



# S409

## Medium Pressure Spin-On Filter Assemblies

Hy-Pro medium pressure S series filters are designed for installation on the return line to remove contaminant ingested or generated by the system. Functions include off-line filtration (kidney loop or filter cart) and some suction applications.

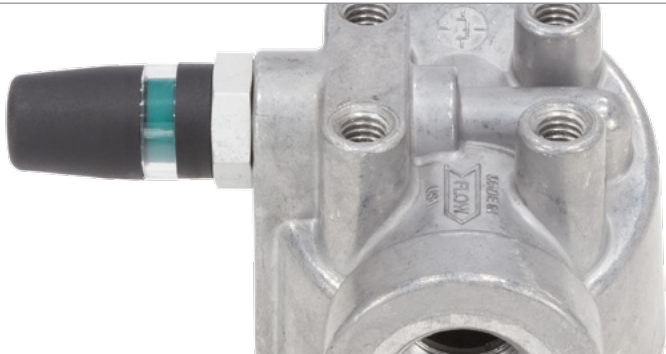
Ideal for automotive manufacturing and assembly machine tools, mobile applications such as waste haulers and transit, filter carts and filter panels, and power unit return line/suction.

**Max Operating Pressure: 500 psi (35 bar)**



### Media matters.

Only Hy-Pro S409 Spin-On assemblies come with DFE rated filter elements to ensure maximum particulate capture and retention. And with media options down to  $\beta_{2.5_{(c)}} \geq 1000$ , you can be sure contamination stays exactly where you want it: out of your fluid.



### Easily configured.

With a variety of connection types and sizes, indicator options, and included mounting provisions all in a compact package, the S409 is ready to go to work in mobile equipment, return line, hydrostatic and other applications.

### Fits in all the right places.

With flow rates up to 35 gpm (132 lpm), temperature resistance to 200°F (93°C), a 2:1 safety factor, high fluid compatibility and a tight footprint, the S409 delivers the best filtration everywhere you need it. Even combine two S409 assemblies in series for incredibly low ISO Codes and water removal in a single pass.



# Filter Sizing Guidelines

## Filter Assembly Sizing Guidelines

Effective filter sizing requires consideration of flow rate, viscosity (operating and cold start), fluid type and degree of filtration. When properly sized, bypass during cold start can be avoided/minimized and optimum element efficiency and life achieved. The filter assembly differential pressure values provided for sizing differ for each media code, and assume 32 cSt (150 SUS) viscosity and 0.86 fluid specific gravity. Use the following steps to calculate clean element assembly pressure drop.

## Sizing recommendations to optimize performance and permit future flexibility

- To avoid or minimize bypass during cold start the actual assembly clean  $\Delta P$  calculation should be repeated for start-up conditions if cold starts are frequent.
- Actual assembly clean  $\Delta P$  should not exceed 10% of bypass  $\Delta P$  gauge/indicator set point at normal operating viscosity.
- If suitable assembly size is approaching the upper limit of the recommended flow rate at the desired degree of filtration consider increasing the assembly to the next larger size if a finer degree of filtration might be preferred in the future. This practice allows the future flexibility to enhance fluid cleanliness without compromising clean  $\Delta P$  or filter element life.
- Once a suitable filter assembly size is determined consider increasing the assembly to the next larger size to optimize filter element life and avoid bypass during cold start.
- When using water glycol or other specified synthetics, we recommend increasing the filter assembly by 1~2 sizes.

Step 1: Calculate  $\Delta P$  coefficient for actual viscosity

### Using Saybolt Universal Seconds (SUS)

$$\Delta P \text{ Coefficient} = \frac{\text{Actual Operating Viscosity}^1 \text{ (SUS)}}{150} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

### Using Centistokes (cSt)

$$\Delta P \text{ Coefficient} = \frac{\text{Actual Operating Viscosity}^1 \text{ (cSt)}}{32} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Step 2: Calculate actual clean filter assembly  $\Delta P$  at both operating and cold start viscosity

$$\text{Actual Assembly Clean } \Delta P = \text{Flow Rate} \times \Delta P \text{ Coefficient (from Step 1)} \times \text{Assembly } \Delta P \text{ Factor (from sizing table)}$$

## Filter Sizing<sup>1</sup>

Filter assembly clean element  $\Delta P$  after actual viscosity correction should not exceed 10% of filter assembly bypass setting. See above for filter assembly sizing guidelines & examples. For applications with extreme cold start condition contact Hy-Pro for sizing recommendations.

## $\Delta P$ Factors<sup>1</sup>

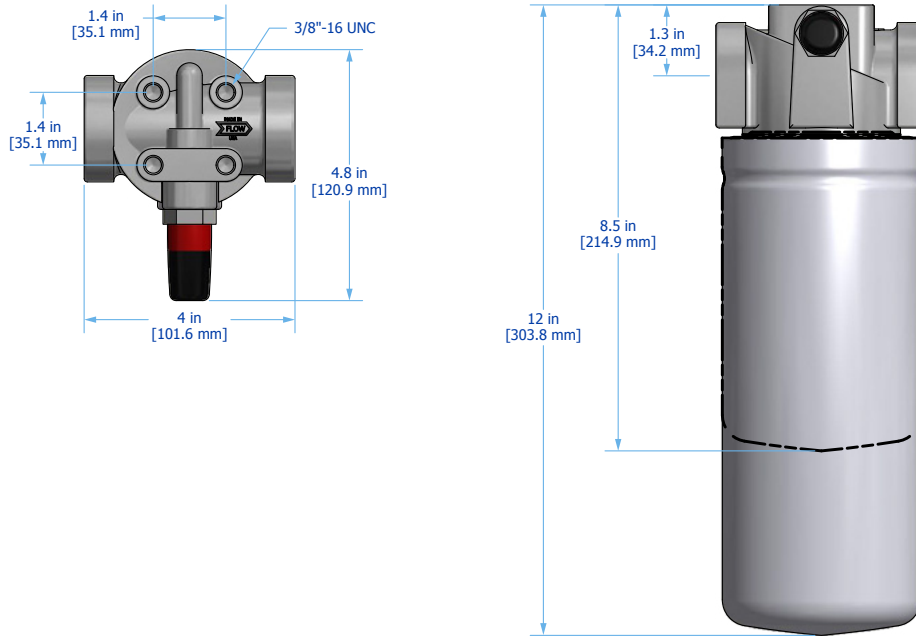
| Length | Units    | Media  |        |        |        |        |        |        |  |
|--------|----------|--------|--------|--------|--------|--------|--------|--------|--|
|        |          | 1M     | 3M     | 6M     | 10M    | 25M    | 25A    | **W    |  |
| L9     | psid/gpm | 0.2961 | 0.2499 | 0.1937 | 0.1737 | 0.1699 | 0.1869 | 0.0306 |  |
|        | bar/lpm  | 0.0054 | 0.0046 | 0.0035 | 0.0032 | 0.0031 | 0.0034 | 0.0006 |  |

<sup>1</sup>Max flow rates and  $\Delta P$  factors assume  $\mu = 150$  SUS, 32 cSt. See filter assembly sizing guideline for viscosity conversion formula.



# S409 Specifications

## Installation Drawing



|                           |   |   |   |  |
|---------------------------|---|---|---|--|
| Operating Temperature     | <b>Fluid Temperature</b><br>30°F to 225°F<br>(0°C to 105°C)   | <b>Ambient Temperature</b><br>-4°F to 140°F<br>(-20C to 60C)  |   |  |
| Operating Pressure        | 500 psi (34.5 bar) max  |   |   |  |
| ΔP Indicator Trigger      | 22 psi (1.5 bar) or 44 psi (3.0 bar)  |   |   |  |
| Element Collapse Rating   | 100 psid (6.9 bard) max   |   |   |  |
| Materials of Construction | <b>Head</b><br>Cast aluminum  | <b>Can</b><br>Stamped steel   | <b>Element Bypass Valve</b><br>Nylon  | <b>Element End Caps</b><br>Zinc or Tin coated carbon steel |
| Media Description         | <b>M</b><br>G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta_{x_{[c]}} \geq 1000$ ( $\beta_x \geq 200$ ) | <b>A</b><br>G8 Dualglass high performance media combined with water removal scrim. $\beta_{x_{[c]}} \geq 1000$ ( $\beta_x \geq 200$ ) | <b>W</b><br>Stainless steel wire mesh media $\beta_{x_{[c]}} \geq 2$ ( $\beta_x \geq 2$ ) |  |
| Replacement Elements      | <b>To determine replacement elements, use corresponding codes from your assembly part number:</b>   |   |   |  |
|                           | <b>Filter Element Part Number</b><br>HP409L9 - [Media Selection Code] [Seal Code]   | <b>Example</b><br>HP409L9-10MB  |   |  |
| Fluid Compatibility       | Petroleum and mineral based fluids (standard). For polyol ester, phosphate ester, and other specified synthetic fluids use fluorocarbon seal option or contact factory.               |   |   |  |

# S409 Part Number Builder

S409       -

Connection    Element Length    Bypass    ΔP Indicator    ΔP Indicator Location    ΔP Indicator Setting    Media    Seal

| Connection | Port Option               | Max Flow Rate                 |
|------------|---------------------------|-------------------------------|
| <b>N12</b> | 3/4" NPT                  | 25 gpm (95 lpm) <sup>1</sup>  |
| <b>N16</b> | 1" NPT                    | 35 gpm (132 lpm) <sup>1</sup> |
| <b>S12</b> | 3/4" SAE-12, 1 1/16" - 12 | 25 gpm (95 lpm) <sup>1</sup>  |
| <b>S16</b> | 1" SAE-16, 1 5/16" - 12   | 35 gpm (132 lpm) <sup>1</sup> |

|          |  |
|----------|--|
| <b>9</b> | 9" (23 cm) nominal length filter element |
| <b>X</b> | No element                               |

|          |                           |
|----------|---------------------------|
| <b>2</b> | 25 psid (1.7 bard) bypass |
| <b>3</b> | 50 psid (3.4 bard) bypass |
| <b>X</b> | No bypass                 |

|          |   |
|----------|---|
| <b>C</b> | dc electrical signal wire (no DIN or visual indication) |
| <b>D</b> | Visual with electric switch (DIN Connection)            |
| <b>V</b> | Visual, Mechanical                                      |
| <b>X</b> | No indicator (port plugged)                             |

|          |                             |
|----------|-----------------------------|
| <b>L</b> | Left side                   |
| <b>R</b> | Right side                  |
| <b>T</b> | Top mount                   |
| <b>X</b> | No indicator (port plugged) |

|          |                                       |
|----------|---------------------------------------|
| <b>2</b> | ΔP 22 psi (1.5 bar) indicator setting |
| <b>3</b> | ΔP 44 psi (3.0 bar) indicator setting |
| <b>X</b> | No indicator (port plugged)           |

| Media Selection | G8 Dualglass                                     | G8 Dualglass + water removal                                | Stainless wire mesh      |
|-----------------|--|---|--------------------------|
| <b>1M</b>       | $\beta_{2.5, [C]} \geq 1000, \beta_1 \geq 200$   | <b>3A</b> $\beta_{5, [C]} \geq 1000, \beta_3 \geq 200$      | <b>25W</b> 25μ nominal   |
| <b>3M</b>       | $\beta_{5, [C]} \geq 1000, \beta_3 \geq 200$     | <b>6A</b> $\beta_{7, [C]} \geq 1000, \beta_6 \geq 200$      | <b>74W</b> 74μ nominal   |
| <b>6M</b>       | $\beta_{7, [C]} \geq 1000, \beta_6 \geq 200$     | <b>10A</b> $\beta_{12, [C]} \geq 1000, \beta_{12} \geq 200$ | <b>149W</b> 149μ nominal |
| <b>10M</b>      | $\beta_{12, [C]} \geq 1000, \beta_{12} \geq 200$ | <b>25A</b> $\beta_{22, [C]} \geq 1000, \beta_{25} \geq 200$ |                          |
| <b>16M</b>      | $\beta_{17, [C]} \geq 1000, \beta_{17} \geq 200$ |   |                          |
| <b>25M</b>      | $\beta_{22, [C]} \geq 1000, \beta_{25} \geq 200$ |   |                          |

|             |  |
|-------------|--|
| <b>B</b>    | Nitrile (Buna)                           |
| <b>V</b>    | Fluorocarbon                             |
| <b>E-WS</b> | EPR seals + stainless steel support mesh |

<sup>1</sup>Maximum recommended flow rate based on velocity through port and internal flow path. Consult sizing guidelines or consult factory for sizing based on flow rate, viscosity, temperature, filter media selection.