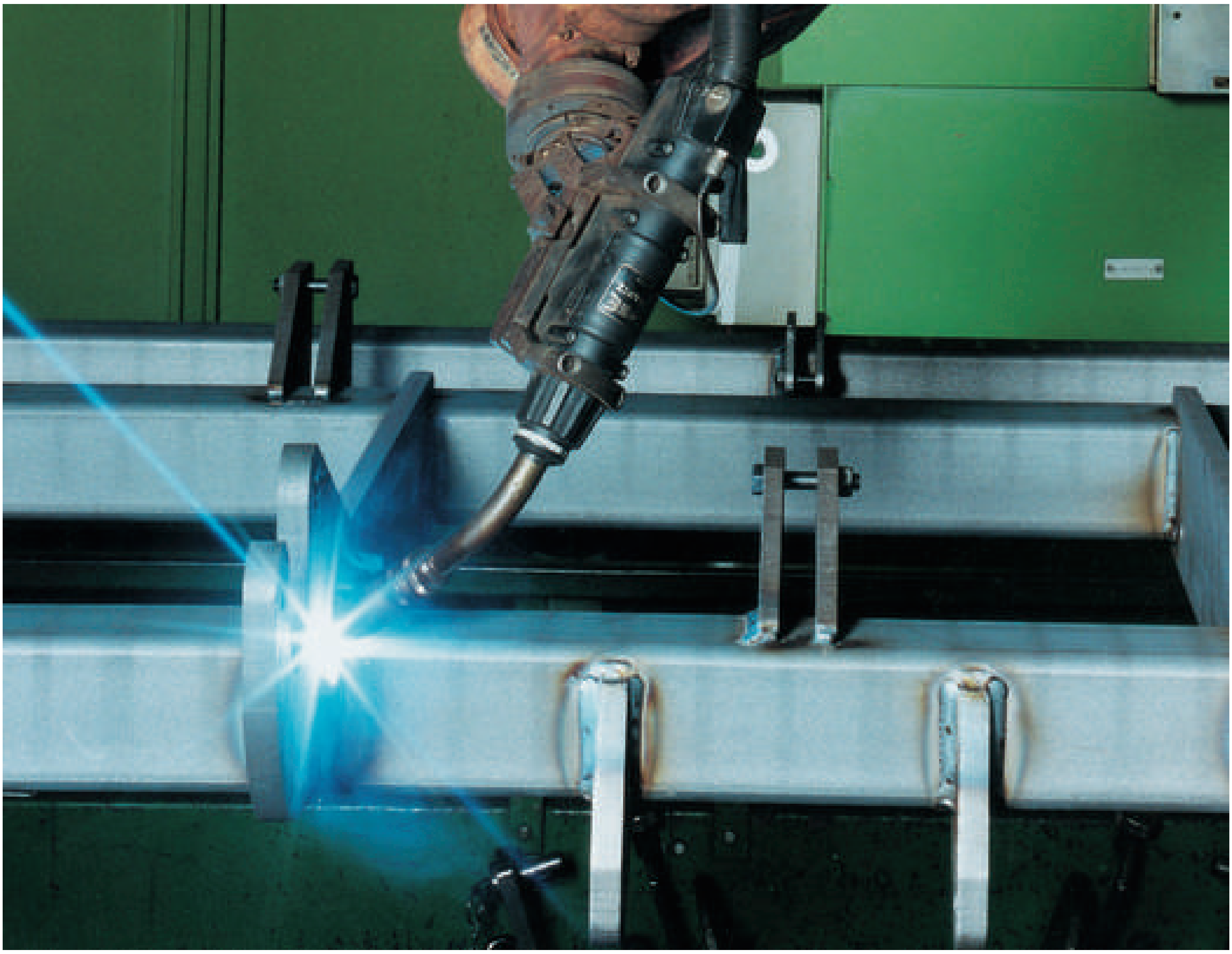
MESSER

MAG welding of unalloyed steels

Process engineering and selection of shielding gases

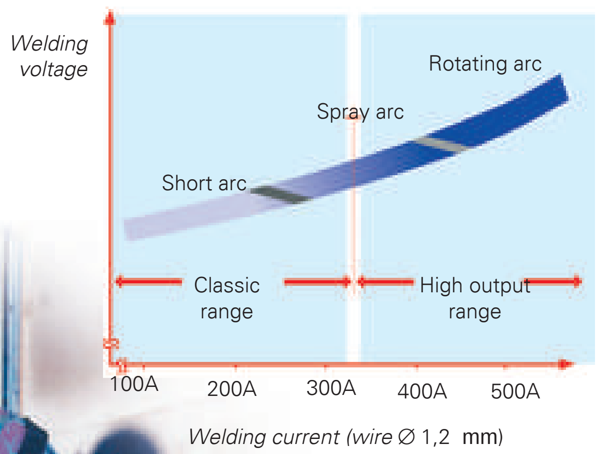


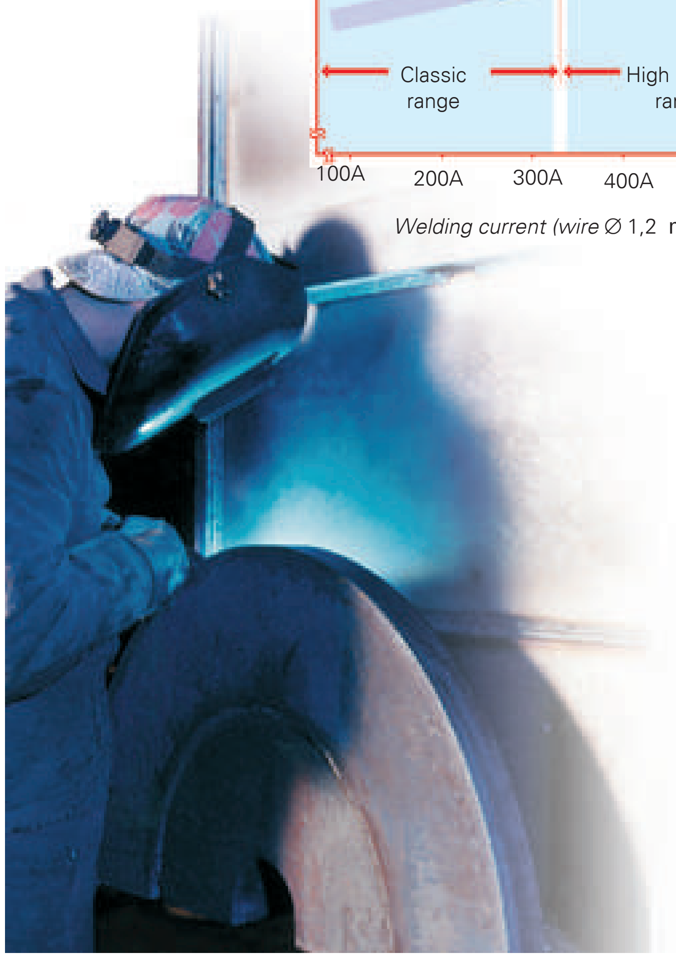
Shielding Gases: Classics and trends

Shielding gases for MAG welding

	Group acc. as ISO 14175	Composition in volume percent			
		Ar	CO_2	O_2	He
Ferroline C8	M20	92	8	-	-
Ferroline C18	M21	82	18	-	-
Ferroline C25	M21	75	25	-	-
Ferroline X4*	M22	96	-	4	-
Ferroline X8*	M22	92	-	8	-
Ferroline C6 X1	M24	93	6	1	-
Ferroline C12 X2	M24	86	12	2	-
Ferroline C5 X5	M23	90	5	5	-
Ferroline He20 C8	M20	72	8	-	20
Carbon dioxide	C1	-	100	-	-

* conditionally suitable for high-alloyed materials, too





A large number of argon mix gases are available for MAG welding. The development of gases is also progressing.

The gas mix classics

Ferroline C18 with 18% CO_2 admixture, Ferroline X8 with 8% oxygen and Ferroline C5 X5 as triple gas mix are proven standard mixes. Oxygen is particularly effective in reducing spatters, while CO_2 can be an advantage for out-of-position welding. In special cases, pure CO_2 is also used, for example with cored wires for out-of-position welding.

Low-activity gases

With Ferroline C8, as with Ferroline X4, the tendency has been turning to low-activity gas. Reduced slag formation and the avoidance of spatters can bring decisive cost advantages.
A positive secondary effect: The mechanical/technological properties of the weld are noticeably improved. This shows the high quality potential of low-activity gases.
C12 X2 and C6 X1 offer the best of both worlds. Here we provide considerably reduced spatter formation and greater suitability out of position welding thanks to the lower O_2 fraction.

High-performance welding

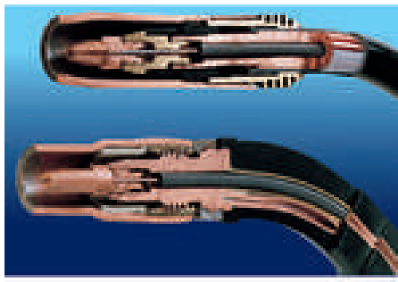
At very high current levels, there is a switch from spray arc to rotating arc. Basically, all argon mix gases are suitable for the rotating arc. The low-activity gas Ferroline X4 renders the switch to rotating arc particularly easy. Helium admixtures, as in TIME gas for example, are used in special cases. These require a higher working voltage.

Process technology in MAG welding

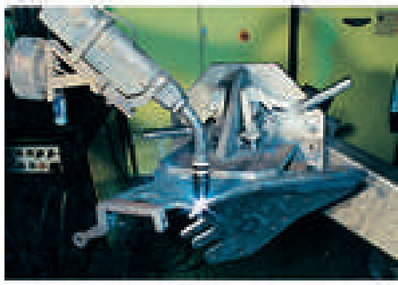
Wire diameter 0.8, 1.0 or 1.2 mm?
Solid wires are predominantly used. Mostly used are 1.0 or 1.2 mm wire electrodes. They permit high melting performances in the normal position and are also suitable for thin sheets and out-of-position welding. Where thin sheets and out-of-position welding predominate, 0.8 and 1.0 mm electrodes, which also have a very high melting performance in normal position, are better. For working exclusively on thin sheets, a 0.8-mm electrode is used. The 1.6-mm electrode is favored for thick sheets in the normal position, but is often being replaced by high performance welding.

What shielding gas quantity is correct?
In the short arc, at 150 A for example, the shielding gas setting is about 12-15 l/min, in the spray arc, at 300 A for example, 15-18 l/min. In the high-output arc above 350 A, this rises to 20-25 l/min. These volumes refer to normal contact tip distances. If the component requires an increased contact tip distance, the gas volumes must be increased accordingly. There must not be too much gas, however, else air is sucked in, leading to porosity. The best regulating characteristics here are provided by cylinder pressure regulators with variable flowmeters (rotameters).

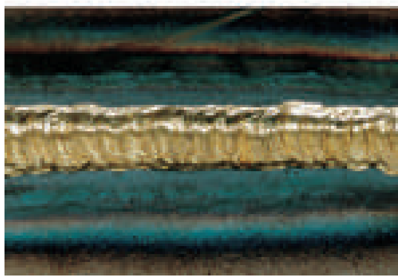
Melting performance – possibilities and limits
MAG welding is today progressing into new performance ranges. 380 A manually and 420 A mechanically are common practice with the 1.2-mm wire electrode and can achieve melting rates of 10 to 12 kg/h. Even higher melt-off performances are reached in the rotating arc range, also known as TIME welding. On a metallurgical basis melting rates of more than 20 kg/h are possible with MAG welding.



The torch: gas or water-cooled?
For exclusive thin sheet working with short duty cycle, i.e. up to the 220-A range, gas-cooled systems are the right choice. At a current of 250 A with the 1.0-mm wire electrode, water cooling is already to be recommended. Water-cooled high-power torches are also considerably lighter and easier to handle than corresponding gas-cooled torches for high output. Furthermore, water cooling always offers a reserve, should the output go higher than planned.

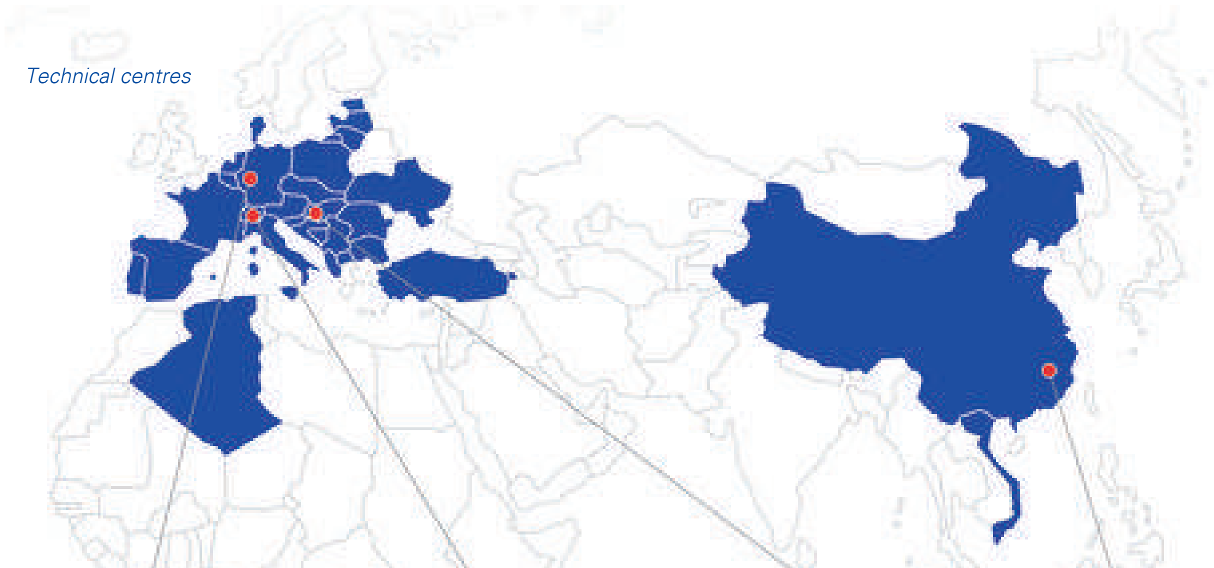


Little slag, no spatters
Clean seams with no reworking, herefore, everything has to be right: High-quality power sources, low-tolerance wires and also, of course, the right adjustment technology. The spatter-prone mixed arc range can be completely avoided by the right choice of wire with the correct diameter. In the case of extreme low-spatter requirements, pulse technology can be used. Low-activity gases offer the best preconditions to minimize slag and spatters.

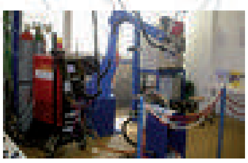


Galvanized sheets: MSG-brazing
Technical advances can throw up new questions. Galvanization, not only in the automobile industry a sign of enhanced quality and long service life, leads, through the vaporization of zinc, to considerable pore formation and spattering during MAG welding. For zinc plating up to 20 µm thick, an alternative here is MSG brazing. A bronze wireelectrode (e.g. CuSi3) is used as filler metal. For typical applications in the thin sheet range will be performed in short arc or pulse arc mode below 100 A. A beneficial side effect: there is no need for regalvanization, as the MSG brazed seam is corrosion resistant.

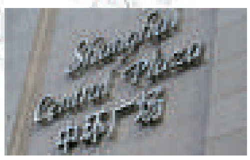
Advice, Delivery, Service




Krefeld


Dällikon


Budapest


Shanghai

Technical centres – sources for innovation
For the development of new technologies in the field of welding and cutting, Messer operates technical centres in Germany, Switzerland, Hungary and China. These facilities provide ideal conditions for innovative projects as well as customer presentations and training courses.

Portfolio of gases – comprehensive and clear
Messer offers a spectrum of gases that extends well beyond the standard fare: it ranges from just the right gas for each application, and clear, application-oriented product designations to the continuous introduction of new gas mixtures designed to address current trends.

Specialised on-site consulting – right where you need it
Specifically in the context of your particular application, we can show you how to optimise the efficiency and quality of your processes. Along with process development, we support you with troubleshooting and process development.

Cost analyses – fast and efficient
We will be glad to analyze your existing processes, develop optimisation proposals, support process modifications and compare the results with the original conditions – because your success is also our success.

Training courses – always up to date
For the optimal handling of our gases, we can train you on processes and how to use them. Our training courses illustrate the use of various shielding gases for welding and explain how to handle them safely. This also includes the storage of the gases and the safe transport of small quantities. Information and training materials for your plant are also part of the service, of course.

You can also download this brochure and many others from the Internet as a PDF file: www.messergroup.com

MESSER

Messer Group GmbH
Gahlingspfad 31
47803 Krefeld
Tel. +49 2151 7811-0
Fax +49 2151 7811-503
welding-technology@messergroup.com
www.messergroup.com

Part of the **Messer** World