

# Datasheet

## Experience

Fine Tubes has been supplying tubular products to the aviation industry for over 50 years. Starting with stainless steels we have continually expanded our process capability and have developed a unique expertise in processing nickel alloys for high temperature/high strength applications and titanium alloys where a high strength to weight ratio is required. Fine Tubes continues to set new standards in meeting the exacting quality standards of the aerospace industry ensuring that new design concepts today become industry standards tomorrow.



## History and Innovation

Our position in the Aerospace industry is through the culmination of our long-term commitment to development and innovation.

- 1957 Stainless tubing supplied to Vickers Viscount Aircraft
- 1965 AM350 Development for Concorde Programme
- 1982 First EEC producer of Seamless Titanium 3AL/2.5V Hydraulic Tubing
- 1999 Eurofighter (EFA) Titanium Tubing supply for Hydraulic Systems & EJ200
- 2002 Manufacture of seamless Ti 6Al/4V for Hydraulic Control Systems
- 2006 Airbus A380 Ti 3AL/2.5V qualified supplier for 5000PSI Hydraulic systems
- 2010 Development of 40 micron wall hx tubes for engines of the space plane Skylon

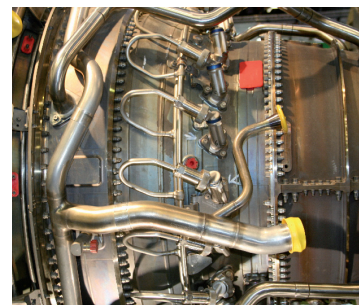
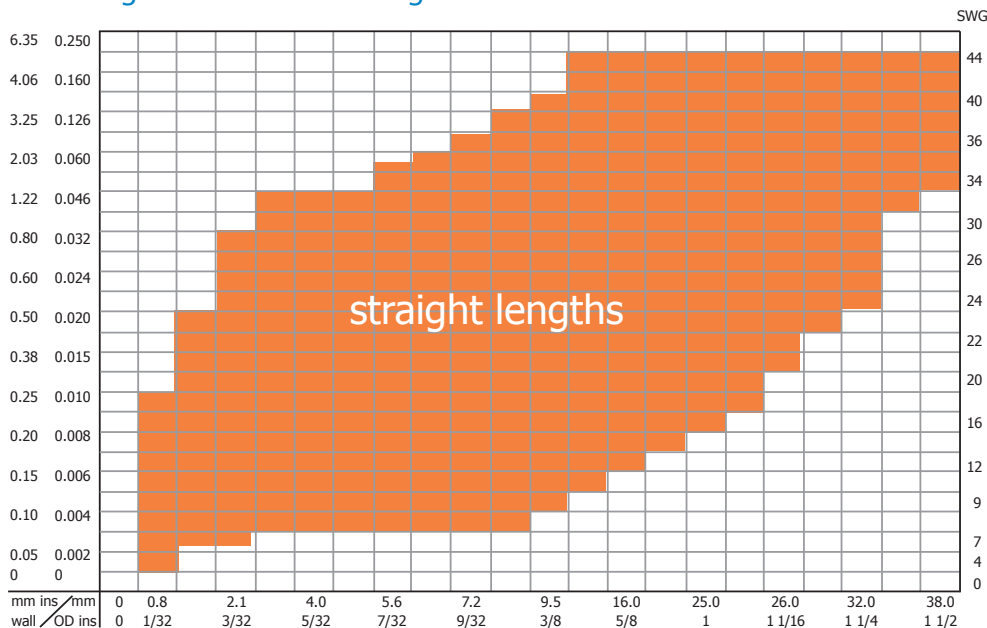


## Applications

- Hydraulic & Pneumatic Control Systems
- Convoluting / Seals
- Cryogenic Heat Exchangers
- Ducting Systems
- Torque Control Rods
- Landing Gear
- Transmission Tubes
- Waveguides
- Fuel Pipes
- Instrumentation



## Size Range for Seamless Tubing



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## Lean Manufacturing

Fine Tubes have embraced the principals of lean manufacturing through a programme originating from the S.M.M.T. and fully implemented by Messier Dowty Ltd (Groupe Safran).

Following on from previous initiatives such as 5-S and TPM our Lean Manufacturing Support Team is challenged with realising cost down objectives using tools such as value stream mapping & SMED. Adding value extends not only to our product engineering but to point-of-use readiness through kitting and J.I.T. type distribution.

## Quality

### Quality Approvals

AS/EN ISO 9100 Rev B	Rolls-Royce SABre
BS/EN ISO 9001:2008	Rolls-Royce Deutschland
Nadcap AS 7102 for Heat Treating	Messier-Dowty PRIDE
Nadcap AS 7114 for Nondestructive Testing	Agusta S.p.A A/316
TÜV Directive 97/23/EC, Annexe 1, Ch. 4.3	Bombardier
SBAC/ASCS TS 157 Iss 5	Westland Sub Teir Supplier
Alrbus UK AUK/SA/30066	

The Quality Assurance system is fully documented in our Q.A. Manual.

### Manufacturing Standards

#### TITANIUM 3AI/2.5V

ABS 5004  
AMS 4943  
AMS 4944  
AMS 4945  
MBBN 6001-4  
MSRR 8673  
ABS 5141

#### TITANIUM 6AI/4V

FT2312 SEAMLESS

#### TITANIUM C.P.

ASTM B338  
BAEM 4044 (SL7)  
MSRR 8609  
AMS 4942

#### STAINLESS STEEL 21-6-9

ASN-A3288/NSA384510  
DAN 41  
SO7-2210  
BACM 157  
AMS 5561  
MSRR 6598  
ABM 7-3058

#### OTHER STAINLESS STEELS

MSRR 6524 347  
BS2T66/T67 347/321  
BST68/T69 347/321  
BST72/T73 347/321  
AMS-T-6845 304  
MIL-T-8808 321/347  
AMS-5566 304  
LN 9398 304/321/347  
AMS-5643 17/4PH  
AMS-5659 15/5PH

#### NICKEL ALLOYS/NIMONICS

MSRR-6513 FV607  
MSRR-7006 NIMONIC 75  
MSRR-7037 C263  
BSHR403 HTA75 (NIMONIC)  
BSHR404 LEGIER. 263  
MSRR6612 FV607  
AMS-5589 718

# Fine Tubes Grade Chart

e114 - aerospace

ALLOY UNS No.	Werkstoff	Chemical Analysis %													Density		Temper		Tensile Rm (min)		Yield Rp 0.2% (min)		Elong. % min	Hardness HV	Application
		C	Mn	Ni	Cr	Fe	Mo	Ti	Nb	N	Al	Other	g/cm <sup>3</sup>	lb/in <sup>3</sup>			ksi	MPa	ksi	MPa					
304L S30403	1.4306	0.035 max	2.0 max	8.0-11.0	18.0-20.0	bal										7.93	0.286	ANN	70	485	25	170	35	200 max	Lower carbon of 304 with good weldability.
	1.4404 1.4435	0.035 max	2.0 max	10.0-13.0	16.0-18.0	bal	2.0-2.5 2.5-3									7.93	0.286	ANN	70	485	25	170	35	200 max	Better corrosion resistance than 304 in chloride Good weldability. 316L with minimum molybdenum content of 2.5%.
321 S32100	1.4541	0.080 max	2.0 max	9.0-12.0	17.0-19.0	bal	5X -0.600									7.93	0.286	ANN	75	515	30	205	35	200 max	Titanium stabilised grade with good weldability, improved resistance to weld decay attack & better mechanical properties at elevated temperatures.
	1.4546	0.080 max	2.0 max	9.0-12.0	17.0-19.0	bal	10XC -1.000									7.93	0.286	ANN	75	515	30	205	35	200 max	As for 321 but uses niobium as stabilising element.
21619 S21900		0.080 max	8.0-10.0	5.5-7.5	19.0-21.5	bal		0.15-0.40								8	0.289	CW	142-162	979-1117	120	827	16	250 min	Good corrosion resistance, high mechanical properties.
	FV607 S64607	0.12-0.16	0.5-1.2	0.4-0.9	10.0-11.7	bal	0.7-1.2	0.35 max								7.7	0.278	HT	130-152	900-1050	107	740	8	290-349	Martensitic grade showing good creep resistance.
174PH S17400	1.4542	0.070 max	2.0 max	3.0-5.0	15.0-17.5	bal		0.15-0.45								7.9	0.286	HT	155	1070	145	1000	5	300 min	Capable of developing high mechanical properties by solution treatment & age hardening.
155PH S15500		0.070 max	1.0 max	3.50-5.5	14.5-15.5	bal		0.15-0.45								7.8	0.282	HT	155	1070	145	1000	12	331-401	Capable of developing high mechanical properties by solution treatment and age hardening.
Alloy 75 N066075	2.4951	0.08-0.15	1.0 max	bal	18.0-21.0	5.0 max	0.20-0.60									8.37	0.303	ANN	100-120	690-830	46	300	30	230 max	High temperature oxidation resistance.
Alloy 263 N07263		0.04-0.08	0.6 Ma	bal	19.0-21.0	0.7 max	5.6-6.1	0.3-0.6								8.36	0.302	HT	140	970	90	620	39	250 min	High creep strength with good weldability.
Alloy 600 N06600	2.4816	0.15 max	1.0 max	72.0 min	14.0-17.0	6.0-10.0										8.42	0.304	ANN	80	550	35	240	30	200 max	Very good combination of strength & oxidation resistance.
Alloy 625 N06625	2.4856	0.10 max	0.5 max	bal	20.0-23.0	5.0 max	8.0-10.0		0.40 max							8.44	0.305	ANN	120	827	60	414	30	260 max	High temperature strength and corrosion resistance.
Alloy 718 N07718	2.4668	0.08 max	0.4 max	50.0-55.0	17.0-21.0	bal	2.80-3.30	0.65-1.15	0.20-0.80							8.19	0.296	HT	185	1275	150	1034	12	331 min	Age hardenable, high strength nickel alloy with good sour well corrosion resistance.
Alloy X750 N07750	2.4669	0.08 max	1.0 max	70.0 min	14.0-17.0	5.0-9.0	2.25-2.75	0.70-1.20	0.40-1.00							8.25	0.298	HT	160	1103	100	689	20	260-360	High temperature strength performance.
MP35N R30035		0.03 max	0.2 max	33.0-37.0	19.0-21.0	1.0 max	9.0-10.5									8.43	0.304	HT	220	1514	200	1380	10	528 max	Nickel cobalt alloy with very high strength, toughness and outstanding corrosion resistance.
CP Grade 2 R50400	3.7035	0.08 max				0.30 max		0.03 max								4.51	0.163	ANN	50	345	40-65	275-450	20		Very high strength to weight ratio combined with excellent seawater corrosion resistance.
Ti 3Al/2.5V Grade 9 R56320	3.7194	0.08 max				0.25 max		0.03 max	2.5-3.50							4.48	0.162	CWSR	125	860	105	725	10		High strength to weight ratio. Excellent corrosion resistance.
Ti 6Al/4V Grade 5 ELI R56401	3.7165								6.0	V 4.0						4.33	0.156	CWSR	159	1100	141	980	8		ELI grade, very high strength to weight ratio.
Ti 425 Ti 4Al/2.5V						1.5			4.0	V 2.5								CWSR	146	1006	129	890	14		Very high strength to weight ratio with improved ductility.

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