ZEROMAG News

Zeromag - variants and deployment options

Zeromag is the demagnetizer of choice for companies worldwide whether welding pipes, plates, girders or pressure vessels. It's invaluable in many industries including oil & gas, power generation, nuclear and smelting. The equipment is simple to use and provides complete control over magnetism in the material overcoming magnetic arc blow in even complex geometries. As no 2 jobs are the same Diverse offer 3 Zeromag variants and 4 different deployment options:

Zeromag variants

1.Zeromag ZM100A. This is our day to day workhorse that can be used in 90% of applications. Supplied as a complete kit (Demagnetisers kit for pipe/plate welders, DKPW) it can take care of magnetism problems with maximum flexibility and is the preferred choice for many pipeline and welding companies.

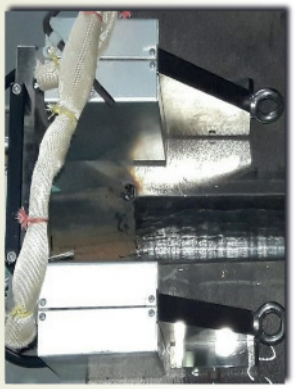
2.Zeromag ZM100A-33. The -33 variant provides 3kW demagnetising power (twice that of the standard ZM100A product) and can drive up to 200m of demagnetising cable. This product is suitable for large pipes or smelting environments.

3.Zeromag ZM50. Provides the same 1.5kW capability are the ZM100A but is housed in a stainless steel pod suitable for subsea habitat deployment.

Deployment options:

1.Freeform cable. Here, 100m demag cable - supplied in two 50m lengths, is used to wind the demag cable flexibly over a wide variety of pipe and plate applications.

2.Clam coils. Used for step and repeat production scenarios these are pipe size specific. Typically used in pairs, one either side of the weld prep, they are fast to deploy and remove, each adding 25 demagnetising turns to the pipe. Although designed for a particular pipe size they can be used on smaller pipes or connected together for larger pipes.



3. Zerozone. This unique attachment facilitates high speed deployment of Zeromag on plates or pipes of any size. Rather than wind demagnetising cable around the components this magnetically efficient design couples the demagnetising power of Zeromag directly into the steel; no winding is required. It gives excellent magnetic coupling in weld preps where cable is very difficult or impossible to deploy. Zerozone has proved invaluable with Zeromag for demagnetising on girders, pressure vessels and large drill components. Examples of project include: facilitating welding of pipes to large pressure vessels, construction of large drills for exploration; and girder and general repair work in a smelter.

4.Bobbins. There are 2 bobbin options, either wooden bobbins pre-wound with up to 100m of cable or aluminium split bobbins that can be wound with the freeform cable and easily removed from the pipe after the welding is completed.

In this issue

Zeromag goes subsea - again

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The standard Zeromag ZM100A has over the years been used in many different industrial applications from pipes to plates from China to America. Although not hyperbaric, it has been used in sub-sea habitats. Previously, at the request of a customer who is a leading sub-sea operator, Diverse have developed a version of Zeromag, the ZM50, designed specifically for sub-sea operation. This new version of Zeromag was integrated into the structure of the habitat vessel. Following the success of the ZM50 further units have been supplied to a customer.

The ZM50 unit is a completely reformatted and redesigned version of the ZM100A to allow it to be packaged in a cylinder which can be sealed in one of the working pods of the sub-sea habitat. The unit is constructed using stainless steel and even with this steel construction the weight has been kept to a reasonable 30Kg.

Although not a stock item, the ZM50 was built to order in about 8 weeks. The ZM50 is supplied as standard with either 50A operating or, with the addition of a second power unit, this can be boosted to 100A matching the performance of the standard Zeromag.

Underwater welding in the wet has made it possible to repair underwater heavy structures such as oil rigs, pipelines and ship plate that cannot be transported to land, to weld in air. This is a difficult process because of low visibility for the welder to see what he is doing and, during the process, the arc and base metal are surrounded by water that can result in quenching of hot material resulting in poor mechanical weld strength and porosity. For pipelines the work is undertaken in a pressurised habitat allowing the welders to work outside the water. All the usual problems of magnetism are the same in or out of the water. If it is an older structure for example an oil rig or exiting pipeline, because these structures have often been left in a single orientation over extended periods, the ferrous parts can become highly magnetised by the earth's magnetic field.

As discussed in our leading article, ZeroZone is now available and this too can be used sub-sea - even with wet welding. In this case the Zeromag can be sited in a habitat or topside and ZeroZone and the Zeromag probe used by the diver in the water. Its operation in this mode requires some small changes to the standard setup: the connectors to the cables to Zeromag need to be sealed from the water (this can be done with a simple grease on the electrical parts and sealing tape); a special version of the Zeromag probe is required sealed for subsea operation. With this arrangement ZeroZone can be used at depths of up to 50m (150 feet).

Applications: Zeromag

Zeromag is a general purpose tool that can be used to null magnetic field or degauss components to allow zero magnetic field and uninterrupted welding.

With such a versatile tool, there are many different ways of conducting any job, and Diverse are routinely called to solve arc blow problems around the world. This note describes the methodology used:

Firstly there is a need to understand the magnitude of problem and to do this we use the Magmeter to do a magnetic site survey. Taking readings in the weld prep gives a good idea of the magnitude of the problem, but by also taking readings on components before fit up allows you to identify which one has the magnetism problem.

Remember that the field reading that you get at the edge of a component is the field in air - in the material the field will be several hundred times higher - so a net reading of 3 gauss in air may indicate a field of several hundred gauss in the component. (Diverse have an instrument that allows measurement of the field in the material, the MF300B+).

Knowing which component has the high field allows deployment of Zeromag preferentially on the magnetized part.

Next we need to decide how to deploy the demagnetising cables. For pipe butt welds there is the choice of coils one side or the other or both. We have found that the most efficient deployment is to have coils on both sides. However there are scenarios where deployment on one side is preferred: for tie-Ins and seabed oil christmas trees the best place for the coils is on the pipe side.

The demagnetising coils can be placed some distance away from the weld prep. - typically 0.5m back from the weld prep This is because the magnetic flux stays preferentially in the steel components. This has the advantage that minimal weld splatter falls on the cables.

The next part of the process is to decide which technique to use to defeat the magnetism. Using Zeromag manual mode and adjusting the demagnetising current to null the field is always successful and is simple. It is always a good starting point! Once you know that this works then auto mode can be used. In production setups with robot welders it is usual to fix the Zeromag probe to a bracket on the torch carrier with the probe running about 50mm ahead of the weld position. In this way the probe is kept in the right position relative to the torch. Remember if the probe is used near the arc or on preheated pipes then the probe must be used with the pressurised air or inert gas feed to keep the sensor cool.

Joint and pipe end degauss is another popular pipe application, requiring the clam coil and ZM150 Zeromag options. For smaller pipes using 2, 25 way clam coils on either side of the weld prep or over the joint, the zone where welding is to be conducted can be degaussed (removing the magnetism) such that once completed the equipment can be simply disconnected and welding conducted without Zeromag in place. If the magnetism returns then the process can be repeated.

Working with butt joints of construction beams is very similar to pipes with the demagnetising coils wrapped around the component parts. However there are projects where the component parts are too large for demagnetising coil wrapping, for example ship plate or LPG tanks. In this case there are 2 options, lay on coils or ZeroZone (see page 1). Lay on coils are deployed as lozenge shaped coils either side of the weld prep but in this case the coils need to be quite close to the weld line, say 50mm and will therefore need some protection. Additionally this is magnetically not so efficient so expect to need to run at rather higher currents for field nulling.

We hope that you found some of the points in this short application note helpful; we are always pleased to discuss specific jobs and applications with Zeromag users.

Ferrite meter - new probe option & improved F% estimate

Diverse's Ferrite meter now has a smaller probe option. One of the key advantages of MF300Fe+ is that the volume of material measured by the

probe is sufficiently large that statistical analysis of Ferrite number (FN) or Ferrite percentage (F%) measurements is not required. The volume being probed is sufficiently large that individual grains are averaged by the measurement giving an instrument that is easy to use without the need for extensive training.

The P10 standard probe has a sensing area 10 mm in diameter and probes to a depth of 1-2 mm. For measurement on hot samples an air cooled version option of the standard probe is available (P10ac).

The standard probe is suitable for many applications but for smaller measurement areas the new P46 probe is a better option. While the P10 could be used on such smaller welds, the resulting measurement would be a combination of the weld ferricity and the ferricity of the pipe/plate

material. The new P46 probe has an active area of 4x6mm allowing measurements on weld widths as small as 4mm. This probe has a new design of robust metal probe end and has a sprung loaded sleeve to minimise tip wear.

Ferrite Percentage

Calibration and verification of ferrite meters is carried out using ferrite number (FN) standards. The MF300Fe+ is calibrated using 16 Secondary Ferrite Number Standards supplied by the National Institute of Standards and Technology (NIST) in the USA. These standards range from 0.5 FN to 111.9 FN.

In practice, many users are interested in percentage ferrite but no calibration standards exist as the F% depends on a number of factors including, details of the stainless steel microstructure and the measurement technique used. An approximation is to assume the F% is 0.7 of the FN, this is particularly good at higher F%. The latest Ferrite Meter software uses a complex transfer curve to convert measured FN to F%.

The MF300Fe+ is supplied fully calibrated with choice of probe and 5 transfer calibration standards. The transfer standards range from ~3 FN to ~115 FN. MF300Fe+ is a stock item available for immediate delivery world wide.

DIVERSE
Zeromag House,
46-48 Whittlesford Road, Shelford,
Cambridge, UK CB22 5EW
Tel: +44 (0)1223 84 44 44
Sales@diverse-technologies.net