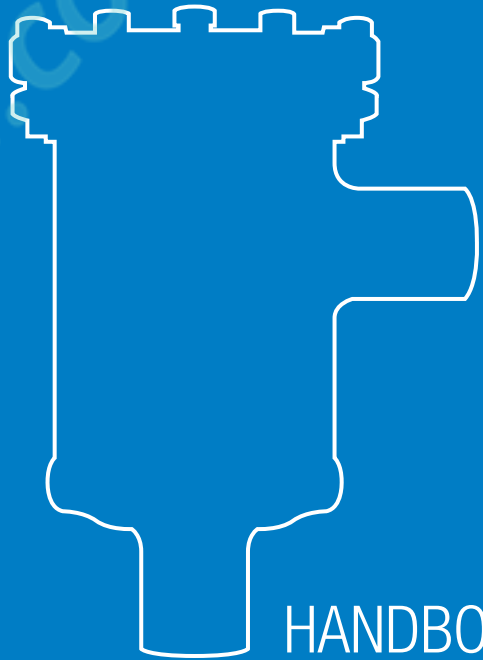


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HANDBOOK

REFRIGERATING SYSTEM PROTECTORS

Ed. 2017



REPLACEABLE SOLID CORE FILTER DRIERS

FOR REFRIGERATION PLANTS THAT USE HCFC, HFC OR HFO REFRIGERANTS



APPLICATIONS

The filters in series 44 illustrated in this chapter are designed for installation on commercial refrigeration systems and on civil and industrial air conditioning plants that use the following refrigerant fluids:

- HCFC (R22)
- HFC (R134a, R404A, R407C, R410A, R507)
- HFO and HFO/HFC mixtures (R1234ze, R448A, R449A, R450A, and R452A)

belonging to Group 2, as defined in Article 13, Chapter 1, Point (b) of Directive 2014/68/EU, with reference to EC Regulation No. 1272/2008.

For specific applications with refrigerant fluids not listed above, please contact Castel Technical Department.

OPERATION

In the case of filters with more than one cartridge, the fluid passage takes place in parallel. As a result, the pressure drop does not increase in proportion with the number of cartridges. A large ring area between the cartridge and the inner surface of the filter allows for the accumulation of solid particles and prevents clogging. Before leaving the filter, the refrigerant fluid must pass through the mesh sieve

in which cartridges are mounted. This eliminates the danger that small particles of drying material be dragged into circulation. Furthermore, at the filter outlet, a plastic cup, the edge of which closely adheres to the inner surface of the filter, prevents dirt from reaching the outlet connection during normal operation and cartridge change.

CONSTRUCTION

Filters in series 4410: these are built with an aluminium cover, zinc plated screws, and the steel body is equipped with brazing connections:

- made from copper pipe EN 12735-1 – Cu-DHP. (No suffix after the connection code)
- Machined from a steel bar EN 10025 S355JR. (“F” suffix after connection code)

They are sold in the following two configurations:

- Codes with an “A” suffix, equipped with 1/4” NPT threaded cover for mounting an access fitting with valve core (for example G9150/R05)
- Codes with a “B” suffix, equipped with blind cover

Filters in series 4420: these filters are manufactured with: zinc plated steel cover, stainless steel screws, steel body equipped with brazing connections machined from steel bar EN 10025 S355JR.

Sold only in the configuration of codes with an “A” suffix, equipped with 1/4” NPT threaded cover for mounting an access fitting with valve core (for example kit G9150/R05)

Cartridges in series 4490, type A and type B, and 4491: are made from moulding a dehydrating filler, made completely from 3 Å molecular sieves, with a suitable binder. The choice of using only 3 Å molecular sieves as the dehydrating material grants the cartridge extraordinary moisture adsorption capacity while maintaining reasonable deacidifying characteristics.

Cartridges in series 4490, type AA and type AB, and 4491, type AA: are made from moulding a dehydrating filler, made from 80% 3 Å molecular sieves and 20% activated alumina, with a suitable binder. The use of a blend of molecular sieves – activated alumina, grant the cartridges a very high deacidifying capacity maintaining very good moisture adsorption characteristics.

The presence of a controlled and defined percentage of activated alumina, lower than the maximum value

recommended by ASERCOM, maintains the original concentration of additives in the polyester oil.

The cartridges in series 4490 have volume of 48 cubic inches, equivalent to about 800 cm³, and are suitable for being used with filters in series 4411, 4412, 4413 and 4414. The cartridges in series 4491 have volume of 96 cubic inches, equivalent to about 1600 cm³, and are suitable for being used with filters in series 4421, 4423, and 4424.

Both have a hollow cylinder shape and are of the same size as the corresponding products of the main international brands. Consequently they are interchangeable. The hollow cylinder shape provides a large surface area to the fluid which to cross it in a radial direction. As a result, drying is highly efficient with a minimum loss of charge.

CARTRIDGE REPLACEMENT

Cartridges must be ordered separately from the filter. They are supplied in individual packages, which are hermetically sealed in metal containers (type 4490), and in special bags (type 4491). Both types of packaging are suitable for long-term storage of the cartridge.

Each cartridge is supplied with two synthetic gaskets to be used as a seal between the two cartridges and between the cartridge and its covers.

If the filter is installed in a system without a by-pass, the cartridge replacement must be done following these instructions:

1. Close the valve on the liquid outlet line.
2. Start the compressor and its auxiliaries in order to transfer the refrigerant charge to the high pressure side of the plant (liquid vessel);

3. Stop the compressor at a sufficiently high suction pressure above atmospheric pressure;
4. Close the service valve on the suction side of the compressor.

NOTE: if during the transfer of the refrigerant to the high-pressure side of the plant, the discharge pressures reach values that are too high (the condenser is flooded due to insufficient capacity of the liquid vessel), shut off the valve on the suction side of the compressor and immediately stop the compressor.

5. Quickly replace the filter cartridge. During preparation for installation of the new cartridge, wrap the filter in a clean rag. The slight over-pressure in the filter and the technician's skill will prevent air from getting into the plant.
6. The cleanliness of the inside of the body is guaranteed by the scraping effect of the cup, which is characteristic of Castel filters.
If it is assumed that air has entered the plant during filter cartridge replacement, put the low-pressure side of the plant under vacuum. Always do this to the circuit involved in the operation.
7. Open the valve on the liquid outlet line.
8. Slowly open the compressor's suction valve and start the compressor and its auxiliaries.
9. Top the charge up, if necessary.

APPROVALS

Filters in series 4410 and 4420 have been approved by the American certification authority Underwriters Laboratories Inc. Filters in series 4410 and 4420 are certified **UL Listed** for the USA with file SA7054, in compliance with American standard UL 207.

TABLE 39: General characteristics of filter driers with replaceable solid core

Catalogue Number			Core Cat. Number	Number of Cores	Core Filtering Surface [cm ²]	Nominal Volume		Connections			PS [bar]	TS [°C]		TA [°C]		Risk Category according to PED Recast
Copper connections		Steel connections						ODS		W (2)		min.	max.	min.	max.	
Theaded cover	Blind cover	Theaded cover				[cu.in]	[cm ³]	Ø [in.]	Ø [mm]	Ø [mm]						
4411/5A	4411/5B	4411/5AF	4490/A - 4490/B ; 4490/AA - 4490/AB	1	420	48	800	5/8"	16	21,3	45 (1)	- 40	+ 80	- 20	+ 50	I
4411/7A	4411/7B	4411/7AF						7/8"	22	26,9						
4411/M28A	4411/M28B	-						-	28	33,7						
4411/9A	4411/9B	4411/9AF						1.1/8"	-	33,7						
4411/11A	4411/11B	4411/11AF						1.3/8"	35	42,4						
4411/13A	4411/13B	4411/13AF						1.5/8"	-	48,3						
4411/M42A	4411/M42B	4411/M42AF						-	42	48,3						
4411/17A	4411/17B	4411/17AF						2.1/8"	54	60,3						
4411/21A	4411/21B	4411/21AF		2.5/8"	-	76,1										
4412/7A	4412/7B	4412/7AF		2	840	96	1600	7/8"	22	26,9						
4412/M28A	4412/M28B	0,05 cm						-	28	33,7						
4412/9A	4412/9B	4412/9AF						1.1/8"	-	33,7						
4412/11A	4412/11B	4412/11AF						1.3/8"	35	42,4						
4412/M42A	4412/M42B	4412/M42AF						-	42	48,3						
4412/17A	4412/17B	4412/17AF						2.1/8"	54	60,3						
4413/7A	4413/7B	4413/7AF		3	1260	144	2400	7/8"	22	26,9						
4413/9A	4413/9B	4413/9AF	1.1/8"					-	33,7							
4413/11A	4413/11B	4413/11AF	1.3/8"					35	42,4							
4413/13A	4413/13B	4413/13AF	1.5/8"					-	48,3							
4413/M42A	4413/M42B	4413/M42AF	-					42	48,3							
4414/11A	4414/11B	4414/11AF	4					1680	192	3200	1.3/8"	35	42,4			
4414/13A	4414/13B	4414/13AF		1.5/8"	-	48,3										
4414/M42A	4414/M42B	4414/M42AF		-	42	48,3										
4414/17A	4414/17B	4414/17AF		2.1/8"	54	60,3										
-	-	4423/17A	4491/A ; 4491/AA	3	1890	300	4800	2.1/8"	54	60,3	32 (1)					II
		4423/21A						2.5/8"	67	76,1						
		4423/25A						3.1/8"	80	88,9						
		4424/25A		4	2520	400	6400	3.1/8"	80	88,9						
		4424/34A						4.1/4"	108	114,3						

(1) : MWP = 470 psi according to UL approval
 (2) : only for shells with steel connections

TABLE 40: Refrigerant flow capacity of filter driers with replaceable solid core

Catalogue Number			Pressure drop 0,07 bar (1) [kW]										
Copper connections		Steel connections											
Theaded cover	Blind cover	Theaded cover	R134a	R22	R404A	R407C	R410A	R507	R1234ze	R448A	R449A	R450A	R452A
4411/5A	4411/5B	4411/5AF	83	90	59	85	87	57	73	78	77	66	60
4411/7A	4411/7B	4411/7AF	145	158	103	149	153	100	128	138	136	116	105
4411/M28A	4411/M28B	–	198	216	141	204	209	137	175	188	186	158	143
4411/9A	4411/9B	4411/9AF	198	216	141	204	209	137	175	188	186	158	143
4411/11A	4411/11B	4411/11AF	231	252	165	238	244	160	204	220	217	184	167
4411/13A	4411/13B	4411/13AF	248	270	177	255	262	171	219	235	232	198	179
4411/M42A	4411/M42B	4411/M42AF	248	270	177	255	262	171	219	235	232	198	179
4411/17A	4411/17B	4411/17AF	248	270	177	255	262	171	219	235	232	198	179
4411/21A	4411/21B	4411/21AF	248	270	177	255	262	171	219	235	232	198	179
4412/7A	4412/7B	4412/7AF	145	158	103	149	153	100	128	138	136	116	105
4412/9A	4412/9B	4412/9AF	224	244	160	231	236	155	198	213	210	179	162
4412/11A	4412/11B	4412/11AF	304	331	216	313	321	210	268	289	285	242	219
4412/M42A	4412/M42B	4412/M42AF	331	361	236	341	350	229	292	315	310	264	239
4412/17A	4412/17B	4412/17AF	331	361	236	341	350	229	292	315	310	264	239
4413/7A	4413/7B	4413/7AF	145	158	103	149	153	100	128	138	136	116	105
4412/M28A	4412/M28B	–	224	244	160	231	236	155	198	213	210	179	162
4413/9A	4413/9B	4413/9AF	224	244	160	231	236	155	198	213	210	179	162
4413/11A	4413/11B	4413/11AF	325	354	232	335	343	225	287	309	304	259	234
4413/13A	4413/13B	4413/13AF	359	391	256	369	379	248	317	341	336	286	259
4413/M42A	4413/M42B	4413/M42AF	359	391	256	369	379	248	317	341	336	286	259
4414/11A	4414/11B	4414/11AF	376	410	268	387	397	260	332	358	353	300	271
4414/13A	4414/13B	4414/13AF	422	460	301	435	446	292	373	401	396	337	305
4414/M42A	4414/M42B	4414/M42AF	422	460	301	435	446	292	373	401	396	337	305
4414/17A	4414/17B	4414/17AF	422	460	301	435	446	292	373	401	396	337	305
–	–	4423/17A	443	483	316	456	468	307	391	421	415	354	320
–	–	4423/21A	488	532	348	503	516	338	431	464	458	389	352
–	–	4423/25A	665	725	474	685	703	460	587	632	624	531	480
–	–	4424/25A	731	797	521	753	772	506	646	695	685	583	528
–	–	4424/34A	1170	1276	835	1206	1236	810	1034	1113	1097	934	845

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.
 The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar / 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

Continued

TABLE 40: Refrigerant flow capacity of filter driers with replaceable solid core

Catalogue Number			Pressure drop 0,14 bar (1) [kW]										
Copper connections		Steel connections											
Theaded cover	Blind cover	Theaded cover	R134a	R22	R404A	R407C	R410A	R507	R1234ze	R448A	R449A	R450A	R452A
4411/5A	4411/5B	4411/5AF	99	108	71	102	105	69	87	94	93	79	71
4411/7A	4411/7B	4411/7AF	188	205	134	194	199	130	166	179	177	150	136
4411/M28A	4411/M28B	–	257	281	184	265	272	178	227	245	241	206	186
4411/9A	4411/9B	4411/9AF	257	281	184	265	272	178	227	245	241	206	186
4411/11A	4411/11B	4411/11AF	300	328	214	310	317	208	265	286	282	240	217
4411/13A	4411/13B	4411/13AF	322	351	230	332	340	223	284	306	302	257	232
4411/M42A	4411/M42B	4411/M42AF	322	351	230	332	340	223	284	306	302	257	232
4411/17A	4411/17B	4411/17AF	322	351	230	332	340	223	284	306	302	257	232
4411/21A	4411/21B	4411/21AF	322	351	230	332	340	223	284	306	302	257	232
4412/7A	4412/7B	4412/7AF	188	205	134	194	199	130	166	179	177	150	136
4412/9A	4412/9B	4412/9AF	291	317	207	300	307	201	257	277	273	232	210
4412/11A	4412/11B	4412/11AF	395	430	281	407	417	273	349	375	370	315	285
4412/M42A	4412/M42B	4412/M42AF	447	487	319	461	472	309	395	425	419	357	323
4412/17A	4412/17B	4412/17AF	447	487	319	461	472	309	395	425	419	357	323
4413/7A	4413/7B	4413/7AF	196	213	139	202	207	135	173	186	183	156	141
4412/M28A	4412/M28B	–	302	329	215	311	319	209	267	287	283	241	218
4413/9A	4413/9B	4413/9AF	302	329	215	311	319	209	267	287	283	241	218
4413/11A	4413/11B	4413/11AF	438	478	313	452	463	303	387	417	411	350	316
4413/13A	4413/13B	4413/13AF	484	528	345	499	511	335	428	460	454	386	349
4413/M42A	4413/M42B	4413/M42AF	484	528	345	499	511	335	428	460	454	386	349
4414/11A	4414/11B	4414/11AF	526	574	375	542	556	364	465	501	494	420	380
4414/13A	4414/13B	4414/13AF	591	644	421	609	624	409	522	562	554	471	426
4414/M42A	4414/M42B	4414/M42AF	591	644	421	609	624	409	522	562	554	471	426
4414/17A	4414/17B	4414/17AF	591	644	421	609	624	409	522	562	554	471	426
–	–	4423/17A	620	676	442	639	655	429	548	590	582	495	448
		4423/21A	683	745	487	704	722	473	603	649	641	545	493
		4423/25A	931	1015	664	959	984	645	822	885	873	743	672
		4424/25A	1023	1116	730	1054	1081	709	904	973	960	817	739
		4424/34A	1638	1786	1168	1688	1731	1134	1447	1558	1536	1308	1183

(1) : Maximum values of the refrigerant flow capacity at which the drier can be used when fluid dehydration is not the a major problem, provided that the original moisture is limited before the installation of the drier.

The maximum refrigerant flow capacities are referred to a total pressure drop of 0,07 bar / 0,14 bar , inlet and outlet connections included, (according to ARI STANDARD 710-2009 - with liquid temperature at + 30 °C and evaporating temperature at - 15 °C)

TABLE 41: General characteristics, dimensions and weights of solid cores

Catalogue Number	Batch characteristic	Filtering Surface [cm ²]	Nominal Volume		Dimensions [mm]			Weight [g]
			[cu.in]	[cm ³]	Ø D ₁	Ø D ₂	H	
4490/A (1)	High moisture adsorption (100% molecular sieve)	420	48	800	47	96	140	730
4490/B (2)								
4490/AA (1)								
4490/AB (2)	Moisture and acid adsorption (80% molecular sieve + 20% activated alumina)							
4491/A (3)	High moisture adsorption (100% molecular sieve)	630	100	1600	53	122	165	1560
4491/AA (3)								

(1): Supplied with cover gaskets as spare part, either for Castel filters or for competitors ones
 (2): Supplied without cover gasket as part part
 (3): Supplied with cover gasket as spare part

TABLE 42: Water capacity and dehydratable charge of one solid core

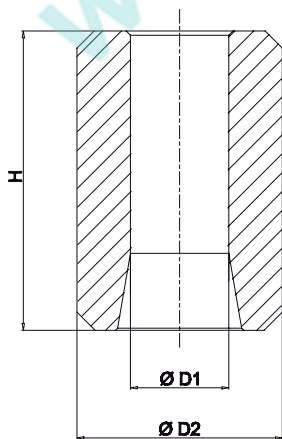
Catalogue Number	Nominal Volume		Water Capacity at + 24 °C (1) [g H ₂ O]					Dehydratable Charge at + 24 °C [kg refrigerant]				
	[cu.in]	[cm ³]	R134a	R22	R404A R507	R407C	R410A	R134a	R22	R404A R507	R407C	R410A
4490/A 4490/B	48	800	82	75	84	67	73	88	81	90	72	79
4490/AA 4490/AB			70	64	71	57	62	75	69	77	61	67
4491/A	100	1600	216	197	220	177	192	232	212	237	190	207
4491/AA			183	167	187	150	163	197	180	201	161	176

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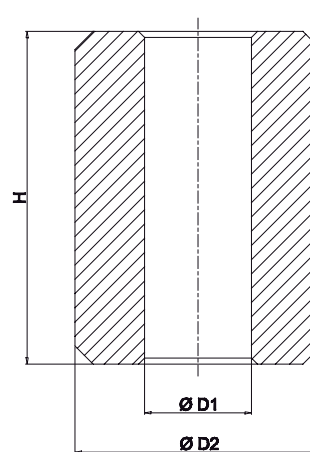
TABLE 42: Water capacity and dehydratable charge of one solid core

Catalogue Number	Nominal Volume		Water Capacity at + 52 °C (1) [g H ₂ O]					Dehydratable Charge at + 52 °C [kg refrigerant]				
	[cu.in]	[cm ³]	R134a	R22	R404A R507	R407C	R410A	R134a	R22	R404A R507	R407C	R410A
4490/A 4490/B	48	800	71	60	78	54	59	76	65	84	58	63
4490/AA 4490/AB			60	51	66	46	50	65	55	71	50	54
4491/A	100	1600	186	158	205	142	155	200	170	220	153	166
4491/AA			158	134	174	121	131	170	144	187	130	141

(1) : Water capacity values are referred to the following conditions, fixed in ARI STANDARD 710-2004 and DIN 8949:2000:
 - Liquid temperatures: 24 °C and 52 °C
 - Equilibrium point dryness, EPD: 60 ppm for R22
 - Equilibrium point dryness, EPD: 50 ppm for R134a , R404A , R407C , R410A e R507



4490



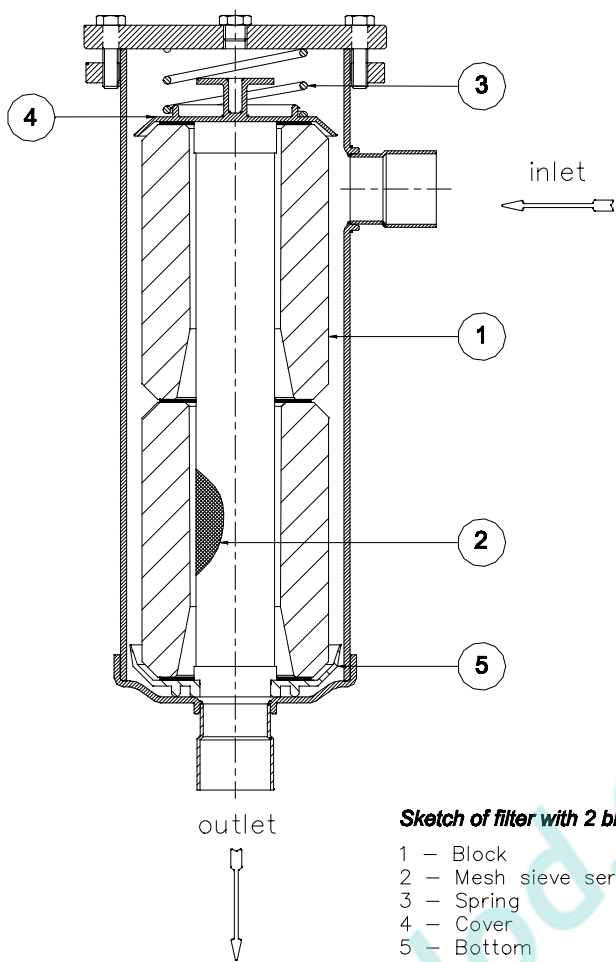
4491

TABLE 43: Dimensions and weights of filters with copper connections

Catalogue Number	Connections		Dimensions [mm]					Weight [g]			
	ODS		Ø D ₁	Ø D ₂	H ₁	H ₂	H ₃		P		
	Ø [in.]	Ø [mm]									
4411/5 (A-B)	5/8"	16	121	149	144	231	185	89	3800		
4411/7 (A-B)	7/8"	22									3800
4411/M28 (A-B)	–	28			150	237		95	3850		
4411/9 (A-B)	1.1/8"										
4411/11 (A-B)	1.3/8"	35			155	242		100	3900		
4411/13 (A-B)	1.5/8"	–									
4411/M42 (A-B)	–	42			167	254		112	3990		
4411/17 (A-B)	2.1/8"	54			158	245		103	4130		
4411/21 (A-B)	2.5/8"	–									
4412/7 (A-B)	7/8"	22									
4412/M28 (A-B)	–	28			292	379	95	5050			
4412/9 (A-B)	1.1/8"	–									
4412/11 (A-B)	1.3/8"	35			297	384	100	5150			
4412/M42 (A-B)	–	42			309	396	112	5270			
4412/17 (A-B)	2.1/8"	54			300	387	103	5400			
4413/7 (A-B)	7/8"	22									
4413/9 (A-B)	1.1/8"	–									
4413/11 (A-B)	1.3/8"	35			433	520	95	6350			
4413/13 (A-B)	1.5/8"	–									
4413/M42 (A-B)	–	42			438	525	100	6480			
4414/11 (A-B)	1.3/8"	35	450	537	112	6520					
4414/13 (A-B)	1.5/8"	–									
4414/M42 (A-B)	–	42	580	667	100	7780					
4414/17 (A-B)	2.1/8"	54	592	679	112	7960					
			583	670	103	7900					

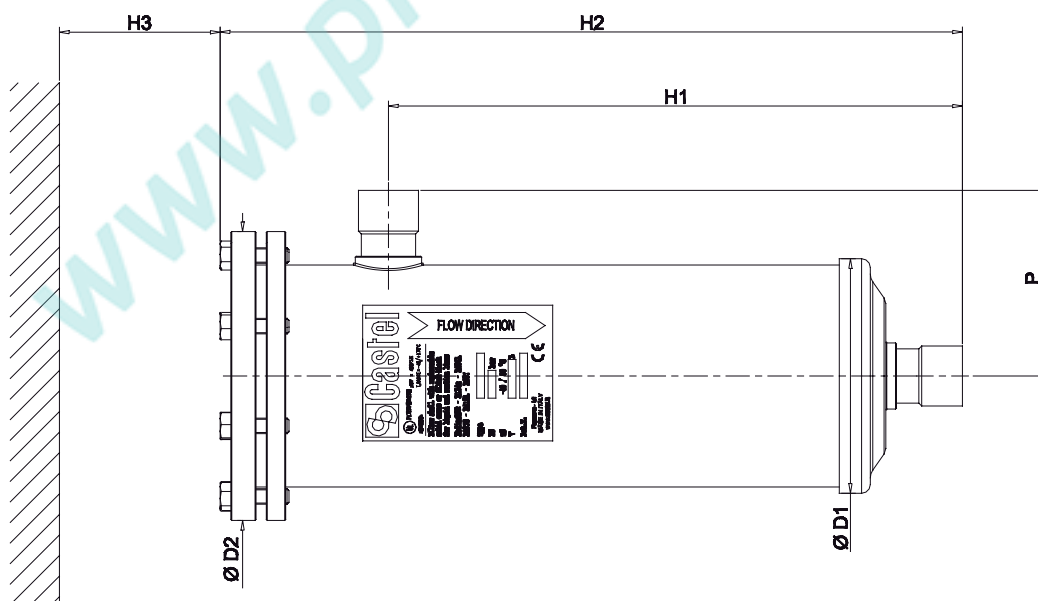
TABLE 44: Dimensions and weights of filters with steel connections

Catalogue Number	Connections			Dimensions [mm]						Weight [g]	
	ODS		W	Ø D ₁	Ø D ₂	H ₁	H ₂	H ₃	P		
	Ø [in.]	Ø [mm]	Ø [mm]								
4411/5AF	5/8"	16	21,3	121	149	144	231	185	90	3810	
4411/7AF	7/8"	22	26,9			150	237		95	3860	
4411/9AF	1.1/8"	–	33,7			155	242		100	4050	
4411/11AF	1.3/8"	35	42,4			167	254		112	4190	
4411/13AF	1.5/8"	–	48,3			158	245		103	4150	
4411/M42AF	–	42	48,3			152	239		95	4350	
4411/17AF	2.1/8"	54	60,3			292	379		95	5280	
4412/7AF	7/8"	22	26,9			297	384	100	5320		
4412/9AF	1.1/8"	–	33,7			309	396	112	5380		
4412/11AF	1.3/8"	35	42,4			300	387	103	5400		
4412/M42AF	–	42	48,3			433	520	95	6400		
4412/17AF	2.1/8"	54	60,3			438	525	100	6600		
4413/7AF	7/8"	22	26,9			450	537	112	6770		
4413/9AF	1.1/8"	–	33,7			580	667	100	7700		
4413/11AF	1.3/8"	35	42,4			592	679	112	7900		
4413/13AF	1.5/8"	–	48,3			583	670	103	8000		
4413/M42AF	–	42	48,3			518	641	600	142	18450	
4414/11AF	1.3/8"	35	42,4			538	661	760	162	17370	
4414/13AF	1.5/8"	–	48,3			705	829			21600	
4414/M42AF	–	42	48,3			163	200	715	839	172	24300
4414/17AF	2.1/8"	54	60,3								
4423/17A	2.1/8"	54	60,3								
4423/21A	2.5/8"	67	76,1								
4423/25A	3.1/8"	80	88,9								
4424/25A	3.1/8"	80	88,9								
4424/34A	4.1/4"	108	114,3								



Sketch of filter with 2 blocks

- 1 – Block
- 2 – Mesh sieve serving as block support
- 3 – Spring
- 4 – Cover
- 5 – Bottom



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