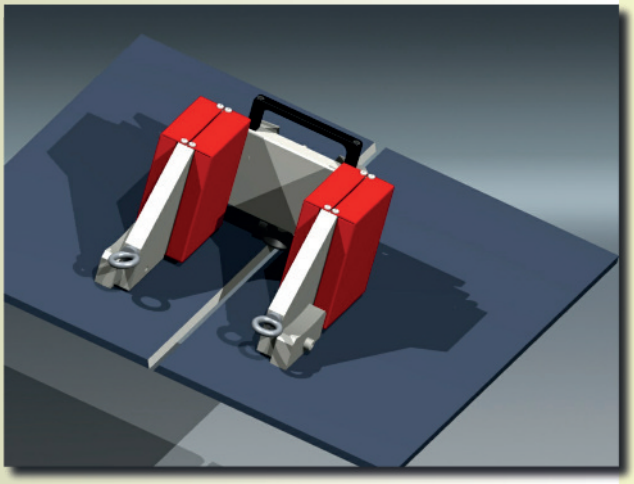
ZEROMAG News

ZeroZone - Zeromag zone accessory

When working with plate or pipes, the demagnetisation process requires that the magnetic field is controlled via the demagnetising cables. This works well when the object can be coiled around with the cables but for large diameters or plate applications lay on coils are used.



For high fields the most efficient way to null the magnetic field is to use ZeroZone. This is pre-wound with 40 turns and provides a magnetic bridge across the weld prep to allow control of the magnetism.

In operation, ZeroZone is placed across the weld prep. The arms and pole pieces are adjusted so that the active area of the pole pieces are in close contact with both sides of the work piece. ZeroZone is then connected back to Zeromag and the system powered on. All the normal modes of Zeromag are available.

Once the magnetism is nulled, welding can commence within the jaws of ZeroZone, and as the weld advances, ZeroZone can be moved to track the torch or welding halted to allow ZeroZone to be moved. The technique used depends on the application. See sub-sea article for under water application.

Zeromag: Smelter work

Recently, Diverse have supplied Zeromag systems to a number of aluminium smelters around the world. These have be used to repair steelwork in the smelter plant that has become magnetized by the induced magnetic field arising from the very high bar bar currents, typically 400KA.

In one case we provided the required product support by guiding the customer's team via Skype meetings. This allowed for truly interactive assistance for very low cost.

In another case one of our team was seconded on-site with the customer and worked with the team to complete a complex welding job. This involved removing magnetic fields of over 800 Gauss working several meters up on the crane gantry.

Zeromag is an excellent tool for removing magnetism induced in steel parts in smelters. Its highly efficient DC field operation means that it is able to null high fields that could never be addressed by AC demagnetisers.

Diverse worked with Rio Tinto on ZeroB, a system to allow welding on busbars. Trial work was carried out in a number of smelters, and it was found that ZeroB worked very well for repairs to bus bars where the field was predictable and the weld pool was not bridging high currents. A very successful project was carried out on a smelter in Bahrain to repair cracks in the power supply busbars.

We continue to have an interest in welding busbars in smelters and would be pleased to discuss specific applications with interested smelters.

Zeromag goes subsea

www.diverse-technologies.net

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 habitats sub-sea. 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 is to be integrated into the structure of the habitat vessel.

The new unit is completely reformatted and redesigned 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.

For this customer speed was of the essence and the time taken to complete the new design and manufacture the first unit was only 10 weeks. The work included new packaging, systems modelling, design and manufacture all completed on schedule. Although we were able to take advantage of some of the design ideas in the standard product, major changes were required in the controller, power unit and packaging.

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. All the usual problems of magnetism remain and indeed, because these structures have often been left in a single orientation over extended periods, the ferrous parts become 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 - with wet welding. In this case the Zeromag is sited 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 40m (130 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. 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 updates - extended memory & user calibration

User calibration has been just one of a number of recent improvements and updates to the MF300Fe+ ferrite meter.

The ferrite level is important to assure minimum exposure to solidification cracking when depositing austenitic stainless steel weld metal. A lower ferrite number is better for corrosion resistance, while balancing higher ferrite content to avoid solidification cracking in the weld deposit. Low ferrite numbers are less important for applications such as cladding where no cracking is observed. Testing for ferrite number can be achieved using the MF300Fe+ and crack testing can be done using liquid penetration verification.

An important update to the Diverse Ferrite meter is the user calibration mode. The concept of user calibration is that small changes in the scale calibration of the instrument can be trimmed by the user using one of the supplied transfer standards. This technique provides confidence in the performance of the instrument and maximises the time between repeat factory calibrations. For example, over time wear occurs where the ferrite meter probe is brought into contact with the sample. This causes small changes in the magnetic response of the probe. This effect can be mitigated with a user calibration on the 'T0' transfer standard: one of the 5 transfer calibration samples supplied with the instrument.

Following requests from our users we have extended the memory storage facilities in the new MF300Fe+. The number of records is significantly increased to 1000 (previously 52), and with each record is stored a user identification (ID) along with the record number. This allows either identification of measurements taken in the field, or IDs can be downloaded direct to the MF300Fe+ for the user to use during data collection. The user identification is a four character field with characters from the ranges 0-9 and A-Z and space.

The PC software to communicate with the instrument has been enhanced to include the extended memory and IDs. With the larger memory communications speeds have been doubled to allow swift uploads and downloads.

These new facilities allow different ways of working with the Ferrite meter, most notably the IDs which can be used to identify measurement sites or a combination of sites . One application is repeated measurements at the same measurement site, e.g. if the site ID is "ABC", then ABC0, ABC1 … ABC9 could be used to identify 10 samples taken at the same point. Once this data is downloaded a simple spreadsheet application can be used to evaluate the mean and standard deviation of that site measurements.

This extended records feature ensures that a days worth of site surveying can be undertaken without the need to return to the office to download results.

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