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

Model Number Selection

NOTES:

Box 1.
Z1 media not offered for use in 500 to 2000 SUS filtration skids. Contact factory for specific applications. (X2, X5) Z1 and Z3 media not offered for use in 2000 to 5000 SUS filtration skids. Contact factory for specific applications. (X3, X6)

Boxes 4 & 5.
Z1 and Z3 media not offered for use in 2000 to 5000 SUS filtration skids. Contact factory for specific applications. All elements are singular construction (no stacked elements). QPML elements only available in the QF5 housing. X2, X3 and X7 skids have one filter housing, box 5. X8 skid has filters in parallel. Box 4 & 5 must have same micron rating.

Box 7.
575 will be built to CSA standards. (E) X7 and X8 only available with 230/460 VAC 3 phase motor.

Boxes 9 and 10.
Motor starter control option – C-series, non-disconnect shut-off, "motor on" light, electrical indicator "change element" light, and type 4x wash down enclosure. Contact factory for additional custom control options.

Box 11.
Continuous bleed option – to eliminate filter air buildup in continuously aerated systems. Includes cap vent port, valve, and return line. (B) Suction strainer standard on all X Skids.

Particle Counter not available for X7 or X8.

OLF Compact Offline Filtration Systems

Formally Known as "KLC - Kidney Loop Compact Systems"

Features and Benefits

- Lower operating costs
- Extended element service life
- Extended fluid life
- Cleaner and more efficient systems
- Easy installation
- High dirt-holding capacity
- Requires low volume of oil

Applications

- Injection molding machines
- Machine tools
- Gear boxes
- Mobile equipment
- Filtration of fluids for intermittently operated hydraulic systems and test stands

Description

Schroeder's OFFLINE FILTRATION SYSTEMS - OLF are designed to filter highly contaminated hydraulic oils efficiently and cost effectively off-line. The OLF is designed for use on hydraulic systems with a reservoir of up to 1000 gallons and is perfect for retrofit situations when additional filtration is required. This compact filter is easy to install and ideal for gear boxes. They are supplied as ready-to-install off-line units complete with pump/motor assembly.

Specifications

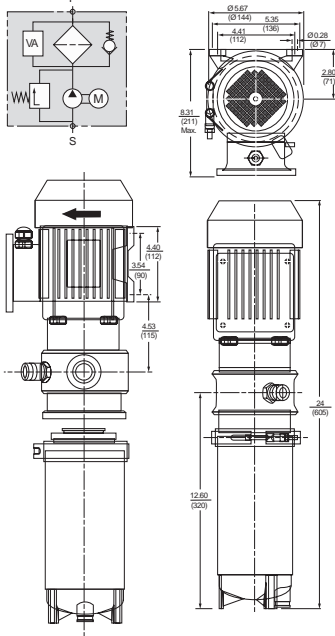|		
Viscosity:	OLF-5/4	to 10,000 SUS
	OLF-5	to 700 SUS
	OLF-5/15	to 3,000 SUS
Operating Pressure:	45 psi (3 bar) max	
Suction Pressure:	-6 psi to 87 psi max	
Fluid Temperature:	32°F to 175°F (0°C to 80°C)	
Ambient Temperature:	-4°F to 104°F (-20°C to 40°C)	
Seals:	Buna N	
Maximum Flow Rate:	OLF-5/4	1.3 gpm
	OLF-5	1.6 gpm
	OLF-5/15	4.9 gpm
Fluids:	Standard mineral oils, water/oil based fluids (min 40% oil in fluid), Consult factory for other fluids	
Media:	Dimicron with or without water removal capability - (2 µm, 20 µm)	
Dirt Holding Capacity:	200g ISO MTD (KLExx particulate elements) / 185g ISO MTD (KLEAxx water elements)	
Water Retention:	Approximately 0.5 quarts (0.5 liters)	
Beta Ratio:	ßx > 1000	
Maximum ΔP:	45 psi (3 bar)	
Connections with Pump/Motor:	OLF-5/4	1 5/16"-12 SAE Female Straight Thread
	OLF-5	3/4"-16 SAE Female Straight Thread
	OLF-5/15	1 5/16"-12 SAE Female Straight Thread
Weight:	OLF-5/4	24.3 lbs (11.0 kg)
	OLF-5	15.5 lbs (7.0 kg)
	OLF-5/15	24.3 lbs (11.0 kg)

Note: SAE connections when using supplied adapters; BSPP connections when supplied adapters are not used. Housing drain standard on all models.
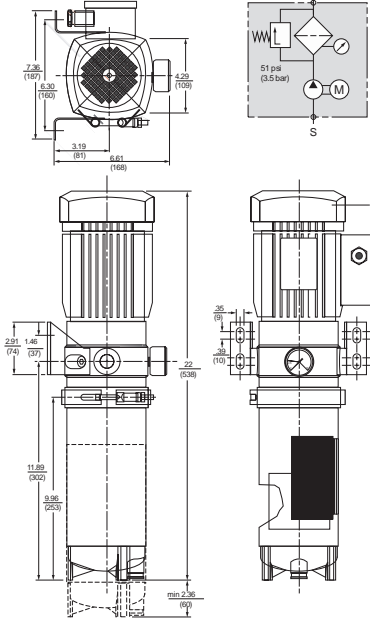
Offline Filtration Systems

Formally Known as "KLC - Kidney Loop Compact Systems"
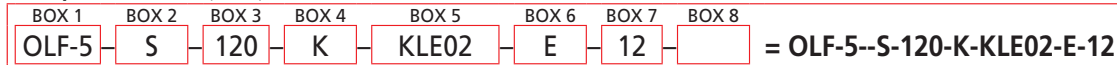
OLF-5/4 | OLF-5/15

OLF-5

Metric dimensions in ( ).

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

How to Build a Valid Model Number for a Schroeder OLF:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
OLF-5							

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
OLF-5	S	120	K	KLE02	E	12		= OLF-5--S-120-K-KLE02-E-12

Model Number Selection

BOX 1	BOX 2	BOX 3
Series	**Pump Type**	**Power Consumption**
OLF-5 = Series 5 (1.6 gpm)	S = Vane Pump* *(standard)*	120 = 120W for all OLF-5
OLF-5/15 = Series 15 (4.9 gpm)	TV = Toploader with Motor *(available for OLF-5/15 & OLFCM-5/15 only)*	200 = 200W for all 24VDC
OLF-5/4 = Series 15 (1.3 gpm)		370 = 370W for all Series 5/15 & 5/4
OLFCM-5/15 = With Fluid Condition Monitoring	E = Flow control valve *(series 5 only)*	Z = without pump/motor *(series 5 only)*

BOX 4	BOX 5	BOX 6	
Voltage	**Element**	**Clogging Indicator**	
K = 115V single phase	KLE02 = 2 micron	E = Standard gauge *(series 5 & 5/4 only)*	
M = 220V single phase	KLE05 = 5 micron	BM = Differential visual	VM2BM.1 *(series 5/15 & 5/4 only)*
N = 440V 3 phase	KLE10 = 10 micron	C = Differential electrical	VM2C.0 *(series 5/15 & 5/4 only)*
T = 12VDC	KLE20 = 20 micron	D = Differential electrical/visual	VM2C.0L… *(series 5/15 & 5/4 only)*
U = 24VDC	KLEA02 = 2 micron with water removal	D4 = Differential electrical/visual with 24VDC Lamp	
	KLEA20 = 20 micron with water removal	DL110 = Differential electrical/visual with 115VAC Lamp	

BOX 7	BOX8
Mechanical Connections	**Supplementary Details**
12 = SAE Connections *(standard)*	C = with ContaminationSensor CS 1310 *(without display; OLFCM only)*
	CD = with ContaminationSensor CS 1320 *(with display; OLFCM only)*
	AC = with ContaminationSensor CS 1310 and AquaSensor AS 1000 *(without display; OLFCM only)*
Consult Factory for special options. Not all combinations available.	ACD = with ContaminationSensor CS 1320 and AquaSensor AS 3000 *(with display; OLFCM only)*

OLF   Offline Filtration Systems

Formally Known as "MTS - Membrane Technology Systems"

5 - 20 gpm
19-75 L/min
85 psi
6.0 bar

Single Membrane Element

Cellulose Filter Layer   Synthetic Membrane   Drainage Structure   Support Tube
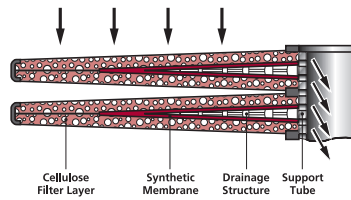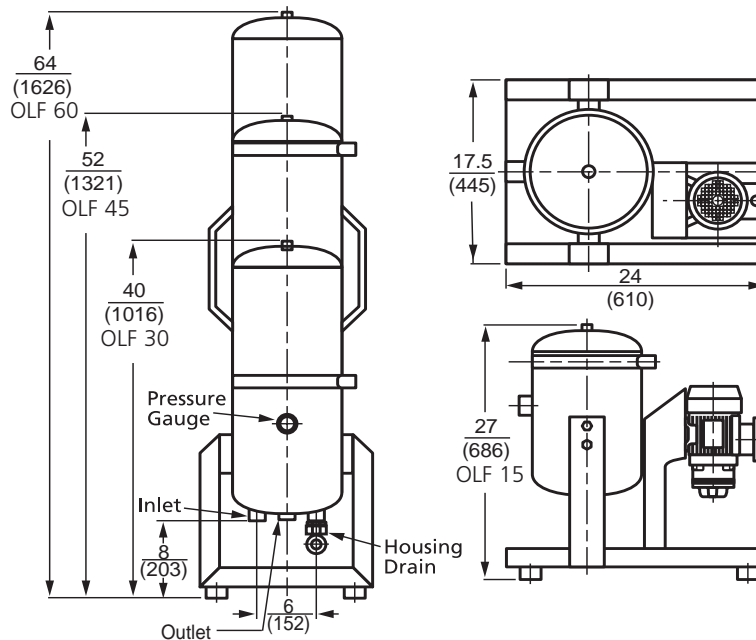
Element Cross Section

Features and Benefits

- Effectively cleans hydraulic and cleaning fluids, lubricating oils, and coolants
- Provides excellent dirt removal efficiency, even in single pass filtration
- Available with pump and motor or can be utilized as an individual filter
- Included framework makes unit ready to install
- Easy to retrofit existing system
- Test points provided on all models
- Housing drain standard on all units

Applications

- Off-line filtration for hydraulic systems and test stands
- Bypass filtration
- Flushing and filling applications
- In-line auxiliary filtration

Description

The OLF from Schroeder is an off-line filtration system that features unique membrane elements constructed of stacked disks where dirt holding capacity is measured in pounds instead of grams, drastically reducing the amount of time required to clean up highly contaminated fluids. The abundant media surface area afforded by the stacked disk construction combined with the highly efficient membrane filtration give the OLF its very impressive dirt retention characteristics. The OLF can hold up to four filter elements and can be supplied as a stand-alone filter or with a pump and motor.
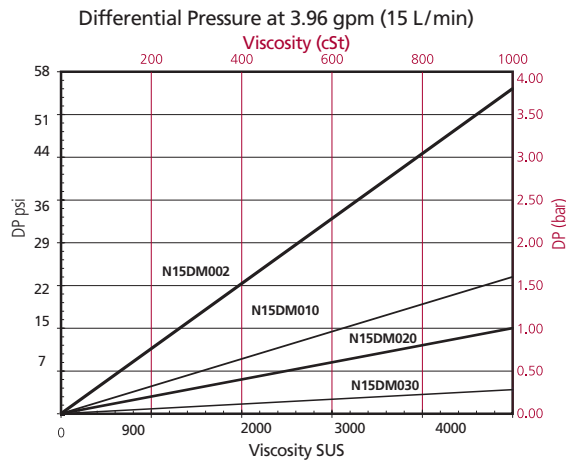

64 (1626) OLF 60
52 (1321) OLF 45
40 (1016) OLF 30
Pressure Gauge
Inlet
8 (203)
Outlet
6 (152)
Housing Drain
17.5 (445)
24 (610)
27 (686) OLF 15

Metric dimensions in ( ).

Offline Filtration Systems OLF

Formally Known as "MTS - Membrane Technology Systems"

Specifications

	OLF-15	OLF-30	OLF-45	OLF-60
Number of Elements:	1	2	3	4
Contamination Retention Capacity:	1.1 lbs (500 g)	2.2 lbs (1000 g)	3.3 lbs (1500 g)	4.4 lbs (2000 g)
Filter Efficiency:	$\beta_x > 1000$	$\beta_x > 1000$	$\beta_x > 1000$	$\beta_x > 1000$
Permissible Δp Across the Element:	72.5 psi (5.0 bar)	72.5 psi (5.0 bar)	72.5 psi (5.0 bar)	72.5 psi (5.0 bar)
Material of Filter Housing:	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Capacity of Pressure Vessel:	5.25 gal (19.87 L)	10.50 gal (39.75 L)	15.75 gal (59.62 L)	20.5 gal (77.60 L)
Max Operating Pressure Filter Housing:	85 psi (6.0 bar)	85 psi (6.0 bar)	85 psi (6.0 bar)	85 psi (6.0 bar)
Material of Seals-Housing (standard):	Buna N	Buna N	Buna N	Buna N
Fluid Temperature:	15° to 175°F (-9.44° to 79.44°C)	15° to 175°F (-9.44° to 79.44°C)	15° to 175°F (-9.44° to 79.44°C)	15° to 175°F (-9.44° to 79.44°C)
Technical Details for Motor-Pumps Units:	5 gpm (18.93 L/min)	10 gpm (37.85 L/min)	15 gpm (56.78 L/min)	20 gpm (75.71 L/min)
Operating Pressure of the Pump:	65 psi (4.48 bar)	65 psi (4.48 bar)	65 psi (4.48 bar)	65 psi (4.48 bar)
Gear Pump (SUS)	75 to 5000	75 to 5000	75 to 5000	75 to 5000
Weight Element	6.6 lbs (2.99 kg)	13.2 lbs(5.99 kg)	19.8 lbs (8.98 kg)	26.4 lbs (11.97 kg)
Weight Housing:	25 lbs (11.34 kg)	33 lbs (14.97 kg)	53 lbs (24.04 kg)	62 lbs (28.12 kg)
Material of Seals in Pumps (standard):	Buna N	Buna N	Buna N	Buna N
Housing Connections: (Units without motor pump groups)	1 5/16-12UN (SAE16)			

Element Pressure Drop

Differential Pressure at 3.96 gpm (15 L/min)

SCHROEDER INDUSTRIES 125
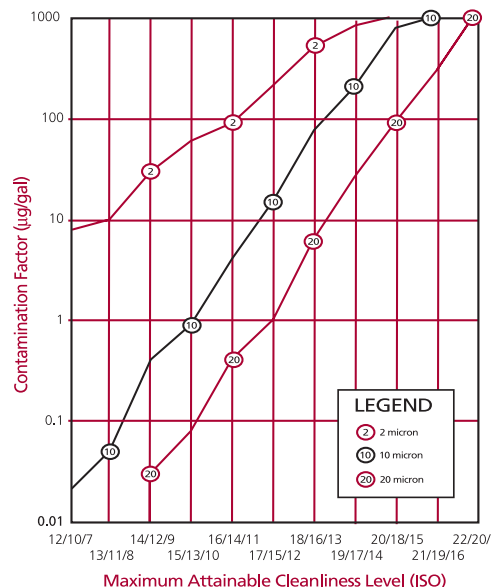
OLF Offline Filtration Systems

Formally Known as "MTS - Membrane Technology Systems"

Sizing Off-line Filtration

The following calculations will help to approximate the attainable system cleanliness level when applying off-line filtration.

Step 1: Select the approximate contamination ingression rate from the chart. Quantitative investigations have yielded the following approximate figures.

Type of System	Contamination Ingression (µg/gal) Surroundings		
	Clean	Normal	Polluted
Closed circuit	1	3	5
Injection molding machine	3	6	9
Standard hydraulic system	6	9	12
Lubrication system	8	11	14
Mobile equipment	10	13	16
Heavy industrial press	14	18	22
Flushing test equipment	42	60	78

Maximum Attainable Cleanliness Level (ISO)

LEGEND
2 micron
10 micron
20 micron

Step 2: Make the correction required for off-line filtration.
The contamination input selected above must be multiplied by the factor:
Main System Flow Rate / Desired Off-line Flow Rate

Note: Main system flow rate must be corrected for cycle time. For example, if the flow rate is 500 gpm, but only runs for 20% of the system cycle, the main system flow rate would be 100 gpm. (500 gpm X 20%)

This yields the expression:

Contamination Factor = Contamination Input (µg/gal) **x Main System Flow Rate** (gpm)
Desired Off-line Flow Rate (gpm)

Calculate the contamination factor using this expression.

Step 3: Determine the attainable cleanliness level. Locate the calculated contamination factor on the y-axis of the attached graph. Go to the right to find the intersection point on the curve corresponding to the desired absolute filter micron rating. Read the resulting attainable cleanliness level on the x-axis. (In case of dynamic flow through the off-line filter, the attainable cleanliness level will be 2 to 3 times worse than indicated by the graph.)

Off-line Filtration Sizing Example:

Type of System: Heavy industrial press

Surroundings: Normal

Main System Flow Rate: 150 gpm

Desired Off-line Flow Rate: 20 gpm (OLF-60)

Step 1: Using this criterion select the approximate contamination ingression rate from the chart above.
This yields a contamination input of 18 µg/gal based on a heavy industrial press with normal surroundings.

Step 2: Make the correction required for off-line filtration.
Contamination Factor = 18 µg/gal x 150 gpm / 20 gpm = 135

Step 3: Determine the approximate attainable cleanliness level for each micron rating using the attached graph. If the attainable cleanliness level is not acceptable, the desired off-line flow rate should be increased. The approximate attainable levels for this example are as follows.

2 µm - ISO 17/15/12

20 µm - Between ISO 20/18/15 and ISO 21/19/16

Offline Filtration Systems   OLF

Formally Known as "MTS - Membrane Technology Systems"

How to Build a Valid Model Number for a Schroeder OLF:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
OLF							

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
OLF	15	15	G	L60	N15DM002	E	12	**= OLF-15/15-G-L60-N15DM002-E/12**

BOX 1

Model
OLF = Stationary offline filter
OLFCM = Stationary offline filter with integrated contamination monitoring sensors

BOX 2

Size
15 = 1 element
30 = 2 elements
45 = 3 elements
60 = 4 elements

BOX 3

Pump Flow Rate (must be ≤ to size)	
15 = 5 gpm	
30 = 10 gpm	This code entry (15,30,45,60) must be less than or equal to the same size entry (15,30,45,60)
45 = 15 gpm	
60 = 20 gpm	
Z = without pump	

BOX 4

Pump Type
G = Gear Pump
Z = Without motor-pump

BOX 5

Motor Voltage
L60 = 115V, Single Phase
O60 = 460V, Three Phase
Z = Without motor-pump

BOX 6

Filter Element
N15DM002 = Dimicron® 2 µm Absolute
N15DM010 = Dimicron® 10 µm Absolute
N15DM020 = Dimicron® 20 µm Absolute
N15DM030 = Dimicron® 30 µm Absolute
Z = No filter element supplied

BOX 7

Clogging Indicator	
E = Standard gauge	
BM = Differential visual	VM2BM.1
C = Differential electrical	VM2C.0
D = Differential visual/electrical	

BOX 8

Model
12 = SAE adapters (BSPP connections are standard)
V = Viton® Seals (NBR seals are standard)
MP = Integrated TestPoint for connection of FCU via Minimess Line
CD = ContaminationSensor CS 1320 (with Display)
CS = ContaminationSensor CS 1310 (without Display) with SMU1260
ACD = ContaminationSensor CS 1320 and AS 3000 (with Display)

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

OLF-P Offline Filtration Systems

Features and Benefits

- Removal of oil aging products, solid particles and water
- Improvement in component lifetime
- Greater machine availability
- Less space required due to compact construction
- Very easy maintenance
- High contamination retention capacity of the elements

Part of the Schroeder Industries 2030 Initiative

Description

The OffLine Filter Pressure (OLFP) is a stationary offline filter and is used to remove oil aging products, water and solid particles from hydraulic and lubrication fluids.

Thanks to its compact construction, the OLFP is also ideally suited for use in even the smallest of installation spaces. The housings are pressure resistant up to 20 bar. Since the housing material is aluminium, the filters are also suitable for low-temperature applications.

The flow can be taken directly from the main flow through an orifice and the orifice determines the flow rate. The offline filters can also be equipped with a motor-pump unit and an inductive particle counter, as an option.

The Trimicron series of filter elements NxTMxxx have been specially developed for the combined removal of fine particles, water and oil aging products. The most modern filter materials with reliable separation characteristics and high contamination retention capacity are used for this purpose.

Specifications

|	OLFP 1	OLFP 3	OLFP 6
Operating Pressure:	Max. 363 psi (25 bar)	Max. 290 psi (20 bar)	
Fluid Temp. Range:	-22° F to 176° F (-30° C to 80° C)		
Max. Operating Viscosity:	1000 cSt		
Ambient Temp. Range:	-22° F to 176° F (-30° C to 80° C)		
Survival Temp.:	-40° F (-40° C)		
Storage Temp.:	-40° F to 176° F (-40° C to 80° C)		
Head Material:	Aluminum		
Bowl Material:	Aluminum		
Seals:	FPM/NBR		
Filter Housing Content:	-2.4 gal. (-9 liters)	-7.1 gal. (-27 liters)	-11 gal. (-43 liters)
Hydraulic Port (IN/OUT):	See table "Hydraulic Connections" on next page		
Filter Element:	1 x N1TMXXX	1 x N3TMXXX	2 x N3TMXXX
Weight:	Approx. 46.3 lbs (21 kg)	Approx. 82 lbs (37 kg)	Approx. 90 lbs (41 kg)

Offline Filtration Systems   OLF-P
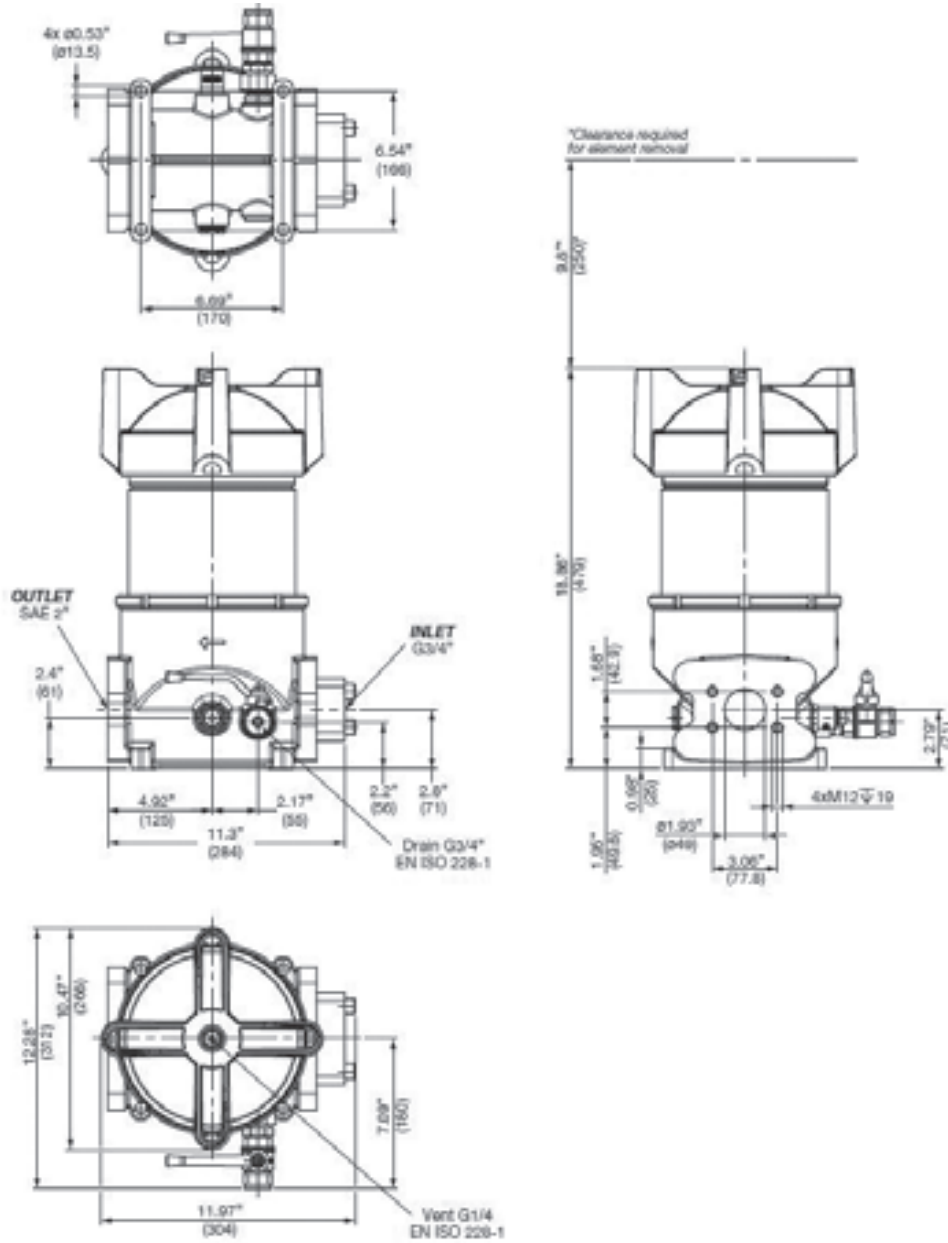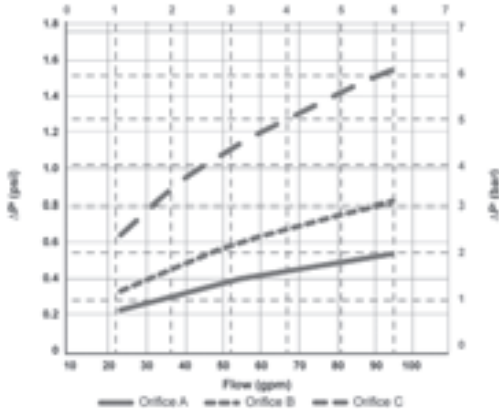
CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

OLFP 1

OLFP 3/6
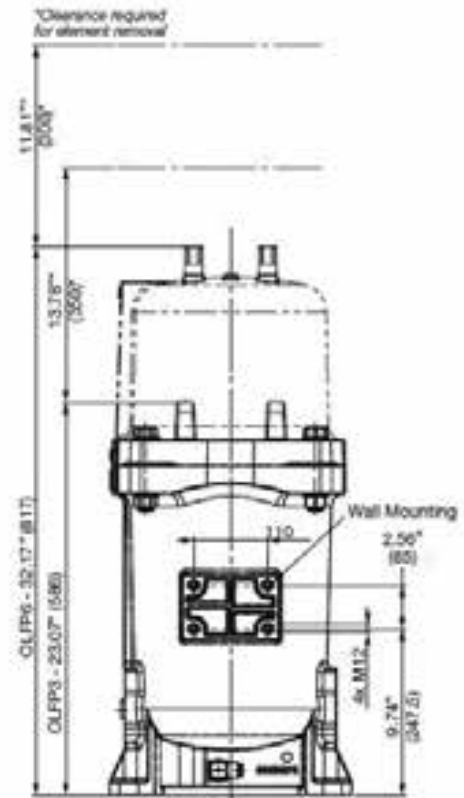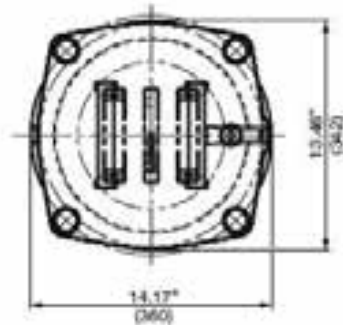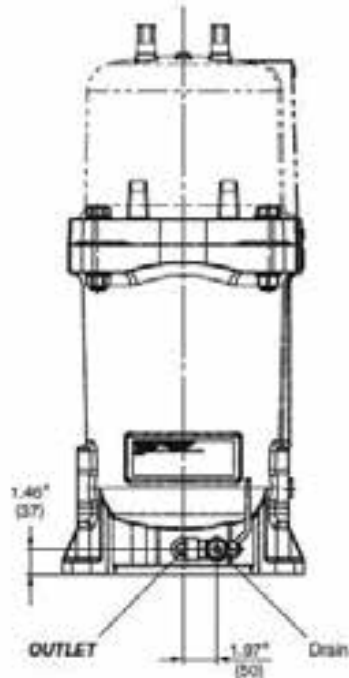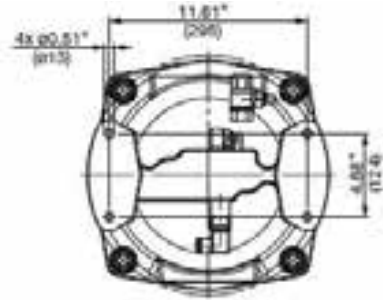
Hydraulic Schematic

*Option: Differential pressure indicator

Replacement Elements

Model Code	Micron Rating	Part No.
N1TM003	3	3284980
N3TM003	3	3566060

Offline Filter System

OLF-P
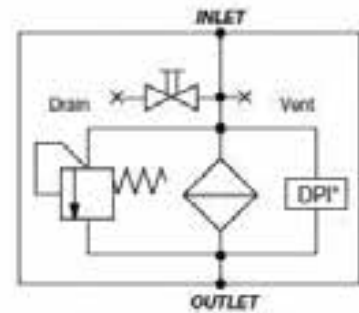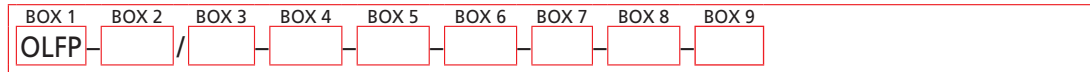
CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

Model Number Selection

How to Build a Valid Model Number for a Schroeder OLF-P:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
OLFP	/		–		–		–	

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
OLFP	1	/ 2	– G	– M	– M	– TM	– N	E	= OLFP-1/2-G-M-M-TM-N E

BOX 1

Series	
OLFP =	Offline Filter - Pressure
OLFPCM =	Offline Filter - Pressure with Condition Monitoring (TCM)

BOX 2

Size	
1 =	Filter size 1 (1 x filter element N1TM003 *)
3 =	Filter size 3 (1 x filter element N3TM003 *)
6 =	Filter size 6 (2 x filter element N3TM003 *)

BOX 3

Flow Rate
2 = 0.53 gpm (2 L/min)
3 = 0.79 gpm (3 L/min)
6 = 1.59 gpm (6 L/min)
Z = variable (without pump)

BOX 4

Type of Pump
O = with orifice
G = gear pump
Z = without

BOX 5

Motor
M = 230 V/50 Hz/1 Phase/0.37 kW
N = 400 V/50 Hz/3 Phase/0.37 kW
AB = 690 V/50 Hz/1 Phase/0.37 kW
X = Other voltages
N60, M60 = Operation at 60 Hz
Z = Without electric motor

BOX 6

Contamination Monitoring
M = TMS Metallic Sensor
A = TWS Water Sensor
Z = Omit

BOX 7

Element Type
TM = Trimicron

BOX 8

Sealing Material
N = NBR
F = FPM

BOX 9

Clogging Indicator
E = Standard, back-pressure indicator
B = Differential pressure indicator, visual (VM2BM.x)
C = Differential pressure indicator, electrical (VM2C.x)
D3 = Differential pressure indicator, visual/electrical (VM2D.x)
D38 = Differential pressure indicator, visual/electrical (VL x GW.0 /-V-113)
Z = Omit

NxTM TriMicron Element Series

Features and Benefits

- Excellent filtration performance ($\beta_{5(c)} > 1000$)
- Low initial differential pressure
- High contamination retention capacity
- Fine particle contamination, water and oil aging products removed by depth filter material
- Broad range of fluid compatibility
- Simple element change

Applications

- Offline filtration in lubrication systems (e.g. in wind turbines)
- Offline filtration in hydraulic systems
- Transmission and hydraulic test rigs

Description

The filter elements in the TriMicron series have been specially developed for the combined filtration of fine solid particle contamination, water and oil-ageing products from hydraulic and lubrication oils in the bypass flow.

They are a combination of pleated and SpunSpray depth filter elements. The filter layers are produced using melt-blown technology (synthetic fibers).

Specifications

Model:	N1	N3
Contamination Retention Capacity ISOMTD at ΔP = 2.5 bar	~ 410 g	~ 410 g
Water Retention Capacity:	~ 680 ml	~ 2.1 l
Beta value $\beta_{5(c)}$ @ 2 bar	> 1,000	
Filtration Rating:	3 µm	
Differential Pressure at Starting Point:	< 0.1 bar	
Permitted Fluid Temperature Range:	14 to 176 °F (-10 to 80 °C)	
Storage Temperature Range:	41 to 104 °F (5 to 40 °C)	
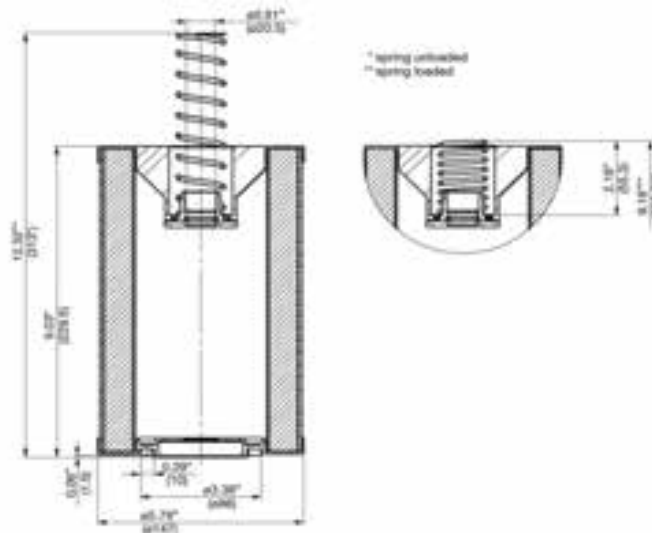
TriMicron Element Series

NxTM

CS 1000

CS 1939

How to Build a Valid Model Number for a Schroeder NxTM TriMicron Element:

	BOX 1	BOX 2	BOX 3	BOX 4
N				/–

Example: *NOTE: One option per box*

	BOX 1	BOX 2	BOX 3	BOX 4	
N	1	TM	003	/– N	= **N1TM003 /- N**

Model Number Selection

CSI-C-11

HY-TRAX®

RBSA

CSM

FCU

MCS

AS

SMU

CTU

EPK

Trouble
Check Plus

HMG2500

HMG4000

ET-100-6

HTB

RFSA

HFS-BC

HFS-15

MFD-BC

MFS, MFD

HY-TRAX®
Retrofit System

MFD-MV

MFS-HV

AMS, AMD

FS

AMFS

KLS, KLD

MCO

AKS, AKD

LSN, LSA, LSW

X Series

OLF Compact

OLF

OLF-P

NxTM

VEU-F

VMU

IXU

Triton-A

Triton-E

NAV

SVD01

OXS

Appendix

BOX 1

Nominal Flow Rate	
1 =	Nominal flow rate 1 L/min
3 =	Nominal flow rate 3 L/min

BOX 2

Element Type	
TM =	TriMicron

BOX 3

Filtration Rating (microns)	
003 =	3

BOX 4

Sealing Material
N = NBR
F = FPM

Element Differential Pressure N1TM

Element Differential Pressure N3TM

VEU Varnish Elimination Unit
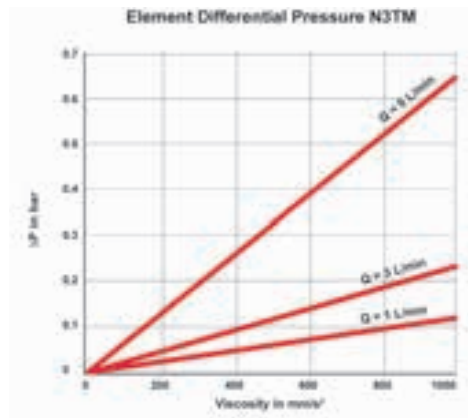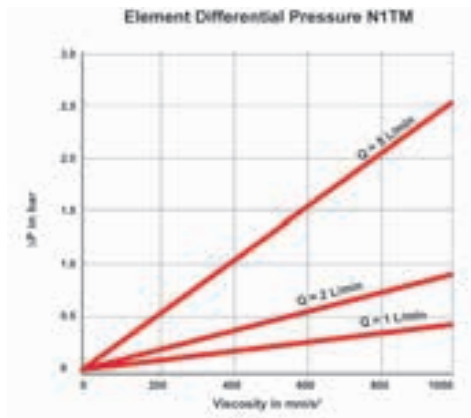
VEU-A-x-M

Features and Benefits

- Removal of solid and gel-like oil aging products
- Increased operating reliability of the system as a result of fewer deposits in hydraulic valves
- Increased oil service life
- Available for existing and for new systems

Applications

- Turbine Lubrication Systems
- Plastic Injection Molding Machines
- Industrial Forges and Presses

Description

The service-friendly Varnish Elimination Unit (VEU) is used to prepare mineral oils and is particularly effective at removing oil aging products (varnish) from mineral oils. Varnish takes the form of oil-insoluble aging products which settle in the tank, in valves or in bearings. These can be filterable gels or solid paint-type deposits. The VEU series product is used in bypass flow. The removal of varnish is based on reducing the oil solubility for varnish with subsequent filtration using a combination of a heat exchanger with Dimicron® filter element technology.

Specifications

Flow Rate:	VEU-x-10-...=10 gpm (38 L/min) VEU-x-15-...=15 gpm (57 L/min)
Fluid Viscosity:	75 to 2,000 SUS
Permitted Operating Fluids:	Mineral-based
Fluid Service Temperature:	VEU-x-10-: 32°F to 140°F (0°C to 60°C) VEU-x-15-: 32°F to 176°F (0°C to 80°C)
Pump Operating Pressure:	87 psi (6 bar) max
Differential Pressure Across Elements:	72.5 psi (5 bar) max
Permissible Inlet Pressure Range:	-5.8 psi to 7 psi (-0.4 bar to 0.48 bar)
INLET Port Connection:	VEU-x-10-: 1-5/8 x 12UN - Male VEU-x-15-: 1-7/8-12UN - Male
OUTLET Port Connection:	1-5/16 x 12UN - Male
Water INLET port connection (VEU-W-...only)	1-1/2 x NPT - Male
Water OUTLET port connection (VEU-W-...only)	1-1/2 x NPT - Male
Supply Voltage:	460V AC / 60Hz / 3 Ph. 575V AC / 60Hz / 3 Ph.
Seal Material:	FKM (Viton®)
Ambient Temperature Range:	32°F to 104°F (0°C to 40°C)
Storage Temperature Range:	0°F to 140°F (-18°C to 60°C)
Relative Humidity:	0% to 80%, non-condensing
Weight:	VEU-x-10-: 1,100 lbs. (499 kg.) VEU-x-15-: 1,150 lbs. (522 kg.)

Sizing + Element Selection

Sizing Chart

Tank Volume (gallons)	VEU-F Model
150 to 1200	VEU-x-10-
225 to 2000	VEU-x-15-

Model Code	Micron Rating	Part No.
N15DM002	2	1251590
N15DM005	5	3252552
N15DM010	10	3115180

Varnish Elimination Unit

Dimensions
VEU-A-x-M

66.85
[1698]

60.50
[1537]

32.00
[813]

Indicator Gauge

OUTLET Port
1-5/16-12UN Male (SAE-16)

OUT   IN

INLET Port
1-5/8-12UN Male (SAE-24)
(VEU-A-10-M-...)
1-7/8-12UN Male (SAE-24)
(VEU-A-15-M-...)

OK-LN-08
Air Cooler

Pump / Motor Group

OLF 45 Filter
Option with Electrical
Differential Pressure Gauge

60.61
[1540]

44.01
[1118]

AIR
FLOW

460V / 60 Hz
Control Panel with
Temperature and
Pressure Differential
Indicator Light with
Adjusting Temperature Setting

A   A

9.50
[241]

Dimensions
VEU-W-**x-M**-…

66.85
[1698]

60.50
[1537]

32.00
[813]

Indicator Gauge

OUTLET Port
1-5/16-12UN Male (SAE-16)

OUT   IN

INLET Port
1-5/8-12UN Male (SAE-20)
(VEU-W-10-M-...)
1-7/8-12UN Male (SAE-24)
(VEU-W-15-M-...)

Z400 HNP NP12
Water Cooler

Pump / Motor Group

OLF 45 Filter

60.61
[1540]

49.77
[1264]

460V / 60 Hz
Control Panel with
Temperature and
Pressure Differential
Indicator Light with
Adjusting Temperature Setting

A   A

9.50
[241]

Dimensions in inches (mm).

How to Build a Valid Model Number for a Schroeder VEU:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
VEU						

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	
VEU	A	15	M	060	DM02	C	= VEU-A-15M060DM02C

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
Model	**Cooling Method**	**Flow Rate**	**Version**	**Motor Voltage**
VEU	A = Air	10 = 10 gpm	S = Stationary	060 = 460V/ 3 Phase
	W = Water	15 = 15 gpm	M = Mobile	P60 = 575V/ 3 Phase

BOX 6	BOX 7
Motor Voltage	**Clogging Indicator**
DM02 = N15DM002, 2µm Absolute	C = Electrical differential pressure switch w/ indicator light in control panel
DM05 = N15DM005, 5µm Absolute	
DM10 = N15DM010, 10µm Absolute	

Model Number Selection

Preferred order codes designate shorter lead times and faster delivery.

VMU Varnish Mitigation Unit 1/4 Series

Features and Benefits

- Removal of solid or gel-type oil aging products
- Operating reliability of the system is increased because there are fewer deposits in hydraulic components
- Increases oil service life
- Available as a complete unit for retrofitting to existing systems, as well as a modular system for new systems

Description

The user-friendly Varnish Mitigation Unit is designed to condition mineral oils. The VMU is particularly effective at removing oil aging products (varnish) from mineral oils.

Varnish takes the form of insoluble oil aging products which settle in reservoirs, valves and bearings. These can be non-filterable gels or solid paint-type deposits.

The VMU series offline filtration system removes varnish through adsorption on an active filter element surface.

Specifications

Hydraulic Data	
MPC Values Achievable	< 20
Flow Rate:	VMU 1 ≈ 0.58 gpm (≈ 2.2 l/min) VMU 4 ≈ 2.4 gpm (≈ 8.9 l/min)
Fluid Temperature:	86 to 140 °F (30 to 60 °C)
Max. Operating Pressure:	87 psi (6 bar)
Permissible Suction Pressure at Suction Inlet IN:	2.9 to 14.5 psi (-0.2 to 1 bar)
Viscosity Range:	78 to 370 SUS (15 to 80 cSt)
Permissible Operating Fluid:	Mineral-based fluids
Connections IN / OUT:	1/2"-20 male JIC / 1/2-20 female o-ring boss
Pump Type:	Gear

Electrical Data	
Power Supply Voltage:	See ordering details
Power Consumption:	0.25 to 0.6 kW / 16 Amps

Ambient Conditions	
Operating Temperature Range:	32 to 104 °F (0 to 40 °C)
Storage Remperature Range	32 to 140 °F (0 to 60 °C)
Relative Humidity:	0 to 80%, non-condensing
Protection Class to DIN 40050:	IP 55

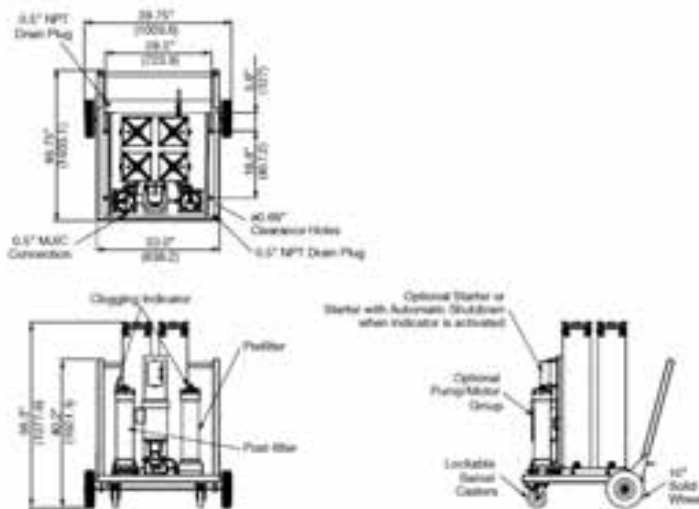| General Data	
Length of Electrical Connection Cable:	5' (1.5 m)
Sealing Material:	FKM (Viton®)
Sound Level at 1m:	< 80 dB(A)
Weight* (empty):	VMU 1 = 155 lbs (70 kg), VMU 4 = 660 lbs (300 kg)
Fluid Cleanliness Required:	ISO 19/17/14 (ISO 4406:1999) 9A/9B/9C (SAE AS4059)

*Weight noted is for a stationary unit.

Varnish Mitigation Unit 1/4 Series

Dimensions
VMU1 Series
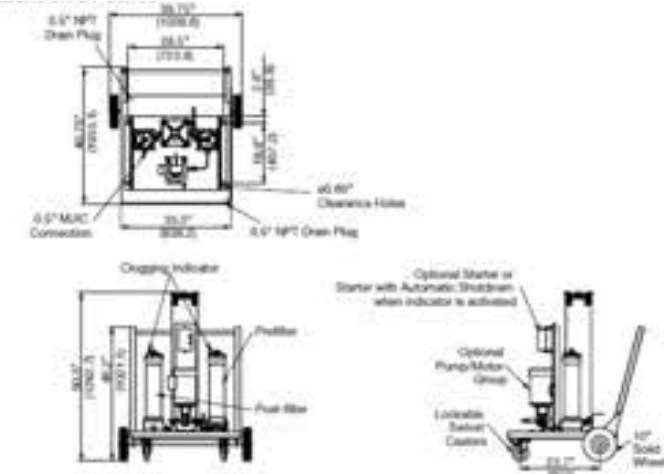
Dimensions
VMU4 Series

Dimensions in inches (mm).

How to Build a Valid Model Number for a Schroeder VEU:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 8
VMU	–	–	–	–	–	–	–	– =

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
VMU	4	M	G	O	G05	BM	G05	PKZ	= **VMU4MGOG05BMG05PKZ**

BOX 1
Series
VMU

BOX 2	
Series	
1 =	1x Varnish Mitigation element NAVME ≈ 0.5 gpm (2.2 l/min)
4 =	4x Varnish Mitigation elements NAVME ≈ 2.5 gpm (8.9 l/min)

BOX 3	
Type	
M =	Mobile
S =	Stationary

BOX 4	
Type of Pump	
G =	Gear Pump
Z =	Without

BOX 5	
Power Supply Voltage	
F =	230 V, 60 Hz, 3 Ph
K =	115 V, 60 Hz, 1 Ph
O =	460 V, 60 Hz, 3 Ph (standard)

BOX 6	
Prefilter	
G05 =	With 5µm element
G10 =	With 10µm element

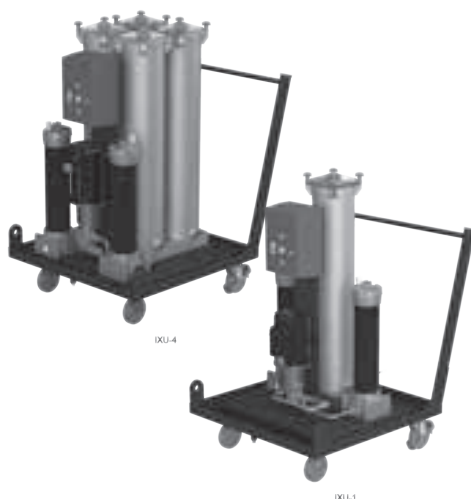| BOX 7	
Clogging Indicator	
BM =	differential pressure indicator – visual (VM2BM.1)
C =	differential pressure indicator – electrical (VM2C.0)

BOX 8	
Postfilter	
G05 =	With 5µm element
G10 =	With 10µm element

BOX 9	
Supplementary Details	
PKZ =	with on-off switch and overload protective motor switch (standard)
FA1 =	with on-off switch, overload protective motor switch and cut-out when filter clogged (requires neutral wire in power supply)
FA2 =	with on-off switch, overload protective motor switch and cut-out when filter clogged (does not require neutral wire in power supply)

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

IXU Ion eXchange Unit

.5 -2.5 gpm
1.9-9.5
L/min

IXU-4

IXU-1

Features and Benefits

- Longer oil change intervals
- Increase in the lifetime of operating fluids and components
- Higher machine availability
- Reduction in functional problems, e.g. with servo valves
- Easy to service unit through
   – Component replacement without tools
   – Filter elements can be removed with the cover pointing "upward"
- Ideal to combine with type SVD Dewatering Units
- Available to service as complete unit, modular system for retrofitting existing bypass circuits or for OEM
- Visual Dirt Alarm® provided on all models
- Sold in North America only.

Applications

- Power plants
- Steel industry
- Other applications with ester-based, flame resistant fluids

Description

This easy to service ion exchange unit of the IXU series is used for conditioning flame resistant, HFD-R-based hydraulic and lubrication fluids. They effectively remove acidic products of decomposition caused by hydrolysis and/or oxidation of the fluid. The units are applied to hydraulic and lubrication oil tanks up to approximately 5,300 gallons (20,000 L) with volumetric flow of up to approximately 2.4 gpm (9 l/min) in the bypass flow. Mobile or stationary IXU are available. The IXU uses Ion eXchange Element (IXE) filled with ion exchange resin.
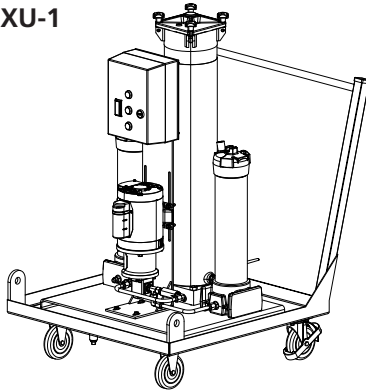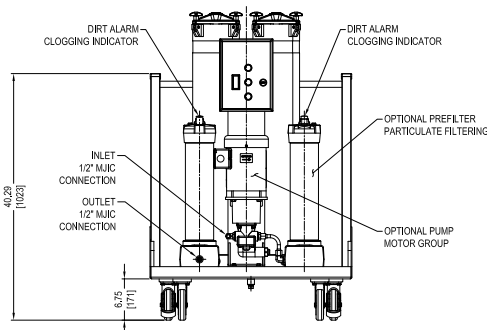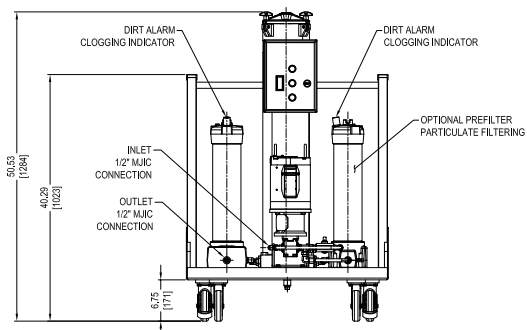
Hydraulic Circuit

DPG

DPG

BYPASS 40 PSI

RELIEF VALVE

M

FLOW 1/2 GPM

OUT

IN
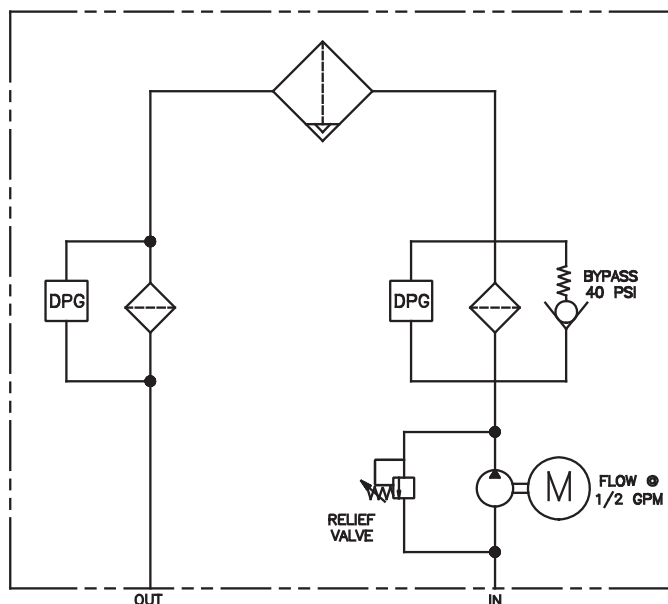
NOTES:

No connection lines included

Ion eXchange Unit   IXU
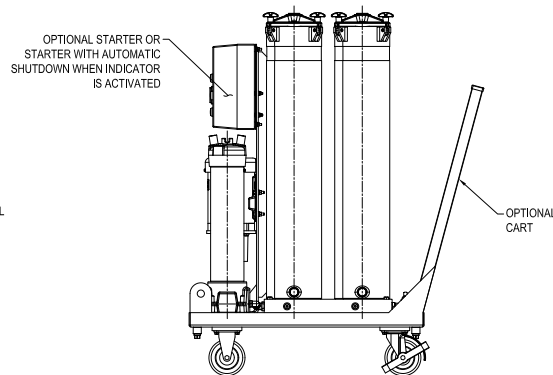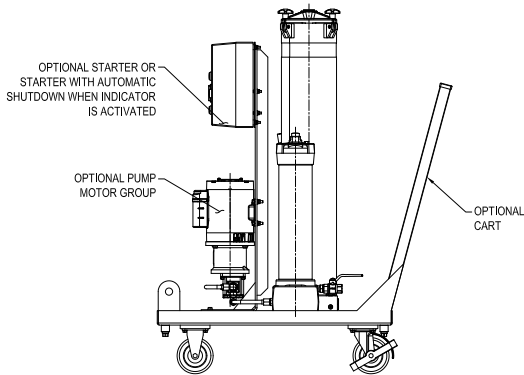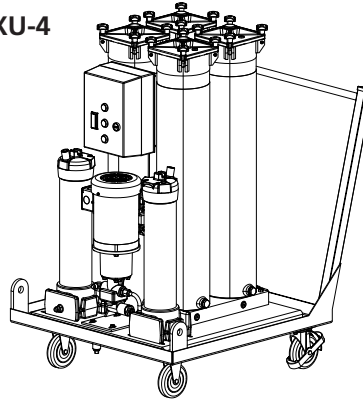
CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

IXU-1

IXU-4

OPTIONAL STARTER OR
STARTER WITH AUTOMATIC
SHUTDOWN WHEN INDICATOR
IS ACTIVATED

OPTIONAL PUMP
MOTOR GROUP

OPTIONAL
CART

OPTIONAL STARTER OR
STARTER WITH AUTOMATIC
SHUTDOWN WHEN INDICATOR
IS ACTIVATED

OPTIONAL
CART

1/2" NPT
DRAIN PLUG

Rp-1/2
CONNECTION
(DRAIN)

.66 [17]
MOUNTING HOLE
(4) PLACES

40.85
[1038]

18.00
[457]

22.00
[559]

OUT   IN

1/2" NPT
DRAIN PLUG

29.50
[749]

31.00
[787]

33.00
[838]

1/2" NPT
DRAIN PLUG

Rp-1/2
CONNECTION (DRAIN)

.66 [17]
MOUNTING HOLE
(4) PLACES

40.85
[1038]

18.00
[457]

28.00
[559]

OUT   IN   1/2" NPT
DRAIN PLUG

29.50
[749]

31.00
[787]

33.00
[838]

DIRT ALARM
CLOGGING INDICATOR

DIRT ALARM
CLOGGING INDICATOR

OPTIONAL PREFILTER
PARTICULATE FILTERING

INLET
1/2" MJIC
CONNECTION

OUTLET
1/2" MJIC
CONNECTION

50.53
[1284]

40.29
[1023]

6.75
[171]

DIRT ALARM
CLOGGING INDICATOR

DIRT ALARM
CLOGGING INDICATOR

OPTIONAL PREFILTER
PARTICULATE FILTERING

INLET
1/2" MJIC
CONNECTION

OUTLET
1/2" MJIC
CONNECTION

OPTIONAL PUMP
MOTOR GROUP

40.29
[1023]

6.75
[171]

IXU — Ion eXchange Unit

Specifications

Neutralization Number:	< 0.1 mg KOH/g possible
Flow Rating:	IXU-1: 0.5 gpm (1.9 l/min) IXU-4: 2.5 gpm (9.5 l/min)
Max. Operating Pressure:	116 psi (7.99 bar)
Suction Pressure @ Inlet:	-5.8 to 14.5 psi (-0.4 to 1 bar)
Viscosity Range:	80 to 400 SUS (15 to 80 cSt)
Fluid Compatibility:	HFD-R (Fire-Resistant / Phosphate-Based Fluids)
Operating Temperature :	32°F to 104°F (0 to 40°C) <80% = Relative humidity (non-condensing)
Hydraulic Connection:	1/2" (-8) Male JIC Inlet and Outlet
Seals:	Viton®
Pump Type:	Gear
Power Consumption:	0.25 - 0.6 kW, depending on motor and voltage
Length of Electrical Cable:	30 ft. (10 m)
Noise Level:	<80 dB at 3 feet (1 m)
Storage Temperature:	32°F to 140°F (0°C to 60°C)

Model Number Selection

How to Build a Valid Model Number for a Schroeder IXU:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
IXU								

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
IXU	1	M	G	J	G10	C	G05		= IXU1MGJG10CG05

BOX 1

Model
IXU

BOX 2

Flow Rate
1 = 0.5 gpm (1.9 l/min)
4 = 2.5 gpm (9.5 l/min)

BOX 3

Transport
M = Mobile
S = Stationary

BOX 4

Pump
G = Gear Pump

BOX 5

Connection Voltage
Omit = 115 V / 60 Hz, 3 Phase
B = 460 V / 60 Hz, 3 Phase
E = 575 V / 60 Hz, 3 Phase

BOX 6

Pre-filter
05 = w/ 5µm Element
10 = w/ 10µm Element
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®

BOX 7

Clogging Indicator
C = Differential Pressure Indicator – Electrical

BOX 8

Post-filter
05 = w/ 5µm element
10 = w/ 10µm element
G05 = 5 µm Excellement® Z-Media® (synthetic) w/GeoSeal®
G10 = 10 µm Excellement® Z-Media® (synthetic) w/GeoSeal®

BOX 9

Accessories	
FA1 = with on/off switch, overload protective motor switch and cut-out when filter clogged (requires neutral wire in power supply)	FA2 = with on/off switch, overload protective motor switch and cut-out when filter clogged (does not require neutral wire in power supply)

Ion eXchange Unit Replacement Elements

Model Code	P/N	Description
IXE36-5.5	3348961	Standard Ion Exchange Resin Element
KKZ5V	7615359	5 Micron Pre/ Post Element
KKZ10V	7628656	10 Micron Pre/ Post Element

NOTES:

IonExchange Element is not included with unit and is to be ordered separately
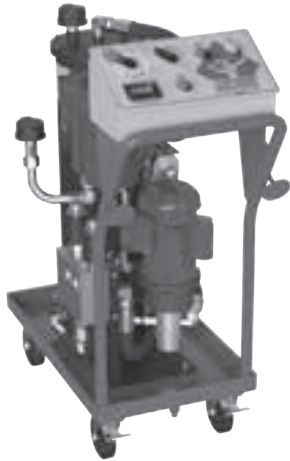
Triton Dehydration Station®

U.S. Patent 8491785

Triton-A

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
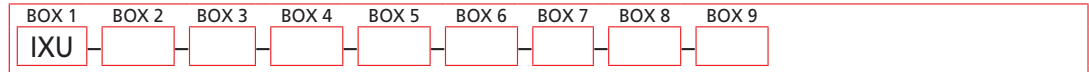OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

2.0 gpm
7.6 L/min

Features and Benefits

- Patented mass transfer technology uses ambient air to optimize and control dewatering rates
- High Dewatering Rates and particulate removal in one system
- Simple Controls; RUN/DRAIN modes
- Reduce fluid recycling cost
- No expensive vacuum pump to service and replace
- Compact, efficient footprint
- Remove free and dissolved water
- Highly effective in low and high humidity environments

Part of the Schroeder Industries 2030 Initiative

Description

Water contamination in hydraulic systems can severely reduce the life of hydraulic systems and fluids. The Triton Dehydration Station® is designed to eliminate 100% of free and up to 90% of dissolved water from small reservoirs, barrels, and gear boxes. Using a patented mass transfer process, the Triton Dehydration Station® efficiently removes water and particulate contamination quickly in all environments. A proprietary design reduces aeration of free and entrained gases of returned fluid. The unit was designed to be extremely portable using the optional cart to access tight areas.

Principle of Operation

The Triton Dehydration Station® uses patented mass transfer dewatering technology. Ambient air is conditioned to increase its water holding capability before injecting to the reaction chamber. Fluid is equally distributed and cascaded down through reticulated media and the conditioned air stream. Water is transformed to water vapor and is expelled from the unit as a moist air stream. The relative humidity of the incoming fluid is continually monitored by an integral AS1000 and displayed real-time on the control panel.

Specifications

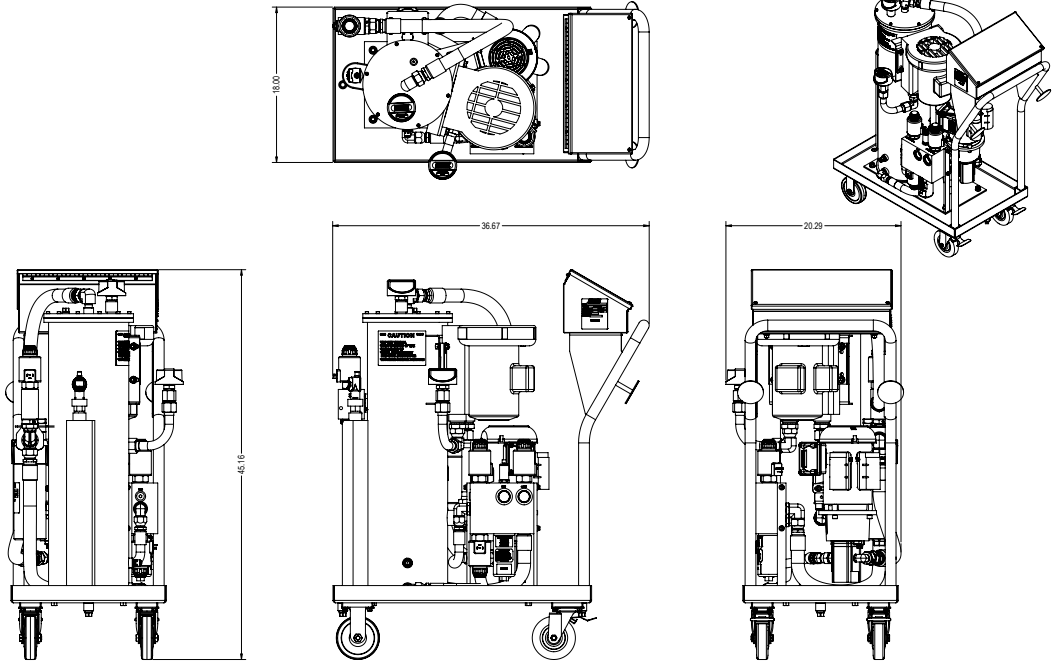|	
Dimensions:	45.2"(H) x 36.7"(W) x 20.3"(D)
Dry Mass:	295 lbs (134 kg)
Inlet Connections:	1" SAE
Outlet Connections:	1" SAE
Flow Rate:	120 gallons/hour or 2.0 gpm
Permissible Inlet Pressure Range:	-5.8 psig (-0.4 bar) to 32 psia (2.2 bar)
Max. Permissible Outlet Pressure:	75 psig (5 bar)
Fluid Service Temperature:	100° F to 150°F (40°C to 65.5°C)
Fluid Viscosity:	70- 1000 SUS (13 - 215 cSt), Explosion-proof: 500 SUS maximum
Power Supply:	110 VAC, 60 Hz, 12 amp
Attainable Water Content:	< 50 ppm
Relative Humidity Display:	Standard, 0-99% Range
Construction:	Reaction Vessel: Stainless Steel Seals: Viton®
Protection Class:	NEMA 2

Element Performance

Media	Filter Rating	DHC (gm)
Z1	ß 4.2$_{(C)}$ ≥1000	55
Z3	ß 4.8$_{(C)}$ ≥1000	57
Z5	ß 6.3$_{(C)}$ ≥1000	62
Z10	ß 10$_{(C)}$ ≥1000	52
Z25	ß 24$_{(C)}$ ≥1000	48

Triton Dehydration Station®
U.S. Patent 8491785

TRITON DEHYDRATION STATION®

TDSAVMABxx1

Dimensions in inches.

Model Number Selection

How to Build a Valid Model Number for a Schroeder Triton-A:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
TDS							

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
TDS	A	V	M	A	B	05	1	= TDSAVMAB051

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
Model	**Flow Rate**	**Seals**	**Mobility**	**Voltage**
TDS	A = 2.0 gpm	V = Viton®	S = Stationary	A = 110V/60 Hz/ 1 Phase
			M = Caster Base	B = 220V/60 HZ/ 1 Phase
				C = 220V/50 Hz/ 1 Phase

BOX 6	BOX 7	BOX 8
Air Source	**Media**	**Option**
B = Integral Blower	01	X = Class 1, Div 2 explosion-proof
C = Compressed Air (customer must supply clean, dry air))	03	1 = Cart Version
	05	Y = Built with CSA approved components (requires CSA inspection on-site)
	10	
	25	

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

Triton Dehydration Station®

Schroeder SMART TECHNOLOGY INSIDE

U.S. Patent 8491785

Triton-E

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
OLF
OLF-P
NxTM
VEU-F
VMU
IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix

15 gpm
56.78 L/min

Features and Benefits

- Patented mass transfer technology uses ambient air to optimize and control dewatering rates
- High Dewatering Rates and particulate removal in one system
- Simple Controls - maintenance, operation and troubleshooting instructions are available in the Human Machine Interface (HMI) Touch Screen
- Reduce fluid recycling cost
- No expensive vacuum pump to service and replace
- Compact, efficient footprint
- Remove free and dissolved water
- Highly effective in low and high humidity elements

Part of the Schroeder Industries 2030 Initiative

Description

Water contamination in hydraulic systems can severely reduce the life of hydraulic systems and fluids. The Triton Dehydration Station® is designed to eliminate 100% of free and up to 90% of dissolved water. The Triton-E can handle large quantities of oil from sizeable hydraulic reservoirs, lubricating circuits, totes and large gear boxes due to the high flow rate of the unit. Using a patented mass transfer process, the Triton Dehydration Station® efficiently removes water and particulate contamination quickly in all environments. A proprietary design reduces aeration of free and entrained gases of returned fluid. The unit is designed to be extremely portable using either the integrated lifting lugs located on each corner of the cart or the optional wheeled version.

Principle of Operation

The Triton Dehydration Station® uses patented mass transfer dewatering technology. Ambient air is conditioned to increase its water holding capability before injecting to the reaction chamber. Fluid is equally distributed and cascaded down through reticulated media and the conditioned air stream. Water is transformed to water vapor and is expelled from the unit as moist air/stream. The relative humidity of the incoming fluid is continually monitored by an integral TestMate® Water Sensor (TWS) and displayed real-time on the control panel in percent saturation.

Specifications

|	
Dimensions:	32"W x 59"L x 70.25" H
Dry Mass:	1000 lbs (453 kg)
Inlet Connections:	1-1/2" MJIC
Outlet Connections:	1-1/2" MJIC
Flow Rate:	15 gpm Standard, (other options available - see Box 2 on the next page)
Inlet Pressure:	Atmospheric
Outlet Pressure:	to 125 psi (8.62 bar)
Fluid Service Temperature:	50° F to 175°F (10°C to 79°C)
Fluid Viscosity:	70-2000 SUS (13 -539 cSt), 2500 with heater
Power Supply:	460 V/3/60 Hz, 13 amps 460 V/3/60 Hz, 28 amps w/heater 575 V/3/60 Hz, 10.5 amps 575 V/3/60 Hz, 23 amps w/heater
Attainable Water Content:	< 50 ppm
Relative Humidity Display:	Standard, 0-99% Range
Construction:	Base Frame: Carbon Steel Vessel: Stainless Steel Seals: Viton®
Protection Class:	NEMA 2

Element Performance

Media	Filter Rating	DHC (gm)	Media	Filter Rating	DHC (gm)
Z1	β 4.2$_{(c)}$ ≥1000	55	Z10	β 10$_{(c)}$ ≥1000	52
Z3	β 4.8$_{(c)}$ ≥1000	57	Z25	β 24$_{(c)}$ ≥1000	48
Z5	β 6.3$_{(c)}$ ≥1000	62			
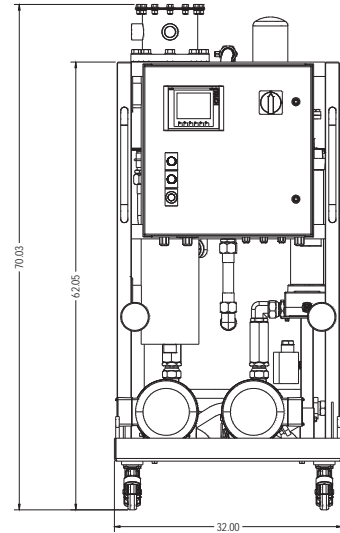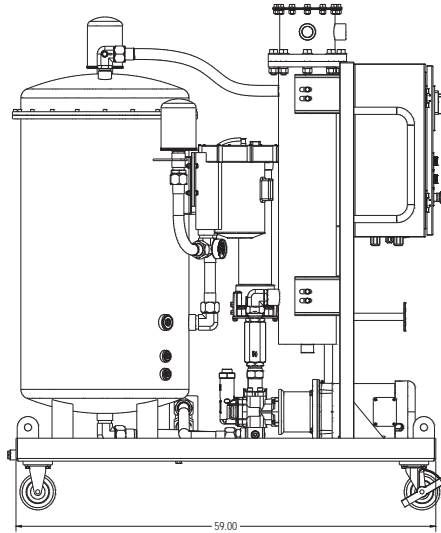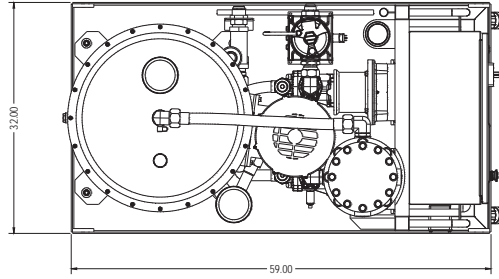
Triton Dehydration Station®

U.S. Patent 8491785

TRITON
DEHYDRATION
STATION®

Metric dimensions in ( ).

Model Number Selection

How to Build a Valid Model Number for a Schroeder Triton-E:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
TDSE							

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
TDSE		V	M	A	B	G05	H	= TDSEVMABG05H
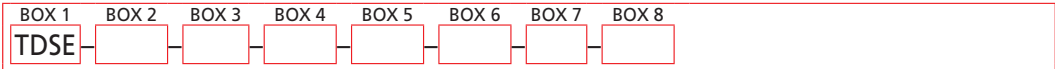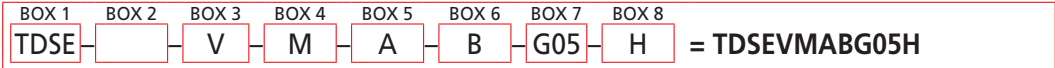
BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
Model	**Flow Rate**	**Seals**	**Mobility**	**Voltage**
TDSE	Omit = 15 gpm	V = Viton®	S = Stationary	A = 460V/3/60 Hz
	22 = 22 gpm		M = Caster Base	B = 575V/3/60 Hz
	VF = 3-15 gpm (Variable)			

BOX 6	BOX 7	BOX 8
Air Source	**Media**	**Option**
B = Integral Blower	G01 = 1 µm Z-Media w/ GeoSeal®	H = 12500 W Heater
	G03 = 3 µm Z-Media w/ GeoSeal®	
	G05 = 5 µm Z-Media w/ GeoSeal®	
	G10 = 10 µm Z-Media w/ GeoSeal®	
	G25 = 25 µm Z-Media w/ GeoSeal®	

North American Vacuum Dehydrator　　NAV

30 gpm
113.6 L/min

Features and Benefits

■ Water Sensor standard on all units to show percent saturation

■ Removes 100% of free and over 90% of dissolved water, as well as 100% of free and over 90% of dissolved gases

■ Maintenance, operating, troubleshooting instructions are in HMI (touchscreen)

■ Automatic mode enables user-defined system shutdowns

■ Use of a low maintenance, dry running claw vacuum pump helps to avoid any dangerous, chemically reactive by-products

👆 Part of the Schroeder Industries 2030 Initiative

Description

The North American Vacuum Dehydrator (NAV) uses vacuum dehydrating technology to remove both free and dissolved water, and gases, from oil. In addition to water and gas, the NAV also removes solid contaminants from the oil with the use of highly efficient filter elements installed on the unit. The NAV is designed for use with larger applications, such as the conditioning of oil in larger hydraulic and lube reservoirs.

Specifications

	NAV 30	NAV 5
Dimensions:	39" W x 76" L x 74" H (99.06 cm x 193.04 cm x 187.96 cm)	36" x 67" x 78" H
Dry Mass:	1990 lbs (903 kg)	1500 lbs (680 kg)
Inlet Connections:	2" NPT	1 ½" NPT
Outlet Connections:	1 ½" NPT	1" NPT
Flow Rate:	30 gpm (114 L/min)	5 gpm (19 L/min)
Inlet Pressure Range:	22 in. Hg - 10 psi	22 in. Hg - 10 psi
Outlet Pressure:	110 psi (7.6 bar)	110 psi (7.6 bar)
Fluid Service Temperature:	39°F to 170°F (3.8°C to 77°C)	39°F to 170°F
Operating Temperature:	39°F to 105°F (3.8°C to 40.6°C)	30°F to 170°F
Fluid Viscosity:	150-3280 SUS (23-700 cSt)	150-3280 SUS (23-700cSt)
Power Supply:	460V	460V
Attainable Water Content:	<10ppm	<10 ppm
Relative Humidity Display:	Standard, 0 - 99%	Standard, 0 - 99%
Constructions:	Base Frame: Carbon Steel Vessel: Carbon Steel Seals: Viton	Base Frame: Carbon Steel Chamber: Carbon Steel Seals: FKM
Protection Class:	NEMA 4	NEMA 4
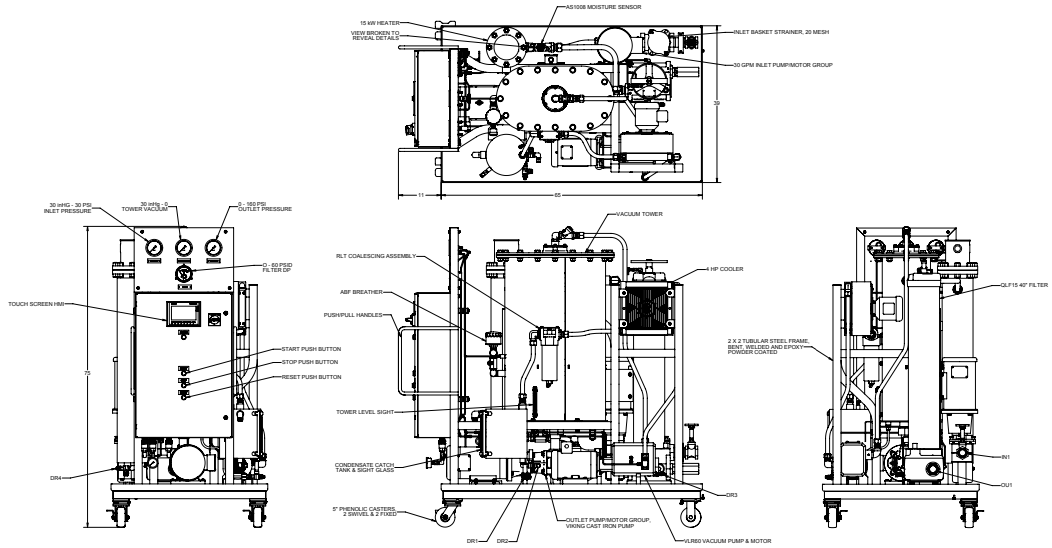
Model Number Selection

How to Build a Valid Model Number for a Schroeder NAV:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7
NAV						

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	
NAV	30	M	2	A	H	10	= NAV30M2AH10

BOX 1	BOX 2	BOX 3	BOX 4
Series	**Flow Rate**	**Operating Fluid**	**Type**
NAV	30 = 30 gpm	M = Mineral Oils (including oils w/ max. Viscosity as identified in specifications	1 = Stationary
	5 = 5 gpm		2 = Mobile

BOX 5	BOX 6	BOX 7
Voltage/Frequency	**Heater**	**Filtration Rating**
A = 460V / 60Hz / 3Ph+PE	H = Standard	3 = 3 Micron
B = 575V / 60HZ / 3PH+PE		5 = 5 Micron
		10 = 10 Micron
		25 = 25 Micron

Vacuum Dehydrator SVD01

1.3 gpm
4.9 L/min

Features and Benefits

- Small, compact and easy to operate unit for use during service calls or emergencies

- Reliable and convenient for continuous or occasional use

- Optional integrated heater to increase the rate of water extraction, especially for colder or higher viscosity fluids

- Optional integrated water content and particulate measurement technology with continuous display of the measurements and storage of the values

- Lower residual water content, gas content and particulate contamination lead to longer oil change intervals, improve life expectancy of components, higher machine availability and reduction in the Life Cycle Cost of equipment.

Description

The Schroeder Vacuum dehydrator SVD01 serves to dewater, degas and filter hydraulic and lubricating fluids. It is ideal for fluid tank sizes of up to 500 gallons, with its flow rate of up to 1.3 gpm, under normal water ingression rates of the fluid.

It works on the principal of vacuum dewatering to extract free and dissolved water as well as free and dissolved gases. By using KLC filter technology, with its high dirt holding capacity to remove particulate contamination, the SVD01 is very cost effective.

Its compact and mobile construction makes it ideally suited for service work or for use in tight spaces. In the version for permanent installation, it provides continuous protection for applications where operating fluids require optimal and continuous care.

Design

As a rough guide, a Vacuum Dehydrator should be sized according to the tank volume of the system. Therefore, a SVD01 can be used on tank volumes up to 500 gallons under normal water ingress conditions. Generally, it must observed that the size is dependent on the application, the operating fluid condition such as starting water concentration, fluid temperature, ambient temperature, the amount of operating fluid as well as the water infiltration rate into the system. These factors greatly affect dewatering performance. It is for that reason that the specifications can only serve as a starting point.

Heater

By using the optional built-in heater, the dewatering capacity can be increased in the case of high viscosity operating fluids or operating fluids at low temperatures. If the temperature of the operating fluid is raised by 18 degrees Fahrenheit then the dewatering capacity increases by up to 50%. The ideal temperature for dewatering is 120 to 140 degrees Fahrenheit. Generally, the heater option has to be chosen, and the heater has to be in operation, for operating viscosities of between 1700 and 4000 SUS.

Specifications

|	
Dimensions:	44.8"H x 23.6"W x 23.2"L
Dry Mass:	265 lbs (120 kg)
Inlet Connections:	G 1½" (BSPP)
Outlet Connections:	G 1" (BSPP)
Flow Rate:	80 gallons/hour (1.3 gpm)
Inlet Pressure:	Atmospheric
Operating Pressure:	up to 65 psi (4.5 bar)
Fluid Service Temperature:	50° F to 175°F (10°C to 79°C)
Fluid Viscosity:	1000 SUS, up to 4000 SUS with optional heater
Power Supply:	230 VAC, 60 Hz, 16 AMP, optional 460 VAC, 60 Hz
Attainable Water Content:	< 100 ppm
Optional Relative Humidity Display:	Standard, 0-99% Range
Seals:	Standard NBR, Optional Viton®
Operating Fluids:	Mineral based hydraulic and lubrication fluids

Vacuum Dehydrator

SVD01 Stationary   **SVD01 Mobile**
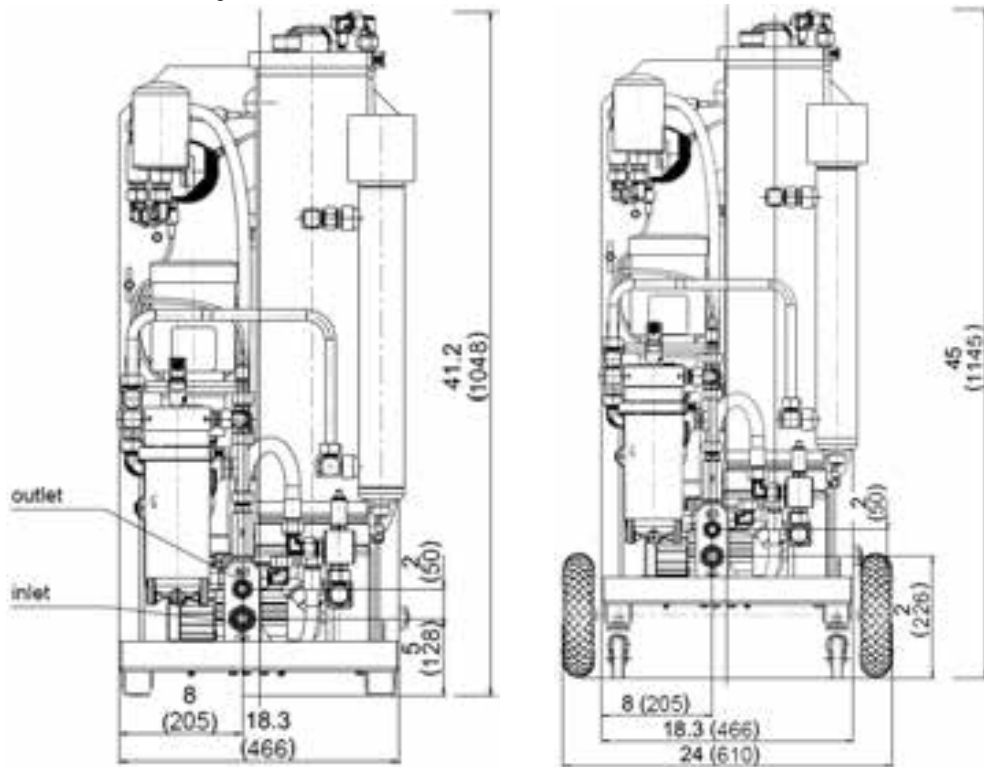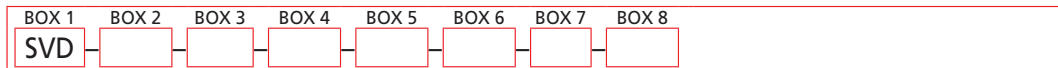

Metric dimensions in ( ).

Model Number Selection

## How to Build a Valid Model Number for a Schroeder SVD01:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
SVD –	–	–	–	–	–	–	

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	
SVD	01	H	S	46	24H	05	TWS	= **SVD01HS4624H05TWS**
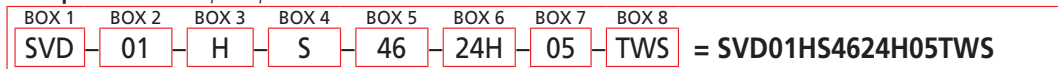
BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
Model	**Flow Rate**	**Fluid Type**	**Mobility**	**Voltage**
SVD	01 = 1.3 gpm	H = Hydraulic & Synthetic Fluid	S = Stationary	23 = 230VAC/60 Hz/1-Phase
		V = HDF-R, Biodegradable	M = Caster Base	46 = 460VAC/60 Hz/3-Phase
				235 = 230VAC/50 Hz/1-Phase

BOX 6	BOX 7	BOX 8
Power	**Media (KLC Element)**	**Option**
12X = 1200 Watts (230 Volt)	02	None = Omit
24H = 2400 Watts w/ Heater (460 Volt)	05	TWS = Water Sensor w/ Display
	10	TCMTWS = Contamination and Water Sensor
	20	

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

OXiStop OXS LID Series
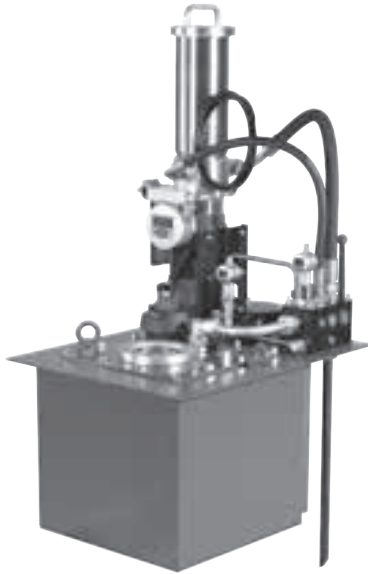
Features and Benefits

- Reduced oil volume up to a factor of 10
- Oil service life is increased as a result of the reduction by up to 80% in air content and reduced dirt ingress
- Higher process speeds
- Higher efficiency
- Reduced noise and wear due to less cavitation
- Ideal for humid and dusty environments
- Reduced costs due to similar size, fewer installation costs, less oil required and easier transport
- Longer component service life, less service downtime of hydraulic system components

Description

Schroeder's OXiStop is a tank solution for hydraulic systems with an integrated, hydraulically driven degassing and dewatering unit. The integrated membrane prevents direct contact with the ambient air. This means the tank can be calculated for the differential operating volume actually required, thus reducing its size. The pump flow rate is no longer important for the tank calculation.

Very low gas and water content is achieved in the fluid. Thanks to the membrane which keeps the fluid "vacuum packed", it is also possible to install the OXiStop in extremely dusty or humid environments. The OXS LID series is installed in a custom-designed tank and contains all necessary components

The OXS LID comes in seven standard sizes, with differential operating volumes ranging from 8 to 32 gallons. Contamination Sensor option available.

The size of the OXiStop (based on required differential operating volume) can be calculated from the sum of the actual volume differences of cylinders, accumulators, hoses etc. that may be present in a system. In addition, allowances must be made for the volume required for thermal expansion in the oil and for possible continuous oil losses. This volume (except for accumulator) should be doubled as a safety margin.

Rule of thumb:

Sum of total accumulator volume + 2x sum of volume difference for cylinders, hoses, temperature expansion, etc. = OXiStop differential operating volume.

Also, it is important to check if the total oil volume in the system is required to return to the tank when maintenance work is carried out.

What's Included

- OXiStop LID according to model code
- Membrane bag holder
- Integrated membrane
- MiniOx degassing unit
- KLC5 offline filtration unit with optional TestMate® Contamination Sensor (TCM)
- TestMate® Water Sensor (TWS-D)
- HNS electronic level sensor

- Breather filter and piping for individual components
- Gasket (interface to tank)
- Operating and maintenance instructions
- Instructions for tank installation

OXS   OXiStop OXS LID Series

Specifications

	OXS 30LID	OXS 45LID	OXS 70LID	OXS 150LID	OXS 250LID	OXS 325LID	OXS 500LID
Differential Operating Volume:	8 gal.	11.8 gal.	18.5 gal.	39.5 gal.	66 gal.	86 gal.	132 gal.
Typical Degassing Rate*:	up to 2.3 gallons per hour						
Max. Viscosity:	up to 1,500 SUS						
Max. Fluid Flow Rate IN/OUT:	238 gpm						
Fluid Temperature:	50°F to 175°F (10°C to +80°C)						
Ambient Temperature**:	-4°F to 104°F (-20°C to 40°C)						
Storage Temperature:	32°F to 104°F (0°C to 40°C)						
Relative Humidity:	0 - 80%, non-condensing						
Filtration Unit:	KLC05						
Filtration Unit Filter Element:	KLE02						
Contamination Retention Capacity:	36 psi (2.5 bar)						
Pump Type:	Vane Pump						
Optimal Sampling Pump Flow Rate:	1.9 gpm (7.5 L/min)						
Filtration Unit Operating Pressure:	145 psi (10 bar)						
Clogging Indicator:	Visual Differential Pressure Indicator						
Electrical Connection:	See Model Code						
Power Consumption:	370 W						
IP Rating per DIN 40050:	IP54						
Permitted Fluids**:	Mineral Based Hydraulic Fluids						
Sealing Material**:	NBR						
Membrane Material**:	PUR						
Typical Lifetime, Membrane:	≈ 6 years with 104°F - 140°F fluid temperature ≈ 2 years with 175°F fluid temperature						

* Typical values for ISO VG 46, 40 °C when saturated with gas. The degassing rate depends on the total gas content in the oil, the oil temperature, and especially the oil viscosity. The degassing rate reduces as viscosity increases.
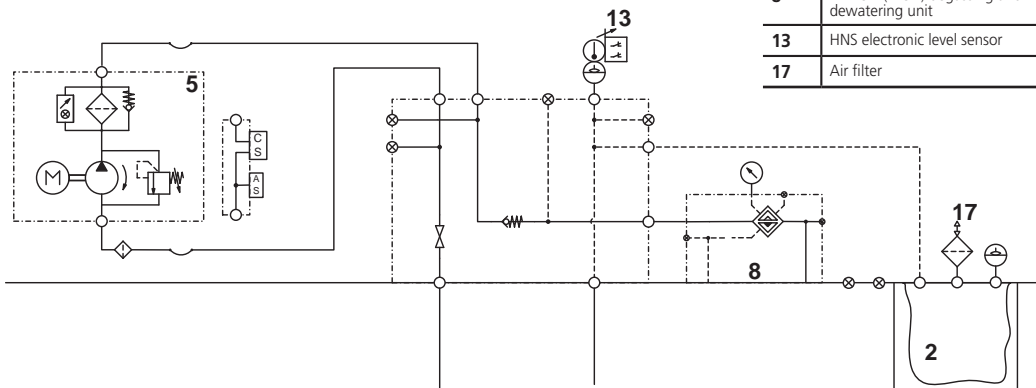
** Others on request

OXiStop OXS LID Series **OXS**

CS 1000
CS 1939
CSI-C-11
HY-TRAX®
RBSA
CSM
FCU
MCS
AS
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
HFS-15
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
OLF Compact
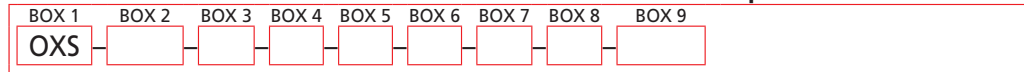OLF
OLF-P
NxTM
VEU-F
VMU
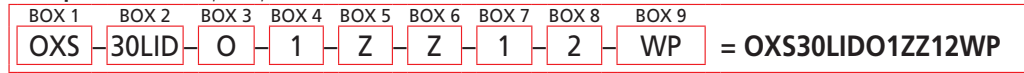IXU
Triton-A
Triton-E
NAV
SVD01
OXS
Appendix
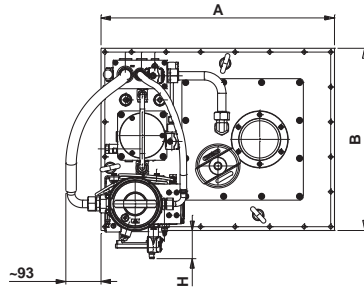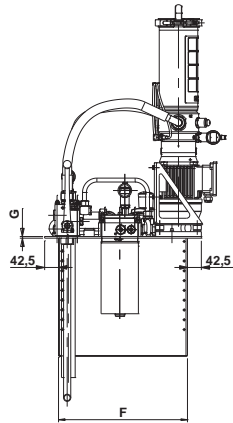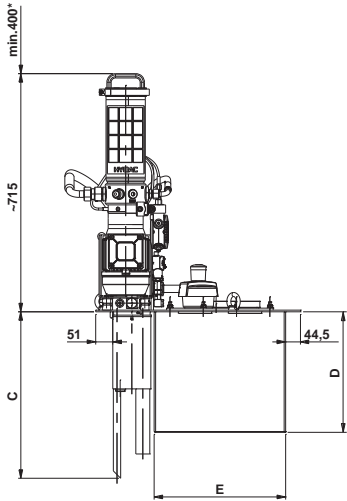
	A	B	C	D	E	F	G	H
OXS 30LID	615	480	500	362	395	395	5	74
OXS 45LID	615	480	610	472	395	395	5	74
OXS 70LID	615	480	820	682	395	395	5	74
OXS 150LID	1015	680	610	472	795	595	5	-27
OXS 250LID	1015	680	820	682	795	595	5	-27
OXS 325LID	1415	880	607	472	1195	795	8	-127
OXS 500LID	1415	880	817	682	1195	795	8	-127

Item	Component
1	OXS LID with membrane bag holder
2	Directional control valve
3	Valve and connection block
4	KLC5 filtration unit
5	Clogging indicator on KLC5
6	Check valve
7	MOX degassing unit
8	EDS electronic pressure sensor or vacuum gauge (optional)
9	Filling port
10	Drain port
11	Pressure test point
12	HNS electronic level sensor
13	Port for visual tank fluid level indicator
14	Vent
15	Air filter
16	TCM Contamination Sensor (optional)
17	TWS-D Water Sensor (optional)
18	Sight glass
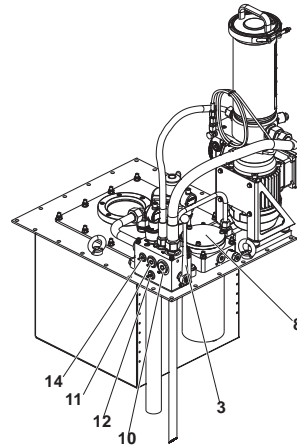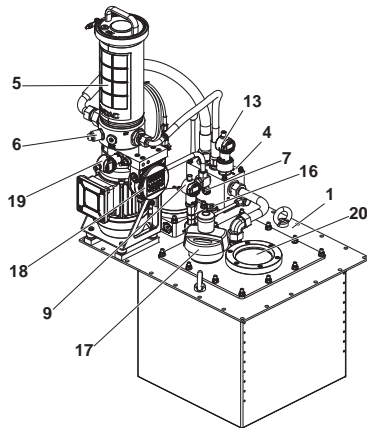
Item	Component
2	Tank membrane
5	KLC5 offline filtration n
3	Valve and connection block
4	KLC5 offline filtration unit
8	MiniOX (MOX) degassing and dewatering unit
13	HNS electronic level sensor
17	Air filter

For replacement element part numbers, please see "Appendix Section - Replacement Elements" of this catalog.

OXS OXiStop OXS LID Series

How to Build a Valid Model Number for a Schroeder OXiStop OXS LID Series:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9
OXS								

Example: *NOTE: One option per box*

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8	BOX 9	
OXS	30LID	O	1	Z	Z	1	2	WP	= **OXS30LIDO1ZZ12WP**

BOX 1		BOX 2		BOX 3		BOX 4	
Model		**Size**		**Voltage**		**Sealing Material**	
OXS		30LID = Operating volume 8 gal.		O = 460 V/60Hz/3-Phase		1 = NBR seals, PUR membrane	
		45LID = Operating volume 11.8 gal.		N = 400 V/50Hz/3-Phase			
		70LID = Operating volume 18.5 gal.					
		150LID = Operating volume 39.5 gal.					
		250LID = Operating volume 66 gal.					
		325LID = Operating volume 86 gal.					
		500LID = Operating volume 132 gal.					

BOX 5	BOX 6
Return Line Filter	**Plate Heat Exchanger + Pump Motor Group**
Z = Omit	Z = Omit

BOX 7	BOX 8
Vacuum Pressure Monitoring, Degassing Unit	**Level/Temperature Monitoring**
1 = Pressure Gauge	2 = Electronic Level Sensor with integrated temperature sensor
2 = Electronic Pressure Sensor (EDS)	

BOX 9
Measuring Equipment
Z = Omit
WP = Water Sensor (TWS-D) + Contamination Sensor (TCM)

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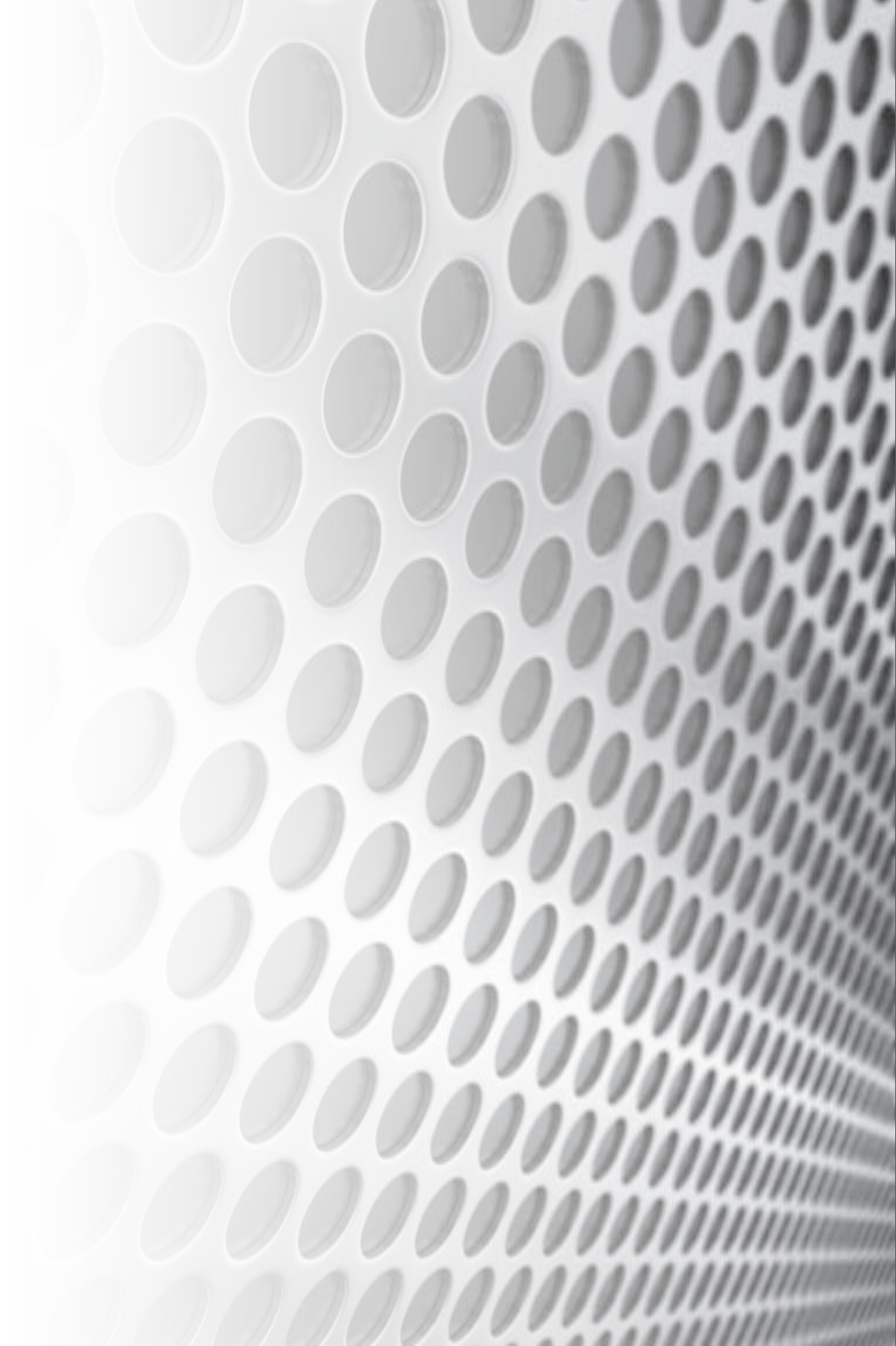
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Replacement Element

Used in FS Series, MFS & MFD Series, AKS & AKD Series, KLS & KLD Series and X-Skid - Standard Capacity Series

Pressure Elements

9" Elements

Model Code	P/N	Description
KW	7630767	Water Removal Element
KWV	7628759	Water Removal Element (viton)
KZ1	7630768	1 Micron Element
KZ1V	7615685	1 Micron Element (viton)
KZ3	7628664	3 Micron Element
KZ3V	7615706	3 Micron Element (viton)
KZ5	7628345	5 Micron Element
KZ5V	7628665	5 Micron Element (viton)
KZ10	7627464	10 Micron Element
KZ10V	7628662	10 Micron Element (viton)
KZ25	7628663	25 Micron Element
KZ25V	7615694	25 Micron Element (viton)

27" Elements

Model Code	P/N	Description
27KW	7629168	Water Removal Element
27KWV	7603050	Water Removal Element (viton)
27KZ1	7628576	1 Micron Element
27KZ1V	7603061	1 Micron Element (viton)
27KZ3	7628577	3 Micron Element
27KZ3V	7629172	3 Micron Element (viton)
27KZ5	7628578	5 Micron Element
27KZ5V	7603077	5 Micron Element (viton)
27KZ10	7628575	10 Micron Element
27KZ10V	7603056	10 Micron Element (viton)
27KZ25	7629170	25 Micron Element
27KZ25V	7603065	25 Micron Element (viton)

18" Elements

Model Code	P/N	Description
KKW	7628654	Water Removal Element
KKWV	7615323	Water Removal Element (viton)
KKZ1	7615325	1 Micron Element
KKZ1V	7615337	1 Micron Element (viton)
KKZ3	7628657	3 Micron Element
KKZ3V	7628760	3 Micron Element (viton)
KKZ5	7628658	5 Micron Element
KKZ5V	7615359	5 Micron Element (viton)
KKZ10	7628655	10 Micron Element
KKZ10V	7628656	10 Micron Element (viton)
KKZ25	7615339	25 Micron Element
KKZ25V	7615346	25 Micron Element (viton)

Used in MFD-BC Filter Cart and HFS-BC

9" Elements

Model Code	P/N	Description
9GW	7604551	Water Removal Element
9GZ3	7604564	3 Micron Element
9GZ5	7604569	5 Micron Element
9GZ10	7604553	10 Micron Element
9GZ25	7604559	25 Micron Element

Used in X-Skid - High Capacity Replacement Elements

16" Elements

Model Code	P/N	Description
16QPML-Z1B	Contact Factory	1 Micron Element
16QPML-Z1V	7602695	1 Micron Element (viton)
16QPML-Z3B	Contact Factory	3 Micron Element
16QPML-Z3V	7602698	3 Micron Element (viton)
16QPML-Z5B	Contact Factory	5 Micron Element
16QPML-Z5V	7602700	5 Micron Element (viton)
16QPML-Z10B	Contact Factory	10 Micron Element
16QPML-Z10V	7602692	10 Micron Element (viton)
16QPML-Z25B	Contact Factory	25 Micron Element
16QPML-Z25V	7602697	25 Micron Element (viton)

39" Elements

Model Code	P/N	Description
39QPML-Z1B	7603313	1 Micron Element
39QPML-Z1V	7603314	1 Micron Element (viton)
39QPML-Z3B	Contact Factory	3 Micron Element
39QPML-Z3V	7603320	3 Micron Element (viton)
39QPML-Z5B	Contact Factory	5 Micron Element
39QPML-Z5V	7603323	5 Micron Element (viton)
39QPML-Z10B	7632409	10 Micron Element
39QPML-Z10V	7603309	10 Micron Element (viton)
39QPML-Z25B	Contact Factory	25 Micron Element
39QPML-Z25V	7603318	25 Micron Element (viton)

Used in X-Skid - Coreless Replacement Elements

16" Elements		
Model Code	P/N	Description
16QCLQFZ1	Contact Factory	1 Micron Element
16QCLQFZ1V	Contact Factory	1 Micron Element (viton)
16QCLQFZ3	Contact Factory	3 Micron Element
16QCLQFZ3V	7628349	3 Micron Element (viton)
16QCLQFZ5	Contact Factory	5 Micron Element
16QCLQFZ5V	Contact Factory	5 Micron Element (viton)
16QCLQFZ10	Contact Factory	10 Micron Element
16QCLQFZ10V	7628348	10 Micron Element (viton)
16QCLQFZ25	Contact Factory	25 Micron Element
16QCLQFZ25V	7628475	25 Micron Element (viton)

39" Elements		
Model Code	P/N	Description
39QCLQFZ1	Contact Factory	1 Micron Element
39QCLQFZ1V	7628372	1 Micron Element (viton)
39QCLQFZ3	Contact Factory	3 Micron Element
39QCLQFZ3V	7628374	3 Micron Element (viton)
39QCLQFZ5	Contact Factory	5 Micron Element
39QCLQFZ5V	7628375	5 Micron Element (viton)
39QCLQFZ10	Contact Factory	10 Micron Element
39QCLQFZ10V	7628732	10 Micron Element (viton)
39QCLQFZ25	Contact Factory	25 Micron Element
39QCLQFZ25V	7628373	25 Micron Element (viton)

Dimicron® Elements - Used in MTS Series and SVD Series

Model Code	P/N	Description
MTE02	Contact Factory	2 Micron Element
MTE05	Contact Factory	5 Micron Element
MTE10	Contact Factory	10 Micron Element
MTE20	7617620	20 Micron Element
MTE30	7617621	30 Micron Element

*Note - Be sure to order the correct number of elements: MTS1 = 1, MTS2 = 2, MTS3 = 3, MTS4 = 4..

Handy Filter Systems Replacement Elements

Model Code	P/N	Description
M3	7616070	3 Micron Element
M10	7631073	10 Micron Element
MZ3	7627545	3 Micron Element
MZ10	7628733	10 Micron Element

AMFS Unit (and all carts/skids using 18"/27" GeoSeal®) Replacement Elements

Model Code	P/N	Description
KKWV	7615323	Water Removal Element (viton)
KKGZ3V	7615301	3 Micron Element (viton)
KKGZ5V	7615304	5 Micron Element (viton)
KKGZ10V	7630721	10 Micron Element (viton)
27KWV	7603050	Water Removal Element (viton)
27KGZ3V	Contact Factory	3 Micron Element (viton)
27KGZ5V	7603035	5 Micron Element (viton)
27KGZ10V	7603028	10 Micron Element (viton)

Dimicron Elements - Used in KLC and OxiStop

Model Code	P/N	Description
KLE02	7632742	2 Micron Element
KLE05	Contact Factory	5 Micron Element
KLE10	7632741	10 Micron Element
KLE20	7632739	20 Micron Element
KLEA02	7632743	2 Micron Element w/Water Removal
KLEA20	7632740	20 Micron Element w/Water Removal

Ion eXchange Unit Replacement Elements

Model Code	P/N	Description
IXE36-5.5	3348961	Standard Ion Exchange Resin Element
KKZ5V	7615359	5 Micron Pre/Post Element
KKZ10V	7628656	10 Micron Pre/Post Element

Pressure Elements

Appendix

Triton-A Unit Replacement Elements

Model Code	P/N	Description
9VZ1V	7604651	1 Micron Element
9VZ3V	7604664	3 Micron Element
9VZ5V	7604673	5 Micron Element
9VZ10V	7628743	10 Micron Element
9VZ25V	7604656	25 Micron Element
PAB3P3N.75AS	7633710	Breather (cart version)
ABF-S40	7627888	Breather (shroud version)

Triton-E Unit Replacement Elements

Model Code	P/N	Description
KKGZ1V	7604651	1 Micron Element
KKGZ3V	7604664	3 Micron Element
KKGZ5V	7604673	5 Micron Element
KKGZ10V	7628743	10 Micron Element
KKGZ25V	7604656	25 Micron Element
MBF-3-M-P20	7627888	Air Breather Element

LSN, LSA, LSW Unit Replacement

Replacement Element Part Numbers				
Size	3µ	5µ	10µ	20µ
RLD250	1307539	2201054	1305954	Contact Factory
RLD400	1313317	2201055	1304608	Contact Factory
LPF160	7620903	7620906	7620895	Contact Factory
LPF240	7620931	7631656	7620924	Contact Factory
LF660	7621004	7621008	7620996	Contact Factory

TCM
TCM-FC
CSI-C-11
HY-TRAX®
RBSA
TIM
TSU
TMU
FCU 1000 Series
TPM
TMS
TWS-C/D
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
KLC
MTS
OLF-P
NxTM
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

Comparison Photographs for Fluid Contamination Class

***Magnification x 100
1 scale mark = 10 µm***

Photos are representative of:

a) 100 ml sample pulled through 0.8 µm 47mm patch

or

b) 28 ml sample pulled through 0.8 µm 25 mm patch

ISO 4406:1999   ISO 14/12/9
NAS 1638   Class 3
SAE AS 4059(D)   Class 4

ISO 4406:1999   ISO 19/17/14
NAS 1638   Class 8
SAE AS 4059(D)   Class 9
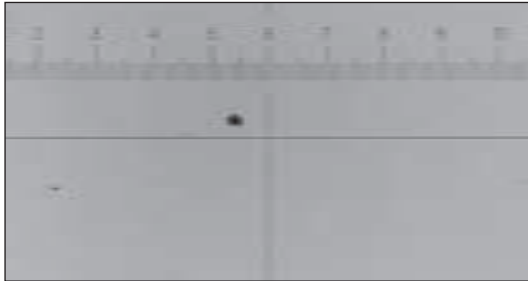
ISO 4406:1999   ISO 15/13/10
NAS 1638   Class 4
SAE AS 4059(D)   Class 5
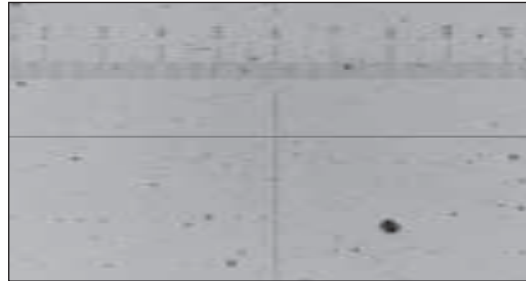
ISO 4406:1999   ISO 20/18/15
NAS 1638   Class 9
SAE AS 4059(D)   Class 10
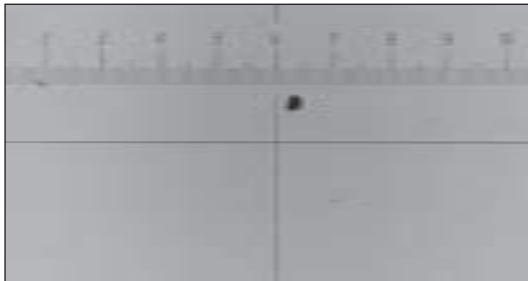
ISO 4406:1999   ISO 16/14/11
NAS 1638   Class 5
SAE AS 4059(D)   Class 6

ISO 4406:1999   ISO 21/19/16
NAS 1638   Class 10
SAE AS 4059(D)   Class 11
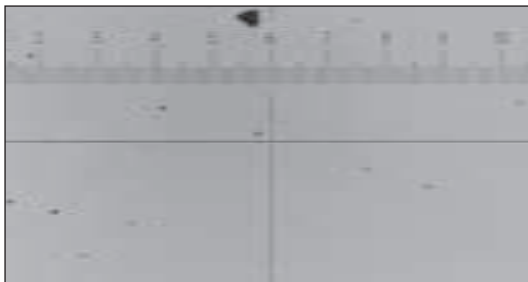
ISO 4406:1999   ISO 17/15/12
NAS 1638   Class 6
SAE AS 4059(D)   Class 7

ISO 4406:1999   ISO 22/20/17
NAS 1638   Class 11
SAE AS 4059(D)   Class 12

ISO 4406:1999   ISO 18/16/13
NAS 1638   Class 7
SAE AS 4059(D)   Class 8

ISO 4406:1999   ISO 23/21/18
NAS 1638   Class 12
SAE AS 4059(D)   Class 13

Contamination Types

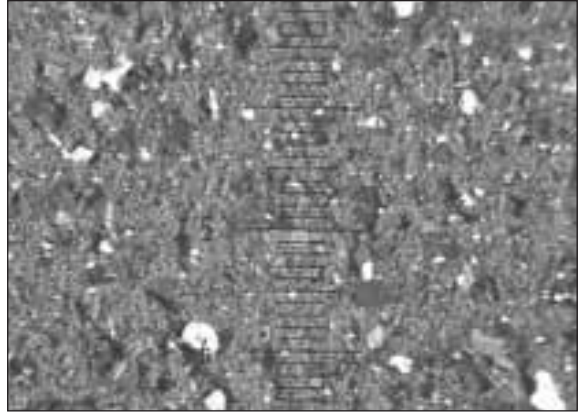*All photos*
x 48 magnification

1 scale mark = 45 µm

Particle Type:

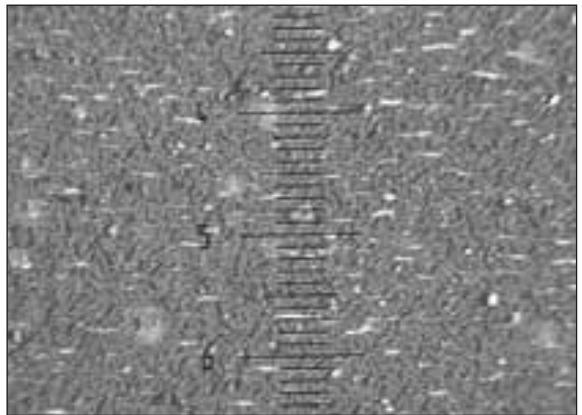Mainly rust; white particles; additives

Effect:

- Rapid oil aging
- Breakdowns in pumps, valves
- Wear and tear

Particle Type:
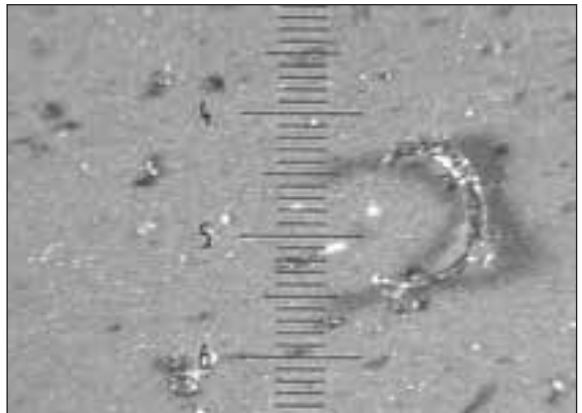
Oil aging products

Effect:

- Blocking of filters
- Silting-up system

Particle Type:

Metal

Effect:

- Breakdowns in pumps, valves
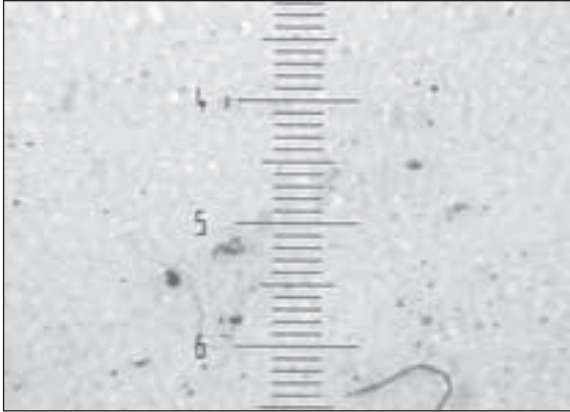- Wearing of seals
- Leakage
- Oil aging

Particle Type:

Particles in bronze, brass and copper

Effect:

- Breakdowns in pumps, valves
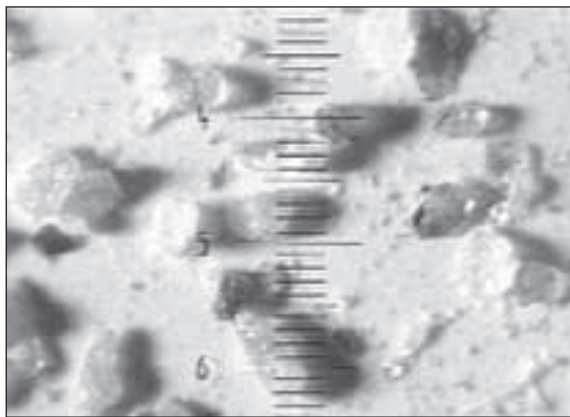- Oil aging
- Leakage
- Wearing of seals

Contamination Types

TCM
TCM-FC
CSI-C-11
HY-TRAX®
RBSA
TIM
TSU
TMU
FCU 1000 Series
TPM
TMS
TWS-C/D
SMU
CTU
EPK
Trouble Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
MFD-BC
MFS, MFD
HY-TRAX® Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
KLC
MTS
OLF-P
NxTM
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

Contamination Types

All photos x 48 magnification

1 scale mark = 45 µm

Particle Type:

Gel-type residue from filter element
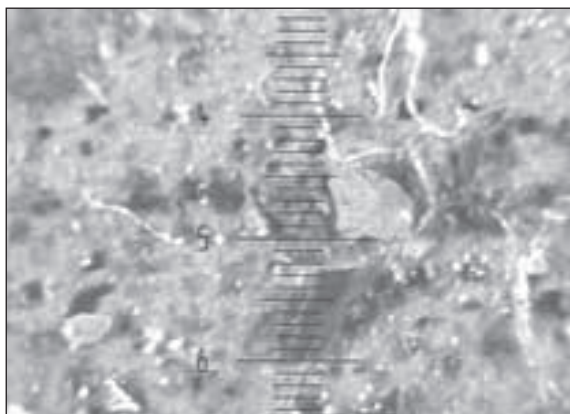
Effect:

- Blocking of filter
- Silting-up

Particle Type:

Silicates due to lack of, or inadequate, air breather filter

Effect:

- Heavy wear on components
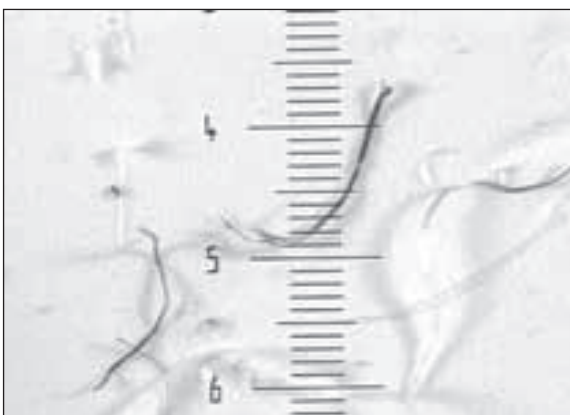- Breakdowns in pumps, valves
- Wearing of seals

Particle Type:

Colored particles (red/brown)
Synthetic particles (blue)

Effect:

- Breakdowns in pumps, valves
- Wearing of seals

Particle Type:

Fibers due to initial contamination, open tank, cleaning cloths, etc.

Effect:

- Blocking of nozzles
- Leaking from seat valves

Contamination Classification According to NAS 1638-01/1964

Extended to particle range 2 - 5 µm

| NAS-Class | Number of Particles/100 ml | | | | | | Amount of Contamination (ACFTD) [mg/l] |
	2 - 5 µm	5 - 15 µm	15 - 25 µm	25 -50 µm	50 - 100 µm	> 100 µm	
00	625	125	22	4	1	0	—
0	1,250	250	44	8	2	0	0.01
1	2,500	500	88	16	3	1	—
2	5,000	1,000	178	32	6	1	—
3	10,000	2,000	356	63	11	2	—
4	20,000	4,000	712	126	22	4	0.1
5	40,000	8,000	1,425	253	45	8	—
6	80,000	16,000	2,850	506	90	16	0.2
7	160,000	32,000	5,700	1,012	180	32	0.5
8	320,000	64,000	11,400	2,025	360	64	1
9	640,000	128,000	22,800	4,050	720	128	3
10	1,280,000	256,000	45,600	8,100	1,440	256	5
11	2,560,000	512,000	91,200	16,200	2,880	512	7 - 10
12	5,120,000	1,024,000	182,400	32,400	5,760	1,024	20
13	—	2,048,000	364,800	64,800	11,520	2,048	40
14	—	4,096,000	729,000	129,600	23,040	4,096	80

Contamination Classification According to SAE AS 4059(D)

ISO 4402 Calibration	>1 µm	>5 µm	>15 µm	>25 µm	>50 µm	>100 µm
ISO 11171 Calibration	>4 µm$_{(c)}$	>6 µm$_{(c)}$	>14 µm$_{(c)}$	>21 µm$_{(c)}$	>38 µm$_{(c)}$	>70 µm$_{(c)}$
SAE Code	A	B	C	D	E	F
000	195	76	14	3	1	0
00	390	152	27	5	1	0
0	780	304	54	10	2	0
1	1,560	609	109	20	4	1
2	3,120	1,220	217	39	7	1
3	6,250	2,430	432	76	13	2
4	12,500	4,860	864	152	26	4
5	25,000	9,730	1,730	306	53	8
6	50,000	19,500	3,460	612	106	16
7	100,000	38,900	6,920	1,220	212	32
8	200,000	77,900	13,900	2,450	424	64
9	400,000	156,000	27,700	4,900	848	128
10	800,000	311,000	55,400	9,800	1,700	256
11	1,600,000	623,000	111,000	19,600	3,390	512
12	3,200,000	1,250,000	222,000	39,200	6,780	1,020

(Contamination Classes)

Contamination Classification

TCM
TCM-FC
CSI-C-11
HY-TRAX®
RBSA
TIM
TSU
TMU
FCU 1000 Series
TPM
TMS
TWS-C/D
SMU
CTU
EPK
Trouble
Check Plus
HMG2500
HMG4000
ET-100-6
HTB
RFSA
HFS-BC
MFD-BC
MFS, MFD
HY-TRAX®
Retrofit System
MFD-MV
MFS-HV
AMS, AMD
FS
AMFS
KLS, KLD
MCO
AKS, AKD
LSN, LSA, LSW
X Series
KLC
MTS
OLF-P
NxTM
IXU
Triton-A
Triton-E
NAV
SVD01
SVD
OXS
Appendix

Contamination Classification in Accordance with ISO 4406:1999

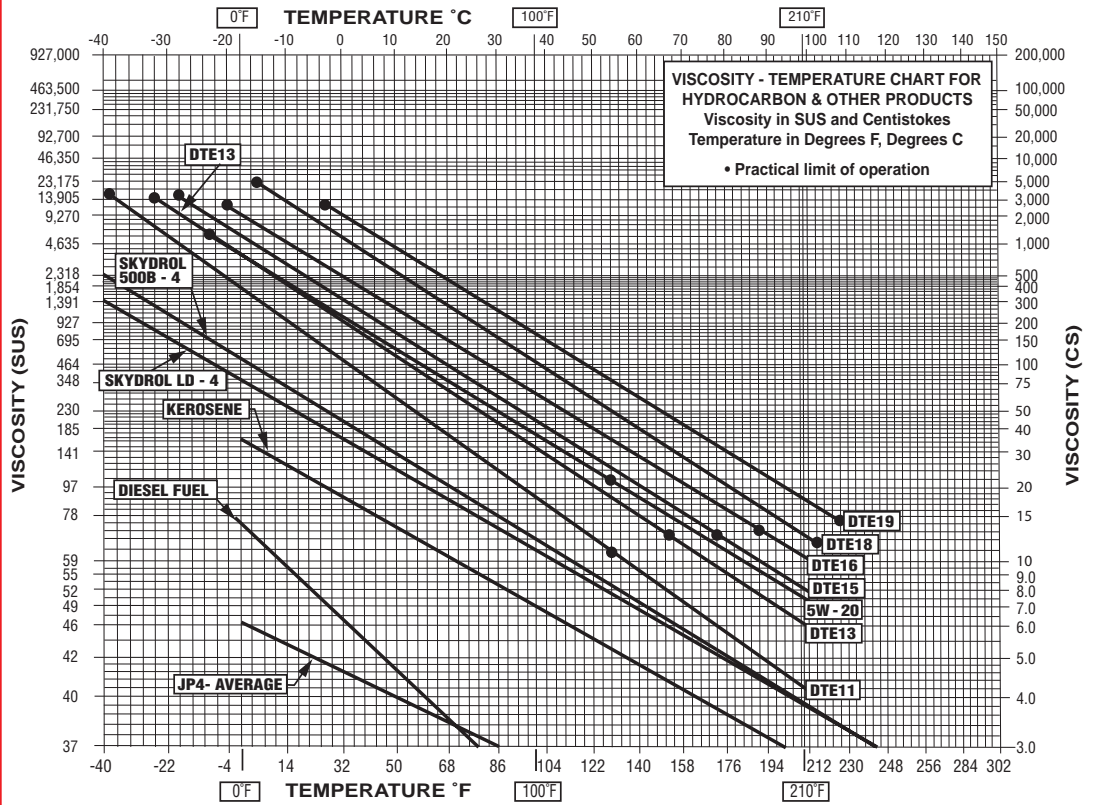| ISO-Class	Number of Particles/ 1 ml		ISO-Class	Number of Particles/ 1 ml	
	more than	up to and up including		more than	up to and up including
0	0.00	0.01	15	160	320
1	0.01	0.02	16	320	640
2	0.02	0.04	17	640	1,300
3	0.04	0.08	18	1,300	2,500
4	0.08	0.16	19	2,500	5,000
5	0.16	0.32	20	5,000	10,000
6	0.32	0.64	21	10,000	20,000
7	0.64	1.3	22	20,000	40,000
8	1.30	2.5	23	40,000	80,000
9	2.50	5	24	80,000	160,000
10	5	10	25	160,000	320,000
11	10	20	26	320,000	640,000
12	20	40	27	640,000	1,300,000
13	40	80	28	1,300,000	2,500,000
14	80	160			

- Current ISO codes are made up of 3 numbers representing the number of particles ≥4 µ(c), ≥6 µ(c) and ≥14 µ(c). *The particle count is expressed as the number of particles per ml.*

- Reproducibility below scale number 8 is affected by the actual number of particles counted in the fluid sample. Raw counts should be more than 20 particles. If this is not possible, then refer to bullet below.

- When the raw data in one of the size ranges results in a particle count of fewer than 20 particles, the scale number for that size range shall be labeled with the symbol ≥.
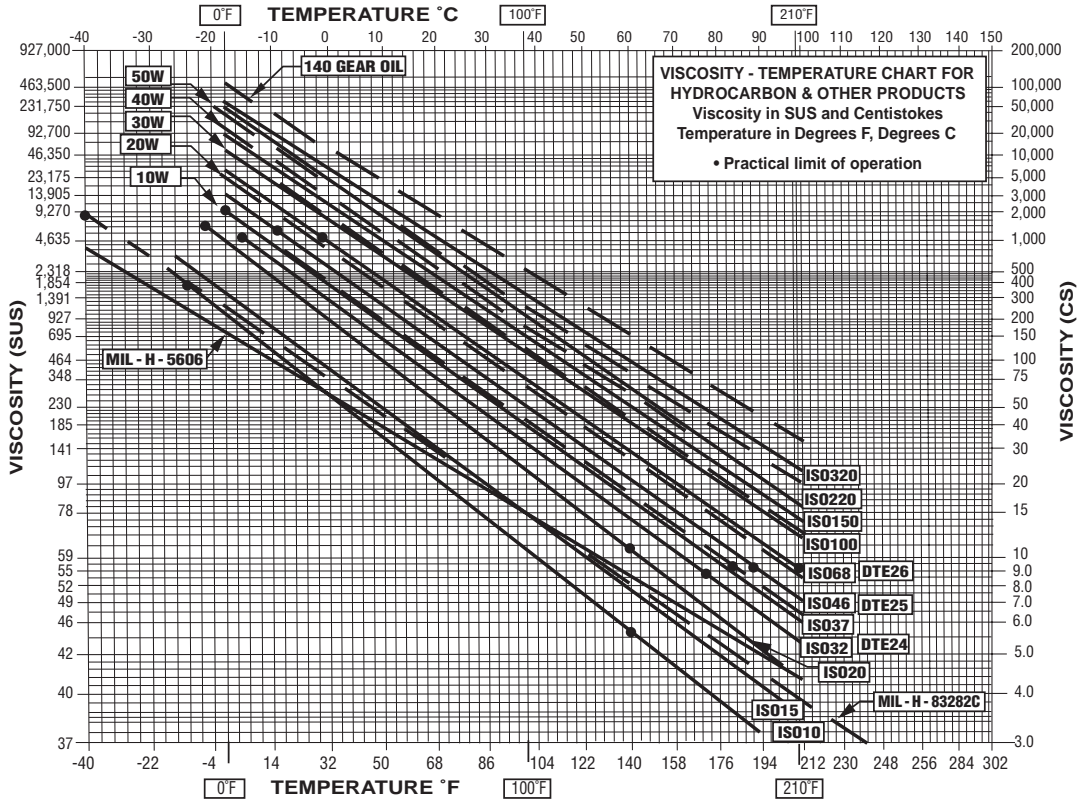
EXAMPLE: A code of 14/12/≥7 signifies that there are more than 80 and up to and including 160 particles equal to or larger than 4 µ(c) per ml and more than 20 and up to and including 40 particles equal to or larger than 6 µ(c) per ml. The third part of the code, ≥7 indicates that there are more than 0.64 and up to and including 1.3 particles equal to or larger than 14 µ(c) per ml. The ≥ symbol indicates that less than 20 particles were counted, which lowers statistical confidence. Because of this lower confidence, the 14 µ(c) part of the code could actually be higher than 7, thus the presence of the ≥ symbol.

VISCOSITY - TEMPERATURE CHART FOR
HYDROCARBON & OTHER PRODUCTS
Viscosity in SUS and Centistokes
Temperature in Degrees F, Degrees C

• Practical limit of operation

Viscosity Chart Appendix

VISCOSITY - TEMPERATURE CHART FOR
HYDROCARBON & OTHER PRODUCTS
Viscosity in SUS and Centistokes
Temperature in Degrees F, Degrees C

• Practical limit of operation

Appendix FluidMonitoring Software FluMoS

FluidMonitoring Software FluMoS light

FluMoS Light fluid monitoring software is a software package for importing, displaying and processing data from Schroeder Industries fluid sensors. 3 sensors can be connected at the same time!

FluMoS Light can be used in conjunction with the latest generation of HSI interface sensors (TCM, TMU, TMS, TWS-C) and the sensors without HSI interface (TIM, TPM).

The FluMoS Light software is used to:

■ Online display of measured values on the PC in table and graphic formats

■ Storage of log files on hard disk

■ Display of log files from hard disk/diskette and storage as graphic file

■ Processing of stored log files with Microsoft Excel

Applications:

■ Remote monitoring of values measured by sensors

■ Condition-based maintenance planning

FluidMonitoring Software FluMoS mobile

Schroeder FluMoS Mobile for Android – Your Access to Schroeder's FluidControl Units

Get your fluid condition monitoring measurement data on your Android device!

FluMoS Mobile is a tool for displaying and downloading measurement data from the FluidControl Unit FCU 1315 and TMU via *Bluetooth*® wireless technology connection as well as the SensorMonitoring Unit SMU 1200 to your Android device. When the TCM, TWS-C, TMS and other smart sensors are used in conjunction with the CSI-C-11, the FluMos Mobile App can be accessed via WiFi connection to display and download measured data.

FluMoS Mobile Features (Version 1.10)

■ Displays current measurement values (solid particle contamination, water saturation and temperature) of your FluidControl Unit FCU1315 and TMU in table format.

■ Displays measurement value progress (solid particle contamination, water saturation and temperature) of your FluidControl Unit FCU1315 and TMU in graphic format (one graphic per measurement channel)

■ Selective download of log files in .dat format from the internal memory of the FCU1315 and TMU or SMU 1200 to your Android device

■ Online storage of measurement data on your Android device

[possible with successor version]

You can easily forward the .dat files per e-mail to other devices such as a PC.

The files can then be processed in FluMoS.

FluidMonitoring Software FluMoS mobile - Screenshot

Notes Section:

Notes Section:
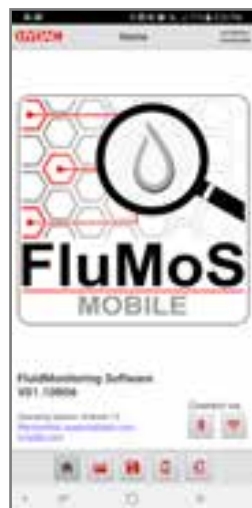
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Monash University, Australia, 1997

Fluid Power University of Bath, GB *Total Cleanliness Control in Hydraulic Systems*

ISO 4405:1991 Hydraulic fluid power - Fluid contamination - Determination of particulate contamination
by the gravimetric method

ISO 4406:1999 Hydraulic fluid power - Fluids - Code for defining the level of contamination of solid particles

ISO 4406:1987 Hydraulic fluid power - Fluids - Methods for coding level of contamination by solid particles

CETOP - RP 94 H - Determination of solid particulates in hydraulic fluids using an automatic particle counter
employing the light extinction principle

ISO 4407:1991 Hydraulic fluid power - Fluid contamination - Determination of particulate contamination by
the counting method using a microscope

ISO 11171:1999 Hydraulic fluid power - Calibration of liquid automatic particle counters

ISO 4402:1991 Hydraulic fluid power - Calibration of automatic count instruments for particles suspended
in liquids - Method using classified AC Fine Test Dust contaminant

NAS 1638: Cleanliness requirements of parts used in hydraulic systems
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CONTMON_DESIGN.html #1.1

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FILTER SYSTEMS PRODUCTS CATALOG

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