



**Seamless stainless
instrumentation tubing**





DMV Instrumentation Tubing is produced between the ranges of 6 x 1 mm to 76 x 2.9 mm sizes from five grades of stainless steel to cater for the majority of specialist industrial uses.

This tubing has a multitude of uses throughout the following industries:

TRANSPORTATION SYSTEMS

- **Automotive**
- **Railway**
- **Shipping construction**
- **Aircraft**

MECHANICAL ENGINEERING

- **Factory facilities**
- **High pressure applications**



MATERIALS The standard austenitic stainless grades used for these applications are as follows:

- **DMV 304 H:** For DMV 304 H the carbon content is increased up to 0.08 %. This chemical analysis enables this stainless steel grade higher mechanical values compared to DMV 304 L.
- **DMV 304 L:** The internal limits of the chemical analysis of all DMV grades are more restricted as prescribed in the international standards. These actions warranty a reduction of precipitations and improve clearly the corrosion resistance and weldability of DMV 304 L.
- **DMV 316 L:** The minimum content of molybdenum for DMV 316 L is defined by 2.25 wtf%. The addition of this element improves specially the pitting and crevice corrosion resistance compared to DMV 304 L.
- **DMV 316 Ti:** The grade DMV 316 Ti is stabilised by titanium. Like DMV 316 L this grade shows a good corrosion resistance, but a better pitting and crevice resistance in non oxidising acids.
- **DMV 321:** DMV 321 is also a titanium stabilised grade and can be used under severe wet chemical requirements. Beside this good corrosion resistance it shows higher mechanical strength at elevated temperatures, compared to the above mentioned grades.

TECHNICAL SPECIFICATIONS

Standards: ASTM A 312, ASTM A 269, ASTM A 213 AW.

Also the norms DIN 17458 Pk1 and NFA 49-117.

Tolerances: For OD \leq 20mm: DIN 2391 : 1994-09
For OD > 20mm: D3/T3 EN ISO 1127:1996-04
D3: \pm 0.75 % but min. \pm 0.3 mm;
T3: \pm 10 % but min. \pm 0.2 mm
D4: \pm 0.50% but min. \pm 0.1 mm on request

Lengths: Metric sizes are normally delivered in standard length of 6000 mm.
For imperial sizes lengths of 6096 mm are available.
Longer straight tubes up to 24 metres are available on request.

Delivery conditions: For OD \leq 15 mm : normally delivered bright annealed.
For OD > 15 mm : bright annealed or annealed and pickled.
Tubes are delivered with plain ends.

Certification: EN 10204 3.1. B or EN 10204 3.1. A.

Quality Approval: The group-wide quality and accreditation regime is applied to ensure equal quality management and quality assurance. Compliance with ISO 9001/9002 is rigorously met.

Copies of other approvals and certificates are provided on request.



Furnace and polishing equipment in the Costa Volpino plant

Dimensions & Pressures

Dimensions		Weight kg /m	Working pressure in bar up to 120 °C for				
OD mm	WT mm		DMV 304	DMV 304 L	DMV 316 L	DMV 316 Ti	DMV 321
6.0	1.0	0.12	409	382	400	436	418
	1.5	0.17	664	621	650	708	679
6.35	0.89/0.91	0.12	333/343	311/321	326/335	355/365	340/350
	1.22/1.24	0.16	493/502	460/470	482/491	525/535	503/513
	1.63/1.65	0.19	-	-	-	-	-
8.0	1.0	0.17	307	287	300	327	313
	1.5	0.24	498	466	488	531	509
	2.0	0.29	690	645	675	735	705
9.53	0.89/0.91	0.19	222/228	208/214	217/224	237/243	227/233
	1.22/1.24	0.25	328/335	307/313	321/327	350/356	335/342
	1.63/1.65	0.32	460/467	430/436	450/456	490/497	470/477
10.0	1.0	0.22	245	229	240	261	251
	1.5	0.31	399	373	390	425	407
	2.0	0.40	552	516	540	588	564
10.2	1.0	0.23	241	225	235	256	246
	2.0	0.40	541	506	529	576	553
12.0	1.0	0.27	204	191	200	218	209
	1.5	0.39	332	311	325	354	339
	2.0	0.49	460	430	450	490	470
12.7	0.89/0.91	0.26	167/171	156/160	163/168	177/183	170/175
	1.22/1.24	0.35	246/251	230/235	241/246	262/268	252/257
	1.63/1.65	0.45	345/350	323/327	338/343	368/373	353/358
14.0	2.11	0.55	459	429	449	488	469
	1.0	0.32	192	179	188	204	196
14.0	2.0	0.59	383	358	375	408	392
	2.5	0.71	479	448	469	510	490
	1.0	0.34	164	153	160	174	167
15.0	1.5	0.50	266	248	260	283	272
	2.0	0.64	368	344	360	392	376
	1.0	0.37	153	143	150	163	157
16.0	1.5	0.54	249	233	244	265	255
	2.0	0.69	345	323	338	368	353
	2.5	0.83	431	403	422	459	441
	3.0	0.96	503	470	492	536	514
17.2	2.3	0.84	359	335	351	382	367
18.0	1.0	0.42	136	127	133	145	139
	1.5	0.61	221	207	217	236	226
	2.0	0.79	307	287	300	327	313
	3.0	1.11	447	418	438	476	457
	1.5	0.68	199	186	195	212	204
20.0	2.0	0.89	276	258	270	294	282
	2.5	1.08	345	323	338	368	353
	3.0	1.25	403	376	394	429	411
	4.0	1.57	537	502	525	572	548
	5.0	1.84	671	627	656	715	685
	2.0	0.95	252	236	246	268	257
21.3	2.6	1.20	328	306	320	349	335
	3.2	1.42	403	377	394	429	412

Table continued opposite

Mechanical and physical properties

DMV designation	UNS	Mechanical properties at 20°C (68°F) 1) 2)										Physical properties at 20°C (68°F)													Magnetic permeability 7)	
		Rp 0.2		Rm			Elongation A _{3.5}	Density	Electric resistivity	Coefficient of expansion 6)	Thermal conductivity	Specific heat	Modulus of elasticity			Torsion 20°C										
		min.	ksi	min.	ksi	ksi							ksi	ksi	ksi		ksi	ksi	ksi	ksi						
DMV 304 H	S30400	200	29.0	500	72.0	740	107	45	7.97	40.0	0.29	0.092	0.72	16.5	9.4	15	8.7	500	0.12	200	29	180	26	84	12	A (1.02)
DMV 304 L	S30403	175	25.0	470	68.0	720	104	45	7.97	40.0	0.29	0.092	0.72	16.5	9.4	15	8.7	500	0.12	200	29	180	26	84	12	A (1.02)
DMV 316 L	S31603	190	27.5	490	71.0	720	104	45	7.97	40.0	0.29	0.092	0.75	16.0	9.2	13.6	7.8	500	0.12	200	29	180	26	84	12	A (1.02)
DMV 316 Ti	S31635	205	30.0	515	75.0	780	113	30	7.97	40.0	0.29	0.092	0.80	16.0	9.2	13.5	7.8	500	0.12	200	29	180	26	84	12	A (1.05)
DMV 321	S32100	200	29.0	490	71.0	740	107	40	7.97	40.0	0.29	0.092	0.72	16.5	9.2	15	8.7	500	0.12	200	29	180	26	84	12	A (1.05)

1) All figures are in weight percent. In case of order the limits of the order specification will apply.
2) For calculations according to DIN 2413 the figures for Rp1.0 will apply. These values are available for all grades.

3) 5 d or 5.65 √S.

4) & 5) Factors for definition weight per metre (kg/m) and per foot (lb/ft): $M = \frac{T(D-T)}{K}$
M = weight kg/m or lb/ft, D = outside diameter, T = wall thickness

6) Mean coefficient of expansion 25-100°C (77-212°F).

7) A = non magnetic.

Dimensions & Pressures

Dimensions		Weight kg /m	Working pressure in bar up to 120 °C for				
OD mm	WT mm		DMV 304	DMV 304 L	DMV 316 L	DMV 316 Ti	DMV 321
22.0	1.0	0.52	112	104	109	119	114
	1.5	0.75	181	169	177	193	185
	2.0	0.98	251	235	245	267	256
24.0	4.0	1.97	447	418	438	476	457
	1.5	0.87	159	149	156	170	163
25.0	2.0	1.13	221	206	216	235	226
	2.5	1.38	276	258	270	294	282
	3.0	1.62	331	310	324	353	338
	2.0	1.23	200	186	195	213	204
26.9	2.6	1.55	259	242	254	276	265
	5.0	2.83	479	448	469	510	490
30.0	2.5	1.69	230	215	225	245	235
	3.0	1.99	276	258	270	294	282
	4.0	2.56	368	344	360	392	376
	2.0	1.56	164	153	160	174	167
33.7	3.2	2.40	262	245	256	279	268
	4.0	2.0	1.87	134	125	131	143
42.0	3.0	2.88	192	179	188	204	196
60.3	2.9	4.09	129	121	126	137	132
76.1	2.9	5.22	102	96	100	109	104

According to DIN 2413-1: 1993-10; pipelines under predominately idle stress up to 120 °C design temperature (min. -10 °C); tubes with inspection certificate and diameter ratio OD/D ≤ 2.0; austenite with Rp0.2 ≤ 0.5 Rm and A ≥ 30 %, without additional wall thickness for corrosion / take off; pressure vessel regulations are to be considered. Please note : DIN 2413-1:1993-10 will be substituted by DIRECTIVE 97/23/EC in May 2003.

Equivalent specification, analyses

DMV designation	Nearest equivalent standard					Mean chemical composition 1)				
	UNS	NF	DIN	BS	JIS	C max.	Cr	Ni	Mo	Others
DMV 304 H	S30400	Z 6 CN 18.09	1.4301	304 S 15	SUS 304	0.08	18.5	9.5		
DMV 304 L	S30403	Z 2 CN 18.10	1.4306	304 S 12	SUS 304L	0.03	19.0	11.0		
DMV 316 L	S31603	Z 2 CND 17.12	1.4404	316 S 12	SUS 316L	0.03	17.0	12.0	2.25	
DMV 316 Ti	S31635	Z 2 CND 17.12	1.4571	320 S17		0.08	17.0	11.5	2.25	Ti>5C <0.6%
DMV 321	S32100	Z 6 CNT 18.10	1.4541	321 S 12	SUS 321	0.08	18.5	10.5		Ti>5x C <0.6%

Mechanical properties at elevated temperatures

DMV designation	Rp 0.2 min.										Rm min.									
	100 °C	212 °F	200 °C	392 °F	300 °C	572 °F	400 °C	752 °F	500 °C	932 °F	100 °C	212 °F	200 °C	392 °F	300 °C	572 °F	400 °C	752 °F	500 °C	932 °F
	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi
DMV 304 H	160	23.0	130	19.0	110	16.0	100	14.5	90	13.0	450	65.0	400	58.0	380	55.0	380	55.0	360	52.0
DMV 304 L	150	21.5	120	17.5	100	14.5	90	13.0	80	11.5	410	59.5	360	52.0	340	49.5	340	49.5	320	46.5
DMV 316 L	170	24.5	140	20.5	120	17.5	110	16.0	100	14.5	450	65.0	400	58.0	390	56.5	390	56.5	370	53.5
DMV 316 Ti	190	27.5	165	24.0	145	21.0	135	19.5	130	19.0	470	68.0	450	65.0	435	63.0	430	62.5	410	59.5
DMV 321	180	26.0	160	23.0	140	20.5	125	18.0	120	17.5	460	66.5	410	59.5	390	56.5	390	56.5	370	53.5



DMV Stainless was incorporated in 1994 through the integration of the seamless stainless steel and nickel alloy tubular business of three well-established European corporations from Italy, Germany and France...

Dalmine, Mannesmann and Vallourec.

The objective of this consolidation was to establish the world's most comprehensive and flexible supplier of quality seamless stainless steel and nickel alloy pipes and tubes.

With facilities in France, Germany, Italy and the United States, DMV is in an excellent position to provide customer support on a global basis.

Through the rationalisation and optimization of the plants, techniques, facilities and personnel, DMV STAINLESS has become synonymous with the concept ...

'Diversity is our Strength'.

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