HY-PRO FILTRATION

DFN Series Low Pressure Duplex Filter

25 bar / 63 bar, 350 psi / 888 psi Max
3M media - 30 GPM / 115 LPM Max
25M media - 58 GPM / 184 LPM Max
*W media - 102 GPM / 384 LPM Max

Applications

Ideal for systems where filters must be serviced while continuous operation is not interrupted.

- Hydrogen Seal Oil
- Wind Turbine
- Hydraulic Systems
- Gearbox Systems
- Servo Systems
- Boiler Feed Pump
- Mechanical/Electro Hydraulic Controls
- Turbine Lube Oil
- Bearing Lube Oil
- Fuel Handling
- FD-ID-PA Fan Lube
- Upgrade Cuno Auto-Kleen filters to a continuous use duplex filter assembly per Westinghouse Operation & Maintenance Memo 109.

Product Specifications

Materials	
Head	Aluminum
Bowl	Aluminum
Seals	Nitrile (buna) or Fluoro (Viton®)
Media options	G8 Dualglass, Stainless mesh
Interior coating	Anodized
Exterior coating	Powder coated or Anodized
Operating Pressure	
DFN19N Series	Maximum 63 Bar, 888 PSI (tested to 82 Bar, 1156 PSI)
DFN39N Series	Maximum 25 Bar, 352 PSI (tested to 32 Bar, 458 PSI)
Temperature rating	Buna -40°F(-40°C) to 225°F(107°C) Viton -15°F(-26°C) to 275°F(135°C)
Fluid compatibility	Biodegradable and mineral based fluids. For high water based or specified synthetics consult factory

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Features, Benefits, Advantages

Duplex Assembly	Maintain continuous filtration while servicing the filter element
User-Friendly Handle	Pistol grip handle with pressure equalization release allows for easy switching with one hand
Compact Assembly	All valve components are integrated into the filter assembly head which keeps the overall assembly size very compact
DFE Rated Filter Elements	DFE Rated filter elements ensure fluid cleanliness even under severe dynamic conditions of hydraulic systems

HY-PRO FILTRATION

DFN FILTER ASSEMBLY SIZING & OPERATING PRESSURE GUIDELINES

DFN19N Series - Flow Rate vs. Differential Pressure (Assembly with Element)

Media code	Element Length	Max flow rate* gpm (lpm)	Port size	Assembly Δp factor* ΔBAR / lpm	Assembly Δp factor* ΔPSI / gpm
3M	4 (single)	21.7 (81,5)	1" SAE Code 61 Flange	0.055	2.871
6M		28.7 (107,9)		0.037	1.927
10M		35.3 (132,4)		0.026	1.303
25M		45.9 (172,4)		0.017	0.886
** W		77.4 (290,3)		0.009	0.47
3M	6 (double)	27.4 (102,7)	1" SAE Code 61 Flange	0.034	1.771
6M		37.2 (139,3)		0.023	1.198
10M		41.8 (156,8)		0.02	1.042
25M		49.2 (184.5)		0.016	0.834
** W		88.9 (333,3)		0.008	0.417
3M	10 (triple)	30.7 (115,1)	1" SAE Code 61 Flange	0.024	1.261
6M		39.9 (149,6)		0.02	1.042
10M		49.2 (184.5)		0.015	0.782
25M		58.4 (219)		0.012	0.625
** W		102.5 (384,6)		0.006	0.313

*Max flow rate and Δp factor assumes μ = 150 sus, 32 Centistokes (mm^2/s). See Δp viscosity conversion formula for viscosity change.

DFN39N Series - Flow Rate vs. Differential Pressure (Assembly with Element)

Media code	Element Length	Max flow rate* gpm (lpm)	Port size	Assembly Dp factor* DBAR / lpm	Assembly Dp factor* DPSI / gpm
3M	6 (single)	21.7 (81,5)	1 1/2" SAE Code 61 Flange	0.0106	0.552
6M		28.7 (107,9)		0.0080	0.417
10M		35.3 (132,4)		0.0066	0.344
25M		45.9 (172,4)		0.0050	0.261
** W		77.4 (290,3)		0.0024	0.155
3M	10 (double)	27.4 (102,7)	1 1/2" SAE Code 61 Flange	0.0084	0.438
6M		37.2 (139,3)		0.0062	0.323
10M		41.8 (156,8)		0.0059	0.287
25M		49.2 (184.5)		0.0041	0.234
** W		88.9 (333,3)		0.0019	0.135
3M	15 (triple)	30.7 (115,1)	1 1/2" SAE Code 61 Flange	0.0075	0.391
6M		39.9 (149,6)		0.0060	0.301
10M		49.2 (184.5)		0.0051	0.266
25M		58.4 (219)		0.0040	0.210
** W		102.5 (384,6)		0.0018	0.117

*Max flow rate and Δp factor assumes υ = 150 sus, 32 Centistokes (mm^2/s). See Δp viscosity conversion formula for viscosity change.

DFN FILTER ASSEMBLY SIZING & OPERATING PRESSURE 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 150 SSU (32cSt) viscosity and 0.86 fluid specific gravity. Use the following steps to identify the correct high pressure filter assembly.

1. Calculate Δp coefficient at both operating and cold start viscosity:

$$\Delta p \text{ Coefficient} = \frac{\text{Actual Operating Viscosity (SSU)}}{150} \times \frac{\text{Actual S.G.}}{0.86}$$

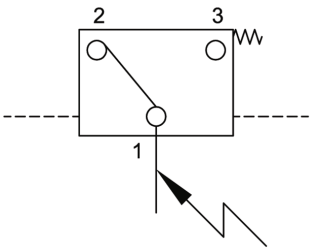
2. Calculate actual clean filter assembly Δp at both operating and cold start viscosity:

Actual assembly clean Δp = Flow rate x Δp Coefficient x Assembly Δp factor (from sizing table)

3. Sizing Recommendations to optimize performance and permit future flexibility:

- To avoid or minimize bypass during cold start the actual assembly clean Δp calculation should be repeated for start-up conditions if cold starts are frequent.
- Actual assembly clean Δp should not exceed 5 psid 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 Δp 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.

ELECTRICAL + LED, ELECTRICAL DIFFERENTIAL PRESSURE INDICATOR INFORMATION



- **Indication pressure - 32 psid, 2,2 bar**
- **Switching voltage - max 230 V ~/=**
- **Switching current - max 2,5 A**
- **Switching power - max 3,5 VA AC / 5 W DC**
- **Contact load - max 60 VA / 40 W**
- **Inrush current - 70 VA**
- **Electrical protection - IP 65**
- **Cable connection - PG11 0 6-10**
- **Contact type - Bistable**

- **Current limiter for DC and AC voltage. If loads are connected over long distances a protective resistor should be connected in series in order to limit the current.**
- **Spark suppression in DC applications. The contacts of reed switches open very fast which causes voltage peaks to be induced when switching off inductive loads (relays, lifting magnets, solenoids). The self-induction currents are short-circuited by connecting a diode in parallel to the inductive load.**
- **Spark suppression in AC applications. In AC applications a diode connected in parallel to the load is not sufficient. RC elements should be connected in parallel to the reed switch.**

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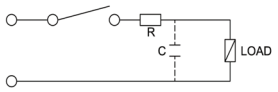

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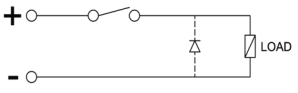

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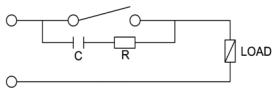


HY-PRO FILTRATION

HIGH PERFORMANCE FILTER ELEMENTS - THE HEART OF A FILTER

Dynamic Filter Efficiency (DFE) Testing

Revolutionary test methods assure that DFE rated elements perform true to rating even under demanding variable flow and vibration conditions. Today's industrial and mobile hydraulic circuits require elements that deliver specified cleanliness under ALL circumstances. Wire mesh supports the media to ensure against cyclical flow fatigue, temperature, and chemical resistance failures possible in filter elements with synthetic support mesh. Contact your distributor or Hy-Pro for more information and published articles on DFE testing.

Media Options

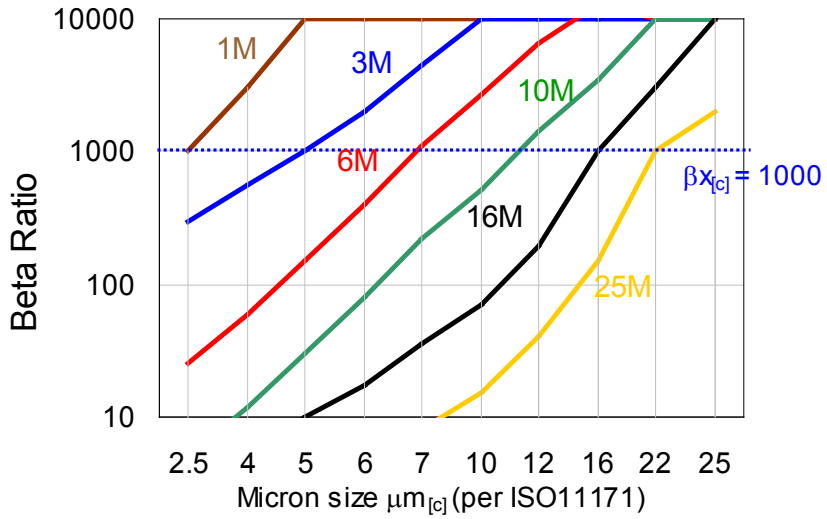
Through extensive testing we have developed media choices to handle any application. Options include G8 Dualglass, Dynafuzz (stainless fiber), and Wire mesh (stainless).

Fluid Compatibility

Petroleum based fluids, water glycol, polyol ester, phosphate ester, high water based fluids and many other synthetics. Contact us for seal material selection assistance.

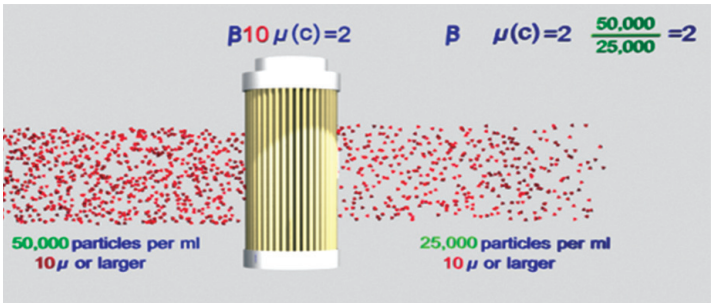
FILTER MEDIA SPECIFICATIONS

Glass Media Code Filtration Efficiency (Beta Ratio) vs Micron

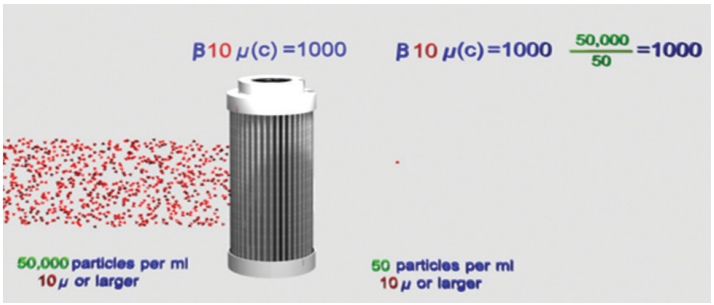


Media Code	Media Description
A	G8 Dualglass high performance media combined with water removal scrim. $\beta x_{[c]} = 1000$ ($\beta x = 200$)
M	G8 Dualglass our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[c]} = 1000$ ($\beta x = 200$)
W	Stainless steel wire mesh media $\beta x_{[c]} = 2$ ($\beta x = 2$) nominally rated

Typical cellulose media performance



Hy-Pro G8 Dualglass media performance



DFN FILTER ASSEMBLY PART NUMBER GUIDE

DFN [Table 1] [Table 2] - [Table 3] [Table 4] [Table 5] [Table 6] [Table 7]

DFN FILTER ELEMENT PART NUMBER GUIDE

HP [Table 1] L [Table 4] - [Table 6] [Table 7]

Bold denotes standard product option. Non-standard options are subject to longer than standard lead time

Table 1 Code	Series Option (Max Flow, Max Pressure)
19N	Small profile DFN Duplex Assembly 24.8 GPM, 93 LPM maximum flow rate 63 Bar, 888 PSI maximum operating pressure
39N	Large profile DFN Duplex Assembly 102 GPM, 382 LPM maximum flow rate 25 Bar, 350 psi maximum operating pressure

Table 3 Code	Porting Option (Series)
B1*	G1" BSPP thread (19N only)
B2	G11/2" BSPP thread (39N only)
F1	SAE 1" Code 61 Flange (19N only)
F2	SAE 11/2" Code 61 Flange (39N only)

* Long lead time. Call for availability.

Table 5 Code	ΔP Indicator
V	Visual pop-up indicator only (manual reset) Indication: 2.2 barΔ, 32 psiΔ
L	Visual indicator with electrical alarm Indication: 2.2 barΔ, 32 psiΔ

Table 7 Code	Seal Material
B	Buna -40°F (-40°C) to 225°F (120°C)
V	Viton® -15°F (-26°C) to 275°F (135°C)

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Table 2 Code	Bypass Valve
B	3,5 bar, 50 psid bypass

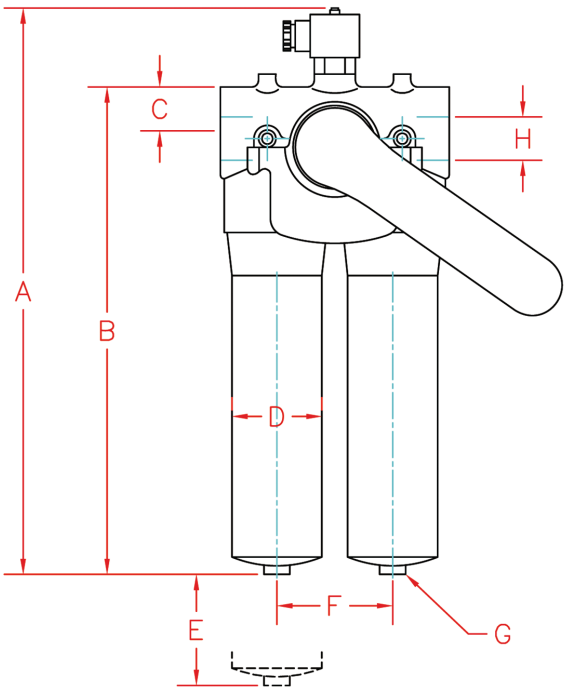
* If maximum system pressure will exceed 25 Bar, 350 PSI and DFN19N assembly is selected the assembly must include a bypass valve (code B) for table 2. HP19N element collapse rating is 30 DBar, 450 DPSI.

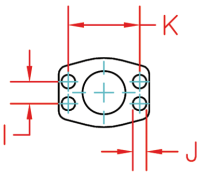
Table 4 Code	Element Length
4*	4" element nominal (19N only)
6*	6" element nominal (19N, 39N)
10	10" element nominal (19N, *39N)
15	15" element nominal (39N only)

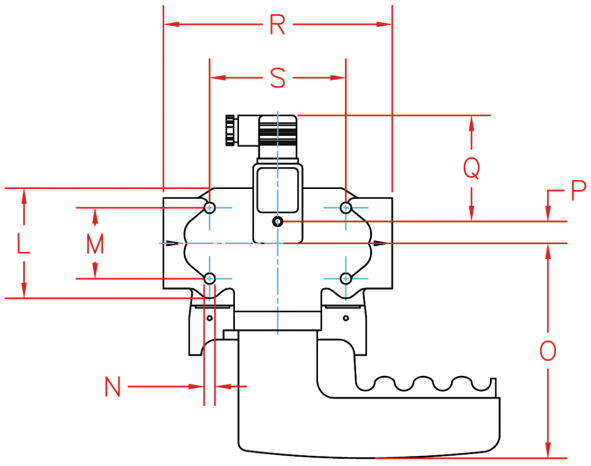
*Expect Long lead time length codes 4, 6, and DFN39N 10 code. Call for availability.

Table 6 Code	Media Selection
1M	$\beta 2.5_{[c]}$ = 1000, β1 = 200
3M	$\beta 5_{[c]}$ = 1000, β3 = 200
6M	$\beta 7_{[c]}$ = 1000, β6 = 200
10M	$\beta 12_{[c]}$ = 1000, β12 = 200
25M	$\beta 22_{[c]}$ = 1000, β25 = 200
25W	25µ nominal mesh media
40W	40µ nominal mesh media
74W	74µ nominal mesh media
149W	149µ nominal mesh media

DFN19N INSTALLATION DRAWING AND SPARE PARTS LIST







	DFN19N*-* 4 IN (mm)	DFN19*-* 6 IN (mm)	DFN19N*-* 10 IN (mm)
A	10.35 (263)	12.72 (323)	16.38 (416)
B	8.07 (205)	10.43 (265)	14.1 (358)
C	1.50 (38)	1.50 (38)	1.50 (38)
D	2.60 (66)	2.60 (66)	2.60 (66)
E	3.15 (80)	3.15 (80)	3.15 (80)
F	3.34 (85)	3.34 (85)	3.34 (85)
G	SW27	SW27	SW27
H	G1 BSPP or 1" SAE Flange Code 61	G1 BSPP or 1" SAE Flange Code 61	G1 BSPP or 1" SAE Flange Code 61
I	1.03 (26,2)	1.03 (26,2)	1.03 (26,2)
J	M 10 x 20	M 10 x 20	M 10 x 20
K	2.06 (52,4)	2.06 (52,4)	2.06 (52,4)
L	3.19 (81)	3.19 (81)	3.19 (81)
M	2.05 (52)	2.05 (52)	2.05 (52)
N	M 8 x 16	M 8 x 16	M 8 x 16
O	5.47 (139)	5.47 (139)	5.47 (139)
P	0.63 (16)	0.63 (16)	0.63 (16)
Q	3.07 (78)	3.07 (78)	3.07 (78)
R	6.61 (168)	6.61 (168)	6.61 (168)
S	3.94 (100)	3.94 (100)	3.94 (100)
Weight	5.7 Lbs (2,6 kg)	6.4 Lbs (2,9 kg)	7.3 Lbs (3,3 kg)

1	**Element (see Element Number Guide)**	**p/n**
2	**Seal Kit**	
	Nitrile NBR	DFN19SKB
	Fluorocarbon	DFN19SKV
	EPR	DFN19SKE
3	**Replacement Bowl Kits**	
	Single length code 4	DFN19B4
	Double length code 6	DFN19B6
	Triple length code 10	DFN19B10

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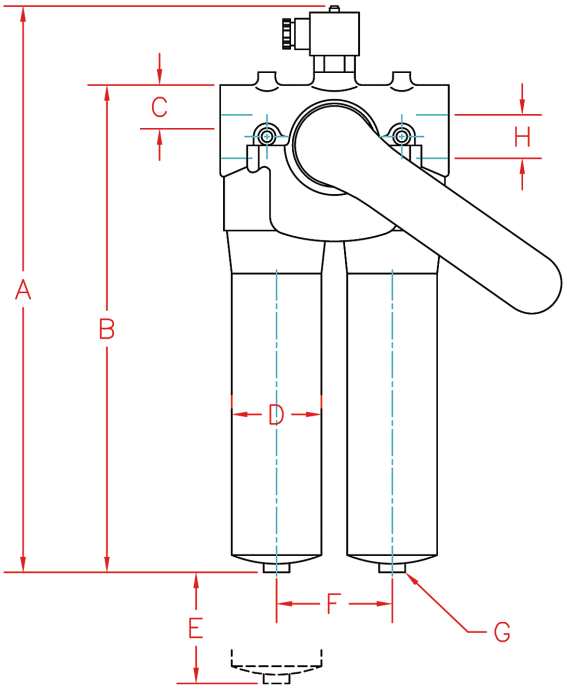
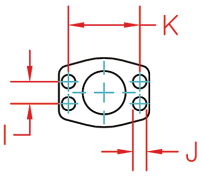
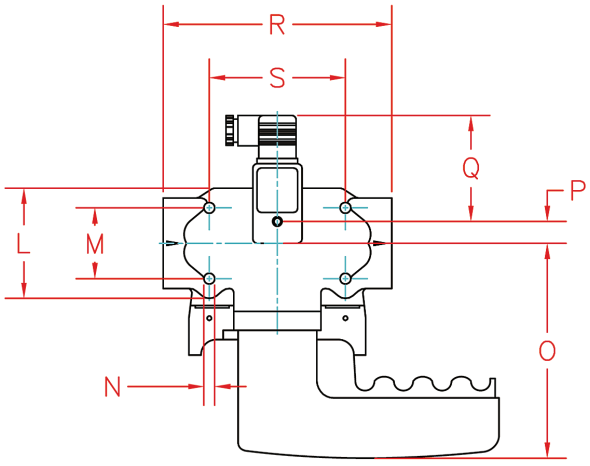
DFN39N INSTALLATION DRAWING AND SPARE PARTS LIST





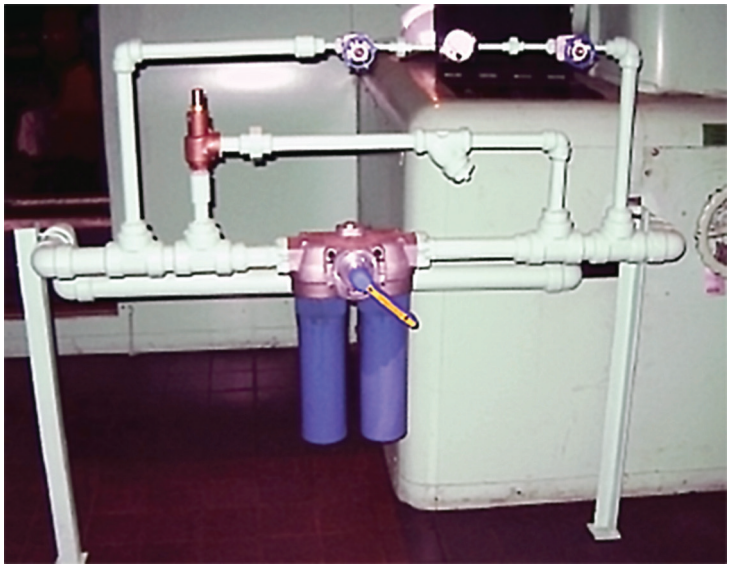


	DFN39N*-* 6 IN (mm)	DFN39N*-* 10 IN (mm)	DFN39N*-* 15 IN (mm)
A	13.74 (349)	17.48 (444)	23.15 (588)
B	11.45 (291)	15.20 (386)	20.87 (530)
C	1.58 (40)	1.58 (40)	1.58 (40)
D	4.29 (109)	4.29 (109)	4.29 (109)
E	4.33 (110)	4.33 (110)	4.33 (110)
F	5.51 (140)	5.51 (140)	5.51 (140)
G	SW32	SW32	SW32
H	G1 1/2" BSPP, 1 1/2" SAE Flange Code 61	G1 1/2" BSPP, 1 1/2" SAE Flange Code 61	G1 1/2" BSPP, 1 1/2" SAE Flange Code 61
I	1.40 (35,7)	1.40 (35,7)	1.40 (35,7)
J	M 12 x 20	M 12 x 20	M 12 x 20
K	2.75 (69,9)	2.75 (69,9)	2.75 (69,9)
L	5.51 (140)	5.51 (140)	5.51 (140)
M	2.44 (62)	2.44 (62)	2.44 (62)
N	M 10 x 20	M 10 x 20	M 10 x 20
O	5.47 (139)	5.47 (139)	5.47 (139)
P	0.75 (19)	0.75 (19)	0.75 (19)
Q	3.07 (78)	3.07 (78)	3.07 (78)
R	11.02 (280)	11.02 (280)	11.02 (280)
S	8.27 (210)	8.27 (210)	8.27 (210)
weight	15.6 Lbs (7,1 kg)	17.6 Lbs (8,0 kg) G1 1/2" BSPP, 1 1/2" SAE Flange Code 61	35.9 Lbs (16,3 kg)

1	Element (see Element Number Guide)	p/n
2	**Seal Kit**	
	Nitrile NBR	DFN39SKB
	Fluorocarbon	DFN39SKV
	EPR	DFN39SKE
3	**Replacement Bowl Kits**	
	Single length code 6	DFN39B6
	Double length code 10	DFN39B10
	Triple length code 15	DFN39B15

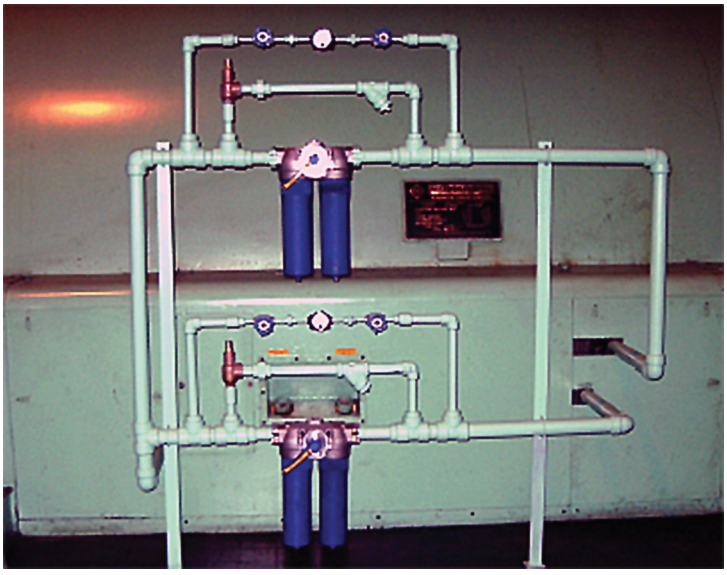
HY-PRO
FILTRATION

DFN39N POWER GENERATION FIELD APPLICATION EXAMPLES



Application: Hydrogen Seal Oil
Flow Rate: 40 GPM (150 LPM)
Oper. Pressure: 20 PSI (1.41 BAR)
Requirement: Continuous Operation

The filter was installed outside the turbine shell along with external bypass and differential pressure indicator loops since a low bypass cracking pressure (< 20 psid) was required to prevent hydrogen seal damage. The filter integral bypass cracking pressure is 50 psid. The external Δp gauge allows for filter condition monitoring, and the duplex arrangement allows for continuous filtration even when the filter element is being serviced. This installation satisfied the requirements detailed in Westinghouse Operation & Maintenance Memo 109.



Application: Mechanical Control Relay Oil
Flow Rate: 30 GPM (112 LPM)
Oper. Pressure: 150 PSI (10 BAR)
Requirement: Continuous Operation

The filter was installed outside the turbine shell along with external bypass and differential pressure indicator loops. In this case there was sufficient system operating pressure to utilize the filter assembly integral bypass valve with a setting of 50 psid (3.2 Bar) for pressure relief. No external bypass line or Δp gauge was required. This installation satisfied the requirements detailed in Westinghouse Operation & Maintenance Memo 109.