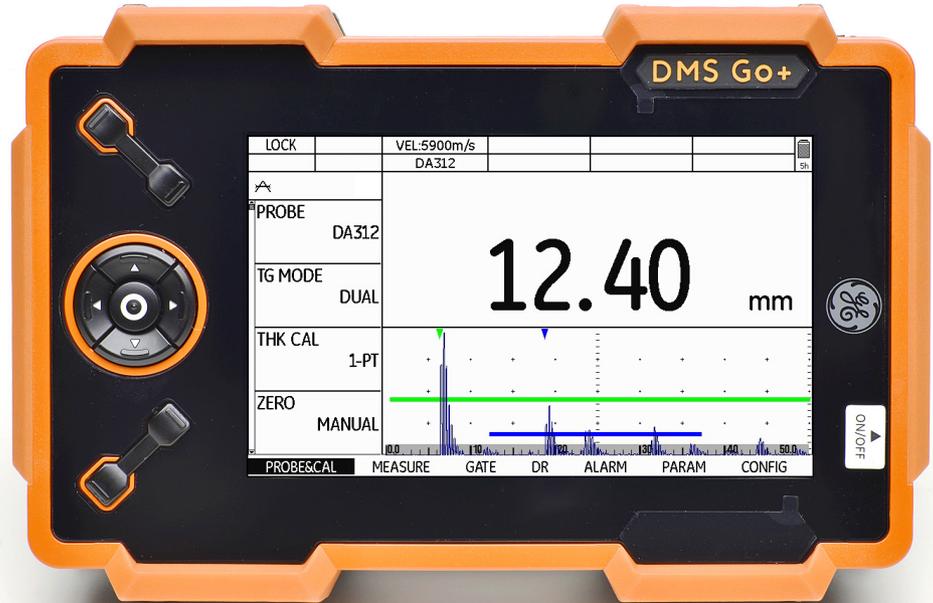


GE  
Measurement & Control



**DMS Go+**

Technical Reference and Operating Manual

This edition 4 (05/2014) applies to the software version 3.20 (April 2, 2014)

You will find the software version and the serial number of your instrument at CONFIG - ABOUT.

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# Function groups and functions

PROBE&CAL	MEASURE	GATE	DR
PROBE DA301	MODE THICKNESS	GATE A START 1.00mm	EXPLORER
TG MODE DUAL	DUAL-MULTI OFF	GATE A WIDTH 200.00mm	PROPERTIES SHOW
THK CAL 1-PT	DISPLAY DELAY 0.000µs	GATE A THR. 30%	VIEW OFF
ZERO AUTO	DISPLAY RANGE 200.00mm	GATE B START 2.50mm	MASTER CMT EDIT
CALIBRATION START	FREEZE OFF	GATE B WIDTH 40.00mm	EXPORT
PROBE ZERO START	MAX GAIN MODE AUTO	GATE B THR. 18%	OVERWRITE OLD
VELOCITY 5900m/s STEEL MILD	MAX GAIN 81.8 dB		
CAL REMINDER OFF	RESULTS CONFIG		
TEMP COMP DISABLE			
probe delay 7.662µs			

## Function groups and functions (cont'd)

ALARM	PARAM	CONFIG	
MIN ON	LOAD P-SET	UPDATE RATE 16Hz	POWER DOWN MANUAL
MIN ALARM 5.00mm	SAVE P-SET	RECTIFY NEG	UNIT mm
MAX ON		RADIX PERIOD	RESOLUTION X.XX
MAX ALARM 7.50mm		LAST READING HOLD	ZERO BLOCK ----- mm ----- m/s
		BRIGHTNESS 10	VEL REF. BLOCK N/A
		COLOR SCHEME3	LOCKOUT CONFIG
		LANGUAGE English	MENU MODE EXPERT
		ORIENTATION RIGHT HAND	FUNC KEY NOT DEFINED
		DT FMT D.M.Y 12H	PASSWORD
		DATE TIME 08.05.2014 06:25 PM	CODE
			ABOUT SHOW

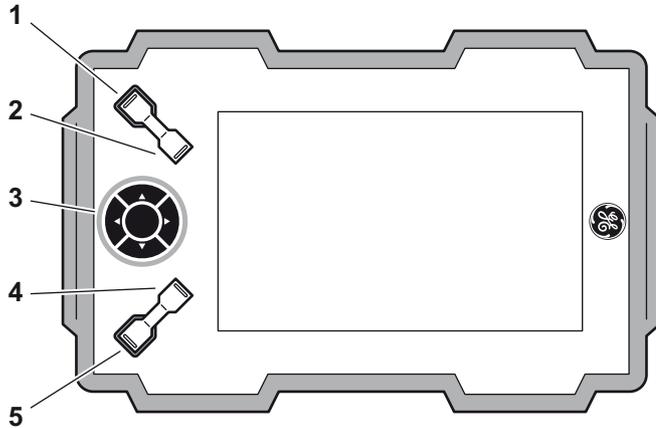
## Status display icons

Icon	Meaning
	SD memory card is inserted, flashes when the SD card is accessed
	Display memory active (Function FREEZE), display is „frozen“.
	Measurement mode S-IP, DUAL
	Measurement mode S-PEAK, S-FLANK
	Measurement mode DUAL-MULTI
	Alarm threshold exceeded or fallen below
	Reminder for calibration

## Power level indicators

Icon	Meaning
	Battery charge level, remaining operating time in hours (approximate value)
	Charger/power adapter is connected, percentage of battery charge level (approximate value)
	Warning: Low battery charge level, remaining operating time in minutes (approximate value)

## Basic key functions



- 1 Function key 1, functions are context-dependent
- 2 Function key 2, functions are context-dependent; keys **1** and **2** simultaneously: Save screen shot
- 3 Keypad, navigation between function groups and functions, changing settings
- 4 Function key 3, functions are context-dependent
- 5 Function key 4, function individually assignable (**CONFIG – FUNC KEY**),

# Navigation

## Keys

## Function

---



Navigation between function groups,  
adjusting values



Navigation between functions  
within a function group



Changing the display orientation (landscape - portrait)



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# Introduction 1

## 1.1 Safety information

The DMS Go+ has been designed and tested according to DIN EN 61010-1: 2011-07, Safety requirements for electrical equipment for measurement, control and laboratory use, and was technically in perfectly safe and faultless condition when leaving the manufacturing works.

In order to maintain this condition and to ensure a safe operation, you should always read the following safety information carefully before putting the instrument into operation.



### ATTENTION

**The DMS Go+ is an instrument for materials testing. Any use for medical or any other applications is not permitted!**

The instrument may only be used in industrial environments.

The DMS Go+ is waterproof according to IP67. It can be operated either with the corresponding lithium-ion batteries or with the charger/power adapter. The charger/power adapter meets the requirements of electrical safety class II.

## Battery operation

For the battery operation of the DMS Go+, we recommend the corresponding lithium-ion battery. You should only use this battery for the battery operation.

You can charge the lithium-ion battery either within the instrument itself or in an external charger. If a lithium-ion battery is inserted, charging starts automatically as soon as you connect the charger/power adapter to the DMS Go+ and to the mains power supply.

For power supply, please also see Chapter 3.2 **Power supply**, page 3-2. For the use of batteries, please also see Chapter 8.2 **Battery care**, page 8-2.

## Software

According to the current state of the art, software is never completely free from errors. Before using any software-controlled test equipment, it is therefore necessary to make sure that the required functions operate perfectly in the intended combination.

If you have any questions about the use of your test equipment, please contact your nearest representative of GE.

## Defects/errors and exceptional stresses

If you have reason to believe that a safe operation of your DMS Go+ is no longer possible, you have to disconnect the instrument and secure it against unintentional reconnection. Remove the lithium-ion battery.

A safe operation is no longer possible for example

- if the instrument shows visible damages,
- if the instrument no longer operates perfectly,
- after prolonged storage under adverse conditions (e.g. exceptional temperatures or especially high air humidity, or corrosive environmental conditions),
- after being subjected to heavy stresses during transportation.

## 1.2 Important information on wall thickness measurement



### ATTENTION

Please read the following information before using your thickness gauge. It is very important that you understand and observe this information to avoid any errors when using the instrument that might lead to false measurement results. Decisions made on the basis of false measurement results may lead to property damages and personal injuries.

### Prerequisites for the use of ultrasonic thickness gauges

This operating manual contains essential information on how to operate your thickness gauge. In addition, there are a number of factors that affect the measurement results. A description of all these factors would go beyond the scope of an operating manual. Therefore, only the most important prerequisites for a safe and reliable ultrasonic thickness measurement are mentioned here:

- Training of the instrument operator (operator)
- Knowledge of special technical measurement requirements and limits
- Choice of the appropriate measuring device

The operation of an ultrasonic measuring device requires proper training in ultrasonic thickness measurement. Proper training comprises for example adequate knowledge of the following:

- Theory of the propagation of sound waves in materials
- Effects of the sound velocity of test material
- Behavior of sound waves at interfaces between different materials
- Propagation of the sound beam within the material
- Effect of the surface quality of test material.

Lack of such knowledge could lead to false measurement results with unforeseeable consequences. Information about the existing training opportunities for ultrasonic inspectors and about the qualifications and certificates that can finally be obtained is available at the national NDT societies or at GE.

GE holds specialized training courses in the field of ultrasonic testing at regular intervals. The scheduled dates for these courses will be given to you on request.

## Limits of ultrasonic testing

The information obtained from ultrasonic tests only refers to those parts of the test object which are covered by the sound beam of the probe used. Should any conclusions from the tested parts be applied to the untested parts of the test object, they should therefore be made with extreme caution. Such conclusions are generally only possible in cases where extensive experience of the components to be tested and proven methods of statistical data acquisition are available.

Boundary surfaces within the test object can completely reflect the sound beam, resulting in reflection points which lie beyond this, for example the component's backwall, remaining undetected. It is therefore important to make sure that all areas to be tested in the test object are covered by the sound beam.

## Ultrasonic wall thickness measurement

All ultrasonic wall thickness measurements are based on a time-of-flight measurement of the sound pulse in the test object. Accurate measurement results therefore require a constant sound velocity in the test object. This requirement is generally met in test objects made of steel, even with different alloying constituents. The variation of sound velocity is so slight that it is only of importance for high-precision measurements. In other materials, for example nonferrous metals or plastics, the sound velocity is nevertheless subject to larger variations. These may affect the measuring accuracy.

## Effect of the test object material

If the material is not homogeneous, the sound waves may propagate at different velocities in different parts of the test object. In this case, an average sound velocity should therefore be taken into account for the instrument calibration.

However, the best results are obtained when the instrument is calibrated using a reference block made of the same material as the test object. This calibration block should have plane-parallel surfaces and a thickness corresponding to the maximum thickness of the test object. The operator should additionally keep in mind that the sound velocity is liable to vary substantially due to heat treatments. This fact must be taken into account when assessing the accuracy of the wall thickness measured by the instrument.

If substantial sound velocity variations are expected, then the instrument calibration should be adjusted to the actual sound velocity values at shorter time intervals. Failure to do so may lead to false thickness readings.

## Effect of temperature variations

The sound velocity within the test object also varies along with material's temperature. This can cause appreciable errors in measurements if the instrument has been calibrated on a cold reference block, whereas the thickness measurement is carried out on a warm test object. Such measurement errors can be avoided either by adjusting the temperature of the reference block used for calibration or by taking the temperature effect on the sound velocity into consideration on the basis of a correction factor obtained from published tables.

## Measurement of remaining wall thickness

The measurement of the remaining wall thickness on plant components, e.g. pipes, tanks, or reaction vessels of all types which are corroded or eroded from the inside, requires a perfectly suitable gauge and special care in handling the probe.

The operator should always be informed about the corresponding nominal wall thicknesses as well as about the likely amount of wall thickness losses.

## Choice of the probe

The probe used for the measurement must be in good condition, i.e. its coupling face or delay line should not show any considerable wear. The measuring range (application range) specified for the corresponding probe in the data sheets must cover the complete thickness range to be inspected. The temperature of the test object must be within the permissible temperature range of the selected probe.

## Use of couplants

The operator must be familiar with the use of the ultrasonic couplant to the effect that the couplant is applied equally during every measurement so that variations in the couplant layer thickness and errors in the subsequent measurement results are avoided. The instrument calibration and the actual wall thickness measurement should be carried out under identical coupling conditions. During this process, the quantities of couplant used should be as small as possible and a constant pressure should be applied to the probe.

In the case of curved coupling faces, for example on tubes, the dual-element probe used for the measurement should be coupled in such a way that its acoustic separation layer forms an angle of  $90^\circ$  with reference to the tube's longitudinal axis.

## Doubling of measured value

A dangerous measuring error in ultrasonic thickness measurement can occur if the thickness is measured below the application range (operating range) specified for the probe used. In this case, the first backwall echo is too small for an evaluation, whereas the second backwall echo has an adequately high amplitude and is therefore evaluated by the instrument. This results in a wall thickness reading which is twice as large as the actual wall thickness. In order to avoid such measuring errors, the operator must carry out an additional check measurement using another probe at the limit of the application range.

## 1.3 Important information on wall thickness measurement using the DMS Go+



### ATTENTION

Please always read the following information about the special features in wall thickness measurement using the DMS Go+. It is absolutely necessary that you observe this information in order to always obtain correct measurement results.

### Probe zero offset

#### High differences in temperature

If the differences in temperature between the storage and inspection site are high, it is necessary that you wait approx. 2 minutes before you use the instrument after connecting the probe.

#### Temperatures below $-10\text{ }^{\circ}\text{C}$

The probe zero offset does not always function correctly

at temperatures below  $-10\text{ }^{\circ}\text{C}$ . You should therefore carry out a 2-point calibration and repeat it in the case of major temperature jumps.

### Couplant residues

In order to ensure a correct probe zero offset, make sure that you always remove the couplant residues before carrying out a new measurement after decoupling the probe.

### Measuring accuracy

Keep in mind that the measuring accuracy is not identical with the display accuracy.

The measuring accuracy depends on the following factors:

- Temperature
- Probe delay line
- Constancy of sound velocity
- Uniformity of surface quality

## Probes

Please note that only probes specified in chapter 2 of this manual are accepted for the DMS Go+.

### V-path correction

The following probes have only one transducer element and therefore require no V-path correction:

- K 1 SC
- G 2 N
- CA 215
- CA 211 A
- A2 DFR
- K-PEN
- CLF 5
- CA 214
- A DFRP
- A2 10 M
- G5 KB
- CLF 4
- CA 211
- A2 DFR
- 5 M 5 DFR

All probes equipped with a transmitter and a receiver element require a V-path correction due to the inclined position of their transducer elements (with wall thicknesses < 60 mm in steel).

The V-path correction is stored in the DMS Go+ for the following probes:

- Alpha2 D
- DA 303
- DA 501 EN
- DA 512
- HT 400 A
- OSS 10
- CA 211A
- DA 312
- DA 503 EN
- D 590
- KBA 525
- TC 560
- DA 301
- DA 312 B1
- DA 507
- FH 2 E
- KBA 560
- D 790

The following probes have been corrected individually during the manufacturing process; the V-path correction is stored in the probe. For some of these probes (marked with \*), this was additionally done for the operating mode DUAL-MULTI.

- DA 401
- DA 411
- DA 453
- DA 462\*
- DA 467
- DA 403
- DA 412\*
- DA 458
- DA 455
- DA 469
- DA 408
- DA 451\*
- DA 461\*
- DA 465
- FH 2 ED REM

## Zeroing

The correct zeroing is important for the measuring accuracy of probes equipped with a transmitter and a receiver element. A difference is made between two methods:

- 1 **Zeroing before coupling the probe**  
(OFF-BLOCK zeroing)
- 2 **Zeroing during probe coupling**  
(ON-BLOCK zeroing)

## Zeroing before coupling the probe (OFF-BLOCK zeroing)

After powering the DMS Go+ on, the length of the delay line below the transmitter element is determined at regular intervals whenever the probe is not coupled for the wall thickness measurement. In this regard, it is important that the coupling face of the probe is free from couplant to a large extent in order to avoid any faulty measurements.

This method is of advantage in cases where rough or curved surfaces may result in a critical coupling. When determining wall thicknesses in plastics, only probes with zeroing before coupling should be chosen:

- DA 401
- DA 411
- FH 2 E
- HT 400 A
- DA 403
- DA 412
- KBA 525
- TC 560
- DA 408
- D 790
- KBA 560

**Zeroing during probe coupling (ON-BLOCK zeroing)**

After coupling the probe (but before each individual wall thickness measurement), the length of the delay line below the transmitter element is determined at first. The actual wall thickness measurement is not carried out till after that.

This method is of advantage whenever a high stability and reproducibility of the measured values are required. For example, if the temperature of the part to be tested differs largely from that of the probe, the delay lines are cooled down during coupling and thus reduced, or they are heated up and thus extended. Each zero drift is thus compensated for immediately before every wall thickness measurement in the case of these probes:

- DA 301
- DA 303
- DA 305
- DA 312
- DA 312 B...
- DA 315
- DA 317
- DA 319
- DA 451\*
- DA 453\*
- DA 461\*
- DA 462\*
- DA 465\*
- DA 467\*
- DA 469\*

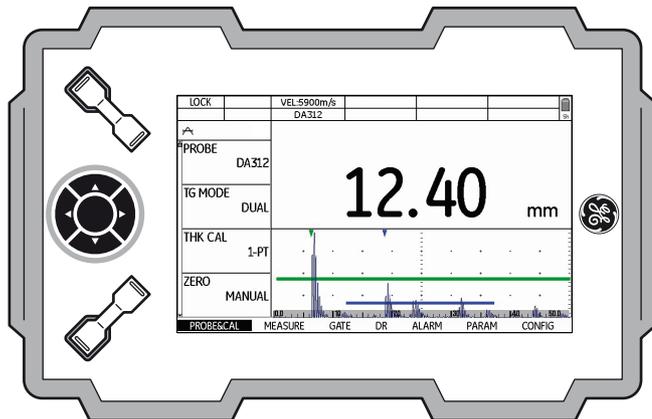
In the case of probes marked with \*, the zero is determined as an arithmetic mean of the two probe delay lines. For example, probes showing beveled wear can thus comply with their original measured-value tolerance better.

## 1.4 The DMS Go+

### Overview of functions

The DMS Go+ is a portable thickness gauge with an integrated data recorder. You can use this instrument for measuring the wall thickness on a large variety of components, for example on tubes, pressure vessels, and other equipment parts whose wall thickness is subject to a gradual reduction.

This makes the DMS Go+ especially suitable for measurement tasks for the documented corrosion test.



### Special features of the DMS Go+

- high measuring stability and reliability thanks to the zero crossing method
- automatic gain control for an improved reproducibility during corrosion tests
- dust-tight and waterproof housing according to IP67
- low weight (845 g incl. batteries)
- long operating time (8 hours) due to lithium-ion battery with internal and external charging possibility
- one-handed operation is possible
- high-resolution color screen (800 x 480 pixels) for the display of measured values and A-scan
- enlarged display of measured values which are easy to read even from a greater distance
- color-coded display of gates for easy differentiation

- high memory capacity with 2GB SD card. SD cards with a memory capacity up to 16 GB can be used.
- measuring range 0.25 ... 14000 mm (steel), depending on the probe, material, and surface
- digital resolution 0.01 mm or 0.1 mm (selectable) over the entire measuring range
- units selectable between inch and mm
- integrated data recorder for 100,000 measurements per file. Several files can be saved to the SD card.
- up to 16 user-definable comments for every file format with up to 16 alphanumeric characters per measuring point
- automatic probe detection with dialog probes, optimized setup and power of the instrument, especially higher measuring accuracy thanks to the individual V-path correction data stored in the corresponding probe used
- MicroGrid function for testing the direct surroundings of the measuring point
- single-element operating mode with measurement at echo flank or echo peak
- MIN operating mode with increased pulse repetition frequency for detecting the smallest reading in a series of measurements
- Dual-Multi operating mode for measuring through coatings
- adjustable minimum and maximum limits with alarm signaling through color change of the reading
- locking function to prevent unintentional changes to the adjustment values

## Options

Various options extend the basic functions of the DMS Go+ and can be enabled by a code in each case.

### DMS Go+ Base

- Basic version, for universal ultrasonic wall thickness measurement

### DMS Go+ TC

- TopCOAT technology for the simultaneous measurement of coating thickness and metal thickness
- Auto-V function for the wall thickness measurement of components with unknown sound velocity, without calibration block during the measurement

### DMS Go+ DR

- Extended data recorder

### DMS Go+ Advanced

- TopCOAT technology for the simultaneous measurement of coating thickness and metal thickness
- Auto-V function for the wall thickness measurement of components with unknown sound velocity, without calibration block during the measurement
- Extended data recorder

## 1.5 Wall thickness measurement using the DMS Go+

### Principle of ultrasonic measurement

At first, the DMS Go+ generates an electric initial pulse which is guided to the transmitter element of the probe. Once there, it is converted into a mechanical ultrasonic pulse. By means of a couplant, the ultrasonic pulse is transmitted from the probe to the material to be tested which it passes through at a velocity typical of the material (sound velocity of the material) until it encounters a change in the material. Part of the pulse energy is reflected from there and sent back to the probe (echo). If the signal reaches the backwall of the test object before that, the reflected pulse is called backwall echo.

A probe can have one (single-element probe) or several transducer elements (dual-element probe).

Dual-element probes are especially suitable in the case of:

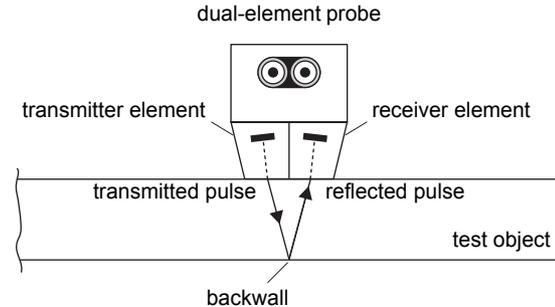
- flaws reaching close to the sound entry surface, i.e. especially in the case of
- deep-level corrosion and erosion.

## Dual mode (measurement mode DUAL)

In the dual mode, the tasks of transmitting (T) and receiving (R) are solved by two transducer elements arranged in such a way that they are mechanically separated from each other. An initial pulse is triggered on the transmitter side and transmitted to the test object. The echoes are received on the receiver side and reconverted into (very weak) electric pulses.

The DMS Go+ measures the time between transmitting and receiving the sound pulse (time of flight). The DMS Go+ determines the material thickness on the basis of the measured time and the material's sound velocity.

The operating principle of a dual-element probe is shown in the following figure.



## Single-element mode (measurement modes S-IP, S-PEAK, S-FLANK)

A single-element probe is used for transmitting and receiving the echoes in the single-element mode. For the wall thickness measurement, the DMS Go+ determines the time of flight between the entry echo and the first echo exceeding the gate A. The entry echo (interface echo) is generated at the transition of the initial pulse from the probe to the test object.

## Multi-echo mode (measurement mode DUAL-MULTI)

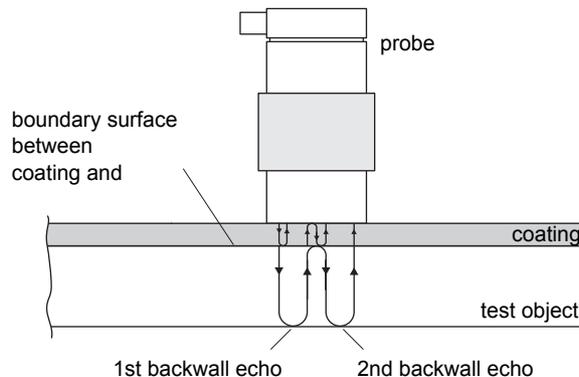
The multi-echo mode is recommended, for example, for the wall thickness measurement of coated test objects. In this mode, two (or several) backwall echoes are used for determining the wall thickness. The multi-echo mode is possible using dual-element probes.

As before, an initial pulse is transmitted by a transducer element to the test material. In the multi-echo mode, however, part of the sound pulse energy is reflected from the boundary surface between the coating (paint coating) and the test material.

The rest of the energy of the first pulse transmitted passes further through the test material and returns as a backwall echo.

The time of flight between the two successive backwall echoes is used, together with the material's sound velocity, for determining the material thickness. The echoes from the coating are ignored in this process.

The operating principle of the multi-echo mode is shown in the following figure.



## TopCOAT method (measurement mode TOP-COAT)

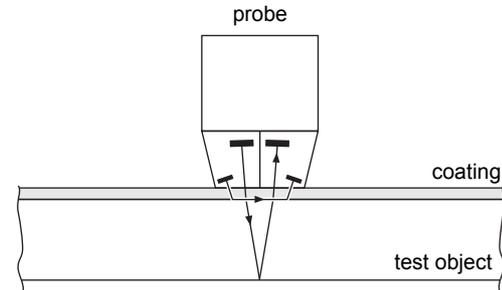
The patented TopCOAT method optimizes the corrosion measurement through paint coatings. In this process, the test object and paint coating are measured at one go, and the two values are displayed on the screen. Measurements using this method are even possible on heavily corroded backwalls.

A special probe equipped with two pairs of transmitter/receiver elements is used for the TopCOAT method.

The first pair of transmitter/receiver elements determines the coating thickness by means of a longitudinal sound wave propagating beneath the surface of the test object. At the same time, the second pair determines the total wall thickness and reduces this value by the coating thickness. The two values are displayed simultaneously on the DMS Go+ screen.

Measurements according to the TopCOAT method are only possible using the DMS Go+ TC.

The following figure shows the operating principle of the TopCOAT method using a special probe.



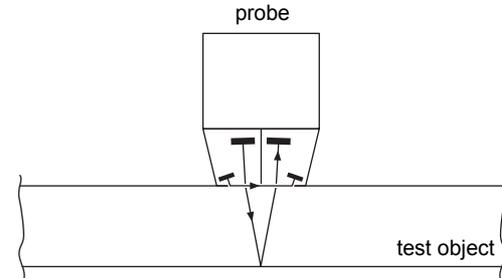
## Auto-V (measurement mode AUTO-V)

The function Auto-V enables to measure the wall thickness of uncoated test objects without knowing the material's sound velocity. In this function, the sound velocity is determined simultaneously with the wall thickness measurement. Uncoated materials can thus be measured without an additional calibration and without the use of reference blocks.

The function Auto-V also uses the probe described with two pairs of transmitter/receiver elements. One pair of transmitter/receiver elements calculates the material's sound velocity by means of a longitudinal sound wave propagating beneath the surface of the test object and by means of the known sound path (distance between transmitter and receiver). At the same time, the second pair determines the time of flight of the sound pulse in the test object and uses this value and the material's sound velocity determined by the first pair to calculate the wall thickness.

In this way, variations in the sound velocity due to temperature variations or local inhomogeneities within the material are also included in the wall thickness calculation.

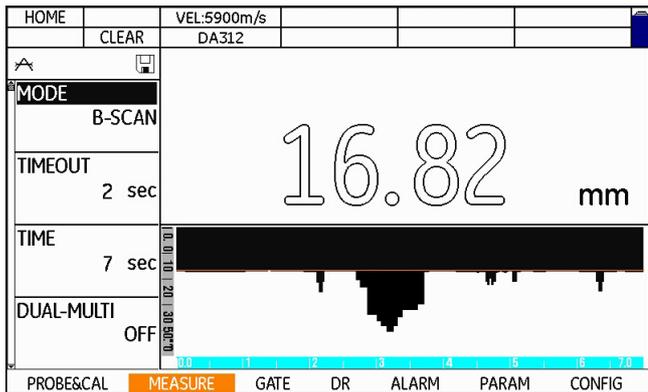
The function Auto-V is only available in the version DMS Go+ TC.



## B-scan

The B-scan is a special, path-dependent representation of the test object's wall thickness. This representation is ideal for the display of corroded sections. The probe is guided over the section to be tested of the component for this representation.

The cross section of the test object shown in the display of DMS Go+ gives the operator a quick overview of the thickness distribution on the component. In this regard, the minimum wall thicknesses become especially well visible. The following display shows a typical B-scan in the display of DMS Go+.

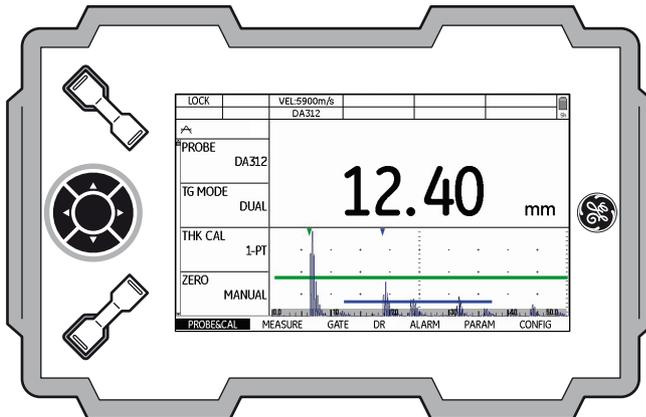


## Display orientation

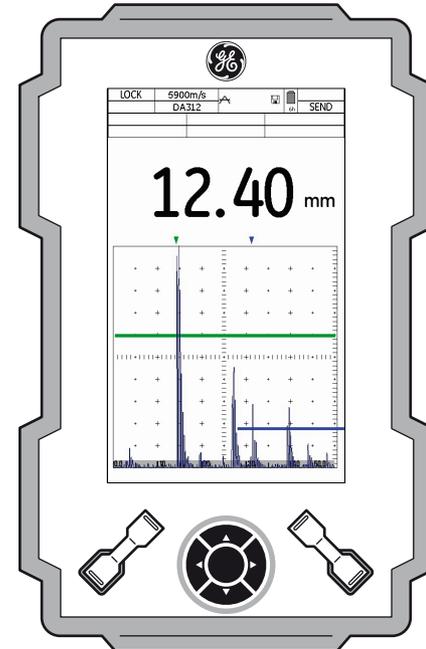
You can change the screen display of DMS Go+ from landscape to portrait mode (see Section **Display orientation**, page 5-6).

In addition, you can toggle between right-hand and left-hand operation (see Section **Selecting the instrument orientation**, page 5-6).

### Display orientation in landscape mode



### Display orientation in portrait mode



## 1.6 The USM Go+

The DMS Go+ uses the same operating principle as the portable flaw detector USM Go+.

Your DMS Go+ can use all functions of the flaw detector USM Go+ by means of a simple software upgrade. You will then have two instruments available in one housing. When you power the instrument on, you can choose the instrument that you want to use (see Chapter 3.5 **Starting the DMS Go+**, page 3-11).

A separate operating manual is available for the USM Go+. The functions of the USM Go+ are therefore not described in the operating manual of the DMS Go+.

## 1.7 How to use this manual

This operating manual applies to all instrument versions of the DMS Go+. Any differences in the functions or adjustment values are marked in each case.

Before operating the instrument for the first time, it is absolutely necessary that you read the chapters 1, 3, and 4. They will inform you about the necessary preparations of the instrument, give you a description of all keys and displays, and explain the operating principle.

In doing this, you will avoid any errors or failures of the instrument and be able to use the full range of instrument functions.

You will find the specifications of the instrument in Chapter 11 **Specifications**.

## Overview

The operation of the DMS Go+ is easy and quick to learn. To be able to use the instrument quickly, you should make yourself familiar with its preparation for use and its basic functions. Please read the following chapter carefully for this purpose:

### Chapter 3 **Initial start-up**

This is where you'll find all the preparatory measures required for using the instrument.

### Chapter 4 **Principles of operation**

gives you an overview of the operating principle of the instrument and of the basic operating steps.

### Chapter 5 **Operation**

shows you the settings that you can define and the operating steps needed for the measurement. It shows the further options and functions presented by the DMS Go+.

### Chapter 6 **Data Recorder**

This chapter describes the functions and options for using the data recorder, as well as the documentation of the measurement results.

### Chapter 7 **Special functions of the DMS Go+ TC**

This chapter describes the options Auto-V and TopCOAT.

### Chapter 10 **Appendix**

You can find additional information about special measurements, the data recorder files types, a function reference, and tables with typical sound velocities in the Annex.

## 1.8 Layout and presentation in this manual

To make it easier for you to use this manual, all operating steps, listings, and special notes are always presented in the same way. This will help you find individual pieces of information quickly.

### Attention and note symbols



#### **ATTENTION**

The **ATTENTION** symbol indicates peculiarities and special aspects in the operation which could affect the accuracy of the results.



#### **Note**

**Note** contains e.g. references to other chapters or special recommendations for a function.

### Listings

Listings are presented in the following form:

- Variant A
- Variant B
- ...

### Operating steps

Operating steps appear as shown in the following example:

- Loosen the two screws at the bottom.
- Remove the cover.
- ...

# Standard package and accessories **2**

## 2.1 Standard package

Product code	Description	Order number
	Thickness gauge DMS Go+	
TC-096	Transport case	109 709
LI-138	Lithium-ion battery, 7.4 V, 3.9 Ah, rechargeable	109 707
LiBC-139	AC power adapter/charger, 100V ... 260V AC	109 708
	SD memory card 8 GB	
	Display screen protector foils (10 pieces)	
WS-342	Safety hand strap	109 753
	Quick Start Guide	
	Operating manual on CD	
	Manufacturer's certificate	

## 2.2 Add-on functions

<b>Product code</b>	<b>Description</b>	<b>Order number</b>
TC	TopCOAT and Auto-V	
DR	Extended Data Recorder	

## 2.3 Preconfigured function packages

<b>Product code</b>	<b>Description</b>	<b>Order number</b>
Base	Thickness gauge DMS Go+ or DMS Go+	
TC	Base with TopCOAT and Auto-V	
DR	Base with Extended Data Recorder	
Advanced	Base with TopCOAT, Auto-V, and Extended Data Recorder	

## 2.4 Recommended probes

Product code	Description	Order number
	Probes for corrosion measurements (one-sided zeroing <b>during</b> coupling):	
DA 301	5 MHz, measuring range 1.2 ... approx. 200 mm	56 904
DA 303	2 MHz, measuring range 5 ... approx. 300 mm	56 905
DA 0.8 G	800 kHz, measuring range 7 ... approx. 60 mm	66 501
DA 312	10 MHz, measuring range 0.6 ... approx. 50 mm	56 906

Product code	Description	Order number
	Dialog probes for corrosion measurements (one-sided zeroing <b>before</b> coupling):	
DA 401	5 MHz, measuring range 1.2 ... approx. 200 mm	58 637
DA 403	2 MHz, measuring range 5 ... approx. 300 mm	58 639
DA 408	800 kHz, measuring range 7 ... approx. 60 mm	58 644
DA 411	as DA 401, connectors at the top	58 857
DA 412	10 MHz, measuring range 0.6 ... approx. 50 mm	58 638

<b>Product code</b>	<b>Description</b>	<b>Order number</b>
	Probes for high-temperature measurements	
DA 315	2 MHz, measuring range 5 ... 150 mm, up to +200 °C	57 167
DA 317	5 MHz, measuring range 2 ... 80 mm, up to +200 °C	57 168
DA 319	10 MHz, measuring range 1 ... 15 mm, up to +200 °C	57 169
DA 305	High-temperature probe, 5 MHz measuring range approx. 4 ... 60 mm, up to +600 °C	56 911
HT 400 A	High-temperature probe, measuring range 0.5 ... approx. 300 mm, up to +540 °C	113-224-760

<b>Product code</b>	<b>Description</b>	<b>Order number</b>
	Probes for special test tasks:	
DA 312 B16	10 MHz, measuring range 0.6 ... approx. 12 mm, dia. 3 mm	66 934
KBA 525	10 MHz, measuring range 0.6 ... approx. 20 mm, dia. 5 mm	113-516-002
FH2ED-REM	Dialog probe, 8 MHz, measuring range 0.75 ... approx. 50 mm, remote control key	113-552-009
TC-560	5 MHz, measuring range 2 ... approx. 200 mm for TopCOAT operating mode (only DMS Go+ TC)	113-544-214

<b>Product code</b>	<b>Description</b>	<b>Order number</b>
	Probes for precision measurements in single-element mode (DMS Go+ and DMS Go+ TC):	
CLF 4	Delay probe, 15 MHz, measuring range 0.25 ... approx. 25 mm	113-527-665
CLF 5	Contact probe, 10 MHz, measuring range 1 ... approx. 50 mm	113-526-005
CA 211 A	Contact probe, 5 MHz, measuring range 2 ... approx. 380 mm	113-544-000
CA 214	5 MHz, only in connection with N 12,5 K delay line	65 121
N 12,5 K	Delay line for CA 214	66 382
G5KB	Contact probe, 5 MHz, measuring range 2 ... approx. 635 mm	58 504
G2N	Contact probe, 2 MHz, measuring range 3 ... approx. 635 mm	58 501
K1SC	Contact probe, 1 MHz, measuring range 5 ... approx. 635 mm	59 074

## 2.5 Recommended probe cables

<b>Product code</b>	<b>Description</b>	<b>Order number</b>
DA 231	1.5 m (for DA 401, DA 403, DA 408)	53 616
DA 233	1.5 m (for DA 315, DA 317, DA 319, DA 411)	54 999
DA 235	1.5 m (for DA 305, DA 412)	54 374
KBA 531 A	1.5 m (for TC-560), with cable gland, with special stainless steel jacket	118-140-058
KBA 535	1.5 m (for HT 400 and HT 400A), with cable gland, with special stainless steel jacket	118-140-099
KBA 536	1.5 m (for HT 400 and HT 400A), with cable gland,	118-140-100
HT-B	Bell-housing grip, plug-on type for HT 400 and HT 400A	118-080-342
ET-104	Extension tube, plug-on type for HT 400 and HT 400A	118-100-104
CL 331	1.5 m (for CLF 4, CA 211 A)	58 160

<b>Product code</b>	<b>Description</b>	<b>Order number</b>
MPKLL 2	2 m (for CA 214, G5KB, G2N)	58 791
MPKL 2	2 m (for K1SC)	50 486

## 2.6 Recommended accessories

Product code	Description	Order number
ZGM	High-temperature coupling paste, 200 ... 600 °C, 100g tube	56 567
LI-138	Lithium-ion battery, 7.4 V, 3.9 Ah, rechargeable	109 707
LiBC-139	AC power adapter/charger, 100 V ... 260 V AC	109 708
CA-040	Battery adapter for external charging of battery	109 713
TC-096	Transport case	109 709
CH-097	Shoulder strap	109 710
WH-098	Shoulder bag for instrument and couplant	109 711
WS-342	Safety hand strap	109 753
EK-492	Ergonomic set (CH-097, WH-098, WS-342)	109 754

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<b>Product code</b>	<b>Description</b>	<b>Order number</b>
UL MATE L	Basic data transfer program UltraMATE L	022-104-560
UL MATE	Evaluation and documentation program UltraMATE	022-103-660



# Initial start-up **3**

## 3.1 Instrument positioning

Fold out the prop-up stand on the rear side of the DMS Go+ and position the instrument on a flat base so that you can easily read the display.

If the instrument has been brought from a cold room into a warmer one, wait until it has adapted to the room temperature before you power it on (to avoid condensation).

If (in rare cases) condensation has developed inside the instrument, the cover may mist up from the inside. In this case, open the top cover until the damp has dried up. You should not power the instrument on until this has happened.



### Note

Don't leave the cover and the lid of the battery compartment open for any longer than is needed for exchanging the memory card or the battery. Otherwise, moisture may penetrate into the instrument.

## 3.2 Power supply

The DMS Go+ can be operated either with an external charger/power adapter or with the corresponding lithium-ion battery.

You can also connect the DMS Go+ to the mains power supply if the battery is in the instrument. A discharged battery is charged in this case, during the instrument operation.

### Operation with charger/power adapter

#### Connection to power supply

For the operation using a charger/power adapter, you should only use the charger/power adapter included in the standard package.

The charger/power adapter is automatically adjusted to every AC voltage between 90 V and 240 V (nominal voltage).

## Connecting the instrument

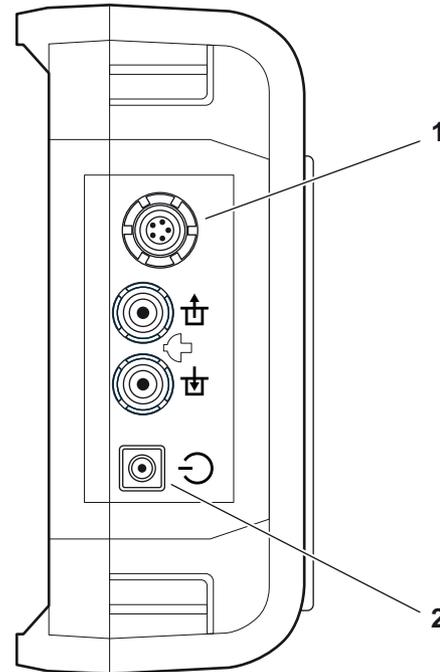
Connect the DMS Go+ to the mains socket-outlet by means of the corresponding charger/power adapter. The socket-contact for connecting the charger/power adapter is located on the side of the DMS Go+.

- Align the Lemo plug of the charger/power adapter with the red mark on the socket (1).
- Push the plug into the socket until it locks into place with a clearly audible click.
- When removing the Lemo plug, pull the metal sleeve on the plug back first in order to open the lock.



### ATTENTION

In order to power the instrument off correctly, press the power On/Off key (2) on the side of the instrument. If the power supply is interrupted (removing the battery, disconnecting the power plug), the operation does not end correctly.



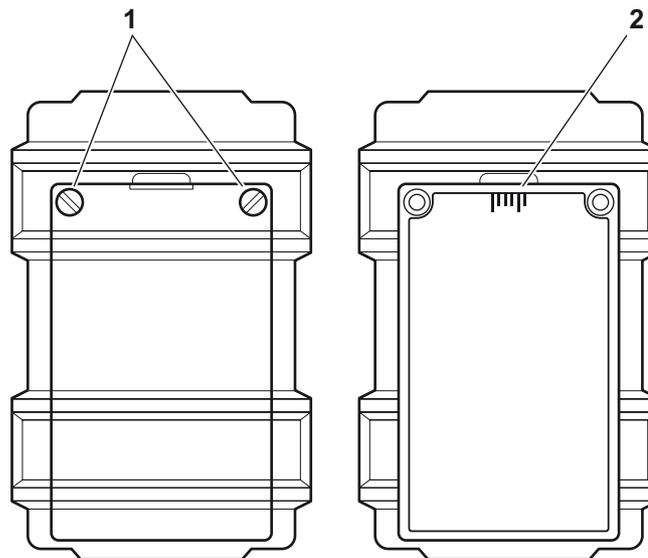
## Operation using batteries

You should only use the corresponding lithium-ion battery for the battery operation.

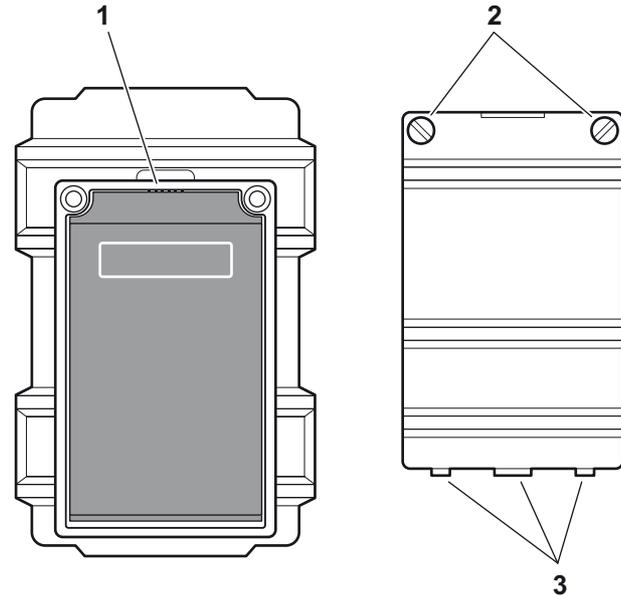
### Inserting batteries

The battery compartment is located on the rear of the instrument. The cover is fastened with two attachment screws.

- Turn the two attachment screws (1) of the battery compartment counterclockwise by one quarter of a turn each in order to loosen them.
- Lift the cover off upward. In the open battery compartment, you will see several connector pins (2) on one side.



- Place the battery in the battery compartment so that the marking faces upwards and the contacts are pushed against the connector pins (1).
- Insert the cover of the battery compartment with the side opposite to the screws at first, and push the lugs (3) into the housing recesses.
- Press the cover firmly down on the side of the screws and turn the two screws (2) clockwise by one quarter of a turn each in order to lock the cover.

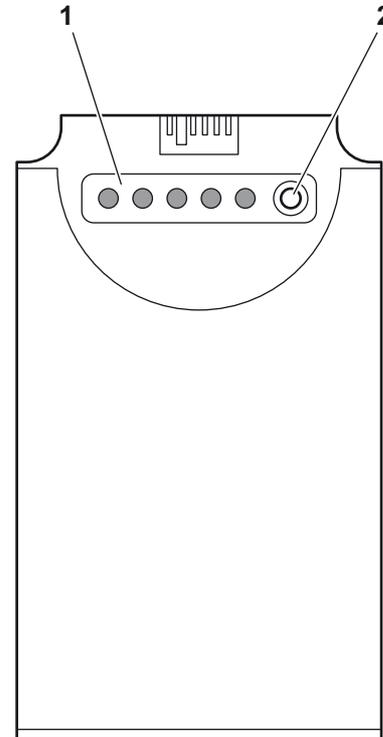


### Checking the charge level of the lithium-ion battery

The lithium-ion battery is provided with a battery charge level indicator. Five light-emitting diodes (1) indicate the level of battery charge. Check the battery charge level before inserting it into the instrument.

The number of diodes that are lit up has the following meaning:

- 5 LEDs: Battery charge level 100 ... 80 %
  - 4 LEDs: Battery charge level 80 ... 60 %
  - 3 LEDs: Battery charge level 60 ... 40 %
  - 2 LEDs: Battery charge level 40 ... 20 %
  - 1 LED: Battery charge level 20 ... 10 %
  - 1 LED is flashing: Battery charge level <10 %
- Press the key (2) next to the LEDs. The LEDs indicate the battery charge level.



## Power level indicator

The DMS Go+ is equipped with a power level indicator that allows to estimate the remaining operating time of the instrument. A battery icon with the corresponding charge level is displayed in the top right corner on top of the A-scan. The battery icon indicates the remaining operating time or the battery charge level.

Icon	Meaning
	Battery charge level, remaining operating time in hours (approximate value)
	Charger/power adapter is connected, percentage of battery charge level (approximate value)
	Warning: Low battery charge level, remaining operating time in minutes (approximate value)

The DMS Go+ is automatically powered off if the operation is no longer ensured. All settings are retained during battery exchange and are immediately available again afterwards.



### Note

If the battery charge level is low, it is absolutely necessary that you finish your test job, power off the instrument, and replace the battery. You should carry a second battery along with you if you cannot use mains power supply to operate the instrument.

## Charging the batteries

You can charge the lithium-ion batteries either directly within the instrument or in an external charger.

### Internal charging

If a lithium-ion battery is inserted, charging starts automatically as soon as you connect the charger/power adapter to the DMS Go+ and to the mains power supply. You can carry out ultrasonic tests and charge the batteries at the same time.

The charging time is approx. ten hours with simultaneous ultrasonic testing. If the instrument is not used for ultrasonic testing, the charging time is approx. eight hours. This charging time applies to ambient temperatures of 25 ... 30 °C.

## Charging status

The LED on the charger/power adapter indicates the status of charging.

- off: Charger/power adapter is not connected to the power supply
- yellow steady light: Charger/power adapter is not connected to the instrument or no batteries are inserted into the instrument
- flashing green light: Charging
- green steady light: Charging is completed, batteries are charged

### External charging

You can charge lithium-ion batteries with an external charger of the DMS Go+. Do not use any other chargers for charging the lithium-ion batteries for the DMS Go+.

### 3.3 Connecting a probe

You can connect all probes recommended in chapter 2 of this manual. In addition to the probe, you need a suitable probe cable for the connection between the probe and the instrument. The probe connectors are located on the side of the instrument.



#### Note

Probes with zeroing **before** coupling should not be coupled when the instrument is powered on. The DMS Go+ tries to detect a zero point as long as the probe is coupled.

#### Dual-type connectors

Most probe cables have a dual-type connector for both connection sockets on the instrument. To prevent a wrong connection, these connectors and the connection sockets on the probe and on the instrument are provided with lugs.

- Connect the probe cable with the probe.
- Connect the probe cable with the probe connections on the side of the instrument.

#### Single-type connectors



#### ATTENTION

If a probe is connected incorrectly, the consequence would be a mismatching which may lead to considerable power losses or even to echo waveform distortions.

Both connector sockets are equally suitable (connected in parallel) for connecting single-element probes so that it does not matter which one of the two sockets is used.

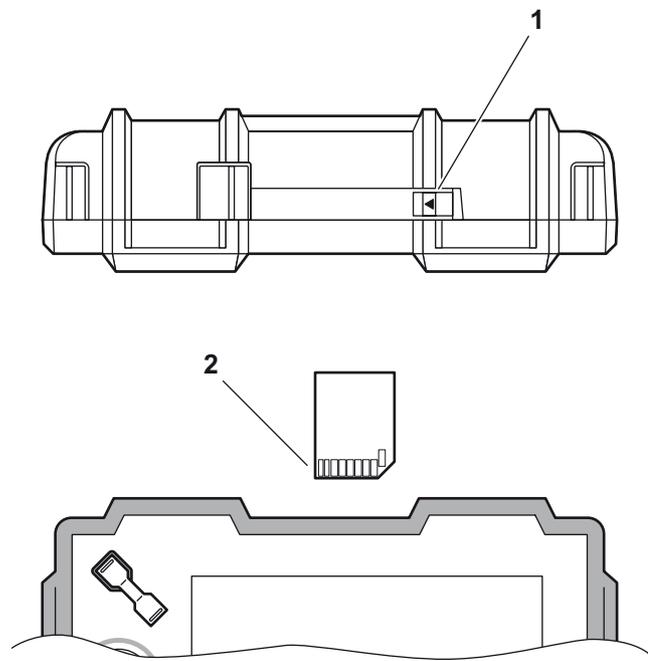
When connecting a dual-element (TR) probe (having one transmitter or pulser element and one receiver element) or two probes (of which one is transmitting and the other one receiving), attention should be paid to the correct allocation of connecting cables (please see symbols on the instrument):

Icon	Meaning
	Transmitter connection
	Receiver connection

## 3.4 Inserting the SD memory card

You can use any standard SD memory card in the DMS Go+. To insert and to remove the memory card, you have to open the watertight cover at the top of the instrument.

- Push the lock of the hinged cover (1) in the direction of the arrow in order to open the cover.
- Insert the SD memory card into the card slot so that the contacts (2) of the card face the instrument front side.
- Press the card down into the card slot until it locks into place.
- Close the cover and make sure that it is locked tightly. If necessary, push the lock up to the limit stop in the opposite direction of the arrow in order to close the cover watertight again.
- To remove the SD card, open the cover and shortly press down the card to unlock it.



## 3.5 Starting the DMS Go+

### Powering On

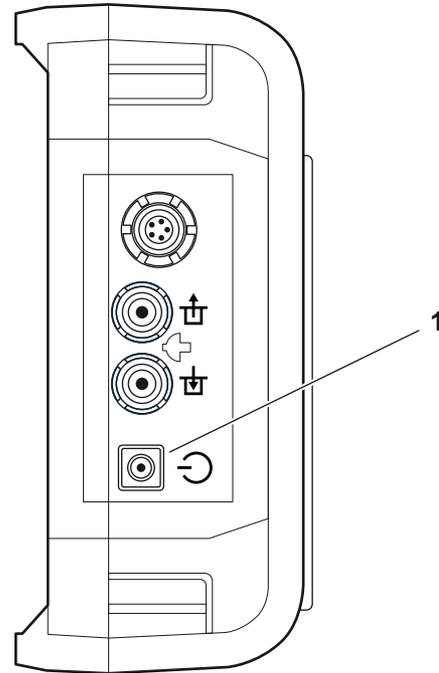
To start the DMS Go+, shortly press the Power key (1) on the side of the instrument casing.

The software is initialized. During this, the display will remain blank for about 3 seconds. If the license for the USM Go is also installed, the display will show the page for selecting the required instrument. Choose the required instrument using the arrow keys on the keypad.

After that, the start display showing the name of the instrument and information on the software, serial number, and the installed options will appear.

The instrument carries out a self-check and then switches over to stand-by mode.

The settings of all function values and the default settings (language and units) are the same as before powering the instrument off.



## Powering Off

To power the DMS Go+ off, shortly press the Power key on the side of the instrument casing.

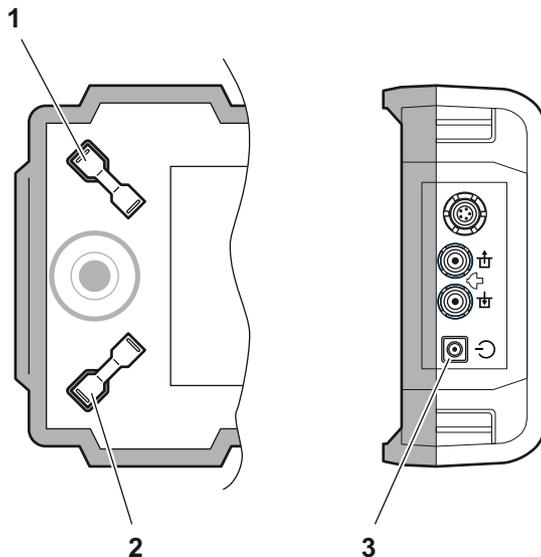
The settings of all function values and the default settings (language and units) are retained after powering off.

## Factory default setting (Reset)

If you can no longer use the functions of your instrument or if the instrument no longer reacts as expected, you can reset it to the factory default settings. Any data saved to the SD card will be retained, all other individual settings, e.g. language and units, will be reset to the factory default settings.

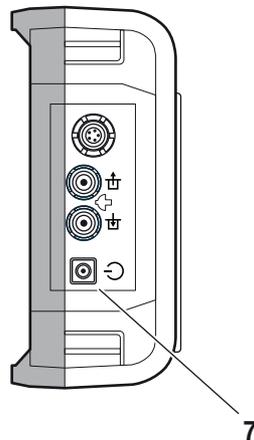
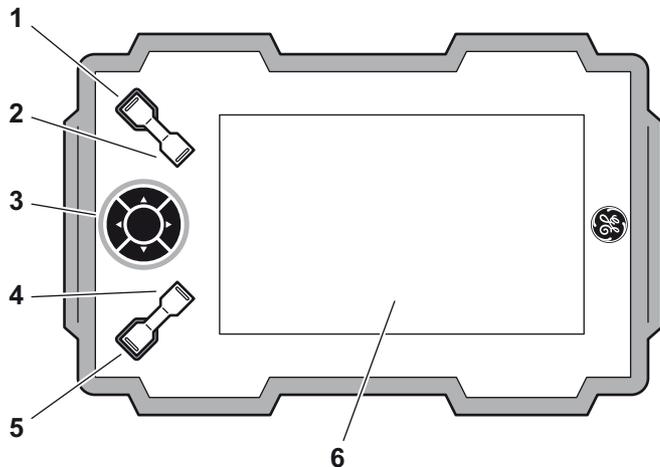
- Power the instrument off.
- Press the further ends of the two Function keys (1 and 2), and the Power key (3) simultaneously, and hold all three keys pressed until the start display or the page of the instrument selection appears.

The instrument starts with the factory default settings (for language selection, see Section **Language setting**, page 5-2).



# Principles of operation 4

## 4.1 Overview of operator's controls



- 1 Function key 1, functions are context-dependent
- 2 Function key 2, functions are context-dependent; keys **1** and **2** simultaneously: Save screen shot
- 3 Keypad, navigation between function groups and functions, changing settings
- 4 Function key 3, functions are context-dependent

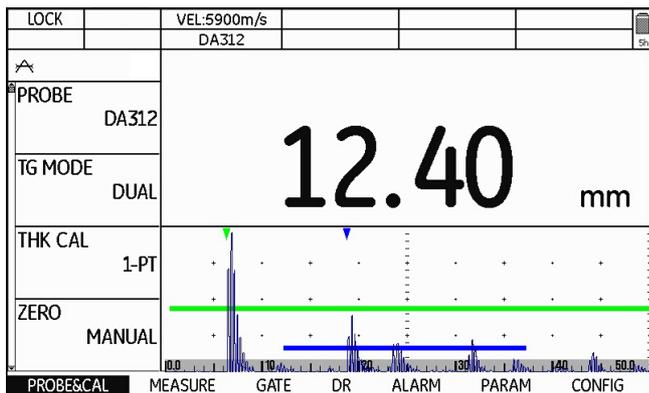
- 5 Function key 4, function is individually assignable (**CONFIG – FUNC KEY**),
- 6 Display for representation of readings, A-scan, B-scan, functions, and data
- 7 Power key for powering on and off

## 4.2 Display screen

### Display modes

The DMS Go+ has a high-resolution display screen for the representation of the A-scan or the B-scan, for the display of readings, important setup parameters and icons, as well as for the representation of different menus.

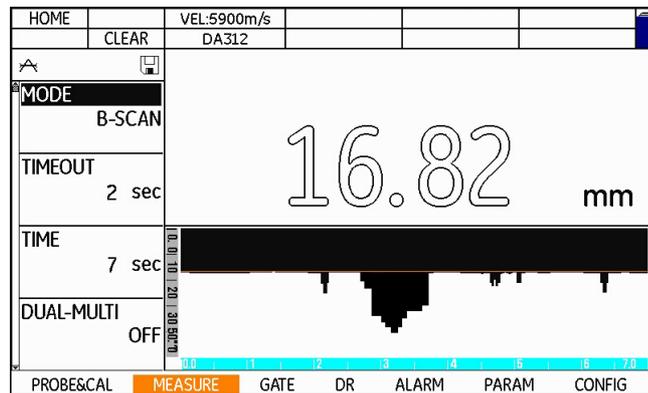
#### Normal display mode reading and A-scan



#### Note

For toggling between the different display modes and operating modes, see Section **Operating modes and views**, page 5-17.

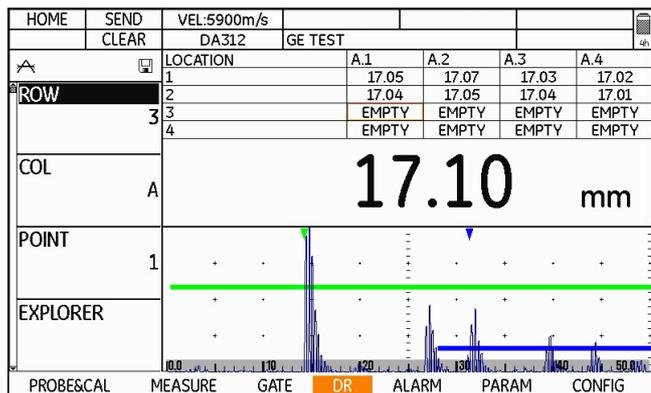
#### Display mode reading and B-scan



### Display mode Data Recorder

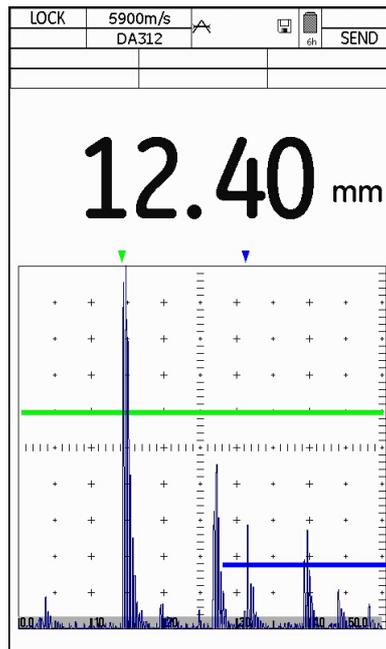
If a data recorder file is loaded, you will see the name and the structure of the data recorder file above the current reading.

The functions to the left on the display screen are used for navigating within the data recorder file.



### Landscape and Portrait mode

You can change the screen display of DMS Go+ from landscape to portrait mode.



## Functions on the display screen

### Function groups

The names of the seven function groups are shown at the bottom of the display screen. The currently selected function group is highlighted.

PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG
-----------	---------	------	----	-------	-------	--------

### Functions

The functions of the currently selected function group are shown on the left side of the display screen.

LOCK	
PROBE	DA312
TG MODE	DUAL
THK CAL	1-PT
ZERO	MANUAL
PROBE&CAL	ME

## Icons and information

### Keypad functions

You can see the current functions of the four function keys in the top left corner of the display screen. The functions are context-dependent and change during the operation.

HOME	SEND	VEL:5900m/s				
	CLEAR	DA312	GE TEST			

### Data boxes

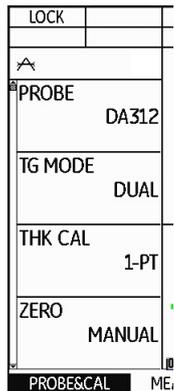
The current sound velocity of the material and the name of the selected probe are displayed at the top center.

Six other data boxes are user-assignable for different data and information.

HOME		VEL:5757m/s	P-DLY:5.000us	LOC:	M-GAIN:84.2dB	
		DA312	TEMP:21°C	GAIN:84.2dB	T-THK:6.33mm	

### Status display icons

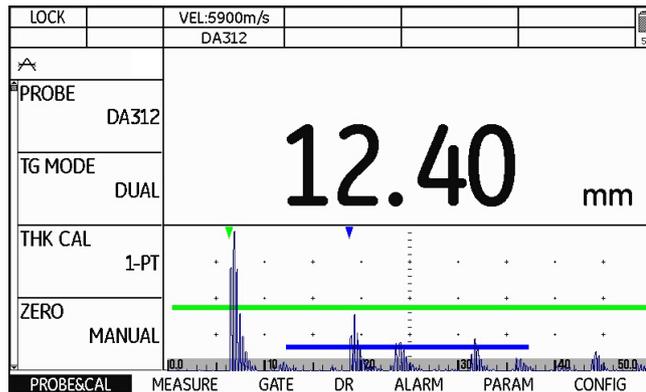
The status displays in the top left corner of the display screen, above the functions, inform about certain active functions, operating modes, or operating status (see Section **Status display icons**, page 0-5).



### Display of reading

The current reading is always displayed in enlarged mode above the A-scan or B-scan.

If an alarm threshold is exceeded, the displayed reading is red.



## 4.3 Navigation and function keys

### Keypad

The five keys of the keypad next to the display screen are used

- for navigation between and within the function groups,
- for changing settings, and
- for selecting adjustment values.



#### Note

If a key is pressed for a longer time, the adjustment values change in larger increments.

The center key of the keypad is normally used for toggling between the display modes Landscape and Portrait.

In special contexts, the keys have further functions which are described together with the corresponding action in this manual.

### Function keys

Apart from the keypad, two groups of keys, including two function keys each, are arranged next to the display screen (see Section **Overview of operator's controls**, page 4-2).

The functions of three function keys are context-dependent and change automatically during the operation. The current functions are displayed in the top left corner of the display screen (see Section **Keypad functions**, page 4-5).

The function of the function key number 4 is user-assignable (see Section **Assignment of function key 4**, page 5-7).

### Power key

The key for powering the instrument on and off is located on the instrument side, next to the probe connectors.

## Key combinations

You can carry out some functions by means of key combinations. To achieve this, you have to press several function keys at the same time (see Section **Overview of operator's controls**, page 4-2).

Function	Keys
Screen shot	Function key 1 + function key 2
Update	Function key 2 + function key 4 + Power key
Reset	Function key 1 + function key 4 + Power key

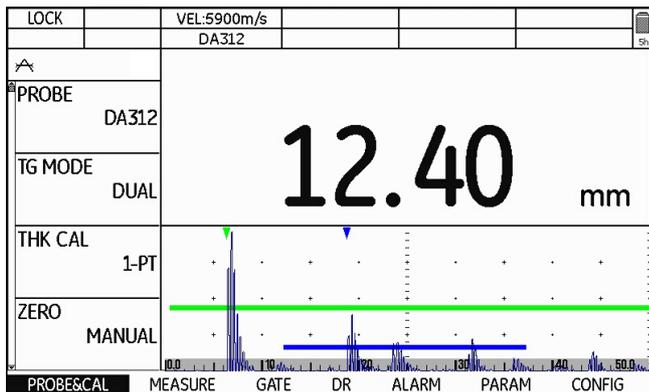
## 4.4 Operational concept

### Changing the display views

The display view changes automatically after selecting the corresponding instrument function or the operating mode (function **MODE**).

#### Normal view reading and A-scan

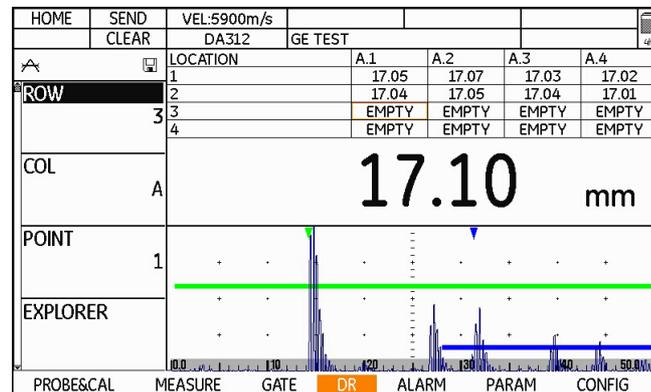
Every time the DMS Go+ is powered on, the normal view with the large display of reading and the functions groups and functions can be seen.



### View Data Recorder

If a data recorder file has been loaded, additional information about the file is automatically displayed above the reading together with the file structure including the saved readings.

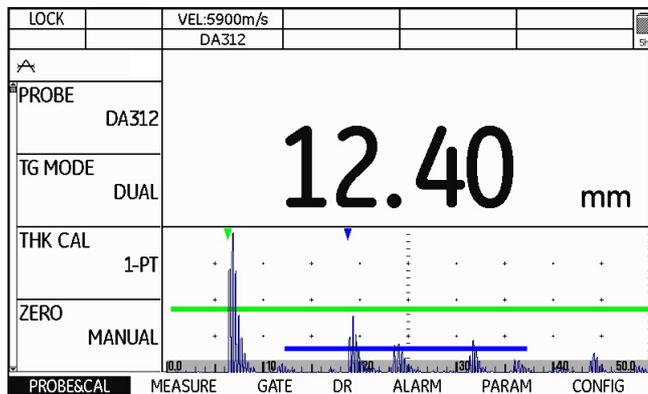
A description of how to handle data recorder files is given in Chapter 6 **Data Recorder**.



## Selecting and setting functions

Shown below the A-scan are the seven function groups which you can directly select using the keys of the keypad. The name of the currently selected function group is highlighted and the corresponding functions are displayed in a list at the left screen edge.

A vertical scroll bar at the utmost screen edge shows the current position in the list for function groups containing more than four functions.



- Press the **left** or **right** arrow keys in order to choose a function group.
- Press the **down** arrow key in order to select the first function of the function group chosen previously.
- Press the **left** or **right** arrow keys in order to change the setting.
- Press the function key 1 (function **HOME**) in order to exit the function.

## Coarse and fine adjustment of functions

You can choose between coarse and fine adjustment for some functions.

Use the lower function keys to make the coarse adjustment. The value will then change either in large increments (e.g. for the function **DISPLAY RANGE**) or you can choose from a series of factory-saved values (e.g. for the function **VELOCITY**)

The fine adjustment is made by means of the **left** and **right** arrow keys of the keypad. The fastness of change is influenced by the duration of the key depression during this (e.g. for the function **VELOCITY**).

During the coarse adjustment, the name of the function is displayed in capital letters (**DISPLAY RANGE**), whereas it is displayed in lower-case letters during the fine adjustment (**display range**).

As long as a function is selected, you cannot toggle between the function groups. To toggle between the function groups, you have to press the function key 1 (function **HOME**) first in order to exit the function.

### Key lock

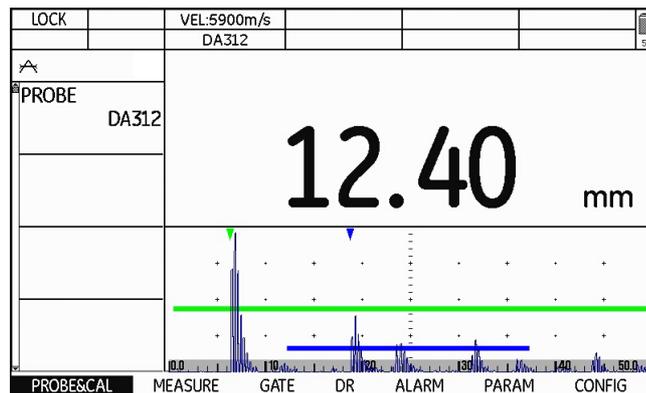
If no function is selected, you can activate the key lock. If the key lock is active, all keys except for the function key 1 are locked and the instrument no longer reacts if a key is pressed.

- Press the function key 1 (function **LOCK**) in order to activate the key lock. The key function **LOCK** is then displayed in the top left corner of the display screen.
- Press the function key 1 (function **LOCK**) once more in order to deactivate the key lock. The instrument reacts again when a key is pressed.

### Disabled functions

If the option **INSPECTOR** is chosen in the function **MENU MODE**, the functions are suppressed and cannot be set.

Depending on other settings, individual functions can be visible (see Section **Function lockout**, page 5-8)





# Operation **5**

## 5.1 Default settings

### Language setting

COLOR SCHEME 3
LANGUAGE English
ORIENTATION RIGHT HAND
DT FMT D.M.Y 12H
DATE TIME 08.05.2014 06:25 PM

Use the function **LANGUAGE** (function group **CONFIG**) to choose the language for the displayed texts.

The following languages are available:

- Bulgarian
- Chinese
- German
- English
- Finnish
- French
- Italian
- Japanese
- Dutch
- Norwegian
- Polish
- Portuguese
- Romanian
- Russian
- Swedish
- Spanish
- Czech
- Hungarian

- In the function group **CONFIG**, select the function **LANGUAGE**.
- Choose the required language. The language changes immediately.

## Units setting

POWER DOWN MANUAL
UNIT mm
RESOLUTION X.XX
ZERO BLOCK ----- mm ----- m/s
VEL REF. BLOCK N/A
LOCKOUT

You can use the function **UNIT** (function group **CONFIG**) to select the required units (mm or in). You can change the units any time. All values are adjusted accordingly.

- In the function group **CONFIG**, select the function **UNIT**.
- Choose the required unit. The unit changes immediately.

## Resolution setting

POWER DOWN MANUAL
UNIT mm
RESOLUTION X.XX
ZERO BLOCK ----- mm ----- m/s
VEL REF. BLOCK N/A
LOCKOUT

You can use the function **RESOLUTION** (function group **CONFIG**) to select the resolution for the display of readings. If the setting **AUTO** is selected, the readings up to 100 mm are displayed with two decimal places (up to 10 in with three decimal places).

- In the function group **CONFIG**, select the function **RESOLUTION**.
- Choose the required resolution. The display of readings changes immediately.

## Radix

UPDATE RATE	16Hz
RECTIFY	NEG
RADIX	PERIOD
LAST READING	HOLD
BRIGHTNESS	10
COLOR	

You can choose the radix symbol. All data are displayed and saved using the selected radix.

- In the function group **CONFIG**, select the function **RADIX**.
- Choose the required radix. The display of readings changes immediately.

## Last reading

UPDATE RATE	16Hz
RECTIFY	NEG
RADIX	PERIOD
LAST READING	HOLD
BRIGHTNESS	10
COLOR	

You can choose the display mode for the thickness value measured last – after uncoupling and before coupling the next time.

- In the function group **CONFIG**, select the function **LAST READING**.
- Choose the required display mode. The display of readings changes immediately.

## Date format, Date, and Time

COLOR SCHEME3
LANGUAGE English
ORIENTATION RIGHT HAND
DT FMT D.M.Y 12H
DATE TIME 08.05.2014 06:25 PM

You can set the date format, the date, and the time using the corresponding functions of the function group **CONFIG** on the second operating level.



### ATTENTION

In view of a correct documentation, always make sure that you are using the correct date and the correct time. Remember to turn the clock during the change from winter time to summer time.

- In the function group **CONFIG**, select the function **DT FMT**.
- Choose the required date format. The time format is changed together with the date format.
- Select the function **DATE TIME**.
- Press the **left** or **right** arrow keys.
- Use the navigation to change the highlighted value and switch over to the next value.
- Change the other values in the same way.
- Finally, press the function key 1 to exit the function. The new values apply immediately.

## Selecting the instrument orientation

BRIGHTNESS	10
COLOR	SCHEME 3
LANGUAGE	English
ORIENTATION	RIGHT HAND
DT FMT	D.M.Y 12H

You can configure the instrument for right-handed or left-handed operation (referred to the probe). The screen display is then rotated through 180°, the functions of navigation and function keys are adjusted accordingly.

- In the function group **CONFIG**, select the function **ORIENTATION**.
- Choose the required orientation. The screen display is immediately switched over.

## Display orientation

You can change the screen display of DMS Go+ from landscape to portrait mode.

It is not possible to access the settings and parameters in the portrait mode.

- Briefly press the center key of the keypad in order to rotate the screen display by 90 degrees.
- Press the center key one more time in order to see the original display mode again.

## Assignment of function key 4

LOCKOUT CONFIG
MENU MODE EXPERT
FUNC KEY NOT DEFINED
PASSWORD
CODE

You can assign a function to the function key 4 (see Section **Overview of operator's controls**, page 4-2) to be able to trigger this function any time. In this way, you can switch for example from right-handed operation over to left-handed operation by pressing the function key 4 (option **LH/RH**).

The following settings are possible:

- **NOT DEFINED** (no function assigned)
  - **NOTE** (choosing a comment, see page 6-20)
  - **μGRID** (adding a MicroGrid, see page 6-29)
  - **LH/RH** (instrument orientation, see page 5-6)
  - **OBSTR/CLEAR** (no measurement possible or delete reading, see page 6-15 f.)
  - **FREEZE** (display freeze, see page 5-52)
  - **CAL** (calibration start, see page 5-25)
  - **ZOOM** (gate magnifier, see page 5-53)
- In the function group **CONFIG**, select the function **FUNC KEY**.
  - Choose the required function.
  - Press the function key 4 to test the function.

## Function lockout

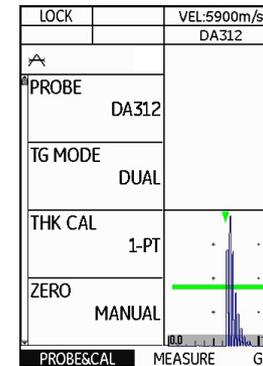
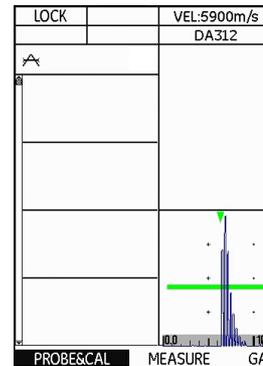
LOCKOUT CONFIG
MENU MODE EXPERT
FUNC KEY NOT DEFINED
PASSWORD
CODE

You can disable the access to the setup functions of the instrument in order to prevent, for example, any accidental changes to settings. The functions are then no longer displayed on the screen.

When the access to the functions is disabled, you can exclude individual functions from the lockout and make them visible. These functions are then selectable and can be changed or set in spite of the general lockout.

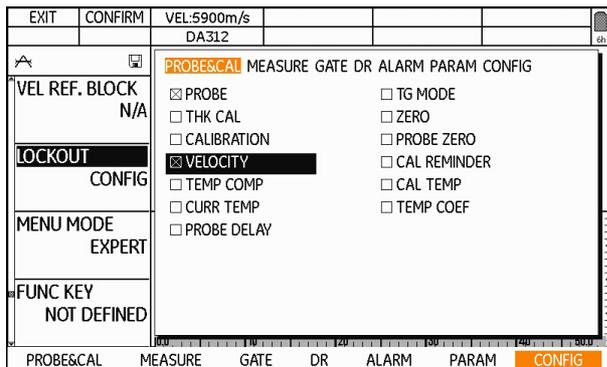
## Disabling all setup functions

- In the function group **CONFIG**, select the function **MENU MODE**.
- Choose the option **INSPECTOR** in order to disable the access to all setup functions.
- Choose the option **EXPERT** in order to enable the access to all setup functions.
- Check whether the functions are visible or not according to the selected setting.



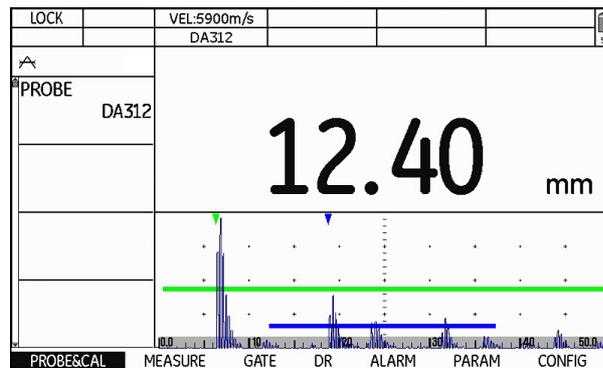
### Enabling individual setup functions

- In the function group **CONFIG**, select the function **LOCKOUT**.
- Press the **left** or **right** arrow keys. A selection menu is displayed.



- Press one of the **left** or **right** arrow keys in order to select the function group.
- Press one of the **up** or **down** arrow keys in order to select the function.

- Press the center key of the keypad in order to exclude the selected function from the general lockout. The function is marked with a cross.
- Select other exceptions in the same way.
- Finally, press the function key 2 (function **CONFIRM**) in order to exit the selection menu and to save the selection.
- Check whether the marked functions are visible in the corresponding function groups and can be changed or set.



## Password protection

You can protect the access to the setup functions with a password. This makes the access to the disabled functions only possible after entering a password (see Section **Function lockout**, page 5-8).

To activate the password protection, you have to set a password. After saving the password, it is only possible to switch to the **EXPERT** mode after entering the password.

### Saving a new password



#### ATTENTION

After saving the password, it is only possible to have full access to the instrument functions after entering the password. If the password is lost, you have to reset the instrument (see Section **Factory default setting (Reset)**, page 3-12).

You can save a password only if there is no password protection yet or if the **EXPERT** mode is active (see Section **Function lockout**, page 5-8).

- In the function group **CONFIG**, select the function **PASSWORD**.
- Press one of the **left** or **right** arrow keys.
- Press the arrow keys to mark the first character for the password.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.
- Press the function key 2 (function **BKSP**) in order to delete the last character.
- Press the function key 4 (function **NEXT**) and set the password again to check it.
- Press the function key 4 (function **NEXT**). The password is saved and immediately valid.

## Changing a password

You can change the password at any time. To do this, you must first enter the current password.

- In the function group **CONFIG**, select the function **PASSWORD**.
- Press one of the **left** or **right** arrow keys.
- Press the arrow keys to mark the first character for the current password.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.
- Press the function key 4 (function **NEXT**).
- Set the new password (see Section **Saving a new password**, page 5-10).

## Deactivating password protection

To deactivate the password protection, proceed in the same way as for changing the password. Instead of a new password, however, you don't choose any characters.

- In the function group **CONFIG**, select the function **PASSWORD**.
- Press one of the **left** or **right** arrow keys.
- Press the arrow keys to mark the first character for the current password.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.
- Press the function key 4 (function **NEXT**). However, do not choose any characters at this point.
- Press the function key 4 (function **NEXT**) and, to check, the function key 4 one more time (function **NEXT**). The password protection is deactivated.

## Power saving mode

POWER DOWN MANUAL
UNIT mm
RESOLUTION X.XX
ZERO BLOCK ----- mm ----- m/s
VEL REF. BLOCK N/A
LOCKOUT

To save power during longer stops or breaks, you can activate the automatic power down function of the instrument after a preset time. The instrument is powered down if no operation takes place during this time. After that, you have to power the instrument on again using the Power key.

If you choose the option **MANUAL**, the instrument is not powered down automatically.

You have a choice between the following automatic power down times:

- 1 min
- 2 min
- 3 min
- 4 min
- 5 min
- 10 min
- 15 min
- 30 min

- In the function group **CONFIG**, select the function **POWER DOWN**.
- Choose the required power down time or the option **MANUAL**.

## Configuring data boxes

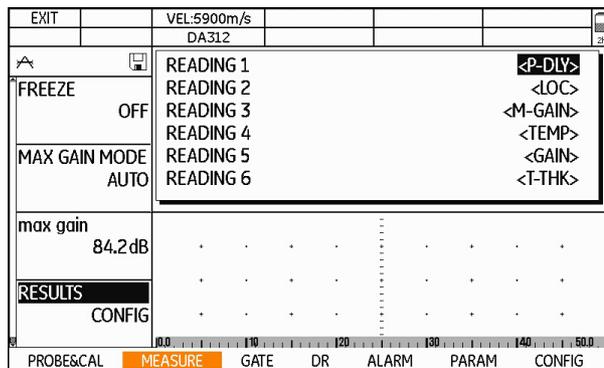
DISPLAY RANGE	200.00mm
FREEZE	OFF
MAX GAIN MODE	AUTO
MAX GAIN	81.8dB
RESULTS	CONFIG

You can use the function **RESULTS** to choose the data to be displayed in the six data boxes at the top of the screen display (see Section **Icons and information**, page 4-5).

You have a choice between the following data:

- **OFF** (no display)
- **P-DLY** (probe delay)
- **LOC** (measuring location)
- **M-GAIN** (maximum gain setting)
- **TEMP** (material temperature setting)
- **GAIN** (current gain)
- **T-THK** (temperature-compensated wall thickness)
- **THK** (measured wall thickness)
- **C-THK** (coating thickness in the operating mode TopCOAT)

- In the function group **MEASURE**, select the function **RESULTS**.
- Press one of the **left** or **right** arrow keys. A selection menu is displayed.



- Press one of the **up** or **down** arrow keys in order to mark the required data box.
- Press one of the **left** or **right** arrow keys in order to select the content for the marked data box.
- Configure the other data boxes in the same way.

- Finally, press the function key 1 (function **EXIT**) in order to exit the selection menu and to save the selection. The selected data are then displayed in the data boxes.

HOME	VEL:5757m/s	P-DLY:5.000us	LOC:	M-GAIN:84.2dB
	DA3L2	TEMP:21°C	GAIN:84.2dB	T-THK:6.33mm

## 5.2 Default settings of the display

The DMS Go+ is equipped with a high-resolution color display. You can optimize the display according to your own viewing habits and to the operating environment.

### Setting the brightness

UPDATE RATE	16Hz
RECTIFY	NEG
RADIX	PERIOD
LAST READING	HOLD
BRIGHTNESS	10
COLOR	

You can set the brightness of the display and select a value from **1** to **10** for this purpose.



#### Note

A high brightness value increases the power consumption, due to which the operating time is reduced in battery operation.

- In the function group **CONFIG**, select the function **BRIGHTNESS**.
- Choose the required value. The display brightness changes immediately.



#### Note

You can extend the operating time by means of the power saver function (see Section **Power saving mode**, page 5-12).

## Selecting the color scheme

BRIGHTNESS	10
COLOR	SCHEME 3
LANGUAGE	English
ORIENTATION	RIGHT HAND
DT FMT	D.M.Y 12H

You can choose one of four color schemes. The color scheme determines the color of all displays and of the background.



### Note

All color schemes are suitable for indoor use. For outdoor use, we recommend **SCHEME 3** and **SCHEME 4**.

- In the function group **CONFIG**, select the function **COLOR**.
- Select the required color scheme. The screen display changes immediately.

## 5.3 Operating modes and views

You can choose from different operating modes and display views for different tasks.

- **THICKNESS** Default setting for general thickness measurements, see page 5-32
- **A-SCAN** A-scan view, see page 5-47
- **B-SCAN** B-scan profile, see page 5-42
- **MIN/MAX** MIN/MAX mode, see page 5-40
- **DIFF** Differential value display, see page 5-46

## Changing the operating mode or view

- In the function group **MEASURE**, select the function **MODE**.
- Select the required operating mode or view. The display view changes immediately.

## 5.4 Saving the settings

LOAD P-SET
SAVE P-SET

You can save the current instrument settings to a file on the SD memory card. The files for the DMS Go+ have the file extension DGO and are saved to the directory DMSGO\DATASETS on the memory card.



### Note

The file name can consist of a maximum of 20 characters.

- In the function group **PARAM**, select the function **SAVE P-SET**.
- Press one of the **left** or **right** arrow keys.
- Press the arrow keys to mark the first character for the file name.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.
- Press the function key 2 (function **BKSP**) in order to delete the last character.
- Finally, press the function key 4 (function **CONFIRM**) in order to save the file with the parameter data set under the specified name.

## Loading settings

You can load and use instrument settings saved to the SD memory card.



### Note

You can only load files with the file extension DGO in the directory DMSG0\DATASETS. Other files are not displayed for selection.

- In the function group **PARAM**, select the function **LOAD P-SET**.
- Press one of the **left** or **right** arrow keys.
- Press the arrow keys to select the required file.
- Press the function key 2 (function **ENTER**) to load the selected file.

The instrument settings of the selected dataset are loaded, and they are immediately active after closing the loading process.

## Deleting settings

You can delete instrument settings saved to the SD memory card.



### Note

You can only delete files with the file extension DGO in the directory DMSG0\DATASETS. Other files are not displayed for selection.

- In the function group **PARAM**, select the function **LOAD P-SET**.
- Press one of the **left** or **right** arrow keys.
- Press the arrow keys to select the required file.
- Press the function key 3 (function **DELETE**) to delete the selected file.
- Confirm the safety prompt. The dataset file is deleted.

## 5.5 Preparing for measurements

You can use the DMS Go+ to measure wall thicknesses or distances and to assess residual wall thicknesses in a simple way. The measured value is displayed directly. Depending on the task definition, you can apply one of the following measuring methods:

- Measurement of residual wall thickness up to the first echo with dual-element probes, for example in the event of corrosion.
- Measurement of a multi-echo sequence with good surfaces on both sides of the test object.
- Wall thickness measurement through coating by evaluating the multi-echo sequence (DUAL-MULTI).
- Simultaneous measurement of wall thickness and coating thickness with single echo (TopCOAT, only with DMS Go+ TC).
- Wall thickness and residual wall thickness measurement with a simultaneous determination of the current sound velocity (Auto-V, only with DMS Go+ TC).



### Note

The functions TopCOAT and Auto-V are described in chapter 7 of this manual.

To prepare for measurements, you have to:

- Select a suitable probe.
  - Select the suitable measurement mode.
  - Calibrate the A-scan display.
  - Calibrate the instrument for the selected probe and measurement mode.
- Connect a suitable probe (see Section **Connecting a probe**, page 3-9).
  - Power the instrument on (see Section **Starting the DMS Go+**, page 3-11).

The further steps are described in detail in the following.

## Choosing the probe type

After connecting a suitable probe for the task, you have to choose the probe type to adjust the DMS Go+ to the probe.

The choice of measurement modes as well as individual functions and parameters available likewise depends on the selected probe type. The composition of the individual function groups varies accordingly.

You have a choice between the following probes:

- A2 DFR
- CA211A
- OSS10
- D790
- DA301
- DA303
- DA312
- DA312B16
- DA501
- DA503
- DA507
- DA512
- DA590
- DIALOG
- DP104
- FH2E
- HT400A
- KBA525
- KBA560
- TC560



### Note

When a dialog probe (probe designation DA4... or ...-D) is connected, the DMS Go+ receives the necessary data from the probe automatically. In that case, you don't have to choose the probe type any more. It is automatically entered after connecting the probe.

- In the function group **PROBE&CAL**, select the function **PROBE**.
- Choose the connected probe. The instrument is immediately adjusted.

## Choosing the measurement mode

You have to choose the suitable measurement mode for the task. By doing so, you define the method for operating the instrument or the data used for determining the measurement result.

You have a choice between the following measurement modes:

### S-IP

The measurement mode S-IP is available for single-element probes.

The wall thickness is determined on the basis of the ultrasonic time of flight from zero up to the last zero crossing before the first flank crossing detected in gate A. The ultrasonic time of flight is corrected by the probe delay line which is calculated during the probe zero offset (see Section **Probe zero offset**, page 5-25).

This measurement mode is suitable for non-coated materials with smooth, parallel surfaces.

### S-PEAK

The measurement mode S-PEAK is available for single-element probes.

The wall thickness is determined on the basis of the ultrasonic time of flight from the last zero crossing before the amplitude peak in gate A up to the last zero crossing before the peak echo in gate B.

This measurement mode is suitable for non-coated materials with smooth, parallel surfaces.

### S-FLANK

The measurement mode S-FLANK is available for single-element probes.

The wall thickness is determined on the basis of the ultrasonic time of flight from the last zero crossing before the first flank detected in gate A up to the last zero crossing before the first flank crossing detected in gate B.

This measurement mode is suitable for coated materials with smooth, parallel surfaces.

## DUAL

The measurement mode DUAL is available for dual-element probes.

The wall thickness is determined on the basis of the ultrasonic time of flight from zero up to the last zero crossing before the first flank crossing detected in gate A. The ultrasonic time of flight is corrected by the probe delay line which is calculated automatically during the zero point calibration.

This measurement mode is suitable for non-coated materials showing corrosion at the rear, especially with curved and irregular backwall or inner wall surfaces.

## DUAL-MULTI

The measurement mode DUAL-MULTI is available for dual-element probes.

The wall thickness is determined on the basis of the ultrasonic time of flight from the last zero crossing before a peak echo is detected in gate A and ends with the last zero crossing before a peak echo in gate B.

This measurement mode is suitable for coated materials with smooth, parallel surfaces.



### Note

Only the measurement modes supported by the selected probe type are displayed as options to choose from. The measurement modes **TOP-COAT** and **AUTO-V** are only available for DMS Go+ TC and described in detail in chapter 7 of this manual.



### ATTENTION

The choice of measurement mode must always be identical for the calibration and the subsequent measurements.

- In the function group **PROBE&CAL**, select the function **TG MODE**.
- Select the suitable measurement mode for the connected probe and measurement task. The instrument is immediately adjusted.

## 5.6 Carrying out the calibration

### Calibrations

You have to carry out various calibrations on the basis of the selected probe type and the selected measurement mode before you can start with measurements. For this purpose, you will normally carry out a probe zero offset and calibrate the DMS Go+ to the sound velocity of the test object.

The probe zero offset is used for determining the exact entry point of the sound pulse in the test object. This compensates for the delay line existing in dual-element probes or the thickness of the contact face with single-element probes.

The determination of the sound velocity in the test object is necessary for the exact calculation of wall thickness. You can choose between 1-point calibration or 2-point calibration for determining the sound velocity. No probe zero offset is required in 2-point calibration because the zero point is calculated by the instrument in this case.



### ATTENTION

The same probe and the same measurement mode have to be chosen for the calibration as for the subsequent measurement operation. Otherwise, measuring errors may occur. Every time the probe or the measurement mode has been changed, you have to carry out a calibration again because even probes of the same type may have different delay lines.



### Note

The calibration methods for the measurement modes **TOP-COAT** and **AUTO-V** are described in detail in chapter 7 of this manual.

## Probe zero offset

You can choose between automatic and manual probe zero offset.



### Note

The probe zero offset is not possible if the option **2-PT** is chosen for the function **THK CAL**. In this case, the function **ZERO** is not visible.

You have a choice between the following methods:

### AUTO

This method determines the probe zero offset automatically while the probe is coupled to the material to be tested.

This method requires good coupling conditions and multiple data acquisitions for determining the ultrasonic time of flight. Since this method performs zeroing every time a measurement is taken, the zero offset is continuously adjusted to temperature changes and delay lines.

### MANUAL

This method uses the reference block at the instrument rear with known wall thickness and sound velocity in order to determine the zero offset for the connected probe.

The method is applicable to both single-element probes and dual-element probes and it even works in critical coupling conditions or with rough surfaces.

### USER

When using a clean, uncoupled probe, this method determines the probe zero offset automatically before coupling and only performs zeroing on user request.

This method works even in critical coupling conditions and with rough surfaces.

### MANUAL zeroing

- Clean the coupling face of the probe from any dirt and couplant.
- Connect the probe to the instrument.
- In the function group **PROBE&CAL**, select the function **PROBE**.
- Choose the connected probe. The instrument is immediately adjusted.
- In the function group **PROBE&CAL**, select the function **ZERO**.
- Select the method **MANUAL**.
- In the function group **PROBE&CAL**, select the function **PROBE ZERO**.
- Press one of the **left** or **right** arrow keys in order to start the zeroing. The message **Put probe on zero block - use couplant** is displayed on the screen.
- Apply some couplant to the instrument reference block and couple the probe. The zeroing is started.

- Keep the probe coupled as long as the message **Acquiring, please stay coupled** is visible on the display screen. When the message is no longer visible, the zeroing is finished.

### USER zeroing

The probe is connected and selected with the function **PROBE**. Zeroing is performed automatically during coupling.

As a special exception, you can start the zeroing process manually.

- Clean the coupling face of the probe from any dirt and couplant.
- In the function group **PROBE&CAL**, select the function **ZERO**.
- Select the method **USER**.
- In the function group **PROBE&CAL**, select the function **PROBE ZERO**.

- Press one of the **left** or **right** arrow keys in order to start the zeroing. The message **Wipe off couplant from probe, press ZERO** is displayed on the screen.
- Press the function key 2 (function **ZERO**). The zeroing is performed.

## Calibration to zero and to sound velocity

To calibrate the DMS Go+ to the sound velocity in the test object, you can choose between two methods, i.e. the 1-point calibration and the 2-point calibration.

As an alternative, if the sound velocity is known, you can set it directly on the instrument (see Section **Setting the sound velocity**, page 5-31).

The 1-point calibration is available for all measurement modes, the 2-point calibration only for the measurement modes S-IP, S-PEAK, S-FLANK, and DUAL.

Zeroing is always carried out first during the 1-point calibration.



### ATTENTION

The reference block at the instrument rear is only used for carrying out the zeroing process.

Only use the calibration blocks recommended by GE for further calibrations (please refer to chapter 2).

### 1-point calibration

The 1-point calibration is carried out using the reference block at the instrument rear and a calibration block with known thickness which is made of the same material as the test object.

Ideally, the wall thickness of the calibration block is the equal to or slightly greater than the expected readings from the test object.

- In the function group **PROBE&CAL**, select the function **THK CAL**.
  - Choose the option **1-PT**.
  - In the function group **PROBE&CAL**, select the function **ZERO**.
  - Select the method **MANUAL**.
  - In the function group **PROBE&CAL**, select the function **CALIBRATION**.
  - Press one of the **left** or **right** arrow keys in order to start the calibration. The message **Put probe on zero block - use couplant** is displayed on the screen.
- Apply some couplant to the instrument reference block and couple the probe. The zeroing is started. After finishing it, the message **Probe zero complete. Remove probe from zero block.** is displayed on the screen.
  - Uncouple the probe. The message **Couple to Cal standard (displayed below) or press ENTER to change cal. block thickness.** is displayed on the screen.
  - If the wall thickness displayed on the screen is not identical with the thickness of the calibration block, press the function key 2 (function **ENTER**).
  - Select the digits that you wish to change using the **left** and **right** arrow keys, and change the value using the **up** and **down** arrow keys.
  - Press the function key 2 (function **DONE**) in order to close the process of changing the thickness value.
  - Apply some couplant to the calibration block with known thickness and couple the probe.

- When the message **Remove probe from Cal Std.** is displayed on the screen, you can uncouple the probe. The 1-point calibration is finished, the instrument is calibrated to the zero and to the sound velocity in the calibration block. The new sound velocity is displayed at the top edge of the display screen.

## 2-point calibration

The 2-point calibration is recommended especially when using dual-element probes in order to compensate for the V-path errors typical of these probes and liable to affect the measuring accuracy.

A stepped calibration block with 2 different thicknesses is required for the 2-point calibration. The wall thicknesses must be selected in such a way that they cover the expected measurement readings.

- In the function group **PROBE&CAL**, select the function **THK CAL**.
- Choose the option **2-PT**.
- In the function group **PROBE&CAL**, select the function **CALIBRATION**.

- Press one of the **left** or **right** arrow keys in order to start the calibration. The message **Couple to Low Cal Std. (displayed below) or press ENTER to change low cal. block thickness.** is displayed on the screen.
- If the wall thickness displayed on the screen is not identical with the low-calibration thickness calibration block, press the function key 2 (function **ENTER**).
- Select the digits that you wish to change using the **left** and **right** arrow keys, and change the value using the **up** and **down** arrow keys.
- Press the function key 2 (function **DONE**) in order to close the process of changing the thickness value.
- Apply some couplant to the low-calibration thickness calibration block and couple the probe. After finishing the measurement, the message **Remove probe from Cal Std.** is displayed on the screen.
- Uncouple the probe. The message **Couple to High Cal Std. (displayed below) or press ENTER to change high cal. block thickness.** is displayed on the screen.

- If the wall thickness displayed on the screen is not identical with the high-calibration thickness calibration block, press the function key 2 (function **ENTER**).
- Select the digits that you wish to change using the **left** and **right** arrow keys, and change the value using the **up** and **down** arrow keys.
- Press the function key 2 (function **DONE**) in order to close the process of changing the thickness value.
- Apply some couplant to the high-calibration thickness calibration block and couple the probe.
- When the message **Remove probe from Cal Std.** is displayed on the screen, you can uncouple the probe. The 2-point calibration is finished, the instrument is calibrated to the zero and to the sound velocity in the calibration block. The new sound velocity is displayed at the top edge of the display screen.

## Setting the sound velocity

If the sound velocity in the test object is known, you can also set it directly without applying one of the calibration methods using a calibration block.

You can find a list of typical sound velocities in different materials in chapter 10 of this manual (see Section **Sound velocities**, page 10-4).



### Note

It is recommended to verify the velocity setting by means of an object with known thickness which is made of the same material as the test object.

- In the function group **PROBE&CAL**, select the function **VELOCITY**.
- Press the function keys 3 and 4 in order to select a material with the corresponding sound velocity.
- Press the **left** and **right** arrow keys in order to manually adjust the sound velocity in increments.

The current velocity setting is displayed at the top of the display screen.

## 5.7 Carrying out measurements



### Note

Please observe the application notes in chapter 10 of this manual when carrying out measurements by means of the DMS Go+ (see Section **Application notes**, page 10-2).

A prerequisite for the measurement is always the correct calibration (zero, sound velocity).

The following steps describe the principle of wall thickness measurement process. Further details depend on the corresponding requirements in each case.

- Clean the surface of the test object from any dirt and loose parts.
- Apply some couplant to the surface of the test object.
- Place the probe carefully but firmly on the material surface. Apply a uniform pressure in order to obtain a stable reading.

If the coupling was successful, the digits in the display of readings are shown in solid mode.

- Watch the A-scan and the display of readings, and wait until both of them are stable.
- Use the function **FREEZE** (see page 5-52) in order to freeze the screen display. You can uncouple the probe afterwards.
- If a data recorder file is active: Press the function key 2 (function **SEND**) in order to save the displayed reading.



### Note

The processes of saving readings and documenting measurement results are described in detail in chapter 6.

## 5.8 A-scan configuration

You can adjust the A-scan display on the screen to your requirements.



### Note

Some of these parameters are automatically set by the instrument during calibration.

### Setting the display range

You can set the display range for the echoes on the screen on the basis of the measurement results to be expected. This includes the setting of display range and display delay.

#### Display range

You can use display range to set the display screen to the thickness range you wish to use for your measurements.

- In the function group **MEASURE**, select the function **DISPLAY RANGE**.
- Select the required display range.

#### Display delay

Make your choice of displaying the set display range starting from the surface of the test object or in a section starting earlier or later.

This allows you to shift the complete screen display and consequently also the display zero.

If the display should start from the surface of the test object, you have to set the display delay to 0.

- In the function group **MEASURE**, select the function **DISPLAY DELAY**.
- Choose the required display delay.

## Setting the gain

You can use the gain to adjust the sensitivity necessary for making the backwall echoes visible on the display screen at the required height.



### ATTENTION

Structural noise etc. is likewise amplified and can interfere with the measurement evaluation.

You can choose between different amplification methods and adjust the maximum gain to your requirements.

You have a choice between the following amplification methods:

### AUTO

The automatic gain control is turned on. The instrument selects one of the values set in the function **MAX GAIN** for the options **HIGH** and **LOW** depending on the sound velocity in the material.

The switch between the value for **HIGH** and the value for **LOW** is at a material velocity of  $6248.4 \text{ m/s} = 246000 \text{ in/s}$  to differentiate between steel and aluminum.

### AGC OFF

The automatic gain control is switched off. The gain setting is fixed and corresponds to the value selected in the function **MAX GAIN**.

### HIGH

The automatic gain control is switched on. The maximum gain is set to the preset (different for each probe) maximum gain value (suitable for attenuative material like stainless steel).

### LOW

The automatic gain control is switched on. The maximum gain is set to the preset (different for each probe) minimum gain value (suitable for less attenuative material like aluminum).

## MANUAL

The automatic gain control is switched on. The maximum gain setting is fixed and corresponds to the value selected in the function **MAX GAIN**.

- In the function group **MEASURE**, select the function **MAX GAIN MODE**.
- Select the required amplification method.
- Select the function **MAX GAIN**.
- Select the required gain value for the method chosen previously or option.

## Selecting the display update rate

You can select the interval for measurements and the A-scan update, as well as for the display of readings. When using the B-scan and MIN/MAX mode, this value is automatically set to 32 Hz.

You have a choice between the following display update rates:

- 4 HZ
  - 8 HZ
  - 16 HZ
- 
- In the function group **CONFIG**, select the function **UPDATE RATE**.
  - Select the required display update rate.

## Selecting the rectification mode

You can select the rectification mode of echo pulses according to your application.

You have a choice between the following rectification modes:

### POS/NEG

Positive/negative half-wave: Only the positive or negative half-waves are displayed.

### FULL

FULL WAVE All half-waves are displayed above the base line on the screen.

### RF

Radio-frequency display: All signals are displayed in their original form.

- In the function group **CONFIG**, select the function **RECTIFY**.
- Select the required rectification mode.

## Setting the probe delay

Every probe is equipped with a delay line between the transducer and the coupling face. The sound pulse must first pass through this delay line before it can enter the test object. You can compensate for this influence of the delay line in the probe in the function **PROBE DELAY**.



### Note

- In the function group **PROBE&CAL**, select the function **PROBE DELAY**.
- Set the probe delay of the connected probe.

## 5.9 Setting the gates

### Task of the gates

The gates are used for selecting the measuring point for the digital time-of-flight or amplitude measurement to determine the wall thickness.

The DMS Go+ makes the two gates A and B available. The gate B is only required in multi-echo sequence measurements and is used for measuring the distance from the material surface up to the first echo (wall thickness measurement) or between two backwall echoes (measurement on coated test objects).

The position of the gates is defined by three parameters: start, width, and threshold height.

The start of gate B is coupled to the first echo in gate A. If you shift the starting point of gate A, the starting point of gate B is automatically shifted by the same value. If there is no echo, the starting point of gate A applies.



### Note

The functions of the gates are only effective within the display range. The gate B is only visible and adjustable if one of the measurement modes **DUAL-MULTI**, **S-FLANK**, or **S-PEAK** is selected (see Section **Choosing the measurement mode**, page 5-22).

### Gate start

You can set the starting points for gate A and gate B.

- In the function group **GATE**, select the function **GATE A START**.
- Set the required starting point for gate A.
- If the selected measurement mode allows it, select the function **GATE B START** and set the required starting point for gate B.

## Gate width

You can set the width of gate A and gate B.

- In the function group **GATE**, select the function **GATE A WIDTH**.
- Set the required width for gate A.
- If the selected measurement mode allows it, select the function **GATE B WIDTH** and set the required width for gate B.

## Gate threshold

You can set the vertical position of the gate in percentage of screen height (A-scan).



### Note

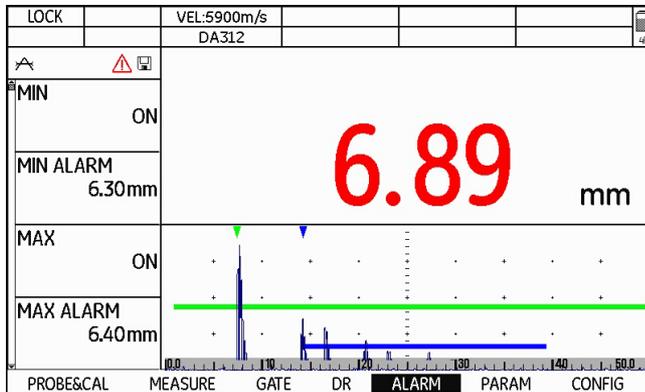
In RF mode, the values between +100% and –100% are possible. When changing from **RF** to **NEG**, **POS**, or **FULL**, negative signs are replaced by positive signs (see Section **Selecting the rectification mode**, page 5-36).

- In the function group **GATE**, select the function **GATE A THR**.
- Set the required position of gate A.
- If the selected measurement mode allows it, select the function **GATE B THR** and set the required position of gate B.

## 5.10 Configuring alarm functions

The DMS Go+ can trigger an alarm signal if preset readings are exceeded or fallen below.

If an activated alarm is triggered, the displayed value on the screen flashes red and the red alarm icon flashes in the status display box (see Section **Status display icons**, page 0-5).



### Minimum value alarm

The alarm is triggered if the set minimum value is fallen below.

- In the function group **ALARM**, select the function **MIN**.
- Choose the option **ON** in order to activate the minimum value alarm.
- Select the function **MIN ALARM** and set the thickness value which should trigger an alarm if fallen below.

### Maximum value alarm

The alarm is triggered if the set maximum value is exceeded.

- In the function group **ALARM**, select the function **MAX**.
- Choose the option **ON** in order to activate the maximum value alarm.
- Select the function **MAX ALARM** and set the thickness value which should trigger an alarm if exceeded.

## 5.11 MIN/MAX mode

The DMS Go+ enables you to determine the minimum and the maximum thickness reading of a series or sequence of measurements.

A sequence of measurements is defined by the waiting time between two measurements. If you couple the probe again within this time, the sequence of measurements is continued. If the waiting time has expired without the probe being coupled, the sequence is automatically terminated. The next time the probe is coupled, a new sequence of measurements starts automatically.

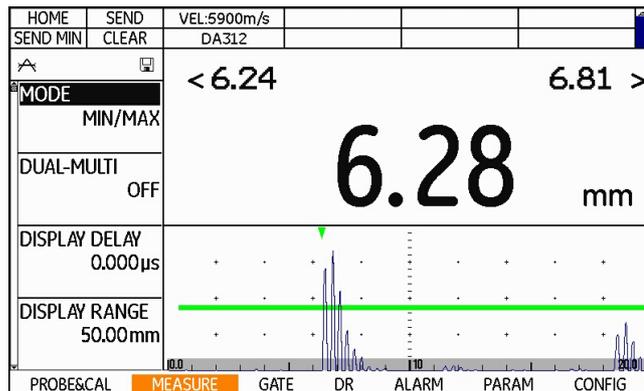


### Note

The display update rate is automatically increased to 32 Hz during the MIN capture mode.

The minimum and the maximum value of the current sequence are displayed in small digits above the last reading obtained.

The expiring waiting time is displayed at the top right corner of the screen display in the power display box.



## Switching the MIN/MAX mode on

You can switch the MIN/MAX mode on any time. The first sequence of measurements starts automatically at the first successful coupling after switching the MIN/MAX mode on.

You can save the current minimum reading during the MIN/MAX mode by pressing the function key 4 (function **SEND MIN**). A new sequence of measurements starts automatically as soon as saving takes place.



### Note

The processes of saving readings and documenting measurement results are described in detail in chapter 6.

- In the function group **MEASURE**, select the function **MODE**.
- Choose the option **MIN/MAX** in order to switch the MIN/MAX mode on.

## Clearing a sequence of measurements

You can clear all readings of the current sequence of measurements.

- Press the function key 3 (function **CLEAR**). The readings of the current sequence of measurements are cleared.
- Couple the probe in order to start a new sequence.

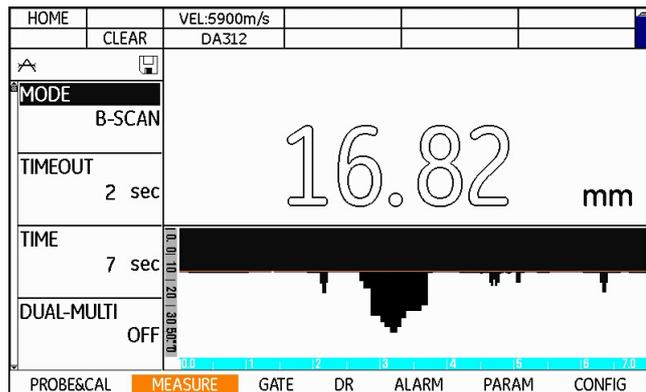
## 5.12 Thickness profiles with the B-scan

Apart from the A-scan, the DMS Go+ presents another possibility of graphical evaluation: the B-scan.

The B-scan enables you to display a thickness profile of the test object on the screen of the DMS Go+.

You can carry out measurements continuously over a maximum period of 30 seconds for the B-scan display with the values from these measurements being used by the DMS Go+ for displaying a subsection of the test object. For this purpose, guide the probe over the section to be displayed during the measurement period.

The display opposite shows the typical B-scan of a test object with a corroded backwall.



### Note

A valid zero calibration must be carried out for the display of the B-scan.

The display update rate is automatically increased to 32 Hz during the measurements for the B-scan.

## Switching the B-scan display on

You can switch the B-scan display on any time.

The display of the thickness profile starts automatically at the first successful coupling after switching the B-scan display on.

Simultaneously with the B-scan display, the DMS Go+ determines the minimum reading detected during the measurements. At the end of the selected display time, this value is displayed above the B-scan, and you can save the reading by pressing the function key 2 (function **SEND**).



### Note

The processes of saving readings and documenting measurement results are described in detail in chapter 6.

- In the function group **MEASURE**, select the function **MODE**.
- Choose the option **B-SCAN** in order to switch the B-scan display on.

## Setting the display time

The display time (in seconds) defines the period of time during which the thickness profile should be recorded. At the end of this time (maximum 30 seconds), the instrument stops the measurements.

The scaling of the X-axis in the B-scan corresponds to the selected display time.

- In the function group **MEASURE**, select the function **TIME**.
- Set the required display time.

## Setting the waiting time

You can set a waiting time (in seconds) for interruptions. The waiting time starts as soon as the probe is uncoupled during a B-scan recording. As long as you couple the probe again within this time, the B-scan display is continued. Otherwise, the instrument will end the B-scan display.

The expiring waiting time is displayed at the top right corner of the screen display in the power display box.

HOME		VEL:5900m/s				
	CLEAR	DA312				

- In the function group **MEASURE**, select the function **TIMEOUT**.
- Set the required waiting time.

## Minimum value line

You can display a minimum reading as a line in the B-scan. The adjusted minimum value is identical with the minimum value which triggers an alarm when fallen below (see Section **Configuring alarm functions**, page 5-39). However, the alarm functions are completely independent of the visible minimum value line. The minimum value line is meant for visual orientation.

- In the function group **ALARM**, select the function **MIN**.
- Choose the option **ON** in order to activate the minimum value alarm.
- Select the function **MIN ALARM** and set the thickness value which should be displayed as a line in the B-scan.

## Recording a B-scan

After setting the display time and the waiting time, you can start recording and displaying the thickness profile.

- Apply some couplant to the complete section of the test object to be scanned.
- Couple the probe and guide it uniformly over the section to be displayed.

The B-scan is generated evenly starting from the edge. As soon as the end of the display range is reached, the display of the thickness profile ends.

The minimum reading of the section is displayed above the B-scan.

- To save, press the function key 2 (function **SEND**).
- Press the function key 3 (function **CLEAR**) in order to clear the B-scan and to start a new recording.



### Note

The processes of saving readings and documenting measurement results are described in detail in chapter 6.

## 5.13 Differential value display

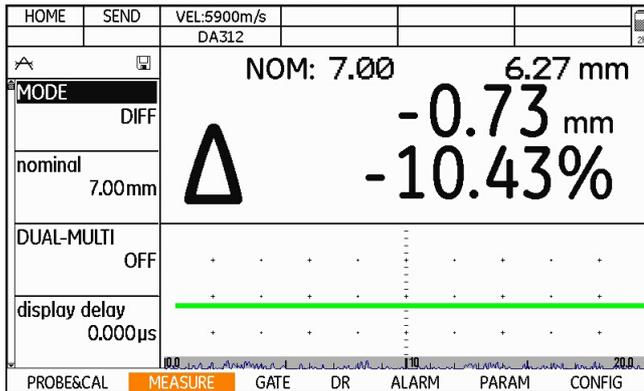
The differential value display shows the difference between a nominal value setting and the measured thickness value. The difference is displayed as an absolute value and as a percentage of nominal value.

A differential value with a positive sign means that the measured value is above the nominal value, a negative sign means that the measured value is below the nominal value. With a nominal wall thickness of 7.00 mm, for example, the value 6.27 mm is displayed as -0.73 mm and -10.43%.

### Switching the differential value display on

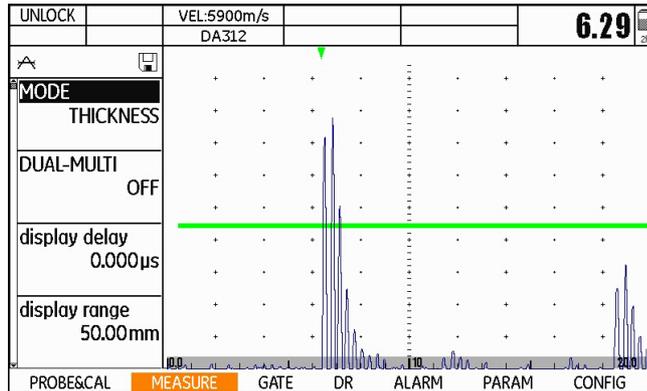
You can switch the differential value display on any time.

- In the function group **MEASURE**, select the function **MODE**.
- Choose the option **DIFF** in order to switch the differential value display on.
- Select the function **NOMINAL** and set the required nominal value.



## 5.14 A-scan view

If necessary, you can display the A-scan so that it covers the complete display screen height. The current thickness reading is then no longer shown in enlarged mode above the A-scan but in reduced form at the top right corner of the display screen.



- In the function group **MEASURE**, select the function **MODE**.
- Choose the option **A-SCAN** in order to switch the A-scan view on.

## 5.15 Other functions

### Saving calibration block data

You can save the data of the calibration blocks for the probe zero offset and the calibration to the sound velocity to the instrument.



#### Note

The data in the function **VEL REF. BLOCK** are only required for the measurement modes **TOP-COAT** and **AUTO-V**.

#### Data of the zero calibration block

- In the function group **MEASURE**, select the function **ZERO BLOCK**.
- Press one of the **left** or **right** arrow keys. A form window appears.

EXIT	DONE	VEL:5900m/s				
		DA312				
A		Zero Block Configuration				
UNIT	mm	Unit			mm	
		Thickness			6.350 mm	
RESOLUTION	X.XX	Velocity			5842 m/s	
<b>ZERO BLOCK</b>						
		6.350 mm	.	.	.	.
		5842 m/s	.	.	.	.
<b>VEL REF. BLOCK</b>						
		N/A	.	.	.	.
		10.0	110	120	130	140
PROB&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG

- Press one of the **left** or **right** arrow keys in order to set the value for the parameter **Thickness**.
- Press one of the **up** or **down** arrow keys in order to switch to the parameter **Velocity**.
- Press one of the **left** or **right** arrow keys in order to set the value for the parameter **Velocity**.
- Press the function key 2 (function **DONE**) in order to save the data. The form window disappears, and the setting data are displayed at the function **ZERO BLOCK**.

### Calibration block data for the sound velocity

- In the function group **MEASURE**, select the function **VEL REF. BLOCK**.
- Press one of the **left** or **right** arrow keys. A form window appears.

EXIT	DONE	VEL:5900m/s				
		DA312				Sh
Velocity Reference Block Configuration						
RESOLUTION	X.XX	Unit				mm
ZERO BLOCK	6.350 mm	Serial Number				N/A
	5842 m/s	Velocity				4680m/s
		Coating Velocity				2375m/s
<b>VEL REF. BLOCK</b>	N/A					
LOCKOUT						
CONFIG						
0.0 10 20 30 40 50						
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG

- Press one of the **left** or **right** arrow keys in order to set the value for the parameter **Unit**.
- Press one of the **up** or **down** arrow keys in order to switch to the next parameter.

- Set the other parameters in the same way.
- Finally, press the function key 2 (function **DONE**) in order to save the data. The form window disappears, and the serial number setting is displayed at the function **VEL REF. BLOCK**.

## Calibration reminder

PROBE ZERO START
VELOCITY 5900m/s STEEL MILD
CAL REMINDER OFF
TEMP COMP DISABLE
probe delay 7.662µs

Certain measurement tasks require a regular calibration of the gauge.

The reminder function of the DMS Go+ uses three criteria from which you can choose one:

- Time in minutes
- Number of readings
- Power On and Off

If you switch on the reminder functions of DMS Go+, a reminder icon is displayed at the top left corner of the display screen once the selected criterion is reached (see Section **Status display icons**, page 0-5).

- In the function group **PROBE&CAL**, select the function **CAL REMINDER**.
- Press one of the **left** or **right** arrow keys. A selection menu is displayed.
- Press one of the **left** or **right** arrow keys in order to select the required criterion.
- If necessary, press one of the **up** or **down** arrow keys in order to define additional settings for the selected criterion.
- Press one of the **left** or **right** arrow keys in order to set the additional data.
- Finally, press the function key 2 (function **CONFIRM**) in order to save the data. The selection menu disappears, and the selected settings are displayed at the function **CAL REMINDER**.

## Temperature compensation

TEMP COMP ENABLE
CAL TEMP 21°C
CURR TEMP 21°C
TEMP COEF 0.00000/°C

Temperature variations affect the sound velocity of material and probe delay line, and consequently also the calibrations. All calibration processes should be carried out on site by using calibration blocks which have the same temperature as the test object in order to minimize errors due to temperature variations.

If the calibration block cannot be heated, the DMS Go+ can use the temperature compensation in order to recalculate the wall thickness of the test object and to display it correctly.

If the temperature of a test object increases, the sound velocity of the material increases slightly as well. This results in a greater wall thickness reading. In order to compensate for this temperature effect, DMS Go+ can calculate a compensated thickness value on the basis of the input temperature of the test object and on the basis of a compensation factor.

In order to use the temperature compensation, you have to configure three parameters:

- **CAL TEMP**  
The temperature of the calibration block (typically the ambient temperature)
- **CUR TEMP**  
The current temperature of the test object.
- **TEMP COEF**  
Temperature coefficient = the change in the sound velocity of the material per degree. Please look up the value in the corresponding guidelines.

- In the function group **PROBE&CAL**, select the function **TEMP COMP**.
- Press one of the **left** or **right** arrow keys in order to choose the option **ENABLE**.
- Select the function **CAL TEMP** and set the temperature of the calibration block.
- Select the function **CUR TEMP** and set the temperature of the test object.
- Select the function **TEMP COEF** and set the temperature coefficient.
- Finally, press the function key 1 (function **HOME**) in order to exit the function. The settings become effective immediately.

**Note**

The DMS Go+ can display both the uncompensated and the compensated thickness value at the same time. To achieve this, configure the data boxes accordingly (see Section **Configuring data boxes**, page 5-13).

**Display freeze (FREEZE)**

You can freeze the display screen of the DMS Go+. The A-scan and the displayed thickness value are then frozen and no longer updated.

This function is available in all measurement modes and display views.

When the function is active, a corresponding icon is displayed at the top left corner of the display screen (see Section **Status display icons**, page 0-5).

- In the function group **MEASURE**, select the function **FREEZE**.
- Press one of the **left** or **right** arrow keys in order to switch the function on.

**Note**

You can assign the function **FREEZE** to the function key 4 (see Section **Assignment of function key 4**, page 5-7).

## Gate magnifier (ZOOM)

The function **ZOOM** expands the gate A up to a maximum covering the entire display width. This enables you to examine the signal in gate A in more detail.

You can only switch on the zoom function if a signal is positioned in the gate.



### Note

The function **ZOOM** is not available in the function groups. You have to assign the function **ZOOM** to the function key 4 to be able to use it (see Section **Assignment of function key 4**, page 5-7).

## 5.16 Enabling options (Upgrade)

LOCKOUT CONFIG
MENU MODE EXPERT
FUNC KEY NOT DEFINED
PASSWORD
CODE

The DMS Go+ is equipped with various options, e.g. for the measurement method TopCOAT. You can enable these options by entering the corresponding codes.



### Note

To order options, you need the serial number of your instrument (please see function **ABOUT** in the function group **CONFIG**).

- In the function group **CONFIG**, select the function **CODE**.
  - Press one of the **up** or **down** arrow keys and enter the first character of the code.
  - Press the **left** arrow key in order to select the next character of the code, and enter the other characters of the code.
  - Finally, press the function key 2 (function **CONFIRM**).
- If the code you have just entered is correct, the option is enabled and is immediately available.
- Select the function **ABOUT**.
  - Press one of the **left** or **right** arrow keys in order to display the start display including the information about the options available.

# Data Recorder **6**

## 6.1 Overview of functions

The Data Recorder of DMS Go+ is a flexible and powerful tool for the organization of measurement tasks and the management of measured values.

EXIT		VEL:5900m/s			
		DA312	GE2014		
POINT		LOCATION	VALUE	COMMENTS	FLAGS
		ELEV1.4.R	6.95		<
		ELEV1.4.B	15.29		>
		ELEV1.5.L	EMPTY		
		ELEV1.5.F	EMPTY		
EXPLORER		RECORD	STATS	HEADER	EDIT COMMENT
		ELEVATION			ELEV1
		TUBE			5
PROPERTIES		POINT			L
SHOW		VALUE			EMPTY
		ATTACHMENT TYPE			NO ATTACHMENT
VIEW		SEND FUNCTION			THICKNESS + ASCAN
LIST		ADVANCE TIME			OFF
		1ST ADVANCE BY			POINT
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM CONFIG

You can use the Data Recorder e.g. to

- save measurement results to the DMS Go+
- save graphical measurement data (A-scan, B-scan)
- evaluate measurement results statistically
- display saved numerical and graphical measurement data
- create and use comment lists
- organize and prepare for measurements by creating empty files with ready-made descriptions of measurement locations and measuring points
- use different file types with a different organization of measurement results for different applications
- export measurement results (CSV, PDF, XML, DAT)

The elements described below are generally stored in a Data Recorder file. Details depend on the selected file type (please refer to section below).

### File name

The file name is meant for the clear identification of the file and it must always be entered.

### File header

Important information about the file is stored in the file header. This includes e.g. the file name, the date of creation, the name of the inspector, as well as remarks, and a memo text.

### Readings

After loading the file, a reading is saved by pressing the function key 2 (function **SEND**) in each case.

### Comments

A comment can be saved on every measuring point.

### Flags

Flags are automatically added to a reading if additional information is stored, for example the A-scan, or a minimum value or maximum value alarm.

You can find a list of flag symbols in Chapter 10.4 **Flag symbols**, page 10-19.

### A-scan

If necessary for the evaluation of measurement results, the signal waveforms on which the readings are based can be saved in the form of an A-scan.



### Note

A-scans require considerably more memory capacity than pure readings.

## 6.2 File types

To save measurement results, you can choose a file type organized according to your application. The DMS Go+ offers six different file type options for you to choose from.

You can save the readings simply as a continuous series for linear, single measurements, e.g. on individual pipelines. The file type **LINEAR** is suitable for this type of saving readings.

For measurements on surfaces, e.g. tank bottoms or walls, it may be useful to divide the measuring area by means of a grid, similar to the coordinate system of a city map. In this way, the measurement locations or measuring points can be coordinated in terms of space. The suitable file types for this are **GRID** or **CUSTOM GRID**.



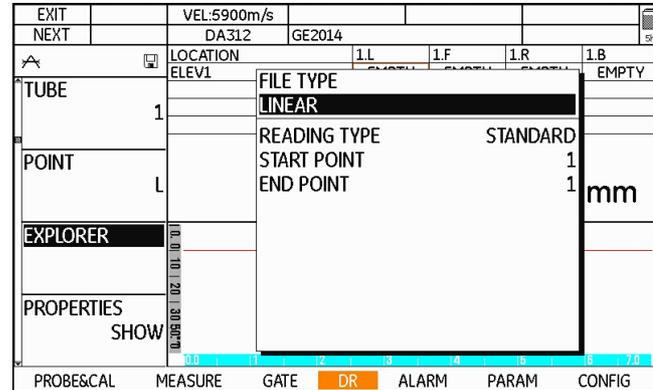
### Note

Please look up detailed information about the file types in Chapter 10.3 **Data Recorder file types**, page 10-7.

## File type LINEAR

The measurement results are organized in linear mode. In this mode, the measurement locations are consecutively numbered with exactly one measuring point being assigned to each measurement location. The number of measuring points is determined during file creation.

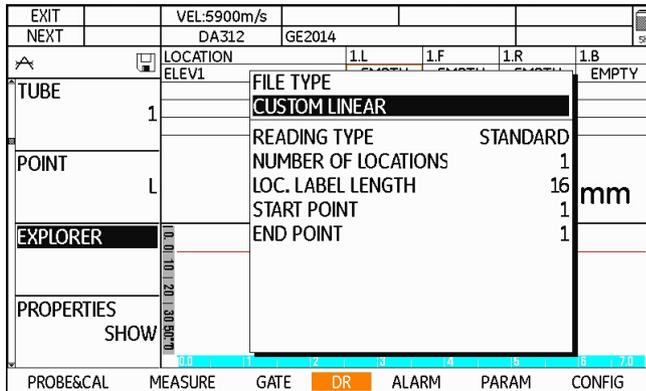
Typical application: Measurements on tanks.



### File type CUSTOM LINEAR

This file type has two structural elements (measurement location and measuring point) Measurement locations must be identified by specific names, measuring points are consecutively numbered. The required number of measuring points can be assigned to each measurement location. The number of measuring points is determined during file creation.

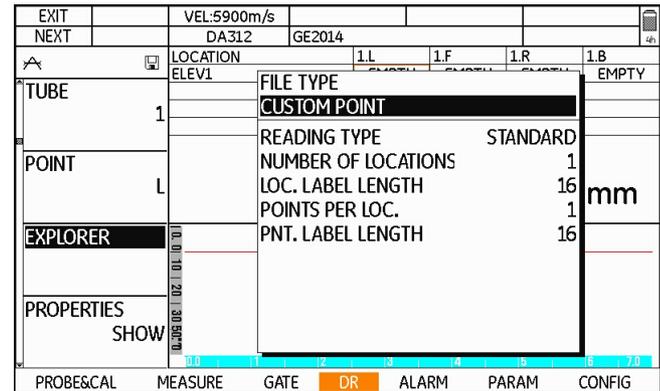
Typical application: Measurements on pipelines.



### File type CUSTOM POINT

This file type has two structural elements (measurement location and measuring point) Measurement locations and measuring points must be identified by specific names, and the required number of measuring points can be assigned to each measurement location. The number of measuring points is determined during file creation.

Typical application: Measurements on pipe systems, pressure vessels.



## File type GRID

This file type is especially suitable for testing areas in which the measurement locations are arranged on a grid. The file can contain several grids. Each grid contains a maximum of 9 measuring points.

Typical application: Measurements on tanks, large-diameter liquid pipes.

EXIT		VEL:5900m/s				
NEXT		DA312	GE2014			
		LOCATION	1.L	1.F	1.R	1.B
		ELEV1				EMPTY
TUBE	1	FILE TYPE				
		GRID				
		READING TYPE	STANDARD			
POINT	L	GRID LABELING	COL-A/ROW-#			
		STARTING ROW	1			mm
		ENDING ROW	1			
EXPLORER		STARTING COLUMN	A			
		ENDING COLUMN	A			
		START POINT	1			
		END POINT	1			
PROPERTIES						
		SHOW				
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG

## File type CUSTOM GRID

This file type is suitable for applications in which each measurement location consists of a grid of the same size. The file can contain the required number of grids. The grid size is determined during file creation, and each measurement location must be identified by a specific name.

Typical application: Measurements on tank bottoms, ship's hulls.

EXIT		VEL:5900m/s				
NEXT		DA312	GE2014			
		LOCATION	1.L	1.F	1.R	1.B
		LOC				EMPTY
TUBE	1	FILE TYPE				
		CUSTOM GRID				
		READING TYPE	STANDARD			
POINT	L	NUMBER OF LOCATIONS	1			
		LOC. LABEL LENGTH	16			mm
		GRID LABELING	COL-A/ROW-#			
EXPLORER		STARTING ROW	1			
		ENDING ROW	1			
		STARTING COLUMN	A			
		ENDING COLUMN	A			
PROPERTIES						
		SHOW				
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG

## File type BOILER

The measurement results are organized in a structure with 3 elements (Elevation, Tube, Point). In this type, every elevation is identified by a specific name. The number of measuring points is determined during file creation. The advantage of this file type is the free choice of the tubes to be tested during the measurements.

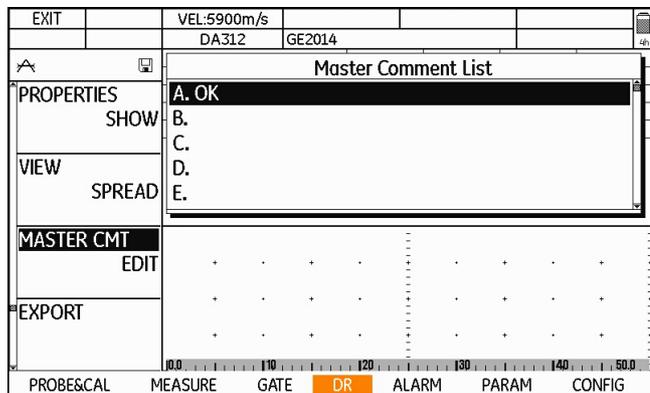
Typical application: Measurements on steam boilers.

EXIT		VEL:5900m/s				
NEXT		DA312	GE2014			
		LOCATION		1.L	1.F	1.R
		ELEV1				1.B
TUBE	1	FILE TYPE				EMPTY
		BOILER				
POINT	L	READING TYPE	STANDARD			
		NUMBER OF ELEVATIONS		1		
		ELEV. LABEL LENGTH		16	mm	
		STARTING TUBE #		1		
EXPLORER		ENDING TUBE #		1		
		POINTS ON TUBE		1		
PROPERTIES						
SHOW						
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG

## 6.3 Master comment list

You can save a comment to each measurement result. You can choose the corresponding comment from a comment list. To do this, you have to start by creating a master comment list with a maximum of 16 entries.

You can change this list at any time, add more comments, and delete comments.



### Creating a master comment list

- In the function group **DR**, select the function **MASTER CMT**.
- Press one of the **left** or **right** arrow keys. A form window appears.
- Press one of the **up** or **down** arrow keys in order to select a list item.
- Press one of the **left** or **right** arrow keys in order to start the entry of the comment.
- Press the arrow keys to mark the first character.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.
- Press the function key 2 (function **BKSP**) in order to delete the last character.
- Press the function key 4 (function **CONFIRM**). The comment is saved.

- Enter the comments for the other list items in the same way.
- Finally, press the function key 1 (function **EXIT**). The master comment list disappears.

**Note**

The master comment list created in this way forms the basis of subsequent file comment lists, each belonging to a certain file (see Section **Adding comments**, page 6-20).

## Changing master comments

You can change the comments of master comments at any time. To delete a comment, just delete all characters one by one using the function **BKSP**.

- In the function group **DR**, select the function **MASTER CMT**.
- Press one of the **left** or **right** arrow keys. A form window appears.
- Press one of the **up** or **down** arrow keys in order to select the list item.
- Press one of the **left** or **right** arrow keys in order to start the editing process of the comment.
- Press the arrow keys to mark the first character.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.

- Press the function key 2 (function **BKSP**) in order to delete the last character.
- Press the function key 4 (function **CONFIRM**). The comment is saved.
- Change the comments for the other list items in the same way.
- Finally, press the function key 1 (function **EXIT**). The master comment list disappears.

## 6.4 Working with files

You can create Data Recorder files in order to load them for subsequent measurement tasks and to save measurement results to them in a structured mode.

You can edit, change, copy, or delete stored files at any time.

When creating a file, you have to define different file parameters, e.g. the number of measuring points. The type and scope of these parameters depend on the selected file type.



### Note

The file parameters are fully described in Chapter 10.3 **Data Recorder file types**, page 10-7.

## Creating a new file



### Note

If you wish to create a file by copying an already existing file, you have to load the existing file first (see Section **Loading a file**, page 6-14). The file type **COPY** is then available as an additional option. In a copy, all properties of the currently loaded file apply but you can change all parameters.

- In the function group **DR**, select the function **EXPLORER**. The file directory of the memory card appears.
- Press the arrow keys to mark the directory to which the file should be saved.
- Press the function key 4 (function **NEW**).
- Press one of the **left** or **right** arrow keys in order to select the file type.

- Press one of the **up** or **down** arrow keys in order to mark the basic parameters available in the selected file type.
- Press the **left** or **right** arrow keys in order to select or set the values of the individual parameters.
- Press the function key 4 (function **NEXT**) in order to enter the file name.
- Press the arrow keys to mark the first character.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.
- Press the function key 3 (function **BKSP**) in order to delete the last character.
- Press the function key 4 (function **NEXT**) in order to switch to the next area of file definition.
- Press one of the **up** or **down** arrow keys in order to select the individual parameters.
- Select the individual parameters and set the required values.
- If the selected file type allows it, press the function key 4 (function **NEXT**) in order to switch to the next area of file definition.
- Finally, press the function key 2 (function **DONE**) in order to save the new file.

The file is saved and is available for recording readings.



### Note

You can already enter the values for the functions **T-MIN** and **T-MAX** at this point.

These settings will subsequently apply when the file is loaded (see Section **Configuring alarm functions**, page 5-39).

## Deleting files

If you don't want to use a file any longer, you can delete it at any time.



### ATTENTION

You cannot undo the deletion of files!

- In the function group **DR**, select the function **EXPLORER**. The file directory of the memory card appears.
- Press the arrow keys in order to select the directory and to mark the files that you wish to delete.
- Press the function key 3 (function **DELETE**). A message prompting you to confirm is displayed.

The file is deleted and is no longer available for recording readings.

## 6.5 Saving measurement results

After creating a Data Recorder file, you can carry out measurements and save the measurement results to this file.



### Note

A description of how to carry out measurements is given in chapter 5 of this manual.

## Loading a file

Before starting the measurements, you have to select the required file for saving the measurement results first.



### ATTENTION

Always make sure that the correct file is selected. The file name is displayed at the top of the display screen during the measurement operation.

- In the function group **DR**, select the function **EXPLORER**. The file directory of the memory card appears.
- Press the arrow keys in order to select the directory and to mark the files that you wish to load.
- Press the function key 2 (function **ENTER**).

The file is loaded and is then ready for recording readings.

## Saving readings

After selecting a file, the empty data points for saving the readings are displayed above the A-scan. The display mode and designation of the measuring points depends on the file type and on the options chosen for the file.

The current target data point for saving the next reading is marked with a broader frame.

HOME	SEND	VEL:5900m/s				
	CLEAR	DA312	GE2014 GR			20
LOC1		A	B	C	D	
1		EMPTY	EMPTY	EMPTY	EMPTY	
2		EMPTY	EMPTY	EMPTY	EMPTY	
3		EMPTY	EMPTY	EMPTY	EMPTY	
ROW	1	4.28 mm				
COL	A					
EXPLORER						
PROPERTIES	SHOW					
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG

- Carry out a measurement as usual (see Section **Carrying out measurements**, page 5-32).
- Press the function key 3 (function **SEND**). The reading is saved to the marked data point. The marking advances automatically to the next data point.
- Save other readings in the same way.

If a measurement cannot be carried out at the planned measuring point, you can save a corresponding remark for this measuring point.

- Press the center key of the keypad *long*. The functions of the function keys change.
- Press the function key 3 (function **OBSTR**). The remark **OBSTR** is saved to the marked data point.



### Note

You can assign the function **OBSTR** together with function **CLEAR** to the function key 4 (see Section **Assignment of function key 4**, page 5-7).

## Special measuring point functions

Special functions are available for editing individual measuring points.

- **μGRID** (see page 6-29)
  - **SEND** (see page 6-15)
  - **NOTE** (see page 6-20)
  - **CLEAR** (see page 6-17)
  - **OBSTR** (see page 6-15)
- Press the center key of the keypad *long*. The functions of the function keys change.

μGRID	SEND	VEL:5900m/s				
NOTE	CLEAR	DA312	GE2014 GR			
x		LOC1	A	B	C	D
1			14.18	14.17	14.18	14.18
2			14.20	14.20	14.57	14.57
3			EMPTY	EMPTY	EMPTY	EMPTY
1						

- Press one of the function keys to trigger the corresponding function.
- Press the center key of the keypad *long*. You will see the default functions of the function keys again.

## Selecting individual measuring points

If necessary, you can mark a certain data point (measuring point) in order to save a reading specifically to this data point.

- In the function group **DR**, select one of the functions **ROW**, **COLUMN**, **ELEVATION**, **TUBE**, or **POINT**, depending on the file type.
- Press the **left** or **right** arrow key in order to choose another measuring point. The marking in the overview of measuring points at the top of the display screen is moved.

or

- Press the center key of the keypad *long*. The functions of the function keys change.
- Press the arrow keys in order to choose another measuring point. The marking in the overview of measuring points at the top of the display screen is moved.

## Clearing a reading

You can clear a stored reading at any time.

- In the function group **DR**, select one of the functions **ROW**, **COLUMN**, **ELEVATION**, **TUBE**, or **POINT**, depending on the file type.
- Press one of the **left** or **right** arrow keys in order to select a data point with a stored reading. The marking in the overview of measuring points at the top of the display screen is moved.
- Press the center key of the keypad *long*. The functions of the function keys change.
- Press the function key 3 (function **CLEAR**). The reading is cleared.



### Note

You can assign the clearing function **CLEAR** together with the function **OBSTR** to the function key 4 (see Section **Assignment of function key 4**, page 5-7).

## Overwriting readings

By selecting a data point which already has a reading assigned to it, you cannot normally overwrite the reading saved there.

However, you can cancel this write protection if necessary. In that case, the previously saved readings can be overwritten at any time.

You have a choice between the following options:

- **NO** (overwriting is not possible)
- **OLD** (overwriting of old files)
- **ALL** (overwriting without confirmation)
- **ASK** (overwriting after confirmation)

- In the function group **DR**, select the function **OVERWRITE**.
- Choose the required option.

## Saving readings with A-scans

You can save readings with or without an A-scan. To do this, you have to configure the send function accordingly.

You have a choice between the following options:

### THICKNESS

Only the reading without an A-scan is always saved.

### THICKNESS / THICKNESS + A-SCAN

If the key is pressed only briefly, the reading is saved, and if the key is pressed long, the A-scan is saved additionally to the reading.

### THICKNESS + A-SCAN

The A-scan is saved additionally to each reading.

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.
- Press either the **up** or **down** arrow key in order to select the property **SEND FUNCTION**.
- Press one of the **left** or **right** arrow keys in order to choose the required option.
- Carry out a measurement as usual.

If you have selected **THICKNESS / THICKNESS + A-SCAN**:

- Press the function key 3 *briefly* (function **SEND**). The reading is saved without an A-scan.
- Press the function key 3 *long* (function **SEND**). The reading is saved with an A-scan.

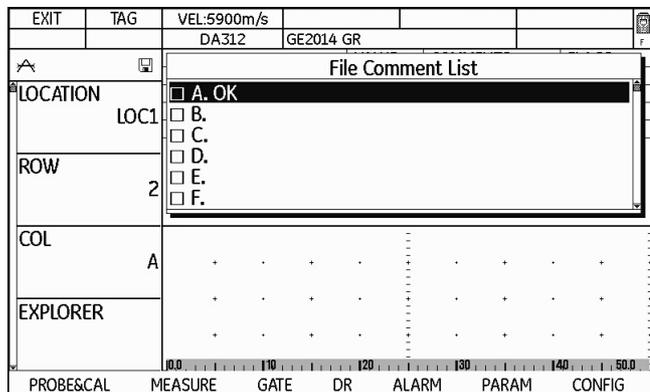
If the reading was saved with an A-scan, a small triangle is shown in the top right corner of the corresponding data point.

A	B	C	D
14.18	14.17	14.18	14.18
14.20	14.20	14.57	14.57
EMPTY	EMPTY	EMPTY	EMPTY

## Adding comments

If necessary, you can add one or several comments to each reading. To do this, choose the required comments from a ready-made list of comments.

Each file has a separate comment list automatically generated on the basis of the master comment list (see Section **Master comment list**, page 6-8).



- Select a measuring point which has a reading saved to it (see Section **Selecting individual measuring points**, page 6-16).
- Press the center key of the keypad *long*. The functions of the function keys change.
- Press the function key 3 (function **NOTE**). A selection menu is displayed.
- Press one of the **up** or **down** arrow keys in order to mark a comment.
- Press the function key 2 (function **TAG**) in order to select the marked comment. Selected comments are marked with a cross before the code letter.
- If necessary, choose other comments in the same way.
- If a selected comment is marked, press the function key 2 (function **UN-TAG**) in order to cancel the selection.

- Finally, press the function key 1 (function **EXIT**) in order to end the selection of comments.

The code letters of the selected comments are displayed in the column **COMMENTS** in the list view.

LOCATION	VALUE	COMMENTS	FLAGS
ELEV1.1.L	14.27	ABC	>
ELEV1.1.F	EMPTY		
ELEV1.1.R	EMPTY		
ELEV1.1.B	EMPTY		



### Note

You can assign the function **NOTE** to the function key 4 (see Section **Assignment of function key 4**, page 5-7).

You cannot add any comments to empty data points (no reading saved). If the marking has automatically advanced to the next, empty data point after saving the reading, you have to select the data point with the corresponding reading again first before selecting the comment (see Section **Selecting individual measuring points**, page 6-16).



### Note

You can deactivate the automatic advance feature (see Section **Automatic advance**, page 6-33).

## Editing a file comment list

If necessary, you can change and complete the comments of a file comment list which have been automatically generated from the master comment list.

EXIT		VEL:5900m/s					
		DA312	GE2014				
		LOCATION	1.L	1.F	1.R	1.B	
		ELEV1	14.27	14.28	EMPTY	EMPTY	
POINT	R						
EXPLORER		RECORD	STATS	HEADER	EDIT	COMMENT	
PROPERTIES		<input type="checkbox"/>	A. OK				
SHOW		<input type="checkbox"/>	B.				
		<input type="checkbox"/>	C.				
		<input type="checkbox"/>	D.				
		<input type="checkbox"/>	E.				
VIEW		<input type="checkbox"/>	F.				
SPREAD		<input type="checkbox"/>	G.				
		<input type="checkbox"/>	H.				
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG	

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.
- Press the **left** or **right** arrow key in order to select the group **COMMENT**.

The file comment list is displayed, and the comments already used are marked with a cross before the code letter.

- Press one of the **up** or **down** arrow keys in order to select a list item.
- Press one of the **left** or **right** arrow keys in order to start the entry of the comment.
- Press the arrow keys to mark the first character.
- Press the center key of the keypad to select the marked character.

- Choose other characters in the same way.
- Press the function key 2 (function **BKSP**) in order to delete the last character.
- Press the function key 4 (function **CONFIRM**). The comment is saved.
- Edit other comments in the same way.
- Press the function key 1 (function **HOME**) in order to end the editing process of the file comment list.

## 6.6 Editing files

You can edit stored files at any time in order to adjust the requirements to the corresponding measurement task and to e.g. make changes to the designations of measurement locations.

EXIT		VEL:5900m/s			
		DA312	GE2014		
POINT		LOCATION	VALUE	COMMENTS	FLAGS
		ELEV1.4.R	6.95		<
		ELEV1.4.B	15.29		>
		ELEV1.5.L	EMPTY		
		ELEV1.5.F	EMPTY		
EXPLORER		RECORD	STATS	HEADER	EDIT COMMENT
		ELEVATION			ELEV1
		TUBE			5
PROPERTIES		POINT			L
	SHOW	VALUE			EMPTY
		ATTACHMENT TYPE			NO ATTACHMENT
VIEW		SEND FUNCTION			THICKNESS + ASCAN
	LIST	ADVANCE TIME			OFF
		1ST ADVANCE BY			POINT
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM CONFIG

## Expanding the file capacity

If necessary, you can expand a file for saving additional measurement results. Depending on the file type, you can then add optional measuring points, elevations, columns, or rows.

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.

- Press the **left** or **right** arrow key in order to select the group **EDIT**.

HOME	APPEND	VEL:5900m/s					
INSERT	DELETE	DA312	GE2014				
		LOCATION	1.L	1.F	1.R	1.B	
POINT		LOC	EMPTY	EMPTY	EMPTY	EMPTY	
		NEWLOC2	EMPTY	EMPTY	EMPTY	EMPTY	
		ELEV1	14.27	14.28	EMPTY	EMPTY	
EXPLORER		RECORD STATS HEADER	EDIT	COMMENT			
		FILE TYPE				BOILER	
		ELEVATION				ELEV1	
PROPERTIES		TUBE				1	
SHOW		POINT				L	
VIEW							
SPREAD							
PROBES&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG	

- Press either the **up** or **down** arrow key in order to select the required parameter.
- Press either the **left** or **right** arrow key in order to select the position into which other items should be inserted.

- Press the function key 4 (function **INSERT**). A form window appears.

EXIT	DONE	VEL:5900m/s					
		DA312					
EXPLORER		INSERT 2 ELEVATIONS.					
PROPERTIES							
SHOW							
VIEW							
SPREAD							
MASTER CMT							
EDIT							
PROBES&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG	

- Press either the **left** or **right** arrow key in order to select the required number.
- Press the function key 2 (function **DONE**). The additional items are inserted into the selected position.

As an alternative to inserting between items already existing, you can append additional items to the end of the file.

**Note**

You can append a maximum of 99 items to a file in one process.

- Press either the **up** or **down** arrow key in order to select the required parameter.
- Press the function key 4 (function **APPEND**). A form window appears.
- Press either the **left** or **right** arrow key in order to select the required number.
- Press the function key 2 (function **DONE**). The additional items are appended.

## Deleting parts of a file

You can remove empty items which are no longer needed from a file. Depending on the file type, you can delete measuring points, elevations, columns, or rows.

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.
- Press the **left** or **right** arrow key in order to select the group **EDIT**.
- Press either the **up** or **down** arrow key in order to select the required parameter.
- Press the function key 3 (function **DELETE**). A form window appears.
- Press either the **left** or **right** arrow key in order to select the required number.
- Press the function key 2 (function **DONE**). The items are deleted.

## Editing header data

If necessary, you can change some information normally stored in the file header when creating a new file. The access to other parameters, e.g. serial number, unit, or velocity is disabled. The following parameters can be edited:

- **DESCRIPTION** (4 lines)
- **PROBE**
- **CALIBRATION**
- **TEMPERATURE**
- **INSPECTOR**
- **COMPANY**
- **T-MIN**
- **T-MAX**
- **ABSOLUTE LOSS**
- **% LOSS**
- **ABSOLUTE GROWTH**
- **% GROWTH**
- **MEMO**

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.
- Press the **left** or **right** arrow key in order to select the group **HEADER**.

HOME		VEL:5900m/s				
		DA312	GE2014			
		LOCATION	4.L	4.F	4.R	4.B
		LOC	EMPTY	EMPTY	EMPTY	EMPTY
POINT		NEWLOC2	EMPTY	EMPTY	EMPTY	EMPTY
	F	ELEV1	14.42	14.35	6.95	15.29
EXPLORER		RECORD STATS	HEADER	EDIT	COMMENT	
		DESCRIPTION				
		SERIAL NUMBER			GOPLS1304005:	
PROPERTIES		PROBE				
	SHOW	CALIBRATION				CA
		TEMPERATURE				
VIEW		INSPECTOR				
	SPREAD	COMPANY				G
		UNIT				mn
PROBES&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG

- Press either the **up** or **down** arrow key in order to select the required parameter.
- Press the **left** or **right** arrow key in order to mark the first character.
- Press the center key of the keypad to select the marked character.
- Choose other characters in the same way.
- Press the function key 3 (function **BKSP**) in order to delete the last character.
- Press the function key 4 (function **CONFIRM**) in order to save the changes.
- Press one of the **up** or **down** arrow keys in order to select the individual parameters.

## Adding a Microgrid

If you wish to record additional measurement values, lying in the immediate vicinity of the measuring point, to a certain individual measuring point, you can store these additional measurement values in a so-called Microgrid.

The Microgrid is a grid consisting of the same number of rows and columns. This makes a kind of square coordinate system available to you for the coordination of additional measuring points in terms of space.

The Microgrid is stored together with the underlying measured value. You always have to save a measured value first before you create a Microgrid for it.

Microgrids can have the following sizes:

- $2 \times 2$  (= 4 measuring points)
- $3 \times 3$  (= 9 measuring points)
- $4 \times 4$  (= 16 measuring points)
- $5 \times 5$  (= 25 measuring points)
- $6 \times 6$  (= 36 measuring points)
- $7 \times 7$  (= 49 measuring points)
- $8 \times 8$  (= 64 measuring points)
- $9 \times 9$  (= 81 measuring points)

- Select a measuring point which has a reading saved to it (see Section **Selecting individual measuring points**, page 6-16).
- Press the center key of the keypad *long*. The functions of the function keys change.



- Carry out the measurements as usual (see Section **Carrying out measurements**, page 5-32).
- Press the function key 2 (function **SEND**). The reading is saved to the marked data point of Microgrid. The marking advances automatically to the next data point.
- Press the function key 1 (function **EXIT**). The Microgrid is closed and you will again see the normal file structure.

**Note**

You can assign the function **μGRID** to the function key 4 (see Section **Assignment of function key 4**, page 5-7)

You cannot add any Microgrids to empty data points (no reading saved). If the marking has automatically advanced to the next, empty data point after saving the reading, you have to select the data point with the corresponding reading again first before creating a Microgrid (see Section **Selecting individual measuring points**, page 6-16).

**Note**

You can deactivate the automatic advance feature (see Section **Automatic advance**, page 6-33).

## Reloading a Microgrid

You can reload a previously created Microgrid at any time in order to save other readings to it. You have to select the data point containing the corresponding reading first (see Section **Selecting individual measuring points**, page 6-16).

- Press the center key of the keypad *long*. The functions of the function keys change.
- Press the function key 1 (function **μGRID**). The Microgrid is displayed.
- Press the function key 1 (function **EXIT**). The Microgrid is closed and you will again see the normal file structure.

## Automatic advance

After saving a reading using the function **SEND**, the next data point is usually selected automatically in order to save the following reading to that position.

You can switch off this automatic data point selection or define other details for it.



### Note

These settings only apply to the currently loaded file in each case.

By configuring this function, you can adjust the order for saving measurement results to the corresponding test task. In this way, you can e.g. determine whether you wish to proceed by rows or by columns for saving measurement results to a grid (file type **GRID**).

HOME		VEL:5900m/s					
		DA312	GE2014				
		LOCATION	VALUE	COMMENTS	FLAGS		
		ELEV1	14.27	14.28	EMPTY	EMPTY	
POINT	L						
EXPLORER		RECORD STATS HEADER EDIT COMMENT					
		SEND FUNCTION		THICKNESS + ASCAN			
		ADVANCE TIME		0.5 sec			
PROPERTIES		1ST ADVANCE BY		POINT			
	SHOW	1ST ADVANCE DIR		FORWARD (+)			
		AUTO REVERSE		OFF			
VIEW		2ND ADVANCE BY		TUBE			
	LIST	2ND ADVANCE DIR		FORWARD (+)			
		AUTO REVERSE		OFF			
PROBE&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG	

Depending on the file type, you can define the following parameters:

### **ADVANCE TIME**

Time after saving a reading at the end of which the next data point is selected automatically. If you choose the option **OFF**, the automatic advance feature is deactivated.

### **1ST ADVANCE BY**

First category for the advance feature. For example, if you choose **COLUMN**, the same measuring point is selected in the next column after saving. If you choose **ROW**, the next measuring point in the same row is selected.

### **1ST ADVANCE DIR**

You can use this parameter to determine the advance direction of the first category.

### **AUTO REVERSE**

You can choose whether to start from the beginning again after saving the last reading in a category or whether to edit the grid by meandering (for example, the first column from the top to the bottom, the second column from the bottom to the top, the third column from the top to the bottom, etc.).

### **2ND ADVANCE BY**

Second category for the advance feature. For example, if you choose **COLUMN**, the first measuring point in the next column is selected after saving all measuring points of a row. Pay attention to the correlation with the parameter **1ST ADVANCE BY**.

### **2ND ADVANCE DIR**

You can use this parameter to determine the advance direction of the second category.

**AUTO REVERSE**

In this case, the parameter refers to the second category.

**ADVANCE TUBE BY**

You can use this parameter to determine the increment for the automatic advance feature.

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.
- Press either the **up** or **down** arrow key in order to select the required parameter.
- Press either the **left** or **right** arrow key in order to choose the required option.
- Press the function key 1 (function **HOME**) in order to make the file properties disappear.

## 6.7 Evaluations

### Viewing statistical evaluations

Taking the stored data as a basis, the DMS Go+ makes different statistical evaluations available for each file that you can view in an overview.

EXIT	VEL:5900m/s						
	DA312	GE2014 GR					
LOC1	A	B	C	D			
1	14.18	14.17	14.18	14.18			
2	14.20	14.20	OBSTR	14.57			
3	EMPTY	EMPTY	3.20	3.45			
RECORD <b>STATS</b> HEADER EDIT COMMENT							
EXPLORER	READINGS						10
	<input type="checkbox"/> EMPTY PNTS						1
	<input type="checkbox"/> OBSTRUCTED PNTS						1
<b>PROPERTIES</b>	<input type="checkbox"/> MIN READING						3.20
SHOW	# MIN PNTS						1
VIEW	<input type="checkbox"/> <T-MIN PNTS						0
SPREAD	<input type="checkbox"/> MAX READING						14.57
	# MAX PNTS						1
PROBE&CAL	MEASURE	GATE	<b>DR</b>	ALARM	PARAM	CONFIG	

The following data are available:

- Number of readings saved
- Number of measuring points without a reading
- Number of obstructed measuring points (**OBSTR.**)
- Minimum reading saved
- Number of minimum readings saved
- Number of readings saved below a MIN value
- Maximum reading saved
- Number of maximum readings saved
- Number of readings saved above a MAX value
- Number of readings with an additional A-scan
- Number of readings with an additional B-scan
- Number of readings with an additional Microgrid
- Difference between the stored maximum and the minimum reading
- Statistical mean value of the stored readings
- Statistical standard deviation of the stored readings

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.
- Press the **left** or **right** arrow key in order to select the group **STATS**.
- Press either the **up** or **down** arrow key in order to view the statistical data.

### Searching for certain data

You can search the statistics for certain data. Only the data of one or several statistical parameters are then displayed, e.g. all data points without a reading.

- Press either the **up** or **down** arrow key in order to mark a parameter of the statistics.
- Press the function key 2 (function **TAG**) in order to select the marked parameter.
- If necessary, choose other parameters in the same way.
- Press the function key 3 (function **SEARCH**) in order to start the search for the corresponding data. The corresponding data points are displayed above the statistics.
- Press the function key 3 (function **STOP**) in order to end the search.

## Changing the view (Spread – List)

HOME	SEND CLEAR	VEL:5900m/s	DA312	GE2014 GR				
EXPLORER	LOC1	A	B	C	D			
	1	14.18	14.17	14.18	14.18			
	2	14.20	14.20	OBSTR	14.57			
	3	EMPTY	EMPTY	3.20	3.45			
PROPERTIES SHOW	3.16 mm							
VIEW	SPREAD							
MASTER CMT EDIT	-----							
PROB&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG		

HOME	SEND CLEAR	VEL:5900m/s	DA312	GE2014 GR				
EXPLORER	LOC1	VALUE	COMMENTS	FLAGS				
	1.A	14.18		#				
	1.B	14.17						
	1.C	14.18		#				
1.D	14.18							
PROPERTIES SHOW	3.16 mm							
VIEW	LIST							
MASTER CMT EDIT	-----							
PROB&CAL	MEASURE	GATE	DR	ALARM	PARAM	CONFIG		

You can toggle between the list display mode and the spread display mode for readings at any time.

The list mode presents the advantage of directly showing additional information about each reading:

- comments stored for the reading
- attachments stored for the reading

Only the corresponding code letters are displayed in the column **COMMENTS** for the stored comments (see Section **Adding comments**, page 6-20).

Flag symbols are used for file attachments in the column **FLAGS** (see Section **Flag symbols**, page 10-19).

- In the function group **DR**, select the function **VIEW**.
- Choose the required view mode.

## Viewing stored reading attachments

You can view the attachments, A-scan, B-scan, or Microgrid stored for a reading at any time on the display screen. For this purpose, you have to first choose the reading for which an attachment has been stored.

- Select a reading which has an A-scan stored for it (see Section **Selecting individual measuring points**, page 6-16).
- In the function group **DR**, select the function **PROPERTIES**.
- Press one of the **left** or **right** arrow keys. The file properties are displayed.

- Press either the **up** or **down** arrow key in order to select the parameter **ATTACHMENT TYPE**.

HOME	VEL:5900m/s				
	DA312	GE2014 GR			
EXPLORE	LOC1	VALUE	COMMENTS	FLAGS	
	1.D	14.18			
	2.A	14.20			
	2.B	14.20		A	
	2.C	OBSTR			
<b>PROPERTIES</b>	<b>RECORD</b>	STATS	HEADER	EDIT	COMMENT
SHOW	LOCATION				LOC1
	ROW				2
	COL				B
VIEW	VALUE				14.20
LIST	<b>ATTACHMENT TYPE</b>				<b>A-SCAN</b>
MASTER CMT	SEND FUNCTION	THICKNESS / THICKNESS + ASCAN			
EDIT	ADVANCE TIME				0.0 sec
	1ST ADVANCE BY				ROW
PROBES&CAL	MEASURE	GATE	<b>DR</b>	ALARM	PARAM
				CONFIG	

- Press the center key of the keypad. The attachment is displayed.

A-scans and B-scans are displayed in a new window on the display screen, Microgrids are displayed at the top of the display screen.

## 6.8 Documenting measurements

### Data export

You can export the measured values recorded and the attachments to the measured values for documentation purposes.

You have a choice between the following file formats:

- **CSV**
- **PDF**
- **XML**
- **DAT**

The export file is stored in the directory DMSGO on the memory card.



#### Note

Only data of the currently loaded file are exported.

- Load a Data Recorder file (see Section **Loading a file**, page 6-14).
- In the function group **DR**, select the function **EXPORT**.
- Press one of the **left** or **right** arrow keys in order to select the file type to be exported.
- Press the function key 2 (function **EXPORT**) in order to start the export. The export file is stored on the memory card.



#### Note

You can read, copy, or delete files by inserting the SD memory card into the SD card reader of your PC or by connecting the DMS Go+ to a PC via a USB cable (see Section **USB interface**, page 9-3).

## Screen shots

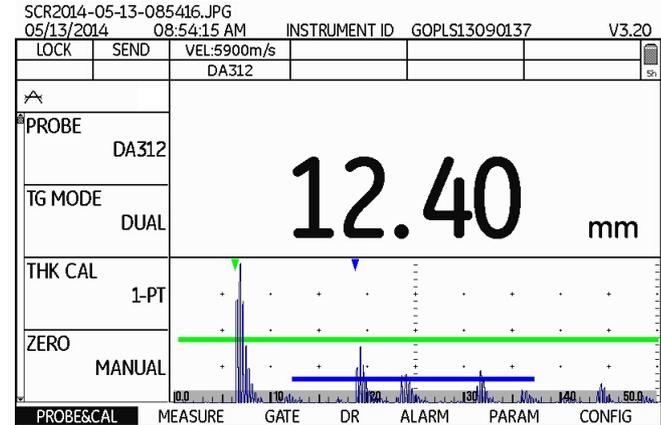
You can save screen shots (images of the current screen display content) independently of the Data Recorder at any time. These screen shots can likewise be used for documentation purposes. The following additional information about the screen display content is displayed:

- File name
- Date
- Time
- Serial number of the instrument
- Software version

The name of the screen shot is automatically generated and is composed of the abbreviation SCR, the date, the time, and a consecutive number, e.g. SCR2014-04-28-121523.JPG.

The screen shots are stored in the format JPG in the directory DMSGO/SHOT on the memory card.

- Press the function keys 1 and 2 at the same time. The screen shot is saved. The memory card icon flashes during saving (see Section **Status display icons**, page 0-5).





# Special functions of the DMS Go+ TC 7

## 7.1 Basics

The DMS Go+ TC has two special functions that enable improved methods of measurement in connection with a special 4-element probe, especially in residual wall thickness measurements through coatings:

- Auto-V
- TopCOAT

Both functions are based on measurements using the 4-element probe, mathematically evaluated by the instrument.

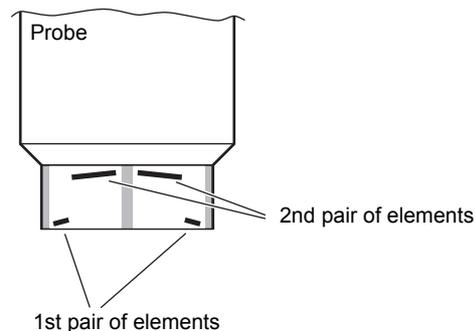
The 4-element probe has 2 transmitter/receiver pairs which are arranged at a different distance from the coupling face of the probe each.

While the first pair of elements (close to the coupling face) is used for acquiring basic data (e.g. sound velocity in the test object), the second pair of elements (lying deeper in the probe) is used for determining the wall thickness of the test object.



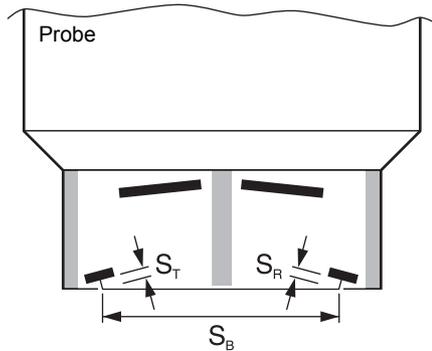
### Note

Only the echoes of the second pair of transducer elements are visible in the A-scan.



After calibrating the DMS Go+ TC to the connected probe, the basic data of the probe are stored in the instrument.

This means that e.g. the sound path between the transmitter and receiver element of the first pair of elements is known, composed of the delay line ( $S_T$ ,  $S_R$ ) and the basic path ( $S_B$ ).



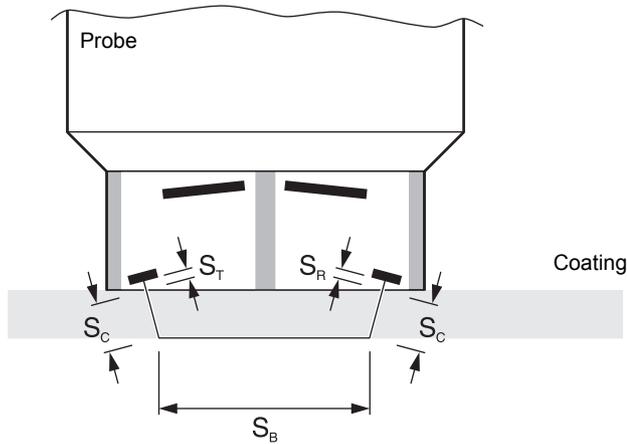
On the basis of this known path and the time of flight measured in each case, the instrument can then directly determine and display the sound velocity in a non-coated test object (Auto-V function).

At the same time, the sound velocity determined in this way can be used for the exact measurement of wall thickness. Thanks to the determination of the sound velocity in the material, taking place simultaneously with the wall thickness measurement, velocity variations caused by the material and the temperature are also immediately taken into consideration in the wall thickness measurement.

When applying the TopCOAT method, the DMS Go+ TC does not use the measurements of the first pair of transducer elements for determining the sound velocity in the material but for determining the thickness of coating on the basis of the extended sound path

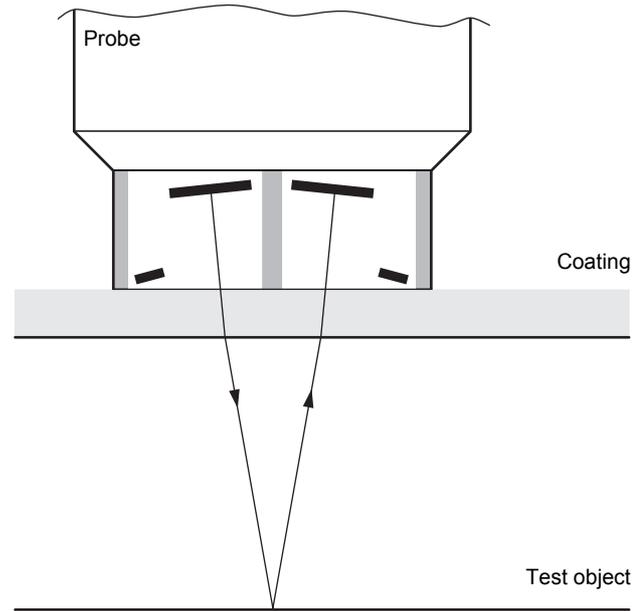
$$(S_T + S_C + S_B + S_C + S_R).$$

The sound velocities in the coating and in the test object are assumed to be known and constant.



Thanks to the exact determination of the coating thickness, the DMS Go+ TC can reduce the measurement value, calculated on the basis of the sound path of the second pair of elements, by the coating thickness and thus display the correct wall thickness of the test object.

This method enables to always determine the wall thickness on the basis of the first backwall echo. This makes the TopCOAT method suitable e.g. for the residual wall thickness measurement on heavily fissured backwalls when measurements between two backwall echoes (DUAL-MULTI) are no longer possible.



**ATTENTION**

An absolute prerequisite for both functions or measurement methods is the calibration of the DMS Go+ with the probe to be used.

The calibration enables to determine the sound path of the first pair of transducer elements, forming the basis for all subsequent calculations.

The calibration also includes the entry of the sound velocity of the velocity reference block used made of copper in the DMS Go+.

The calibration is described below for both functions.

## 7.2 Measurement mode Auto-V

### Applications

The Auto-V function is used for the simultaneous determination of sound velocity and wall thickness on non-coated test objects.

The simultaneous determination of sound velocity is not possible in wall thickness measurements on coated test objects.



#### ATTENTION

A prerequisite for correct measurement results is a good homogeneity of the material in the immediate vicinity of the measurement location.

As opposed to that, large-area inhomogeneities have an effect on the calculation of wall thickness.

### Choosing the probe

To be able to use the Auto-V function, you have to connect a special 4-element probe to the DMS Go+.

The following probes from GE are suitable for Auto-V:

- TC-560

### Activating Auto-V

- Connect a suitable probe to the instrument.
- In the function group **PROBE&CAL**, select the function **PROBE**.
- Choose the connected probe. The instrument is immediately adjusted.
- Select the function **TG MODE** and choose the option **AUTO-V**.

## Zeroing for Auto-V



### ATTENTION

The calibration described below is an absolute prerequisite for the subsequent measurements.

## Checking reference block data

A special velocity reference block made of copper belongs to every DMS Go+ TC. The data of this reference block are usually already stored in your DMS Go+ TC.

At first, check that these data (sound velocity and serial number) correspond to those of the reference block. If necessary, you can enter new data, e.g. if the original reference block has been lost (see Chapter **Saving calibration block data**, page 5-48).

The sound velocity (V) in inch/ $\mu$ s and m/s, and the serial number (S/N) are engraved on two sides of the reference block.

## Carrying out probe zero offset



### ATTENTION

It is absolutely necessary that you use low-viscosity couplant for the probe zero offset (e.g. light machinery oil or glycerin).



### Note

Before starting the calibration, set an initial sound velocity between 5000 and 6000 m/s in order to reduce the calibration time.

- In the function group **PROBE&CAL**, select the function **TG MODE**.
- Choose the option **AUTO-V**.
- In the function group **PROBE&CAL**, select the function **VELOCITY**.
- Set a value between 5000 and 6000 m/s.

- Apply some couplant to the reference block at the instrument rear and to the reference block made of copper.
- In the function group **PROBE&CAL**, select the function **PROBE ZERO**.
- Press one of the **left** or **right** arrow keys in order to start the zeroing. The message **Put probe on zero block - use couplant** is displayed on the screen.
- Couple the probe. The calibration starts.
- Keep the probe coupled as long as the message **Acquiring, please stay coupled** is visible on the display screen. When the message is no longer visible, the calibration for the measurement mode Auto-V is finished.

You can then carry out wall thickness measurements on non-coated test objects. Every time you couple the probe, you can see the current sound velocity in the test object at the top of the display screen.

## 7.3 Measurement mode TopCOAT

### Applications

The TopCOAT method is used for the determination of wall thickness and coating thickness on coated test objects.

It is thus possible to carry out residual wall thickness measurements through coatings on the basis of the first backwall echo.

The sound velocities in the test object and in the coating must be known for the application of the measurement mode TopCOAT. These sound velocities can be

- entered manually,
- determined using the measurement mode Auto-V (see Chapter 7.2 **Measurement mode Auto-V**, page 7-6),
- determined by means of calibration blocks (described later in this section).

### Choosing the probe

To be able to use the TopCOAT function, you have to connect a special 4-element probe to the DMS Go+.

The following probes from GE are suitable for the TopCOAT method:

- TC-560

### Activating TopCOAT

- Connect a suitable probe to the instrument.
- In the function group **PROBE&CAL**, select the function **PROBE**.
- Choose the connected probe. The instrument is immediately adjusted.
- Select the function **TG MODE** and choose the option **TOP-COAT**.

## Zeroing for TopCOAT



### ATTENTION

The calibration described below is an absolute prerequisite for the subsequent measurements.

## Checking reference block data

A special velocity reference block made of copper belongs to every DMS Go+ TC. The data of this reference block are usually already stored in your DMS Go+ TC.

At first, check that these data (sound velocity and serial number) correspond to those of the reference block. If necessary, you can enter new data, e.g. if the original reference block has been lost (see Chapter **Saving calibration block data**, page 5-48).

The sound velocity (V) in inch/ $\mu$ s and m/s, and the serial number (S/N) are engraved on two sides of the reference block.

## Carrying out probe zero offset



### ATTENTION

It is absolutely necessary that you use low-viscosity couplant for the probe zero offset (e.g. light machinery oil or glycerin).



### Note

Before starting the calibration, set an initial sound velocity between 5000 and 6000 m/s in order to reduce the calibration time.

- In the function group **PROBE&CAL**, select the function **TG MODE**.
- Choose the option **TOP-COAT**.
- In the function group **PROBE&CAL**, select the function **VELOCITY**.
- Set a value between 5000 and 6000 m/s.

- Apply some couplant to the reference block at the instrument rear and to the reference block made of copper.
- In the function group **PROBE&CAL**, select the function **PROBE ZERO**.
- Press one of the **left** or **right** arrow keys in order to start the zeroing. The message **Put probe on zero block - use couplant** is displayed on the screen.
- Couple the probe. The calibration starts.
- Keep the probe coupled as long as the message **Acquiring, please stay coupled** is visible on the display screen. When the message is no longer visible, the zeroing for the TopCOAT method is finished.

The coating thickness is displayed next to the wall thickness reading on the display screen.

## Sound velocity in the test object.

The sound velocity in the test object must be known and set in the instrument for TopCOAT measurements (see Section **Setting the sound velocity**, page 5-31).

You can enter the material velocity manually or determine it by means of DMS Go+.



### Note

If you carry out measurements using the measurement mode **AUTO-V** on a non-coated area of the same test object, the current material velocity is known and set in the instrument. You can switch to the measurement mode **TOP-COAT** immediately. The sound velocity that was determined last is maintained.

## Calibration to the sound velocity

For calibrating the DMS Go+ TC, you need three calibration blocks:

- the reference block at the instrument rear,
- the calibration block made of copper,
- a non-coated calibration block made of the same material as the test object and with known thickness. Ideally, the thickness of this calibration block is the equal to or slightly greater than the expected readings from the test object.

At the beginning of the calibration to the sound velocity, you have to carry out the automatic probe zero offset.



### ATTENTION

It is absolutely necessary that you use low-viscosity couplant for the probe zero offset (e.g. light machinery oil or glycerin).

- Apply some couplant to all three calibration blocks.
- In the function group **PROBE&CAL**, select the function **CALIBRATION**.
- Press one of the **left** or **right** arrow keys in order to start the calibration. The message **Put probe on zero block - use couplant** is displayed on the screen.
- Couple the probe. The zeroing is started. After finishing it, the message **Probe zero complete. Remove probe from zero block.** is displayed on the screen.
- Uncouple the probe. The message **Put probe on reference block - use couplant** is displayed on the screen.
- Center the probe above the reference block and turn it so that the flat side is parallel to the groove cut in the reference block.
- Couple the probe to the center of the reference block and keep it steady. After finishing it, the message **TopCOAT zero completed. Remove probe from reference block.** is displayed on the screen.
- Uncouple the probe. The message **Couple to Cal standard (displayed below) or press ENTER to change cal. block thickness.** is displayed on the screen.

- Select the digits that you wish to change using the **left** and **right** arrow keys, and change the value using the **up** and **down** arrow keys.
- Press the function key 2 (function **DONE**) in order to close the process of changing the thickness value.
- Couple the probe.
- Keep the probe coupled as long as the message **Acquiring, please stay coupled** is visible on the display screen. When the message is no longer visible, the calibration for the TopCOAT method is finished.

The sound velocity for the measurement mode TopCOAT is then correctly set.

## Sound velocity in the coating

In addition to the sound velocity in the material, the sound velocity in the coating must also be known for TopCOAT measurements. The factory-set default value for this is 2375 m/s. This value should usually produce satisfying results.



### ATTENTION

As the sound velocity in the coating has an effect on the determination of coating thickness and consequently also on the calculation of wall thickness, the accuracy of the displayed thickness reading depends on the coating velocity stored in the instrument.

### Storing the coating velocity

You have to store the exact sound velocity in the coating in the DMS Go+ TC for accurate measurements. Use to the function Auto-V to determine the sound velocity.

- In the function group **PROBE&CAL**, select the function **TG MODE**.
- Choose the option **AUTO-V**.
- Apply some couplant to the coated side of the calibration block and couple the probe. The measured sound velocity is displayed at the top edge of the display screen.
- In the function group **MEASURE**, select the function **VEL REF. BLOCK**.
- Press one of the **left** or **right** arrow keys. A form window appears.
- Press one of the **up** or **down** arrow keys in order to switch to the parameter **Coating Velocity**.

- Press one of the **left** or **right** arrow keys in order to set the value.
- Finally, press the function key 2 (function **DONE**) in order to save the data. The form window disappears.



### ATTENTION

If possible, check the sound velocity in the coating measured in this way by using different coating thicknesses.

# Maintenance and care **8**

## 8.1 Instrument care

Clean the instrument and its accessories using a moist cloth. The following are exclusively recommended for cleaning:

- Water,
- a mild household cleaner, or
- alcohol (no methyl alcohol).



### **ATTENTION**

Do not use any methyl alcohol, and no solvents or dye penetrant cleaners! The plastic parts may be damaged or become brittle due to them.

## 8.2 Battery care

### **Battery care**

The capacity and life of batteries mainly depend on the correct handling. Therefore, please observe the tips below:

You should charge the batteries in the following cases:

- before the initial startup,
- after a storage time of 3 months or longer,
- after frequent partial discharge.

## Charging the batteries

You can charge the lithium-ion battery either within the instrument itself or by means of the external charger recommended by us. Please observe the operating instructions for the charger in this regard.

The handling of batteries, the charging process, and the meaning of LEDs and power indicators is described in detail in Chapter **Operation using batteries**, page 3-4.



### ATTENTION

You should only use the batteries recommended by us and the corresponding charger. Any improper handling of the batteries and charger involves an explosion hazard.

## 8.3 Maintenance

The DMS Go+ requires basically no maintenance.



### ATTENTION

Any repair work may only be carried out by members of authorized GE service staff.

## 8.4 Software updates

You can install the latest software updates for the DMS Go+ yourself. You can check the version installed in your instrument.

- In the function group **CONFIG**, select the function **ABOUT**.
- Press one of the **left** or **right** arrow keys. The start display of the instrument appears.

The line **MAIN CODE** shows the version number and the date of the installed software.

- Press the function key 1 in order to switch back to the normal view again.

## Download of update files

You can download the latest software version for your instrument from the GE Inspection Technologies website by means of any customary web browser.

After downloading, you have to copy the update file to the main directory of the SD memory card.

- Open the browser and enter the address **www.geinspectiontechnologies.com**.
- After the default homepage has appeared, select another language at the top edge of the display if necessary.
- Click **Download Center** on the left. The page appears.
- Choose the following entries from the lists:  
Business type: **Inspection Technologies**  
Product category: **Ultrasound**  
Product family: **Thickness gauges**  
Download type: **Software**
- Enter **DMS** in the search box and click the button **Search**. The results are displayed.

- In the column **Title**, click the entry **USM Go/DMS Go Software Update**.
- Read the displayed text **Software Terms and Conditions Acceptance** and click **I ACCEPT** to confirm. The **Registration Form** appears.
- Fill in the registration form and, finally, click **SUBMIT**. The download form appears.
- In the column **Download**, click **Download Update**.
- Select the memory location and click **Save**.
- Unzip the downloaded archive file (.zip) and save the update file (.sdu) to an appropriate location.
- Copy the update file (.sdu) to the main directory of the SD memory card.

## Installing an update



### Note

Only one file with the extension **.sdu** may be located in the main directory of the SD card for the installation. If several update files are located in the main directory, the installation process is aborted and an error message is displayed.

To install the new software, proceed as follows:

- Check whether the file has the extension **.sdu**. If not, the file is not suitable for the DMS Go+ and must not be used.
- Power the DMS Go+ off.
- Insert the SD memory card containing the update file into the DMS Go+ (see Chapter 3.4 **Inserting the SD memory card**, page 3-10).

- Press the function key 2 (1), the function key 4 (2), and the Power key (3) at the same time, and hold all three keys pressed until the display screen is turned on and the message **FLASH UPGRADE MODE** appears.

The installation process will then start. The following messages are displayed one by one:

### LOADING FILE

### VERIFYING FILE

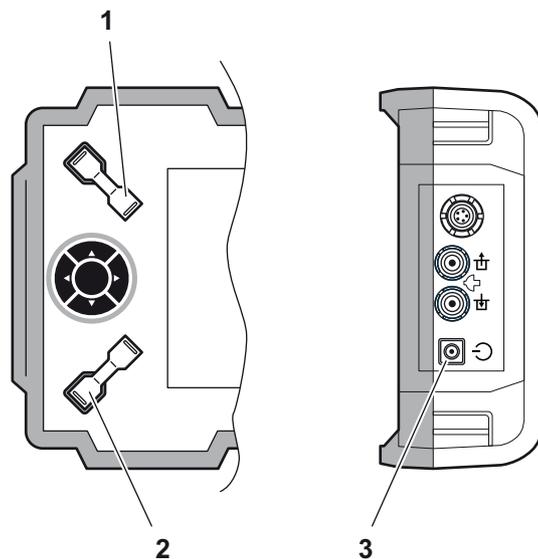
### PROGRAMMING FLASH

At the end of the installation, the instrument is powered off automatically. After this, you can power the DMS Go+ on again and use the new software version.



### Note

For resetting the instrument to factory default settings, see Section **Factory default setting (Reset)**, page 3-12.



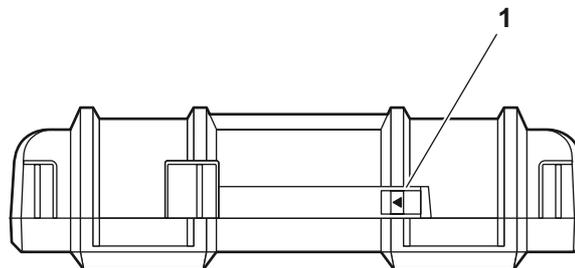
# Interfaces and Peripherals **9**

## 9.1 Interfaces

### Overview

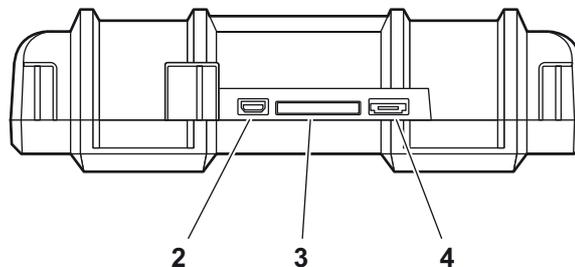
The interfaces are located under the watertight cover on the top of the instrument.

- Push the lock of the hinged cover (1) in the direction of the arrow in order to open the cover.
- Close the cover and make sure that it is locked tightly. If necessary, push the lock up to the limit stop in the opposite direction of the arrow in order to close the cover watertight again.



The following are located under the cover:

- USB interface (2)
- Card slot for SD memory cards (3)
- Service interface (4)



## USB interface

The USB interface is executed as micro USB connector and is used for data exchange with a PC.

When you connect the instrument to a PC via a standard USB cable, the SD memory card inserted into the instrument is added to the list of active drives on the PC.

After this, you can carry out all normal file operations on the SD memory card, e.g. copying and deleting of files.

To learn more about handling of the SD memory card, see Chapter 3.4 **Inserting the SD memory card**, page 3-10.



### Note

If the instrument is connected to a PC via the USB interface, it functions as an external drive. It is then not possible to use the instrument. After disconnecting the USB cable, the normal operation is possible again.

## Service interface (Mini RS232-C)

The service interface is only meant to be used for service purposes by the GE customer service.

## 9.2 Peripherals

The DMS Go+ is not provided for the direct connection of peripherals, e.g. printers or monitors.

For more details on documentation, see Section **Documenting measurements**, page 6-40.

# Appendix 10

## 10.1 Application notes

### General notes

The DMS Go+ is easy to use and produces reliable and reproducible measurement results if handled correctly and in consideration of all the conditions which may affect the accuracy of measurements. Some of the most common influential factors are explained in this chapter.

### External inclusions inside the material

If the DMS Go+ displays a value during a sequence of measurements which is considerably smaller than the one obtained from a measuring point lying in the close vicinity, this may have been caused by a material defect (for example external inclusion) reflecting the sound pulses instead of the backwall. If this occurs, this area should be checked by means of another suitable NDT method in order to find out the cause for the conspicuous reading.

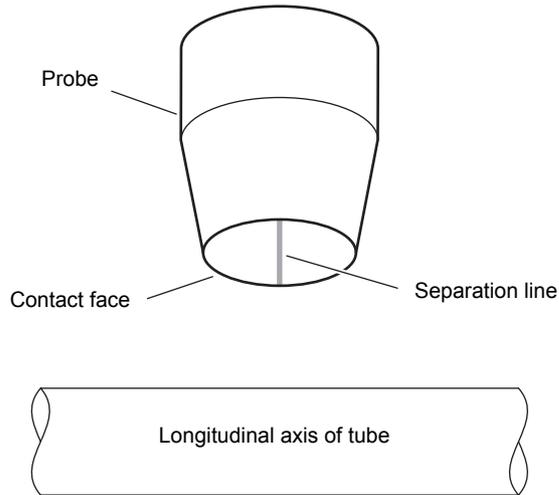
### Surface quality

Tool marks running parallel to the coupling face may cause measurement errors in the case of a great peak-to-valley height. If the acoustic separation layer of the probe is set at right angles to the marks, this effect does not occur.

Incorrect readings are obtained in some cases due to a too rough test surface because of excessive couplant accumulating between the probe and the test object surface. Very rough surfaces can totally prevent the coupling (no coupling signal). A surface treatment is required in such cases.

### Curved surfaces

In measurements on convex surfaces, for example tubes or cylindrical tanks, it is necessary to couple the probe to the surface center for radial scanning. The acoustic separation layer of the probe must be set at right angles to the longitudinal axis of the test object (please refer to figure on the next page). Probes with small contact face diameters improve the coupling on convex surfaces.



### Wall thickness measurement on hot test objects

Equipped with the probe DA 305 for high-temperature applications, the DMS Go+ can be used for wall thickness measurements on materials with a surface temperature of max. 600 °C. A coupling paste especially developed for such applications is likewise required. It is recommended to proceed as follows:

- Calibrate the DMS Go+ according to the instructions given in this manual.
- Clean the test surface carefully by means of a wire brush and remove any possibly existing oxide layers.
- Knead the coupling paste ZGM for high temperatures in the tube before using it. After that, apply one drop of ZGM (diameter approx. 5 mm) to the contact face of the probe, not to the test object.
- Couple the probe carefully to the test surface.

To avoid any damages to the probe contact face, do not turn or rotate the probe while it is in contact with the test surface. If the surface is curved, pay attention to the correct orientation of the acoustic separation layer of the probe. To achieve a good coupling, let the coupling paste ZGM melt for 2 to 3 seconds. The coupling paste can ignite all of a sudden at temperatures over 550 °C. This does not affect the coupling quality in any way.

- Do not leave the probe coupled for longer than 5 seconds. On curved surfaces, good coupling can be achieved by slightly rocking the probe.
- Remove any residual couplant carefully from the probe before carrying out another measurement.



### ATTENTION

When using the HT 400A, it is absolutely necessary that the attached table for coupling and cooling times be taken into consideration.

Cooling with water may destroy the probe!

## 10.2 Sound velocities

The table shows typical sound velocities in different materials (longitudinal wave).

The actual sound velocities depend on the exact composition, temperature, and treatment of the material and may vary largely, especially in the case of metal alloys and plastics.

Material	m/s
Aluminum (alloy)	6380
Aluminum (pure)	6320
Aluminum oxide	9000 ... 9850
Lead	2150
Iron (pure)	5960
Epoxy resin	2600 ... 2840
Glass (window glass)	5790
Glass (crown glass)	5800
Glass (safety glass)	6080

<b>Material</b>	<b>m/s</b>
Gold	3240
Rubber (hard)	220 ... 2540
Material	m/s
Rubber (soft)	1460 ... 2200
Cast iron (lamellar)	3800 ... 4700
Cast iron (vermicular)	4700 ... 5500
Cast iron (nodular)	5100 ... 5700
Inconel	5700
Copper	4700 ... 5000
Magnesium	5800
Brass (CuZn30)	4700
Brass (CuZn40)	4400
Monel	5300 ... 6000
Nickel (hard)	5810
Nickel (soft)	5610

<b>Material</b>	<b>m/s</b>
Platinum	3960
Plexiglas (PMMA)	2730
Polyamide (6.6 Nylon)	2600
Polyethylene (PE hard)	2530
Polyethylene (PE soft)	2000
Polypropylene (PP hard)	2600
Polypropylene (PP soft)	2000
Polystyrene (PS)	2350
Polyvinyl chloride (PVC hard)	2400
Polyvinyl chloride (PVC soft)	2200
Silver	3600
Silicon	8950
Silicon carbide	12180
Silicon nitride	10000 ... 13000
Steel (austenitic)	5650 ... 5850

<b>Material</b>	<b>m/s</b>
Steel (duplex)	5750 ... 5950
Steel (ferritic)	5920
Cast steel (austenitic)	5730
Teflon (PTFE)	1340 ... 1400
Titanium	6100 ... 6230
Uranium	3200 ... 3380
Uranium dioxide	4520 ... 5160
Uranium carbide	4010 ... 4640
Tungsten	5200 ... 5460
Tungsten carbide	6660
Zinc	4190
Tin	3320
Zircaloy 4	4700
Zircon (pure)	4300
Zirconium oxide	7040

## 10.3 Data Recorder file types



### Note

In the file format **STANDARD**, only the wall thickness is recorded. In the file format **EXTENDED**, the recording includes extended data (e.g. date and time of recording, probe type, sound velocity, measurement mode).

### File type **LINEAR**

<b>READING TYPE</b>	File format: <b>STANDARD</b> or <b>EXTENDED</b>
<b>START POINT</b>	First measuring point (1 ... 99,999)
<b>END POINT</b>	Last measuring point (1 ... 99,999)
<b>FILE NAME</b>	Free text, up to 16 characters
<b>PROBE</b>	Free text, up to 16 characters

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<b>CALIBRATION</b>	Free text, up to 16 characters
<b>UNITS</b>	Units: <b>mm</b> or <b>in</b>
<b>COMPANY</b>	Free text, up to 16 characters
<b>DESCRIPTION</b>	Free text, 4 lines with up to 16 characters each
<b>INSPECTOR</b>	Free text, up to 16 characters
<b>TEMP</b>	Free text, up to 16 characters
<b>T-MIN</b>	Minimum value which triggers an alarm if fallen below
<b>T-MAX</b>	Maximum value which triggers an alarm if exceeded
<b>MEMO</b>	Free text, up to 16 characters

## File type GRID

<b>READING TYPE</b>	File format: <b>STANDARD</b> or <b>EXTENDED</b>
<b>GRID LABELING</b>	Alphabetic or numeric labeling of rows and columns: COL-A/ROW-# (columns alphabetically, rows numerically), COL-#/ROW-A (columns numerically, rows alphabetically)
<b>STARTING ROW</b>	Number of the first row (1 ... 702)
<b>ENDING ROW</b>	Number of the last row (1 ... 702)
<b>STARTING COLUMN</b>	Number of the first column (A ... ZZ)
<b>ENDING COLUMN</b>	Number of the last column (A ... ZZ)
<b>START POINT</b>	First measuring point (1 ... 99,999)
<b>END POINT</b>	Last measuring point (1 ... 99,999)
<b>FILE NAME</b>	Up to 16 characters
<b>PROBE</b>	Free text, up to 16 characters
<b>CALIBRATION</b>	Free text, up to 16 characters
<b>UNITS</b>	Units: <b>mm</b> or <b>in</b>

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<b>COMPANY</b>	Free text, up to 16 characters
<b>DESCRIPTION</b>	Free text, 4 lines with up to 16 characters each
<b>INSPECTOR</b>	Free text, up to 16 characters
<b>TEMP</b>	Free text, up to 16 characters
<b>T-MIN</b>	Minimum value which triggers an alarm if fallen below
<b>T-MAX</b>	Maximum value which triggers an alarm if exceeded
<b>MEMO</b>	Free text, up to 16 characters

## File type CUSTOM LINEAR

<b>READING TYPE</b>	File format: <b>STANDARD</b> or <b>EXTENDED</b>
<b>NUMBER OF LOCATIONS</b>	Number of measurement locations (1 ... 999)
<b>LOC. LABEL LENGTH</b>	Maximum number of characters for labeling measurement locations (1 ... 16)
<b>START POINT</b>	First measuring point (1 ... 99,999)
<b>END POINT</b>	Last measuring point (1 ... 99,999)
<b>FILE NAME</b>	Up to 16 characters
<b>PROBE</b>	Free text, up to 16 characters
<b>CALIBRATION</b>	Free text, up to 16 characters
<b>UNITS</b>	Units: <b>mm</b> or <b>in</b>
<b>COMPANY</b>	Free text, up to 16 characters
<b>DESCRIPTION</b>	Free text, 4 lines with up to 16 characters each
<b>INSPECTOR</b>	Free text, up to 16 characters
<b>TEMP</b>	Free text, up to 16 characters

<b>T-MIN</b>	Minimum value which triggers an alarm if fallen below
<b>T-MAX</b>	Maximum value which triggers an alarm if exceeded
<b>MEMO</b>	Free text, up to 16 characters
<b>PREFIX TEXT</b>	Text before the automatic numbering
<b>STARTING NUMERIC</b>	Start value for the automatic numbering
<b>INCREMENT BY</b>	Increment value for the automatic numbering
<b>SUFFIX TEXT</b>	Text after the automatic numbering

## File type CUSTOM GRID

<b>READING TYPE</b>	File format: <b>STANDARD</b> or <b>EXTENDED</b>
<b>NUMBER OF LOCATIONS</b>	Number of measurement locations (1 ... 999)
<b>LOC. LABEL LENGTH</b>	Maximum number of characters for labeling measurement locations (1 ... 16)
<b>GRID LABELING</b>	Alphabetic or numeric labeling of rows and columns: COL-A/ROW-# (columns alphabetically, rows numerically), COL-#/ROW-A (columns numerically, rows alphabetically)
<b>STARTING ROW</b>	Number of the first row (1 ... 702)
<b>ENDING ROW</b>	Number of the last row (1 ... 702)
<b>STARTING COLUMN</b>	Number of the first column (A ... ZZ)
<b>ENDING COLUMN</b>	Number of the last column (A ... ZZ)
<b>FILE NAME</b>	Up to 16 characters
<b>PROBE</b>	Free text, up to 16 characters
<b>CALIBRATION</b>	Free text, up to 16 characters
<b>UNITS</b>	Units: <b>mm</b> or <b>in</b>

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<b>COMPANY</b>	Free text, up to 16 characters
<b>DESCRIPTION</b>	Free text, 4 lines with up to 16 characters each
<b>INSPECTOR</b>	Free text, up to 16 characters
<b>TEMP</b>	Free text, up to 16 characters
<b>T-MIN</b>	Minimum value which triggers an alarm if fallen below
<b>T-MAX</b>	Maximum value which triggers an alarm if exceeded
<b>MEMO</b>	Free text, up to 16 characters
<b>PREFIX TEXT</b>	Text before the automatic numbering
<b>STARTING NUMERIC</b>	Start value for the automatic numbering
<b>INCREMENT BY</b>	Increment value for the automatic numbering
<b>SUFFIX TEXT</b>	Text after the automatic numbering

## File type CUSTOM POINT

<b>READING TYPE</b>	File format: <b>STANDARD</b> or <b>EXTENDED</b>
<b>NUMBER OF LOCATIONS</b>	Number of measurement locations (1 ... 999)
<b>LOC. LABEL LENGTH</b>	Maximum number of characters for labeling measurement locations (1 ... 16)
<b>POINTS PER LOC.</b>	Number of measuring points per measurement locations (1 ... 9,999)
<b>PNT. LABEL LENGTH</b>	Maximum number of characters for labeling measuring points (1 ... 16)
<b>FILE NAME</b>	Up to 16 characters
<b>PROBE</b>	Free text, up to 16 characters
<b>CALIBRATION</b>	Free text, up to 16 characters
<b>UNITS</b>	Units: <b>mm</b> or <b>in</b>
<b>COMPANY</b>	Free text, up to 16 characters
<b>DESCRIPTION</b>	Free text, 4 lines with up to 16 characters each
<b>INSPECTOR</b>	Free text, up to 16 characters
<b>TEMP</b>	Free text, up to 16 characters

<b>T-MIN</b>	Minimum value which triggers an alarm if fallen below
<b>T-MAX</b>	Maximum value which triggers an alarm if exceeded
<b>MEMO</b>	Free text, up to 16 characters
<b>PREFIX TEXT</b>	Text before the automatic numbering
<b>STARTING NUMERIC</b>	Start value for the automatic numbering
<b>INCREMENT BY</b>	Increment value for the automatic numbering
<b>SUFFIX TEXT</b>	Text after the automatic numbering

## File type BOILER

<b>READING TYPE</b>	File format: <b>STANDARD</b> or <b>EXTENDED</b>
<b>NUMBER OF ELEVATIONS</b>	Number of elevations (1 ... 999)
<b>ELEV. LABEL LENGTH</b>	Maximum number of characters for labeling elevations (1 ... 16)
<b>STARTING TUBE #</b>	First measuring point of the first tube (1 ... 999)
<b>ENDING TUBE #</b>	Last measuring point of the last tube (1 ... 999)
<b>POINTS ON TUBE</b>	Identification of the points on the tube (L = left, C = center, R = right, B = back, F = front)
<b>FILE NAME</b>	Up to 16 characters
<b>PROBE</b>	Free text, up to 16 characters
<b>CALIBRATION</b>	Free text, up to 16 characters
<b>UNITS</b>	Units: <b>mm</b> or <b>in</b>
<b>COMPANY</b>	Free text, up to 16 characters
<b>DESCRIPTION</b>	Free text, 4 lines with up to 16 characters each
<b>INSPECTOR</b>	Free text, up to 16 characters

<b>TEMP</b>	Free text, up to 16 characters
<b>T-MIN</b>	Minimum value which triggers an alarm if fallen below
<b>T-MAX</b>	Maximum value which triggers an alarm if exceeded
<b>MEMO</b>	Free text, up to 16 characters
<b>PREFIX TEXT</b>	Text before the automatic numbering of measurement location
<b>STARTING NUMERIC</b>	Start value for the automatic numbering of measurement location
<b>INCREMENT BY</b>	Increment value for the automatic numbering of measurement location
<b>SUFFIX TEXT</b>	Text after the automatic numbering of measurement location

## 10.4 Flag symbols

The flag symbols are displayed on the screen in addition to the readings in the column **FLAGS** if the spread viewing format is selected.

- > maximum value alarm triggered
- < minimum value alarm triggered
- A an A-scan is stored for the reading
- B a B-scan is stored for the reading
- # a Micro Grid has been created for the reading
- %– percentage loss
- %+ percentage growth
- absolute loss
- + absolute growth
- () old reading exists

## 10.5 Function directory



### Note

Some functions are only available if the corresponding options are enabled by entering the license code.

Function	Function group	Description	see page
POWER DOWN	<b>CONFIG</b>	Power saving function, powers down the instrument after a preset time if no operation takes place.	5-12
RESOLUTION	<b>CONFIG</b>	Choice of the resolution for the display of readings.	5-3
DISPLAY DELAY	<b>MEASURE</b>	Display start shift.	5-33
DISPLAY RANGE	<b>MEASURE</b>	Width setting of display range.	5-33
GATE A THR.	<b>GATE</b>	Setting of the vertical position of gate A in percentage of screen height.	5-38
GATE B THR.	<b>GATE</b>	Setting of the vertical position of gate B in percentage of screen height.	5-38
GATE A WIDTH	<b>GATE</b>	Width setting of gate A.	5-38
GATE B WIDTH	<b>GATE</b>	Width setting of gate B.	5-38
GATE A START	<b>GATE</b>	Setting of the starting point for gate A.	5-37
GATE B START	<b>GATE</b>	Setting of the starting point for gate B.	5-37
CODE	<b>CONFIG</b>	Entry of the enabling code for optional functions and extensions.	5-54

<b>Function</b>	<b>Function group</b>	<b>Description</b>	<b>see page</b>
VIEW	<b>DR</b>	Display of the readings in spread or list format.	6-38
DATE TIME	<b>CONFIG</b>	Setting of date and time.	5-5
DATE FORMAT	<b>CONFIG</b>	Choice of date format.	5-5
RADIX	<b>CONFIG</b>	Choice of the character for decimal notation. Period or comma.	5-4
THK CAL	<b>PROBE&amp;CAL</b>	Choice of the method for the calibration to sound velocity.	5-27
PROPERTIES	<b>DR</b>	Displaying and editing Data Recorder files.	6-24
FREEZE	<b>MEASURE</b>	Holding and freezing the screen display.	5-52
UNITS	<b>CONFIG</b>	Choice of units.	5-3
RESULTS	<b>MEASURE</b>	Choice of data for the six data boxes at the top of the display screen.	5-13
CAL REMINDER	<b>PROBE&amp;CAL</b>	Configuring the reminder function for calibrations.	5-50
EXPLORER	<b>DR</b>	Creating, selecting, and deleting Data Recorder files.	6-11
EXPORT	<b>DR</b>	Exporting readings.	6-40
COLOR	<b>CONFIG</b>	Choice of color scheme for the display screen.	5-16
FUNC KEY	<b>CONFIG</b>	Choice of the function for function key 4.	5-7
VELOCITY	<b>PROBE&amp;CAL</b>	Choice and setting of material velocity.	5-31
RECTIFY	<b>CONFIG</b>	Choice of the rectification mode for the echo pulses.	5-36
BRIGHTNESS	<b>CONFIG</b>	Setting of display brightness.	5-15

<b>Function</b>	<b>Function group</b>	<b>Description</b>	<b>see page</b>
VEL REF. BLOCK	<b>CONFIG</b>	Calibration block data for the operating modes TopCOAT and AUTO-V.	5-48
CALIBRATION	<b>PROBE&amp;CAL</b>	Start of calibration to the sound velocity.	5-27
Master Cmt	<b>DR</b>	Editing the master comment list.	6-8
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MAX ALARM	<b>ALARM</b>	Wall thickness value which triggers an alarm if exceeded.	5-39
MAX GAIN MODE	<b>MEASURE</b>	Choice of amplification method.	5-34
MAX GAIN	<b>MEASURE</b>	Setting of gain values for the selected amplification method.	5-34
MENU MODE	<b>CONFIG</b>	Disabling the access to the instrument setup function.	5-8
TG MODE	<b>PROBE&amp;CAL</b>	Choice of the suitable measurement mode for the probe type.	5-22
MIN	<b>ALARM</b>	Alarm function for falling below a minimum value.	5-39
MIN ALARM	<b>ALARM</b>	Wall thickness value which triggers an alarm if fallen below.	5-39
MODE	<b>MEASURE</b>	Choice of the operating mode.	5-17
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<b>Function</b>	<b>Function group</b>	<b>Description</b>	<b>see page</b>
ORIENTATION	<b>CONFIG</b>	Configuration of the instrument for left-handed or right-handed operation.	5-6
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PROBE DELAY	<b>PROBE&amp;CAL</b>	Setting of probe delay line.	5-36
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SAVE P-SET	<b>PARAM</b>	Saving the current instrument settings to a file on the memory card.	5-18
LOCKOUT	<b>CONFIG</b>	Enabling of individual functions if lockout of all setup functions has been activated with the function MENU MODE.	5-8
LANGUAGE	<b>CONFIG</b>	Choice of the language for the texts on the display screen.	5-2
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UPDATE RATE	<b>CONFIG</b>	Choice of the display update rate.	5-35
ABOUT	<b>CONFIG</b>	Display of the instrument version and the options enabled.	5-54
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## 10.6 EU Declaration of Conformity

The DMS Go+ conforms to the requirements of the following EU directives:

- 89/336/EEC (Electromagnetic compatibility)

The conformity with the requirements of the EU directive 89/336/EEC is proven by the observance of the standard specifications

- EN 55 011:1998, Class A, Group 2, and
- EN 61 000-6-2:2005
- EN 61 000-6-4:2001

The conformity with the requirements of the EU directive 73/23/EEC, amended by 93/68/EEC, is proven by the observance of the standard specification

- EN 61 010-1:2001

## 10.7 Manufacturer/Service addresses

The ultrasonic thickness gauge DMS Go+ is manufactured by:

### **GE Sensing & Inspection Technologies GmbH**

Robert-Bosch-Straße 3  
50354 Hürth  
Germany

T +49 (0) 22 33 601 111

F +49 (0) 22 33 601 402

The DMS Go+ is manufactured according to the state-of-the-art methods using high-quality components. Thorough in-process inspections or intermediate tests and a quality management system certified to DIN EN ISO 9001 ensure an optimum quality of conformance and workmanship of the instrument.

Should you nevertheless detect an error on your instrument, power the instrument off and remove the batteries. Inform your local GE customer service and support, indicating the error and describing it.

Keep the shipping container for any repairs possibly required which cannot be made on the spot.

If there is anything special that you would like to know about the use, handling, operation, and specifications of the instruments, please contact your nearest GE representative or turn directly to:

GE Sensing & Inspection Technologies GmbH

Service-Center  
Robert-Bosch-Straße 3  
50354 Hürth  
Germany

or:

Postfach 1363  
50330 Hürth  
Germany

T +49 (0) 22 33 601 111  
F +49 (0) 22 33 601 402

**USA**

GE Inspection Technologies, LP  
50 Industrial Park Road  
Lewistown, PA 17044  
USA

T +1 717 242 03 27  
F +1 717 242 26 06

## 10.8 Environmental protection regulations

This section contains information about the following topics:

- WEEE directive
- Disposal of batteries

### WEEE directive (Waste Electrical and Electronic Equipment)

GE is an active participant in Europe's Waste Electrical and Electronic Equipment (WEEE) take-back initiative, directive 2002/96/EC.

The instrument that you have bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in the environment and to diminish the pressure on our natural resources, we advise you to use the appropriate take-back systems. Those systems will reuse or recycle in an environmentally safe way most of the materials of your instrument which is no longer capable of functioning.

The crossed-out wheeled bin symbol invites you to use those systems.



If you need more information on the collection, reuse, and recycling of recyclable material, please contact your local waste management company.

Visit our website at [www.ge-mcs.com](http://www.ge-mcs.com) for take-back instructions regarding our systems and for more information about this initiative.

## Disposal of batteries

This product contains batteries that cannot be disposed of as unsorted municipal waste in the European Union. Please read carefully the data sheets for the battery type used. Each battery is marked with this symbol which indicates that the product may contain cadmium (Cd), lead (Pb), or mercury (Hg). For proper recycling, return the batteries to the manufacturer or to a designated collection point.



## What do the markings mean?

Batteries and accumulators must be marked (either on the battery, on the accumulator, or on their packaging, depending on the size) with the separate collection symbol. In addition, the marking must include the chemical symbols of specific levels or toxic metals as follows:

- Cadmium (Cd) over 0.002 %
- Lead (Pb) over 0.004 %
- Mercury (Hg) over 0.0005 %

### The risks and your role in minimizing them

By participating in the proper waste disposal, you would make a valuable contribution towards reducing the damages possibly caused to the environment and human health by the batteries or accumulators. For proper recycling, you should return the instrument and/or the batteries it contains to the manufacturer or to a designated collection point.

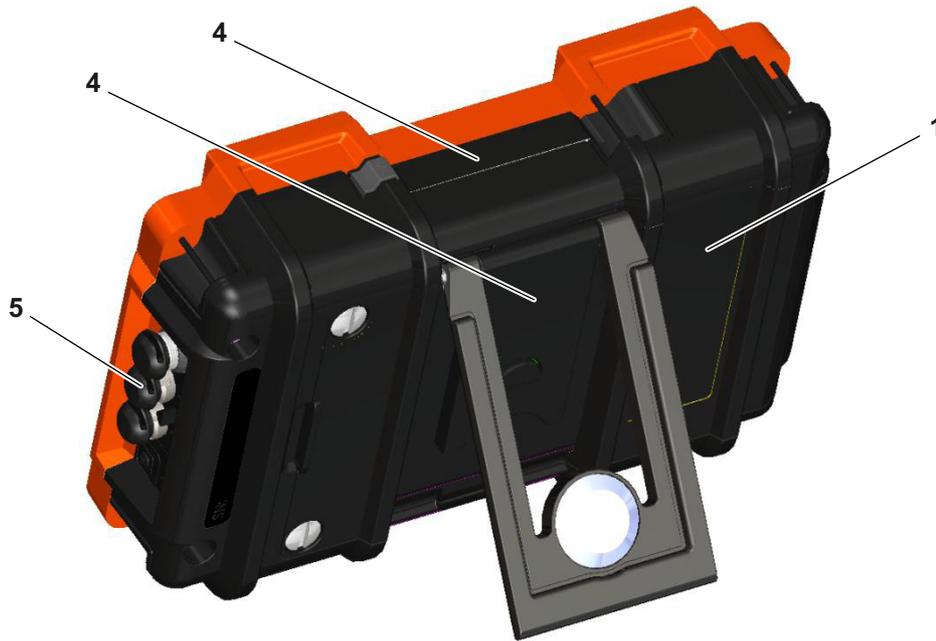
Some batteries or accumulators contain toxic metals that pose serious risks to human health and to the environment. When required, the product marking may include chemical symbols that indicate the presence of toxic metals in the product: Pb for lead, Hg for mercury, and Cd for cadmium.

- **Cadmium** poisoning can result in cancer of the lungs and prostate gland. Chronic diseases may include kidney damage, pulmonary emphysema, as well as bone diseases such as osteomalacia and osteoporosis. Cadmium may also cause anemia, discoloration of the teeth, and anosmia (loss of smell).
- **Lead** is poisonous in all compounds. It accumulates in the body so that any form of exposure is critical. Ingestion and inhalation of lead can cause severe internal injuries. These may result in brain damage, convulsions, malnutrition, and sterility.
- **Mercury** creates hazardous vapors already at room temperature. Exposure to high concentrations of mercury vapor can cause a variety of severe symptoms. These include e.g. chronic inflammation of mouth and gums, personality change, nervousness, fever, and rashes.

# 10.9 Recycling directives

## Overview

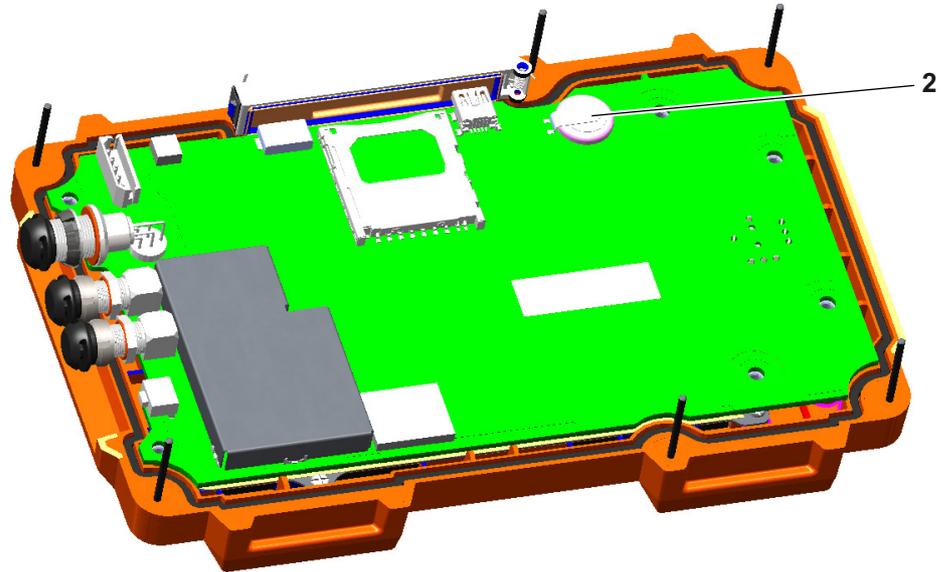




<b>Item No.</b>	<b>Recycling/Material Code</b>	<b>Description</b>
1	Lithium-ion battery	Lithium-ion battery in the battery compartment on the rear panel of instrument
2	Battery ML1200	Lithium backup battery on the main board
3	Polycarbonate, Polymex, TPE, brass, copper	Upper and lower instrument covers, as well as battery lid, partly contain steel, upper instrument cover contains embedded brass threads, keypad
4	Magnesium die casting	Upper watertight instrument cover, prop-up stand
5	Rubber	Rubber sleeves on the LEMO connectors

## Materials to be disposed of separately

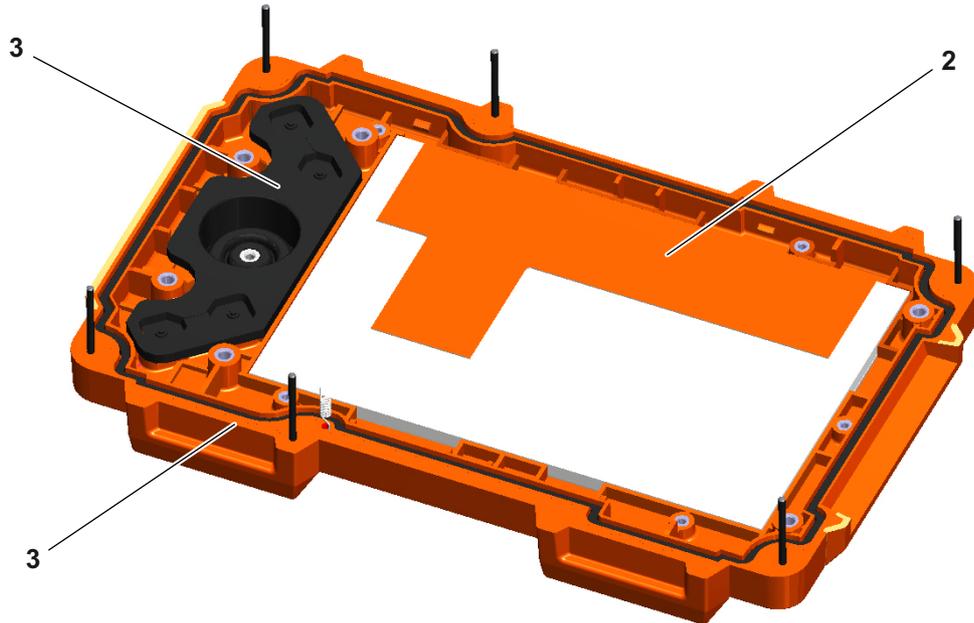


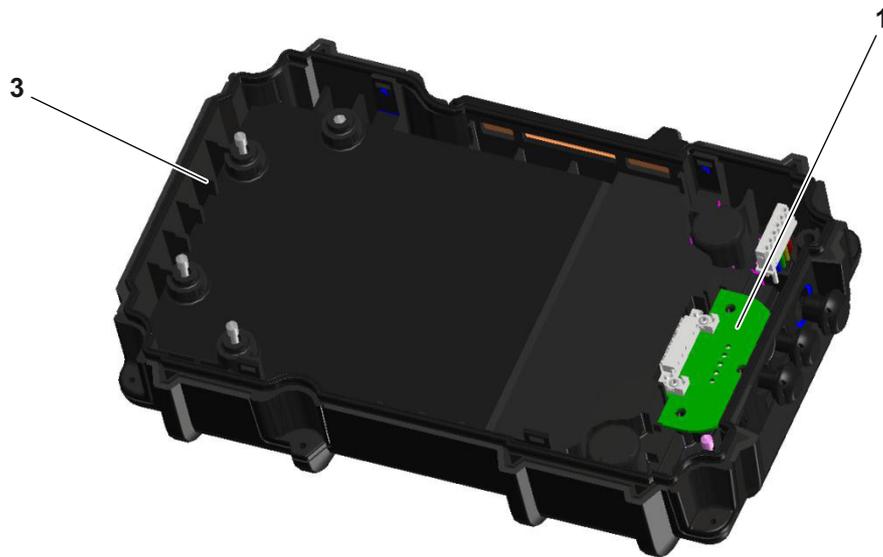


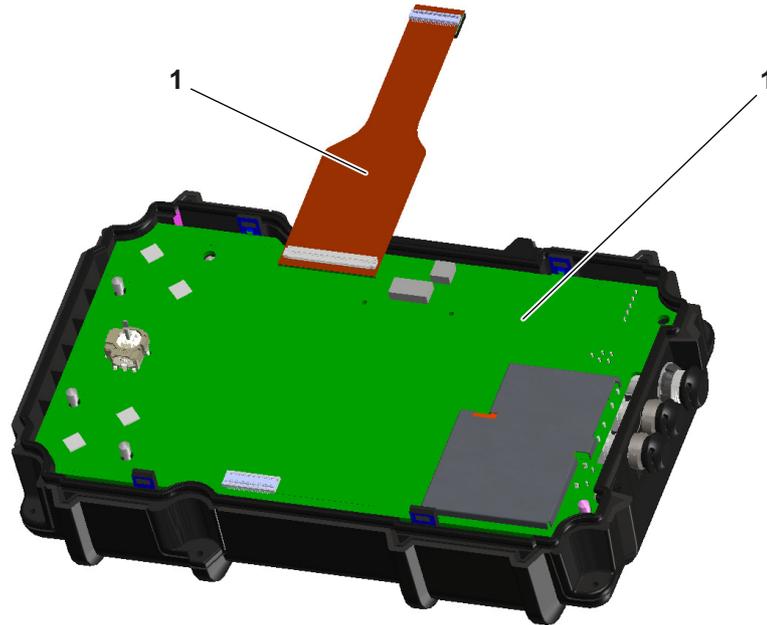
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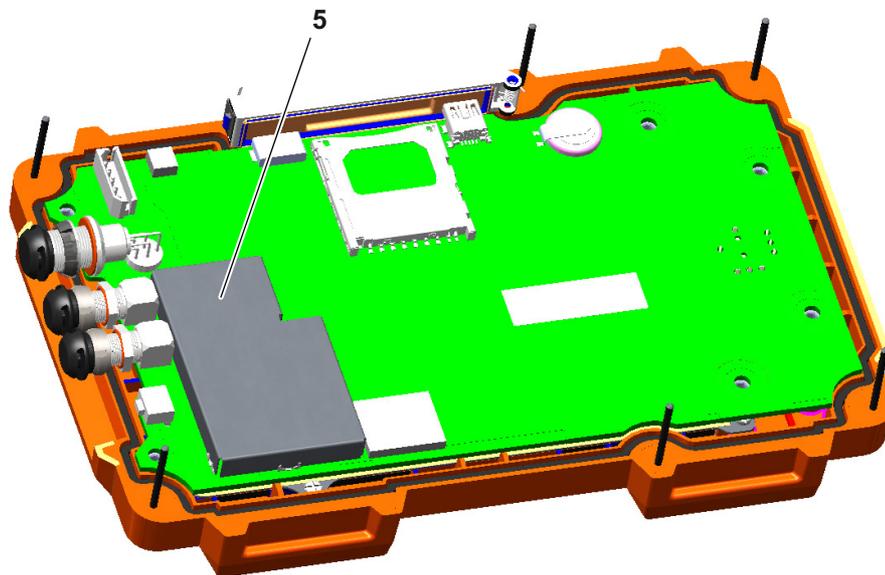
Item No.	Recycling/Material Code	Description
1	Lithium-ion battery	Battery compartment, remove after opening the battery lid
2	Battery ML1200	On the main board To remove the battery, loosen the screws on the rear panel of the instrument. After this, the lower instrument cover can be taken off.

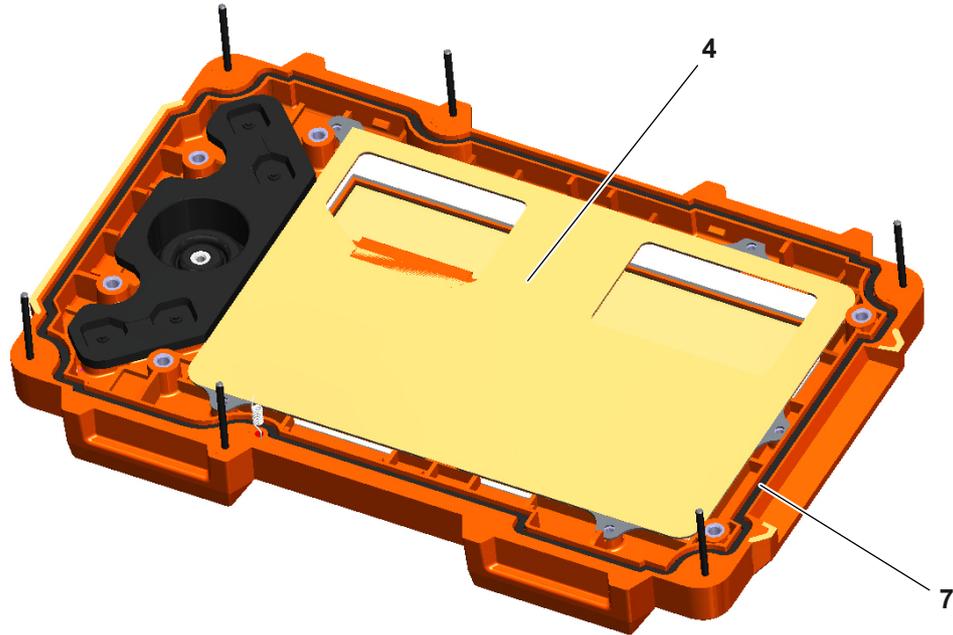
## Other materials and components

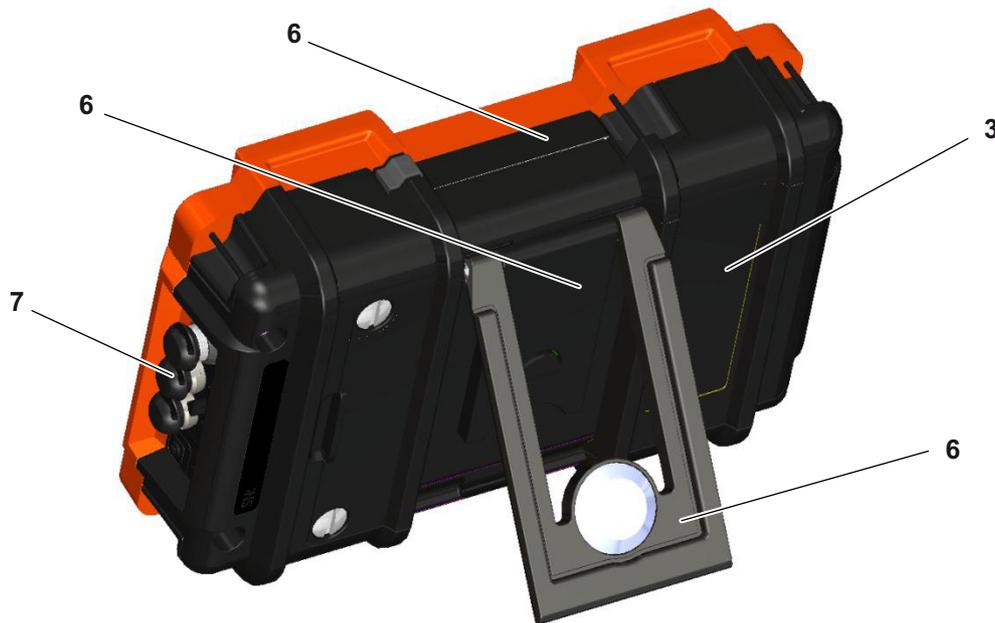












<b>Item No.</b>	<b>Recycling/Material Code</b>	<b>Description</b>
1	Main board, battery board, flexible PC PC boards mounted in the housing board	
2	TFT display	Mounted in the upper instrument cover under a stainless steel lid which is wrapped up in yellow foil
3	Parts of the housing, polycarbonate, Polymex, keypad	Parts of the housing, keypad
4	Stainless steel	Cover of TFT display
5	Steel	Protecting cover on the main board
6	Magnesium die casting	Upper watertight instrument cover, prop-up stand
7	Rubber	Rubber sleeves on the LEMO connectors, rubber joints

## Recycling data of the DMS Go+

**Recycling/Material Code**

**Weight approx. (g) Description**

---

### **Material/components to be disposed of and handled separately**

Lithium-ion battery

Battery compartment

Battery ML1200

Battery holder on the main board

### **Material/components possibly interfering with certain recycling processes**

PC boards

PC boards within the housing

Parts of the housing, polycarbonate,  
Polymex

Parts of the housing, keypad

TFT display

Mounted in the upper instrument cover under a stainless steel lid which is wrapped up in yellow foil

---

<b>Recycling/Material Code</b>	<b>Weight approx. (g)</b>	<b>Description</b>
<b>Normally advantageous material/components</b>		
Stainless steel		Cover of TFT display
Steel		Protecting cover on the main board
Magnesium die casting		Upper watertight instrument cover, prop-up stand
Rubber		Rubber sleeves on the LEMO connectors, rubber joints
Fasteners, cables, clamps, screws and bolts, ...		
<b>Total weight including battery</b>	<b>850</b>	

Special notes: none



# Specifications 11

## 11.1 Specifications of the DMS Go+

### Display screen

Active range (W × H)	108.0 × 64.8 mm, diagonal 5 inches
Size	5 inches
Resolution (W × H)	800 × 480 pixels
Contrast ratio	≥300
Brightness	≥200 cd/m <sup>2</sup>
Range (display width)	max. 14 m (551 inches) in steel, in normal mode, depending on the probe, material, and surface

## Display

Display shift (display delay)	0 ... 3,500 $\mu$ s
Probe delay	0 ... 1,000 $\mu$ s
Velocity	250 ... 16,000 m/s
Resolution of readings	0.01 mm or 0.1 mm (0.001 inches or 0.01 inches), selectable over the entire measuring range
Display modes	Temperature-corrected thickness Thickness and A-scan B-scan MIN/MAX capture mode Difference Data Recorder

## Connectors

Probe connectors	2 × LEMO-00, mechanical reverse polarity protection
USB interface	Micro USB connector
Service interface	1 × Mini-RS232C, only used for service purposes

## Pulser

Pulser mode	Square-wave pulser
Pulser voltage	automatically matched to the probe (120 V or 250 V)
Pulser falling/rising time	max. 10 ns
Pulser width	automatically matched to the probe

## Receiver

Digital gain 110 dB dynamic range, automatic gain control with manual (set by user) High, Low, and Auto gain limit

## Memory

Card slot SD card slot for standard SD cards

Capacity 8 GB, SD card

Datasets 100,000 measurements per file. Several files can be saved to the SD card.

## Environment

Battery	Operating time: 6 hours with full charge Charging method (standard): internal with charger/power adapter Charging method (optional): external charger Charge level: proportional charge level indicator
Charger/power adapter	Universal power supply unit 100 ... 240 VAC, 50/60 Hz, meets the requirements of CCC, CE, UL, CSA, and PSE
Size (W × H × D)	175 × 111 × 50 mm
Weight	850 g incl. battery
Languages	Bulgarian, Chinese, Czech, Dutch, English, Finnish, French, German, Hungarian, Italian, Japanese, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish

## Protection

Damp heat and humidity (storage)	10 cycles: 10 hrs at +60 ... +30 °C, 10 hrs at +30 ... +60 °C, transition within 2 hrs (507.4)
Temperature shock (storage)	3 cycles: 4 hrs at -20 ... +60 °C, 4 hrs at +60 °C transition within 5 minutes (503.4, Procedure II)
Vibration:	General exposure: 1 hr per axis, 514.5-5 Procedure I, Annex C, Figure 6
Shocks	6 cycles per axis, 15 g, 11 ms, half-sine (516.5 Procedure I)
Loose cargo (in shipping containers)	514.5 Procedure II
Transit drop (packaged for shipment)	26 drops, 516.5 Procedure IV
Enclosure	IP67 according to IEC 529
Operating temperature range	0 ... 55 °C

---

Storage temperature range	-20 ... +60 °C, 24 hrs including battery
Compliance	EMC/EMI: EN 55011, EN 61000-6-2:2001 Ultrasound: EN 12668, ASTM E1324, E317, ANSI/NCSL Z 540-1-1994, MIL STD 45662A, MIL STD 2154

## Options

TopCOAT	TopCOAT technology for the simultaneous measurement of coating thickness and metal thickness
Auto-V	Auto-V function for the wall thickness measurement of components with unknown sound velocity, without calibration block during the measurement
DR	Extended Data Recorder

## 11.2 Specifications according to EN 12668

You will find the specifications according to EN 12668 for your instrument on the product CD included in the standard package.





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