

**Model CG10 & CG20**

**Corrosion Gauge**

**Operating Instructions**



This product meets the Electromagnetic Compatibility Directive.

The product is Class A, Group 1 ISM equipment according to CISPR 11.

Group 1 ISM product: A product in which there is intentionally generated and/or used conductively coupled radio-frequency energy which is necessary for the internal functioning of the equipment itself.

Class A product are suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

*Note : In the close presence of some radio transmitters, erroneous readings may be given. If this occurs tests should be repeated at another location.*

These operating instructions are available for download on our website [www.elcometerndt.com](http://www.elcometerndt.com).

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elcometer<sup>®</sup><sub>NDT</sub>

Material Safety Data Sheets for the ultrasonic couplant supplied with the CG10 & CG20 and available as an accessory, are available to download via our website:

Elcometer NDT Ultrasonic Couplant Material Safety Data Sheet :

[www.elcometerndt.com/images/MSDS/elcometer\\_ultrasonic\\_couplant.pdf](http://www.elcometerndt.com/images/MSDS/elcometer_ultrasonic_couplant.pdf)

Elcometer NDT Ultrasonic Couplant Material Safety Data Sheet :

[www.elcometerndt.com/images/MSDS/elcometer\\_ultrasonic\\_couplant\\_hi\\_temp.pdf](http://www.elcometerndt.com/images/MSDS/elcometer_ultrasonic_couplant_hi_temp.pdf)

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Thank you for purchasing this Elcometer product. Welcome to Elcometer NDT.

The Model CG10 and CG20 Corrosion Gauges are world beating products. With the purchase of this gauge you now have access to the worldwide service and support network of Elcometer NDT. For more information visit our website at [www.elcometerndt.com](http://www.elcometerndt.com).

## 1 ABOUT YOUR GAUGE

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The Model CG10 and CG20 are corrosion gauges that measure with extreme versatility. They have the ability to measure coatings and material thickness simultaneously while maintaining the ability to locate pits, flaws and defects in the material. Based on the same operating principles as SONAR, the Model CG10 and CG20 is capable of measuring the thickness of various materials with accuracy as high as 0.01 millimetres (0.001 inches). The principal advantage of ultrasonic measurement over traditional methods is that ultrasonic measurements can be performed with access to only one side of the material being measured.

### 1.1 STANDARDS

Your gauge can be used in accordance with the following Standards and test methods; ASTM E 797, EN 14127 and EN 15317.

### 1.2 WHAT THIS BOX CONTAINS

Model CG10 and CG20, Bottle of couplant, Battery (2 x), Carrying case, Test certificate, Operating instructions, CD with sound velocity programming software, RS232 cable and USB Serial converter.






*Note: The box does **not** include a transducer; these must be ordered separately. To order a transducer, contact Elcometer NDT or your local Elcometer NDT supplier.*

### 1.3 PACKAGING

The gauge is packed inside its carry case within a cardboard box. Please ensure that the packaging is disposed of in an environmentally sensitive manner. Consult your Local Environmental Authority for further guidance.

To maximise the benefits of your new Elcometer NDT gauge, please take some time to read these Operating Instructions. Do not hesitate to contact Elcometer NDT or your Elcometer NDT supplier if you have any questions.

## 2 THE KEYPAD

Key	Functions	Model
	Press to switch the gauge on or off. When switching off, the gauge retains all of its settings. If the gauge is idle for 5 minutes, it will switch itself off.	CG10 CG20
	Press to change units (metric/imperial)	CG10 CG20
	Switches the display backlight between three settings; on, off and auto. <ul style="list-style-type: none"> <li>• ON - backlight is on</li> <li>• OFF - backlight is off</li> <li>• AUTO - backlight automatically illuminates while the gauge is making a measurement and switches off after several seconds (to conserve battery life).</li> </ul>	CG10 CG20
	Press to zero the gauge	CG10 CG20
	Press to select material type.	CG20

## 3 GETTING STARTED

### 3.1 FITTING BATTERIES

Your gauge may be used with dry cell batteries or rechargeable batteries. 2 x LR6 (AA) alkaline batteries are supplied with this gauge. When the battery voltage is low the entire display will start to flash. When this occurs the batteries should be replaced.

To fit or replace batteries:

1. Unscrew battery compartment cover.
2. Referring to battery polarity instructions on rear of gauge, insert batteries into gauge ensuring correct polarity.
3. Replace battery compartment cover.

*Note: Remove the batteries from the gauge if it is to remain unused for a long period of time. This will prevent damage to the gauge in the event of malfunction of the batteries.*

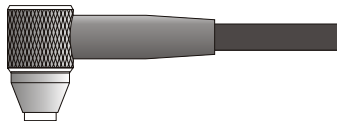


**Model CG20**

### 3.2 FITTING THE TRANSDUCER

The transducer transmits and receives ultrasonic sound waves that the gauge uses to calculate the thickness of the material being measured.

The transducer connects to the gauge via the attached cable, and two coaxial connectors. When using transducers manufactured by Elcometer NDT, the orientation of the dual coaxial connectors is not critical; either plug may be fitted to either socket.



The transducer must be used correctly in order for the gauge to produce accurate, reliable measurements.

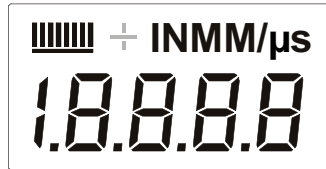


## 4 THE DISPLAY

*Stability indicator*

- One vertical bar - no readings are being taken
- Less than 5 bars - reading is unstable and may be inaccurate
- More than 5 bars - reading is stable

*Units (IN, MM, IN/ $\mu$ s, M/s)*



*Measurement value/Text*

*Note: The display will hold the last value measured, until a new measurement is made.*

*Note: When the battery voltage is low, the entire display will begin to flash. When this occurs, the batteries should be replaced.*

## 5 SETTING UP THE GAUGE

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### 5.1 TRANSDUCER - ZEROING

Setting the zero point for the transducer is important for the same reason that setting the zero on a mechanical micrometer is important. If the zero point of the transducer is not set correctly, all of the measurements the gauge makes will be in error by some fixed number.


Though the gauge will remember the last zero point, it is generally a good idea to set the zero point whenever the gauge is switched on, and always when a different transducer is used.

The zero probe routine *must* be done prior to calibration.

1. Switch on the gauge and connect the transducer.
2. Remove all couplant from the face of the transducer and check that the wearface of the transducer is clean and free of any debris.
3. Apply a drop of couplant on the transducer and place the transducer in steady contact with the probe zero disk (the battery cover located on the top of the unit), and obtain a steady reading.

The display should show a thickness value, and nearly all the bars of the stability indicator should be illuminated.

Note: The value that is displayed will change depending on the current velocity setting in your gauge. Disregard the value displayed; it is not important. What is important is accurately performing these steps to ensure reliability of the zero calculation.

4. While the transducer is firmly coupled to the disc, press  .



The display will show 'Prb0' while it is calculating its zero point.

5. Remove the transducer from the probe zero disk.

Your gauge is now zeroed.

## 5.2 CALIBRATING

In order for the gauge to make accurate measurements, it must be calibrated to the sound-velocity of the material being measured.

Different types of material have different sound-velocities. For example, the velocity of sound through steel is 5918 m/s (about 0.233 in/ $\mu$ s) and the velocity of sound through aluminium is 6350 m/s (about 0.248 in/ $\mu$ s). If the gauge is not set to the correct sound-velocity, all of the measurements the gauge makes will be erroneous by some fixed percentage.

The CG10 gauge can store one material sound velocity that can be adjusted by connection to a computer see "Editing the User-defined Sound-velocity Values" on page 10.

To calibrate your CG20 gauge for the material you are measuring, you select the material from a list of materials stored in the gauge. For each material stored in the list there is a corresponding sound-velocity value. There are eight factory-set materials which you cannot change, plus two user-definable sound-velocity values :

Display	Material	Sound-velocity	
		m/s	in/ $\mu$ s
StL	Steel 4340	5918	0.233
StSt	Stainless Steel 303	5664	0.223
Alu	Aluminium 2024	6350	0.251
IrOn	Cast Iron	4572	0.179
PLE	Plexiglass	2692	0.106
PVC	PVC	2388	0.094
PLSt	Polystyrene	2337	0.092
PLur	Polyurethane	1778	0.070
uSr1	User-defined sound-velocity 1		
uSr2	User-defined sound-velocity 2		

### 5.2.1 Selecting a material and sound-velocity (CG20 only)

Repeatedly press  until the material/sound-velocity you require is displayed.

### 5.2.2 Editing the User-defined Sound-velocity Values

To calibrate your gauge for the material you are measuring, use ElcoMaster™ 2.0 software to change the stored material velocities.

Connect the gauge to your PC and the software, then follow the on screen instructions to change the calibration values.

## 6 TAKING READINGS


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**Disclaimer:** Inherent in ultrasonic thickness measurement is the possibility that the instrument will use the second rather than the first echo from the back surface of the material being measured. This may result in a thickness reading that is TWICE what it should be.

Responsibility for proper use of the instrument and recognition of this phenomenon rests solely with the user of the instrument.

Other errors may occur from measuring coated materials where the coating is insufficiently bonded to the material surface. Irregular and inaccurate readings may result. Again, the user is responsible for proper use and interpretation of the measurements acquired.

### 6.1 BEFORE YOU START

- Prepare the surface - see "Condition and Preparation of Surfaces" on page 18.
- Set the zero point of the transducer - see "Setting up the Gauge" on page 7.
- Select units; press  to select metric (mm) or imperial (inches).

## 6.2 PROCEDURE

### 1. Apply couplant

For the gauge to work correctly there must be no air gap between the transducer and the surface of the material to be measured. This is achieved using a couplant.

Before the transducer is placed on the surface, put a small amount of couplant on the surface of the material. Typically a single drop is sufficient.

### 2. Place transducer onto the surface of the material to be measured

Press the transducer wearface into the couplant. Moderate pressure on the top of the transducer using the thumb or index finger is sufficient; it is only necessary to keep the transducer stationary and the wearface seated flat against the surface of the material.

### 3. Read display

If six or seven bars of the stability indicator are showing, the display will be reading the correct thickness of the material directly beneath the transducer.

If the stability indicator has fewer than five bars showing, or the numbers on the display seem erratic, check to make sure that there is an adequate film of couplant beneath the transducer, and that the transducer is seated flat against the material.

The gauge will perform a number of measurements every second when the transducer is in contact with the surface of the material. The display is updated as each reading is taken.

### 4. Remove transducer from surface

The display will show the last measurement made.

*Note: Occasionally, a small film of couplant that is left on the transducer surface will be measured by the gauge as it is removed. Using less couplant can reduce this effect.*

## 7 STORAGE

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Your gauge has a Liquid Crystal Display. If the display is heated above 50°C (120°F) it may be damaged. This can happen if the gauge is left in a car parked in strong sunlight.

Always store the gauge in its case when it is not being used.

If the gauge is to remain unused for long periods of time, remove the batteries and store them separately. This will prevent damage to the gauge in the event of malfunction of the batteries.

## 8 MAINTENANCE

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You own one of the finest corrosion gauges in the world. If looked after, it will last a lifetime.

### 8.1 FAULTS

Your gauge is designed to give many years reliable service under normal operating and storage conditions. The gauge does not contain any user-serviceable components. In the unlikely event of a fault, the gauge should be returned to your local Elcometer NDT supplier or directly to Elcometer NDT. The warranty will be invalidated if the instrument has been opened.

### 8.2 TRANSDUCER

The transducer will wear with repeated use. Transducer life depends on the number of measurements taken and the manner in which readings are taken. To extend transducer life, always set the transducer down so that it is perpendicular to the panel surface. Dragging the transducer along the surface will reduce the life of the transducer. Replacement transducers are available from your local Elcometer NDT supplier or directly from Elcometer NDT.

## 9 TECHNICAL SPECIFICATION

Measurement Rate (Manual)	4 readings per second
Measuring Range <sup>a</sup>	0.63 mm to 500 mm (0.025" to 19.999")
Measurement Resolution	0.01 mm (0.001")
Velocity Calibration Range	1250 m/s to 10000 m/s (0.0492 in/ $\mu$ s to 0.3937 in/ $\mu$ s)
Velocity Selection Options	<b>CG10</b> - One user programmable velocity <b>CG20</b> - Two user-programmable velocities 8 pre-calibrated velocities (aluminium, cast iron, plexiglass, polystyrene, polyurethane, PVC, stainless steel and steel)
Weight (including batteries)	284 g (10 oz)
Dimensions (W x H x D)	63.5 mm x 114.3 mm x 31.5 mm (2.5" x 4.5" x 1.24")
Gauge Operating Temperature	-30°C to 50°C (-20°F to 120°F)
Case	Aluminium case with gasket sealed end caps and waterproof membrane keypad
PC Connection	RS232 serial port. Windows PC interface software
Display	12.7 mm (0.5 ") high digits with LED backlight (on/off/auto).
Power Source	Two 1.5 V AA alkaline or 1.2V rechargeable cells. Typically operates for 200 hours on alkaline and 120 hours on rechargeable cells (charger not included.) <i>Note: Alkaline batteries must be disposed of carefully to avoid environmental contamination. Please consult your local environmental authority for information on disposal in your region. Do not dispose of any batteries in fire.</i>

- a. Measuring Range depends on material, surface conditions and the transducer selected.



## 10 WARRANTY

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Elcometer NDT warrants your gauge against defects in materials and workmanship for a period of two years from receipt by the end user.

Additionally, Elcometer NDT warrants transducers and accessories against such defects for a period of 90 days from receipt by the end user. If Elcometer NDT receives notice of such defects during the warranty period, Elcometer NDT will either, at its option, repair or replace products that prove to be defective. The warranty will be invalidated if the instrument has been opened.

### 10.1 EXCLUSIONS

The above warranty shall not apply to defects resulting from: improper or inadequate maintenance by the customer; unauthorised modification or misuse; or operation outside the environmental specifications for the product.

Elcometer NDT makes no other warranty, either express or implied, with respect to this product. Elcometer NDT specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. Some states or provinces do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion may not apply to you. However, any implied warranty of merchantability or fitness is limited to the two-year duration of this written warranty.

This warranty gives you specific legal rights, and you may also have other rights, which may vary from country to country, state to state or province to province.

## **10.2 OBTAINING SERVICE DURING WARRANTY PERIOD**

If your hardware should fail during the warranty period, contact Elcometer NDT and arrange for servicing of the product. Retain proof of purchase in order to obtain warranty service.

For products that require servicing, Elcometer NDT may use one of the following methods:

- Repair the product
- Replace the product with a re-manufactured unit
- Replace the product with a product of equal or greater performance
- Refund the purchase price.

## **10.3 AFTER THE WARRANTY PERIOD**

If your hardware should fail after the warranty period, contact Elcometer NDT for details of the services available, and to arrange for non-warranty service.

## 11 SPARES & ACCESSORIES

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### 11.1 TRANSDUCERS

Elcometer NDT gauges are **not** supplied with a transducer as standard - this must be ordered separately. The transducers listed below are the most commonly used however, Elcometer NDT offer a wide range of other transducers to suit various applications.

Further information on the transducers available and their applications can be found on the Elcometer NDT Knowledge Centre on [www.elcometerndt.com](http://www.elcometerndt.com).

#### Description

2.25 MHz 1/4" Potted Side Transducer

5 MHz 1/4" Potted Side Transducer

5 MHz 1/4" Potted Side High Damped Transducer

7 MHz 1/4" Potted Side High Damped Transducer

10 MHz 1/4" Potted Side Transducer

#### Sales Part No.

TX2M25CP-2

TX5M00CP-4

TX5M00CP-10

TX7M50CP-6

TX10M0CP-4

### 11.2 CALIBRATION BLOCKS

Elcometer NDT offer a comprehensive range of calibration blocks to suit a wide range of applications and standards.

Selecting the correct calibration block for the application is essential to ensure accurate evaluation. The form, shape and material of the calibration block should be appropriate for the material being inspected. Any artificially induced flaw should closely resemble that of the actual flaw being tested for.

The calibration blocks listed below are a selection of those available - details of the full range can be found on [www.elcometerndt.com](http://www.elcometerndt.com).

**Description**

Calibration Block: 8 Step; 1 - 8mm

Calibration Block: 10 Step; 2 - 20mm

Calibration Block: 10 Step; 2.5 - 25mm

Replace \* with S1018 = 1018 Steel Block; A = Aluminium Block; SS = Stainless Steel Block;

T = Titanium Block.

**Sales Part No.**

TW-24005-\*

TW-24006-\*

TW-24007-\*

**11.3 ULTRASONIC COUPLANT**

Each gauge is supplied with a 120ml (4oz) bottle of standard ultrasonic couplant. Replacement bottles and couplant for high temperature applications are available from your local Elcometer NDT supplier or directly from Elcometer NDT.

**Description**

Ultrasonic Couplant, 120 ml (4 oz)

Ultrasonic Couplant, 360 ml (12 oz)

Ultrasonic Couplant, High Temperature 343°C (650°F), 120 ml (4 oz)

Ultrasonic Couplant, High Temperature 482°C (900°F), 120 ml (4 oz)

**Sales Part No.**

TC-24034-1

TC-24034-2

TC-24034-4X

TC-24034-5X

*Note: A wide range of other transducers and accessories is available - see [www.elcometerndt.com](http://www.elcometerndt.com) for details.*

**11.4 MISCELLANEOUS****Description**

RS232 Cable USB to Serial Converter

**Sales Part No.**

TL-24031

## **12 CONDITION AND PREPARATION OF SURFACES**

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Further information can be found on the Elcometer NDT Knowledge Centre on [www.elcometerndt.com](http://www.elcometerndt.com).

## **13 APPLICATION NOTES**

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Further information can be found on the Elcometer NDT Knowledge Centre on [www.elcometerndt.com](http://www.elcometerndt.com).

## 14 SOUND VELOCITIES OF COMMON MATERIALS

Material	Sound velocity	
	(m/s)	(in/μs)
Aluminium	6350	0.250
Bismuth	2184	0.086
Brass	4394	0.173
Cadmium	2769	0.109
Cast Iron	4572	0.180 (Approx.)
Constantan	5232	0.206
Copper	4674	0.184
Epoxy Resin	2540	0.100 (Approx.)
German Silver	4750	0.187
Glass, Crown	5664	0.223
Glass, Flint	4267	0.168
Gold	3251	0.128
Ice	3988	0.157
Iron	5893	0.232
Lead	2159	0.085
Magnesium	5791	0.228
Mercury	1448	0.057
Nickel	5639	0.222
Nylon	2591	0.102 (Approx.)

Material	Sound velocity	
	(m/s)	(in/μs)
Paraffin	2210	0.087
Platinum	3962	0.156
Plexiglas	2692	0.106
Polystyrene	2337	0.092
Porcelain	5842	0.230 (Approx.)
PVC	2388	0.094
Quartz Glass	5639	0.222
Rubber, Vulcanised	2311	0.091
Silver	3607	0.142
Steel	5918	0.233
Steel, Stainless	5664	0.223
Stellite	6985	0.275 (Approx.)
Teflon	1422	0.056
Tin	3327	0.131
Titanium	6096	0.240
Tungsten	5334	0.210
Water	1473	0.058
Zinc	4216	0.166