

Fume Composition Chart

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IIW/CVIII "health and safety"

Fume composition related to welding process and consumables

This document has been prepared by IIW/CVIII.

This document may be used to identify the key components of welding fume and their percent composition range by weight.

Key components which can affect exposure guidelines for general welding fume are manganese, hexavalent chromium, total chromium, soluble barium and in some cases, nickel.

Process	Filler Metal	Shielding Gases	Components in Consumable	Range of Key Components in Welding Fume Fume Analysis, Wt. (%)										
				Fe	Mn	Si	Na	F	K	Mg	Li	Ni	Cr VI	Cr(total)
Manual	Mild - low alloy steel	NA	Fe, Mn, Si, Na, F, K	12.0 - 62.0	1.0 - 8.0	1.0 - 14.0	6 - 9.0	6 - 21.0	<.01 - 25.0	---	---	---	---	---
	Stainless steel	NA	Fe, Mn, Si, F, K, Ni, Cr	5.0 - 15.0	1.0 - 8.0	2 - 13.0	1.0 - 15.0	8.0 - 23.0	1.0 - 29.0	---	2.0 - 7.0	5 - 6.0	<1.0 - 6.0	4.0 - 12.0
	Nickel - nickel alloy	NA	Fe, Ni, Ba, Cr, Ca, Cu, Si, Sr	1.0 - 9.0	.8 - 3.0	1.0 - 2.0	2.0 - 3.0	4.0 - 15.0	1.0 - 2.0	<.01 - 3.0	---	3.0 - 8.0	14.0 - 38.0	---
	Hardfacing	NA	Fe, Mn, Si, K, F, Cr	2.0 - 57.0	4 - 31.0	1.0 - 6.0	2 - 8.0	2.0 - 15.0	1.0 - 14.0	9 - 5.0	---	---	---	6 - 20.0
Automatic Semi-automatic (flux cored)	Mild - low alloy steel (Self-Shielded)	NA	Fe, Mn, Ba, Si, F, Ca	7.0 - 42.0	5 - 7.0	1 - 8.0	2 - 22.0	4.0 - 24.0	<.01 - 15.0	9 - 28.0	4 - 8.0	.02 - 2.0	Ba(sol) 1.0 - 24.0	Ba(total) 4.0 - 42.0
	Mild - low alloy steel (Gas-Shielded)	CO ₂ 98Ar/2O ₂ 90Ar/10CO ₂ 75Ar/ 25CO ₂	Fe, Mn, Si, F, Na, K, Cr	28.0 - 62.0	5.0 - 18.0	1.0 - 5.0	.3 - 13.0	6 - 17.0	1 - 9.0	<.01 - 4.0	1 - 1.0	---	---	Cr(total) 4 - 2.0
	Hardfacing	NA	Fe, Mn, Si, F, Cr	4.0 - 37.0	1.0 - 38.0	<.01 - 2.0	<.01 - 6.0	1.0 - 18.0	2 - 6.0	6 - 25.0	---	---	Cr VI 4 - 1.0	Cr(total) 5 - 11.0
	Stainless steel (Gas-Shielded)	CO ₂ 75Ar/ 25CO ₂	Fe, Mn, Si, F, K, Cr	12.0 - 19.0	5.0 - 8.0	5.0 - 8.0	5.0 - 12.0	3.0 - 6.0	1.0 - 3.0	<.01 - .04	---	1.0 - 3.0	Cr VI 3 - 2.0	Cr(total) 8.0 - 13.0
Automatic Semi-automatic (solid wire)	Stainless steel (Self-Shielded)	NA	Fe, Mn, Si, F, K, Cr	13.0 Approx.	6.0 Approx.	4.0 Approx.	5.0 Approx.	21.0 Approx.	18.0 Approx.	<.01 - 3.0 Approx.	---	3.0 Approx.	Cr VI 4.0 Approx.	Cr(total) 9.0 Approx.
	Mild - low alloy steel (Wire)	CO ₂ 98Ar/2O ₂ 90Ar/10CO ₂ 75Ar/ 25CO ₂	Fe, Mn, Si, Cu	52.0 - 63.0	4.0 - 12.0	1.0 - 6.0	---	---	---	---	---	---	---	---
	Stainless wire	98Ar/2O ₂	Fe, Mn, Si, Ni, Cr	29.0 - 38.0	7.0 - 12.0	---	---	---	---	---	---	5.0 - 6.0	Cr VI 8 - 2.0	Cr(total) 11.0 - 13.0

Elemental components listed are in the form of oxides.
Fluorine listed is in the form of fluorides

Denotes Possible Exposure Guideline Factor