Gas shielded arc welding

Selected reference tables

Inert gas welding
selected reference tables

At a glance
This summarized compilation of reference tables is intended as an aid to orientation in shielding gas welding. It gives an overview of the wide range of welding inert gases and their areas of application.

The tables can be helpful in the solution of welding problems but you should not miss out on the experience and advice of our welding experts. Special information on our shielding gases is contained in our detailed publications.

For optimum control of profitability in inert gas welding, Messer has developed a welding cost calculation system with computer aided measured value processing. We are happy to place this facility at the disposal of users on request.

Inert gas welding

Tungsten inert gas welding

Non-consumable tungsten electrode

TIG
Tungsten inert gas welding
open arc

Plasma
Plasma-welding
confined arc

Metal inert gas welding

consumable wire electrode

MIG
Metal inert gas welding
Inert gas atmosphere

MAG
Metal active gas welding
CO_2 or O_2
in shielding gas

Shielding gases for welding at a glance

Product designation	Group according as ISO 14175	Composition [%]						Process according as DIN EN 14610
		Ar	He	O_2	CO_2	H_2	N_2	
Welding-Argon 4.6	I1	100						TIG/MIG
Argon Special 4.8	I1	100						TIG/MIG
Helium 4.6	I2		100					TIG/MIG
Aluline He90	I3	10	90					TIG/MIG
Aluline He70	I3	30	70					TIG/MIG
Aluline He50	I3	50	50					TIG/MIG
Aluline He30	I3	70	30					TIG/MIG
Aluline He15	I3	85	15					TIG/MIG
Aluline N	Z	balance					0,015	TIG/MIG
Aluline He15 N	Z	balance	15				0,015	TIG/MIG
Aluline He30 N	Z	balance	30				0,015	TIG/MIG
Aluline He50 N	Z	balance	50				0,015	TIG/MIG
Inoxline H2	R1	98				2		TIG
Inoxline H5	R1	95				5		TIG
Inoxline H7	R1	92,5				7,5		TIG
Inoxline N1	N2	98,75					1,25	TIG
Inoxline N2	N2	97,5					2,5	TIG
Inoxline He15 N1	N2	83,75	15				1,25	TIG
Inoxline He3 H1	R1	95,5	3			1,5		TIG
Inoxline X2	M13	98		2				MAG M
Inoxline C2	M12	97,5			2,5			MAG M
Inoxline C3 X1	M14	96		1	3			MAG M
Inoxline He15 C2	M12	83	15		2			MAG M
Inoxline He30 H2 C	Z	balance	30		0,12	2		MAG M
Ferroline C8	M20	92			8			MAG M
Ferroline C18	M21	82			18			MAG M
Ferroline C25	M21	75			25			MAG
Ferroline X4	M22	96		4				MAG M
Ferroline X8	M22	92		8				MAG M
Ferroline C5 X5	M23	90		5	5			MAG M
Ferroline C6 X1	M24	93		1	6			MAG M
Ferroline C12 X2	M24	86		2	12			MAG M
Ferroline He20 C8	M20	72	20		8			MAG M
carbon dioxide (industrial grade)	C1				100			MAG C
Forming gas (N_2-H_2-mixes)	N5					5-25	95-75	Root protection

Areas of application

Standard shielding gases and their application in TIG welding

Product	Typical Mixes	Group acc. ISO 14175	Application
Welding Argon		I1	High alloy and mild steels, aluminum alloys, other non ferrous metals
Inoxline H	2 % H_2 5 % H_2 7,5 % H_2	R1 R1 R1	Austenitic CrNi steels (5% and 7.5% preferably fully mechanical)
Inoxline N	1,25 % 2,5 % 15 % He,1,25 % N_2	N2 N2 N2	Duplex, super-duplex fully austenitic CrNi steels
Helium 4.6		I2	Aluminum (negative polarity welding) Steels (orbital technique)
Aluline He	15 % He 30 % He 50 % He 70 % He 90 % He	I3 I3 I3 I3 I3	Aluminum, Nickel, Steels (orbital technique), Copper, TIG DC welding (preferably 90% He)
Aluline N	0,015 % N_2	Z	Aluminum + Al - alloys
Aluline He N	15 % He, 0,015 % N_2 30 % He, 0,015 % N_2 50 % He, 0,015 % N_2	Z Z Z	Aluminum + Al - alloys
Argon 4.8		I1	Gas sensitive materials such as titanium, niobium, molybdenum, tantalum, as well as for root protection
Forming gas (N_2-H_2 mixes)	5 % H_2 8 % H_2 12 % H_2 20 % H_2 25 % H_2	N5 N5 N5 N5 N5	Root protection for high alloy and alloyed steels

Standard shielding gases and their application in MIG welding

Product	Typical Mixes	Group acc. ISO 14175	Application
Aluline He	30 % He 50 % He 70 % He	I3 I3 I3	Aluminum, nickel alloys CuNiFe alloys, copper Aluminum materials
Aluline N	0,015 % N_2	Z	Aluminum + Al - alloys
Aluline He 15 N Aluline He 30 N Aluline He 50 N	15 % He, 0,015 % N_2 30 % He, 0,015 % N_2 50 % He, 0,015,% N_2	Z Z Z	Aluminum + Al - alloys
Inoxline He 30 H2 C	30 % He, 2 % H, 0,12 %	Z	Nickel-based materials
Helium 4.6		I2	Copper (if preheating not possible)

Applications for MAG welding

Product families for MAG welding

Product family	Application
Inoxline	high alloy steels, conditionally mild steels
Ferroline	mild steels, conditionally high alloy steels

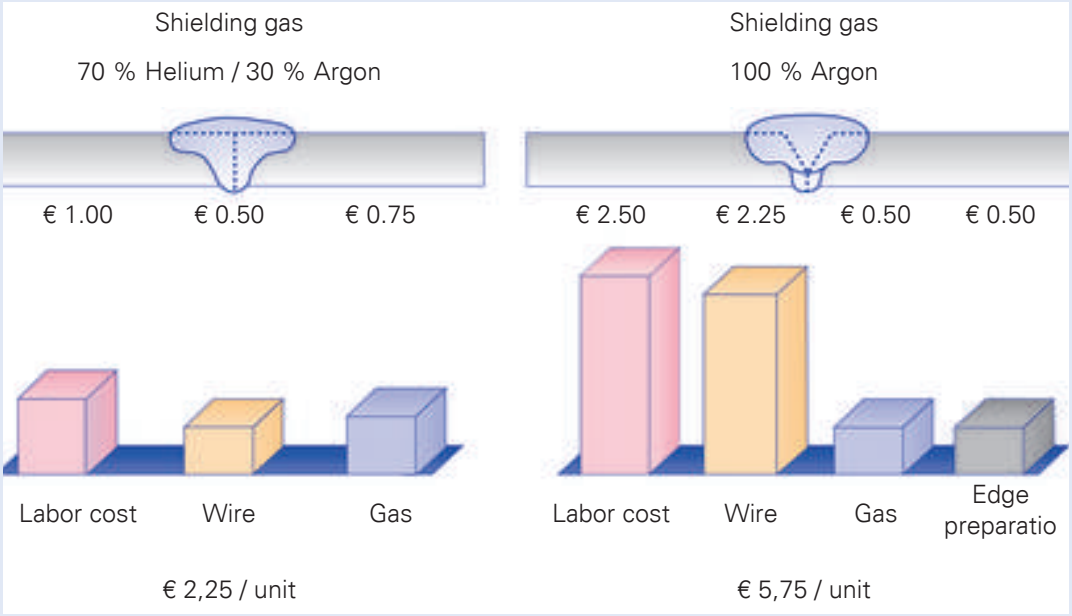
Classification of shielding gases for joint welding and related processes according as DIN EN ISO 14175

short term		Components [%]					
main group	sub group	oxidizing		inert		reductive	low reactive
		CO_2	O_2	Ar	He	H_2	N_2
I	1			100			
	2				100		
	3			Balance	$0,5 \leq He \leq 95$		
M1	1	$0,5 \leq CO_2 \leq 5$		Balance[a]		$0,5 \leq H_2 \leq 5$	
	2	$0,5 \leq CO_2 \leq 5$		Balance[a]			
	3		$0,5 \leq O_2 \leq 3$	Balance[a]			
	4	$0,5 \leq CO_2 \leq 5$	$0,5 \leq O_2 \leq 3$	Balance[a]			
M2	0	$5 < CO_2 \leq 15$		Balance[a]			
	1	$15 < CO_2 \leq 25$		Balance[a]			
	2		$3 < O_2 \leq 10$	Balance[a]			
	3	$0,5 \leq CO_2 \leq 5$	$3 < O_2 \leq 10$	Balance[a]			
	4	$5 < CO_2 \leq 15$	$0,5 \leq O_2 \leq 3$	Balance[a]			
	5	$5 < CO_2 \leq 15$	$3 < O_2 \leq 10$	Balance[a]			
	6	$15 < CO_2 \leq 25$	$0,5 \leq O_2 \leq 3$	Balance[a]			
	7	$15 < CO_2 \leq 25$	$3 < O_2$ 10	Balance[a]			
M3	1	$25 < CO_2 \leq 50$		Balance[a]			
	2		$10 < O_2 \leq 15$	Balance[a]			
	3	$25 < CO_2 \leq 20$	$2 < O_2 \leq 10$	Balance[a]			
	4	$5 < CO_2 \leq 25$	$10 < O_2 \leq 15$	Balance[a]			
	5	$25 < CO_2 \leq 50$	$10 < O_2 \leq 15$	Balance[a]			
C	1	100					
	2	Balance	$0,5 \leq O_2 \leq 30$				
R	1			Balance[a]		$0,5 \leq H_2 \leq 15$	
	2			Balance[a]		$15 < H_2 \leq 50$	
N	1						100
	2			Balance[a]			$0,5 \leq N_2 \leq 5$
	3			Balance[a]			$5 < N_2 \leq 50$
	4			Balance[a]		$0,5 \leq H_2 \leq 10$	$0,5 \leq N_2 \leq 5$
	5					$0,5 \leq H_2 \leq 50$	Balance
O	1		100				
Z	Gas mixtures with components, which are not listed in the table or gas mixtures with a composition out of the specified range. [b]						

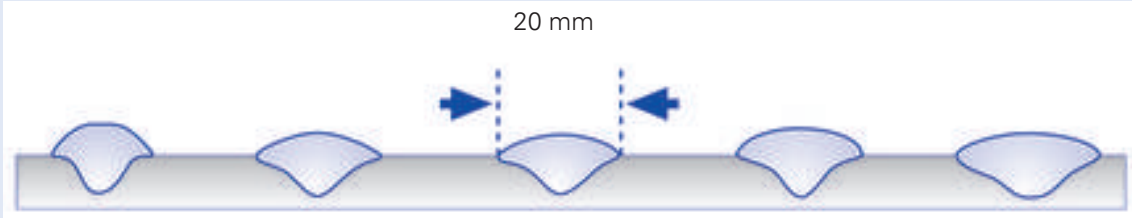
[a] For this classification Argon may be replaced partially or completely with helium.

[b] Two gas mixtures with the same Z-classification must not be replaced against each other.

Cost comparison



Penetration intensification



100 % Argon	70 % Argon 30 % Helium	50 % Argon 50 % Helium	30 % Argon 70 % Helium	100 % Helium

Base material:	Al Mg 4,5 Mn
Welding current:	240 A
Sheet thickness:	20 mm

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