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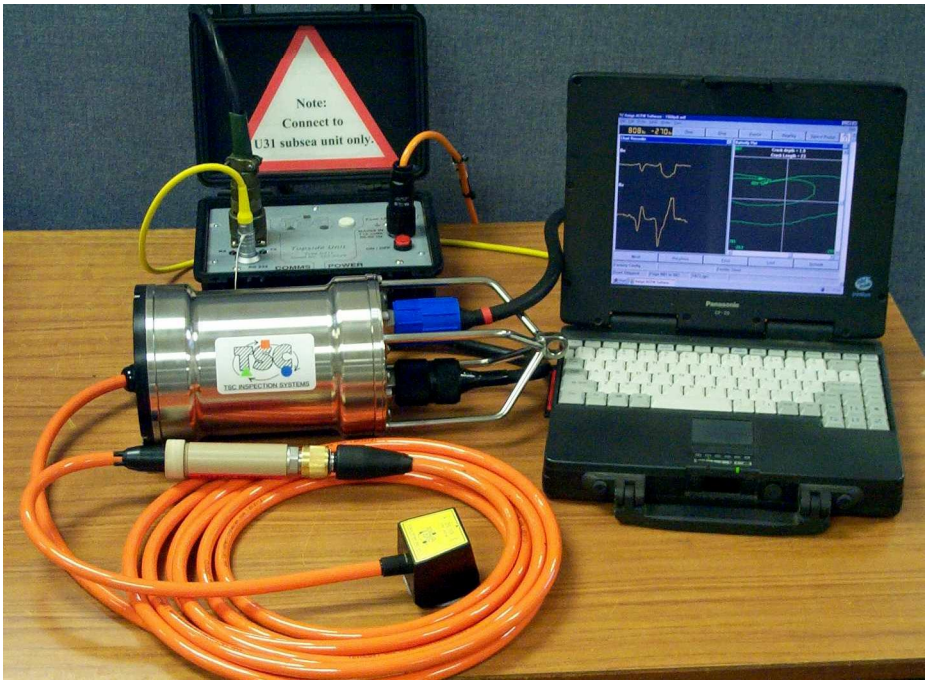
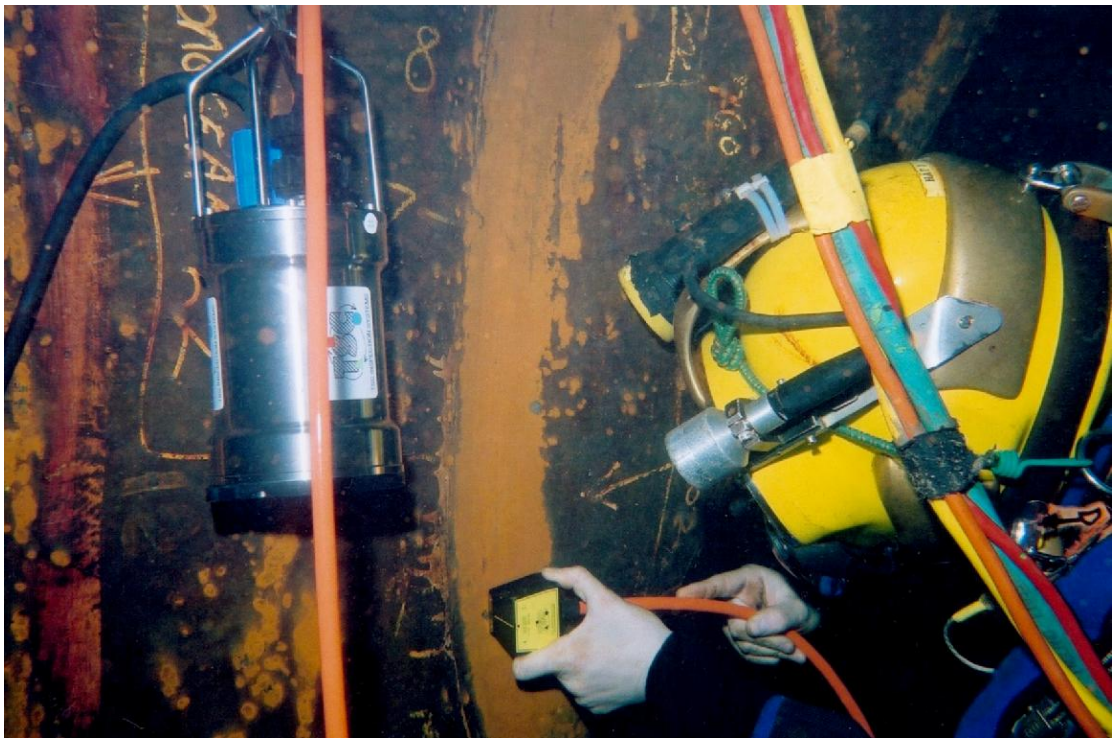
UNDERWATER ACFM CRACK MICROGAUGE
MODEL U31D

PRODUCT INFORMATION





The Model U31 Underwater ACFM Crack Microgauge represents the latest in ACFM subsea inspection technology. The new instrument offers all the advantages of ACFM inspection, available on earlier TSC subsea instruments, but in a much smaller, lighter package designed specifically for ease of diver deployment.

The system provides:

- Rapid scanning using a hand-held probe.
- Reliable crack detection and sizing (length and depth).
- Reduced cleaning requirements with no need to clean to bare metal.
- Capable of inspecting corroded surfaces, or through non-conducting coatings several millimetres thick.
- Windows software for ease of operation and compatibility with other Windows applications.
- Full data storage for back-up, off-line view and audit purposes.
- Access to a wide range of geometries using TSC's range of active subsea probes.
- Probes with embedded serial numbers to simplify operation and reduce likelihood of operator error.
- Capable of operating at water depths up to 300m.

BACKGROUND TO ACFM

Alternating Current Field Measurement (ACFM) is an electromagnetic inspection technique and relies on the fact that an alternating current flowing in a component will be disturbed by the presence of a crack. The ACFM probe introduces an electric current locally into the structure and measures the associated electromagnetic fields close to the surface. The presence of a defect disturbs the associated fields and the information is graphically presented to the system operator. The ends of a defect are easily identified to provide information on defect location and length. The significance of a defect, in terms of structural integrity, generally depends on the ***depth*** of the defect. Using mathematical models, the system also provides the depth of the defect, thus allowing an immediate evaluation of the significance of the indication.

This is a major advantage compared to other techniques that only give detection or at best, length information. ACFM systems have been used for a range of applications where rugged inspection systems are needed. The speed of scan provides a rapid and cost effective means of inspecting welded connections with reduced cleaning requirements compared to conventional techniques.

The probes have been developed to minimise signals from features that are not cracks, eg corrosion, undercut, HAZ, material property changes, etc, thus overcoming the problems often associated with other electromagnetic systems and minimising false calls.

The ACFM technique has been approved for weld inspection by major authorities around the world, including Lloyds, ABS, Bureau Veritas, DNV and OCB Germanischer Lloyd.

BACKGROUND TO COMPANY

Established in 1984, TSC are leaders in the application of ac field measurement techniques to industrial applications. The ACFM technology has been developed in-house from the successful ACPD technique to provide a system for crack detection ***and*** sizing without the need for any electrical contact. The crack sizing capability has resulted from theoretical studies at University College London, which allows the prediction of crack depth from a knowledge of the surrounding ac electromagnetic fields.

The hardware developments make use of state of the art low noise analogue electronics and the control system has been developed using the latest Windows software techniques. The result is a system that provides reliable subsea inspection of welded structures that has been developed by a Company specialising in structural inspection and structural integrity assessment. TSC are therefore in a unique position and able to provide customers with not only the inspection system, but also the back-up in terms of procedural development, customisation to suit specific applications and even an evaluation of the significance of any defects found.

Typical applications

The model U31D instrument is used extensively for the inspection of offshore structures and is commonly specified for routine weld inspection on floating and fixed platforms. The range of probes available allows inspection of all common underwater structural weld details, including repair ground areas. In addition to structural inspection, ACFM is also used for inspection of pipelines, vessels and marine components, including thrusters and propellers.

The basic model U31D system can also be upgraded to operate with a range of multi-element array probes. These are particularly useful when inspecting uniform geometries or flat areas, such as marine propellers, thruster blades or FPSO mooring chains.

ROV use

The model U31D system is specifically targeted at diver deployed inspection. The instrument can however be upgraded for ROV deployment, where the ROV provides power and comms. Systems are available for operation in water depths to 2000m.

SYSTEM SPECIFICATION

Subsea Unit Weight:	7.6kg in air 4.3kg in water
Subsea Unit Size:	142mm diameter x 260mm
Probe Cable Length:	5 metres standard, up to 50m by special request.
Serial Communications Cable:	5 metres as standard up to 30 metres if required.
Operating Temperature:	-20º + 40ºC
Maximum Operating Depth:	300m as standard, can be extended to 2000m for ROV deployment (See Product Information for U31R)
Power Requirements:	110v AC. 200mA
Optional Array Support:	32 channels (i.e. 16 sensor pairs) with single field or 24 channels with twin fields, plus position encoder.

SOFTWARE

The U31 operates with TSC's *ASSIST* suite of software thus providing a common operating environment with other ACFM products. This avoids the need for operator retraining.

The ASSIST Software contains the following features

- Operates in Windows 2000, XP and Vista environments, supporting simultaneous running of word processor/spreadsheet package etc, and interface to all common printers.
- Graphics display of processed data for crack detection.
- Automated clock markings to indicate position on scan.
- Variable speed time base to suit application.
- Multiple screen facility for comparing consecutive scans.
- Screen marker to identify special features.
- Replay facility to review data.
- Real time adjustment of trace position on screen.
- Moveable cursors for use during data review.
- ACFM crack depth calculation and crack size data shown on screen.
- Free format text input associated with each file.
- Multiple page facility in a single file.
- Automated back up of data onto diskette and hard disk.
- Full system status reports for checking hardware.
- Graphical print out of data screens.
- Data transfer into standard spreadsheets.
- Automated set-up of probe-dependent instrument settings.
- Allows off-line review and analysis of data as originally collected.
- Crack depth sizing over a wide range of coating thickness'.
- Operating procedures and software user manuals available in on-line Windows help files.

COMPARISON WITH U21 UNDERWATER ACFM CRACK MICROGAUGE

The Model U21 Crack Microgauge had been in use around the world for subsea weld inspection. This is now replaced by the Model U31 which provides all the functionality of the Model U21 but in a significantly smaller package.

Quick Comparison:

Subsea Unit	**U31**	**U21**
Size (excluding fittings)	142mm dia x 260mm	270mm dia x 510mm
Weight in Air	7.6Kg	33Kg
Weight in Water	4.3Kg	4.0Kg
Maximum Operating Depth	300m	300m
Maximum Probe Cable Length	50m	5m
Topside Unit		
Size	240x200x110mm	560x350x180mm
Weight	2Kg	9Kg

Size difference between U31 and U21 Subsea Units

OPERATOR TRAINING

Lloyds/CSWIP Accredited Operator training courses are held at various centres in the United Kingdom and overseas, details on request. The course duration is five working days.

AVAILABILITY

The U31 Underwater ACFM Crack Microgauge is available from TSC worldwide through our network of agents and distributors. Details of these can be found on our website, or contact TSC direct for further details.