Consumables for repair and maintenance welding
We have chosen ESAB as our supplier!

"Skanska Dredging AB is a company whose equipment is used in extremely gruelling conditions worldwide and subjected to many different kinds of wear and tear. To minimise downtime-related costs and reduce the scrapping of components, we currently maintain our equipment continuously.

We have chosen ESAB as our supplier because it has a wide range of both consumables and machines that match our requirements. We also receive technical support and swift assistance in emergencies.

The last of these factors is especially important as far as we are concerned."

Cornelius Quist
Workshop manager
Skanska Dredging AB, Sweden.
The right consumable for repair and maintenance welding produces the best results

ESAB is the world’s leading producer of welding consumables, welding and cutting machines and equipment and accessories for improving the working environment in connection with welding and cutting. We run operations in virtually every part of the world and have production facilities on every continent. In addition, we have more than 90 years’ experience of the industry.

We offer an extensive programme of consumables for repair and maintenance welding for most materials and welding methods. This folder presents some of the key products.

For more detailed product information, please consult ESAB’s Repair and Maintenance Welding Handbook.

Key products

Gouging, cutting and piercing OK 21.03

Dissimilar and difficult to weld steels, buffer layers

OK 68.82
OK Autrod 16.75
OK 67.45
OK Tubrodur 14.71

Rebuilding OK 83.28
OK Tubrodur 15.43

Hardfacing OK 84.58
OK Tubrodur 15.52
OK 84.78
OK Tubrodur 14.70

Cast iron OK 92.18
OK 92.60
OK Tubrodur 15.66

Bronzes OK 94.25
OK Autrod 19.40

Manganese steel OK 86.08
OK Tubrodur 15.60

Aluminium OK 96.50
OK Autrod 18.05
Gouging, cutting and piercing

Carbon-arc gouging is often used for joint preparation, root gouging or removing defects. This can also be successfully carried out without gas or compressed air and without using special equipment as the same electrode holder/equipment is used as in normal welding.

**OK 21.03**
A special electrode designed for arc gouging, cutting and piercing carbon steel, stainless steel, manganese steel, cast iron and other metals, apart from pure copper. The joint surfaces are very smooth and subsequent post-grinding is usually unnecessary. Stainless and manganese steels will require some light grinding.

OK 21.03 is ideal for cast iron as it dries up and burns off impurities, as well as graphite, from the joint surfaces, which could otherwise cause cracks or pores during welding.

---

**Dissimilar and difficult to weld steels, buffer layers**

Repair and maintenance welding sometimes involves the joining of dissimilar steel to one another such as stainless steel to an unalloyed or low-alloy steel. In addition, there are many kinds of steel which are regarded as difficult to weld; they include steel with a high carbon content, high strength steel and tool steel. Steel with an unknown composition is also included in this group. On many occasions, preheating is also difficult.

To obtain good results in all these situations, overalloyed consumables, so-called austenitic consumables, should be used for welding. They withstand large-scale dilution, they are ductile and they are also highly crack-resistant. They are also used as buffer layers when hardfacing to prevent flaking and cracking in the base material.

**OK 68.82**
An overalloyed handwelding electrode with high strength, which is ductile and crack-resistant when it comes to welding joints in materials that are difficult to weld, in dissimilar material joints and for buffer layers. It can be welded without preheating, but preheating at 150-200°C is recommended for steels with a high carbon equivalent. Ideal for welding joints between stainless and unalloyed/low-alloy steels and other high-alloy steels.

If the material is unknown, OK 68.82 is the right choice. OK 68.82 is a problem-solver.

**OK Autrod 16.75**
A solid wire for MIG welding with material properties and applications corresponding to those of OK 68.82.

**OK 67.45**
An incredibly crack-resistant electrode which is ideal for materials that are difficult to weld as a result of its fine ductility and ability to tolerate impurities without cracking. OK 67.45 is a good choice if you are looking for ductility rather than strength. It is also ideal for welding manganese steel and HARDOX steel.

This electrode is also excellent for positional welding.

**OK Tubrodur 14.71**
A continuous self-shielding flux-cored wire with material properties and applications corresponding to those of OK 67.45. As this wire is of the so-called self-shielding type, it is also ideal for outdoor work. OK Tubrodur 14.71 can also be used for submerged arc welding.
Rebuilding

Worn down parts can easily be returned to their original condition using rebuilding. During the subsequent hardfacing, it is also advantageous to build up the surface with a softer material, a buffer layer as hardfaced weld metals should not normally be welded in more than three layers because of the risk of flaking and cracking.

These rebuilt weld metals, should be able to withstand impact and resist moderate abrasion. Moreover, it should be possible to weld them in many layers without causing problems like cracking. Suitable consumables are types that produce weld metals of moderate hardness. This type of weld metal is also used against metal-to-metal wear.

**OK 83.28**
An electrode designed for the rebuilding of wheel gauges and axles but also as the buffer layer prior to hardfacing.

The beads have a fine surface finish and can easily be widened by oscillating the electrode. This electrode is ideal for positional welding. The slag comes off easily, thereby making it easy to maintain the correct working temperature while welding. Weld metal hardness is about 30 HRC, making it easy to machine.

**OK Tubrodur 15.43**
A continuous self-shielding flux-cored wire with material properties and applications corresponding to those of OK 83.28. It is welded without shielding gas. Produces very uniform, fine beads, which means that a minimum of subsequent machining is required. Easy slag removal means that it is also extremely useful for mechanised welding.

Hardfacing

Hardfacing can significantly extend the service life of parts which are exposed to wear.

To choose the correct consumable for hardfacing, it is important to know the kind of wear to which the part has been subjected. However, wear is usually made up of different types and the choice therefore has to be some form of compromise. The choice of consumable should nonetheless be based on the dominant kind of wear. The following products have been chosen for the combination of impact and abrasion and for extreme abrasion.

**OK 84.58**
An electrode for hardfacing steel and 14% manganese steel to resist the combination of abrasion and impact, in applications such as crushing hammers, buckets and the teeth of excavator buckets. The weld metal is highly crack-resistant and can be welded in several layers without any risk of cracking. It has a uniform hardness of 55-58HRC in both single- and multi-layer beads. The weld metal can only be ground.

**OK Tubrodur 15.52**
A continuous flux-cored wire with material properties and applications corresponding to those of OK 84.58. It can be welded with or without shielding gas. OK Tubrodur 15.52 is also used for submerged arc welding, in combination with OK Flux 10.71.

**OK 84.78**
An electrode for hardfacing steel and 14% manganese steel which has been subjected to extreme abrasion in applications including the cement industry, brickworks, dredgers and earth movers.

The weld metal, which is rich in carbide, should not be welded in more than three layers and has a hardness of 59-63HRC. The high alloy content enables it to retain is resilience, even after long-term use at high temperature. The weld metal can only be ground.

**OK Tubrodur 14.70**
A continuous flux-cored wire which is welded without shielding gas. Its material properties and applications correspond to those of OK 84.78.
Cast iron

There are many different grades of cast iron and welding cast iron is completely different from welding steel. Some grades are easier to weld, some are more complicated, while others are impossible. One example of the impossible type is white cast iron.

Using the right technique and the right consumable, it is possible to produce ductile, crack-resistant welds. Cast iron is welded in conjunction with production welding and repair welding and the most frequently-used types of consumable are pure nickel and nickel-iron alloys.

OK 92.18
A nickel electrode for welding grey iron, nodular iron and malleable castings. It is suitable for smaller material thicknesses and when strength requirements are not paramount. The weld metal is extremely ductile and soft. It is easy to machine.

Typical applications include repairing casting defects in pump housings and engine blocks, repairing cracks and coating sliding surfaces and the surfaces of bearings.

OK 92.60
An iron-nickel electrode which has been specially developed to withstand high currents.

The strength of the weld metal is higher than that of OK 92.18 and the weld metal is used in joints that are subjected to heavy stress. This electrode is suitable for welding most kinds of cast iron, for welding cast iron to unalloyed steel, for stainless steel and multi-layer welding. It also withstands the dilution of phosphorus and sulphur more effectively than OK 92.18. The weld metal can be machined.

OK Tubrodur 15.66
A continuous flux-cored wire, MIG welding, with material properties and applications corresponding to those of OK 92.60.

It is welded with Ar+2%O₂. In the case of minor repairs, it can also be used for TIG welding.

Bronzes

Copper is a soft material, but when it is alloyed with silicon, tin or aluminium, for example, it is possible to obtain alloys, otherwise known as bronzes.

They play an important role as they are able to withstand corrosion, erosion, cavitation and metal-to-metal wear.

Most of these alloys can be used for hardfacing or joining.

OK 94.25
An electrode for joining and hardfacing copper and copper alloys, primarily of the tin-bronze type. It is also suitable for welding joints between steel, cast iron and nickel alloys. The weld metal has good strength with good elongation, as well as fine corrosion properties in salt water, for example.

OK Autrod 19.40
An aluminium-bronze electrode for MIG welding of materials of the same type. Ar or a mixture of Ar and He should be used as the shielding gas. The weld metal is ideal for metal-to-metal wear. Coating bearing surfaces is one example. Its corrosion properties in salt water make it suitable for repairing propellers, for example. For TIG welding OK Tigrod 19.40.
Manganese steel

Steel and weld metal made of manganese steel, the most common being 11-14% manganese, are fairly soft as untreated materials, but they have a tendency to cold-harden if they are worked using heavy impact and/or pressure. This makes them ideal for use as wear parts in crushers and within the mining industry. The steel wears, however and repairs normally involve repairing cracks and fractures and resurfacing worn surfaces. The second of these types of repair is usually combined with a layer of hardsurfacing weld metal. These repairs are usually performed using consumables of the same type, but so-called austenitic stainless consumables can also be used.

OK 86.08
This is the classical 14% manganese steel electrode. The hardness of the weld metal is around 190HB. The hardness and wear resistance increase as the level of cold working increases. The maximum hardness is approximately 45HRC.

This electrode is ideal for positional welding. Applications include the repair of casting defects in manganese steel, wear plates, crusher plates and crushing hammers.

OK Tubrodur 15.60
A continuous self-shielding flux-cored wire. Its material properties and applications correspond to those of OK 86.08.

Aluminium

The main reasons why aluminium alloys have become increasingly important as a structural material include their light weight and good strength properties, plus the fact that most alloys can be welded. The fusion welding methods that are used most are TIG welding and MIG welding, but, when it comes to repairs and maintenance, the advantages offered by handwelding electrodes are also utilised.

The principal rule is that the consumable should have the same composition as the base material.

OK 96.50
A silicon-alloyed aluminium electrode for handwelding cast so-called silumin alloys of the 12% silicon type. It is used to repair engine blocks, cylinder heads, fans and fittings. The weld metal changes colour in conjunction with anodising. The electrode is supplied in a VACPAC™.

OK Autrod 18.05
An aluminium wire corresponding to OK 96.50 for MIG welding. This wire produces an even, fine surface finish and an extremely crack-resistant weld metal.

The weld metal changes colour in conjunction with anodising. When used for TIG welding, the product is known as OK Tigrod 18.05.
Handbook for Repair and Maintenance Welding
We have a detailed user's handbook in which we describe repair and maintenance welding and the products that are used.