

# Ferroline

MAG welding of unalloyed steels



## Shielding Gases: Classics and trends

A large number of argon mix gases are available for MAG welding according to the application. Up-to-date gas mixtures, adjusted to modern requirements through ongoing development, are offered alongside the classics.

### The gas mix classics

Ferroline C18 and Ferroline C8 with 18 % and 8 % CO<sub>2</sub> respectively and Ferroline X4 with 4 % O<sub>2</sub> are tried-and-tested standard gas mixtures. Oxygen is particularly effective in reducing spatters, while CO<sub>2</sub> can be an advantage for out-of-position welding. In special cases, pure CO<sub>2</sub> 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<sub>2</sub> fraction. There is a tendency for emissions of smoke, dust and gases such as carbon monoxide to decrease with the active gas component.

### High-performance welding

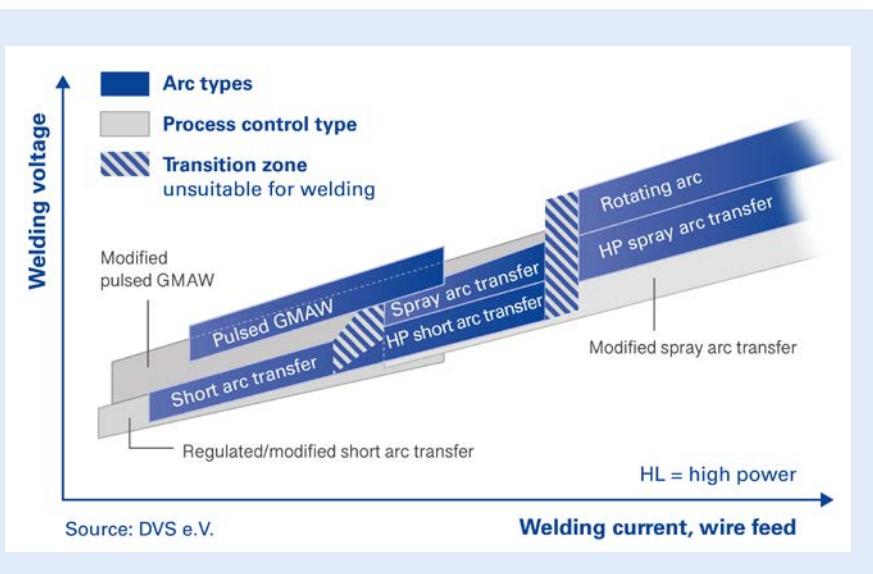
Greater cost effectiveness means higher deposition efficiency and less re-working afterwards. Modern arc controls allow high currents of up to 500A and above with wires of appropriate diameter. Low reactivity shielding gases, such as Ferroline X4, facilitate these welding processes and produce a low-spatter result.



### Shielding gases for MAG welding

	Group acc. as ISO 14175	Composition in volume percent			
		Ar	CO <sub>2</sub>	O <sub>2</sub>	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



### Different types of arc and process control options

Various process control options have recently been introduced for the classic arc types. Qualitative and economic advantages can be achieved just in combination with appropriate shielding gases.

### Process technology in MAG welding

Wire diameter 0.8, 1.0 or 1.2 mm? Solid wires are predominantly used. The mostly used wire electrodes are the 1.0- or 1.2-mm types. They permit high melting performances in the normal position and are also suitable for thin sheets and out-of-position welding. 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?

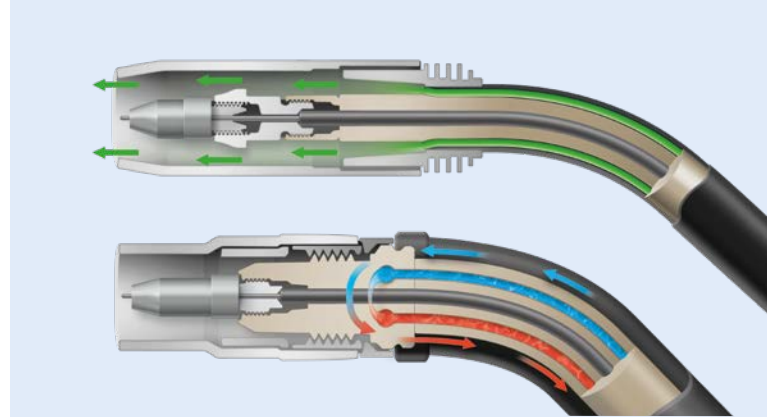
In the short arc, at 150 A for example, the shielding gas setting is about 12-15 l/min, in the spray arc, at 300 A for example, 15-18 l/min. In the high-output arc above 350 A, this rises to 20-25 l/min. This relates to the usual contact tip distances. If the component in question requires a greater contact tip distance, shielding gas flow rates 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

Nowadays, MAG welding is 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. Yet, at a current of 250 A with the 1.0-mm wire electrode, water cooling is to be recommended. Water-cooled high-power torches are also considerably lighter and easier to handle than corresponding gas



MSG burner: gas-cooled (top) and liquid-cooled (bottom)

cooled torches for high output. Furthermore, water cooling always offers a reserve, should the output go higher than planned.

### Less slag, less spatter

Everything must be right to achieve clean welds without re-working: high-quality power source, wires made to tight tolerances and, of course, the right arc parameter settings. 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. This is where we would like to refer to our products Ferroline C12X2 and Ferroline C6X1.

### Galvanized sheets: MSG-brazing

Technical advances can raise 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 wire electrode (e.g., CuSi3 or CuAl8) 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. We ideally recommend Ferroline C2 or Ferroline X1 as a shielding gas. A beneficial side effect: there is no need for regalanization, as the MSG brazed seam is corrosion resistant.



## Advice, Delivery, Service



### Technical centers – sources of innovation

For the development of new technologies in the field of welding and cutting, Messer operates technical centers in Europe, Asia and the Americas. 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.

### Specialized on-site consulting – right where you need it

Specifically, in the context of your particular application, we can show you how to optimize the efficiency and quality of your processes. We support you with troubleshooting and process development.

### Cost analyses – fast and efficient

We will be glad to analyze your existing processes, develop optimization proposals, support process modifications and compare our results with the previous situation – because your success is also our success.

### Training courses – always up to date

Our training courses demonstrate the application of our various shielding gases and outline the safe handling with them. These also include the storage of the gases as well as the safe transport of small quantities. Information and training material for your company also belong to this service. We offer regular webinars on the usage of our products.



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