



**Advanced Test Equipment Rentals**  
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**INSTRUCTION MANUAL**

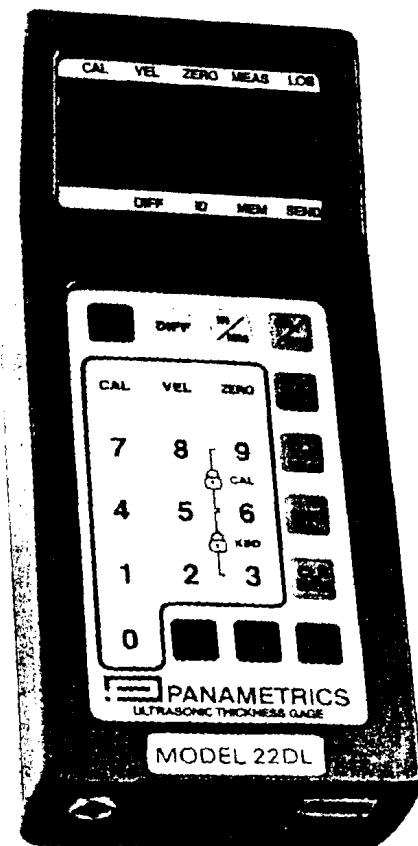
# **ULTRASONIC THICKNESS GAGES**

**MODELS 22DL, 22DLHR, & 22DLHP**

Software V1.06

Manual No. 910-020G

7/13/94



**PANAMETRICS**

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## 6 SPECIFICATIONS

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### THICKNESS MEASUREMENT RANGE:

Model 22DL	0.008-10" or 0.2-200mm
Model 22DLHR	0.005-10" or 0.1-200mm
Model 22DLHP	0.050-20" or 1.25-200mm.

NOTE: Above ranges are for 0.001" resolution. Thickness range also depends on material and transducer type. Refer to the APPLICATION SECTION of the operators manual for a more complete discussion and table of thickness range versus materials and transducer frequency and type.

### THICKNESS RESOLUTION:

The following resolutions are selectable from the keyboard:

0.01"	LOW	0.1mm
0.001"	STANDARD	0.01mm
0.0001"	HIGH	0.001mm

### THICKNESS ACCURACY, CALIBRATED:

± One count of least significant digit (LSD)

### THICKNESS TEMPERATURE AND STABILITY EFFECTS:

± 1/2 count of LSD maximum for STANDARD and LOW resolution and ± 1 count of LSD maximum for HIGH resolution from -10°C to 50°C exclusive of transducer and coupling effects. These figures are for all velocities and all thicknesses within the specified ranges.

### MEASUREMENT RATE:

2 per second

### ZERO CALIBRATION RANGE:

0-520 Zero Display Counts in low and standard resolution and 0-5200 in high resolution for 22DL and 22DLHR

0-999 Zero Display Counts in low and standard resolution and 0-9999 in high resolution for 22DLHP

VELOCITY CALIBRATION RANGE:	0.0300 - 0.5511 in./uS 0.762 - 13.999 mm/uS
VELOCITY RESOLUTION:	0.0001 in./uS or 0.001mm/uS displayable and settable.
VELOCITY ACCURACY, CALIBRATED:	± One count of LSD.
DIFFERENTIAL MODE:	Permits measurements relative to a preset nominal value.
DIFFERENTIAL MODE RESOLUTION:	0.01", 0.001", 0.0001" or 0.1mm, 0.01mm, 0.001mm selectable from keyboard (same as thickness resolution).
DIFFERENTIAL MODE SETPOINT RANGE	0 - 20" or 0-200mm
DIFFERENTIAL SETPOINT ACCURACY:	Absolute
MEASUREMENT RANGE (DIFFERENTIAL MODE):	Model 22DL: 0.008 - 10" or 0.2 - 200mm.  Model 22DLHR 0.005 - 10" or 0.13 - 200mm.  Model 22DLHP 0.050 - 20" or 1.25 - 200mm.
DIFFERENTIAL READING ACCURACY:	± 1/2 LSD
CALIBRATION MODE:	Permits calibration of gage by entering, via keyboard, or computer through the RS-232 interface, known thickness or sound velocity values of samples to be measured.
VEL MODE:	After entering the CAL mode the VELOCITY key permits the operator to measure the apparent thickness of a sample of known thickness and, after the apparent reading has been stored, enter the actual thickness of the sample using the keypad. This is equivalent to calibrating the span or velocity in the instrument.

ZERO MODE:	After entering the CAL mode the ZERO key permits the operator to make a measurement of the apparent thickness of a thin sample of known thickness and of the same material used to establish the velocity calibration and, after the measured thickness is stored, to enter the actual thickness of the thin sample using the keypad. This is equivalent to calibrating the zero offset of the instrument.
	NOTE: Upon returning to the measurement mode after a calibration sequence the micro-processor will automatically calibrate both the velocity and the zero offset in accordance with the stored information. Note that it is only necessary to conduct the calibration process one time for the automatic calibration of the gage. Please refer Section 4 for more complete discussion of calibration procedure.
CAL LOCK MODE:	Locks calibration settings to prevent accidental change to the calibration.
DISPLAY:	4 1/2 digit (19999 counts) Liquid Crystal Display (LCD). 0.5" (12.7mm) numerals. 4 decimal points. 12 Flags/Symbols. Direct non-multiplexed drive for maximum viewing angle and contrast.
DISPLAY UNITS, SYMBOLS, AND FLAGS:	in. or mm (Thickness) in./uS/ or mm/uS (Velocity) Low Battery Indicator Keyboard Lock LOS flag (Loss of Signal or Coupling) CAL flag (Calibration Mode) ZERO flag (Zero Calibration Mode) VEL flag (Velocity Calibration Mode) MEAS flag (Measure Mode) DIFF flag (Differential Mode) ID flag (Display a memory location) MEM flag (Display Stored Data) SEND flag (Sending Stored Data)
DISPLAY RESPONSE TIME:	0.1S maximum @25°C 0.25S maximum @-10°C
DISPLAY HOLD/BLANK MODE:	Display blanks after last reading or holds reading for 10 seconds and then blanks. This mode is selectable from the front panel.

RECEIVER BANDWIDTH: Model 22DL 2 to 20MHz (-3dB)  
 Model 22DLHR 4 to 30MHz (-3dB)  
 Model 22DLHP 0.5 to 5MHz (-3dB)

MEASUREMENT TEST MODE: Mode I (Excitation to First Echo)

TRANSDUCER CONNECTOR: Lemo S Series, Size 00 or equivalent.

INTERNAL DIAGNOSTIC TEST MODES: Permits diagnostic testing and setup mode to be selected from the keypad.

METRIC/ENGLISH MODES: Allows conversion between English and metric units via keypad.

DATA LOGGER FUNCTIONS: Unit will store, recall, clear and transmit via RS-232 up to 1000 thickness readings.

STANDARD DATA OUTPUT FORMAT

<u>I.D.</u>	<u>THICKNESS</u>	<u>UNITS</u>	<u>FLAGS</u>	<u>SU#</u>
00001	0.122	IN	M	01
00002	0.118	IN	M	01
00003	0.131	IN	M	01
00004	-----	---	M L	01
05001	11.19	MM	M	02
05002	10.81	MM	M	02
05003	00.04	MM	M D	03

<u>SU#</u>	<u>VELOCITY</u>	<u>ZERO</u>	<u>DIFF</u>
01	0.0912 IN/US	123	00.000IN
02	02.286 MM/US	123	000.00MM
03	02.286 MM/US	123	011.00MM

IDENTIFICATION (I.D.) NUMBER: A number between 1 and 19999 which identifies or locates every stored thickness reading. I.D. numbers increment automatically when thickness values are stored or may be entered from the keyboard.

MAXIMUM NUMBER OF STORED THICKNESS VALUES: 1000

STORED THICKNESS VALUE: Thickness values are saved exactly as displayed.

UNITS: Each saved value is accompanied by either "IN" for inches or "MM" for millimeters.

ZERO MODE:	After entering the CAL mode the ZERO key permits the operator to make a measurement of the apparent thickness of a thin sample of known thickness and of the same material used to establish the velocity calibration and, after the measured thickness is stored, to enter the actual thickness of the thin sample using the keypad. This is equivalent to calibrating the zero offset of the instrument.
	NOTE: Upon returning to the measurement mode after a calibration sequence the microprocessor will automatically calibrate both the velocity and the zero offset in accordance with the stored information. Note that it is only necessary to conduct the calibration process one time for the automatic calibration of the gage. Please refer Section 4 for more complete discussion of calibration procedure.
CAL LOCK MODE:	Locks calibration settings to prevent accidental change to the calibration.
DISPLAY:	4 1/2 digit (19999 counts) Liquid Crystal Display (LCD). 0.5" (12.7mm) numerals. 4 decimal points. 12 Flags/Symbols. Direct non-multiplexed drive for maximum viewing angle and contrast.
DISPLAY UNITS, SYMBOLS, AND FLAGS:	in. or mm (Thickness) in./uS/ or mm/uS (Velocity) Low Battery Indicator Keyboard Lock LOS flag (Loss of Signal or Coupling) CAL flag (Calibration Mode) ZERO flag (Zero Calibration Mode) VEL flag (Velocity Calibration Mode) MEAS flag (Measure Mode) DIFF flag (Differential Mode) ID flag (Display a memory location) MEM flag (Display Stored Data) SEND flag (Sending Stored Data)
DISPLAY RESPONSE TIME:	0.1S maximum @25°C 0.25S maximum @-10°C
DISPLAY HOLD/BLANK MODE:	Display blanks after last reading or holds reading for 10 seconds and then blanks. This mode is selectable from the front panel.

SETUP NUMBER:	Each saved value is accompanied by a number between 1 and 50 which identifies the "setup" consisting of velocity, zero, and differential reference at which that thickness measurement was taken. A table of all setup values is transmitted at the end of each data table.
FLAGS:	Each saved value is accompanied by one or more flag symbols to further describe the data. M = Thickness Measurement D = Differential Thickness L = Loss of Signal (the transducer was not making good contact when the reading was saved).
OUTPUT FORMAT:	Data is transmitted in a serial ASCII string as shown above. See also Appendix IV.
BAUD RATE:	Selectable: 150, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, or 9600. See Appendix VII.
WORD LENGTH:	Selectable: 7 or 8, See Appendix VII.
STOP BITS:	Selectable: 1 or 2, See Appendix VII.
PARITY:	Selectable: even, odd, or none. See Appendix VII.
OUTPUT CONNECTOR:	Ruggedized 6 pin modular telephone type.
OUTPUT CABLE:	6 or 12 feet long, with 25 male pin "D," 25 female pin "D," or 9 female pin "D" connector.
SIGNALS AVAILABLE:	Data out of gage. Data into gage. Busy from gage.  <div style="margin-left: 40px;"> <p>&lt;3V = gage cannot receive data. &gt;3V = gage can receive data.</p> <p>Ready to send from gage.</p> <p>&gt;3V = gage has data to be transmitted. &lt;3V = gage has no data to be transmitted.</p> <p>Data Set Ready into gage.</p> <p>&gt;3V = enables gage to send data. &lt;3V = prevents gage from sending.</p> </div> <p>Ground</p>

POWER REQUIREMENTS:	6VDC (supplied from internal batteries) or 85-110VAC, 100-130VAC, or 200-260VAC 50-60Hz supplied to external charger provides unit operating power for all conditions of battery charge state including recharging.
BATTERY:	6V Rechargeable NiCad battery pack.
BATTERY CHARGE LIFE:	Standard and low resolution .001" (.01mm) or .01" (.1mm) -  32 hours minimum (Unit on with continuous transducer contact)  50 hours typical (Unit on with typical transducer contact)  52 hours minimum (Unit on with no transducer contact)  High resolution .0001" (.001mm) -  4 hours minimum (Unit on with continuous transducer contact)  20 hours typical (Unit on with typical transducer contact)  52 hours minimum (Unit on with no transducer contact)
LOW BATTERY INDICATOR:	Battery Symbol on display blinks on and off when battery voltage first becomes low (approximately 4 hours remaining in the standard and low resolution mode), then lights steadily.
CHARGER:	External Charger/AC Adaptor connects to socket on bottom end of gage. 10 hour maximum charge period for fully discharged batteries.
CHARGER CONNECTOR:	Lemo S Series, Size 0, 4 pin
AUTO POWER OFF:	Unit power automatically shuts off approximately 6 minutes after the last measurement or keystroke. Also automatically shuts off when the battery voltage is too low for reliable operation.
KEYPAD:	Sealed color coded keyboard with tactile and audible feedback.



OPERATING TEMPERATURE  
RANGE:

-10°C to +50°C

SIZE

LENGTH x WIDTH x HEIGHT

7.6 x 3.3 x 1.5 inch  
193 x 84 x 38mm

WEIGHT:

17.9 oz. (0.51Kg)

ACCESSORIES:

Charger/AC Adapter  
Test Block  
Couplant  
Data Output Cable  
Manual  
Carrying Case

OPTIONAL ACCESSORIES:

Transducers  
Cables  
Protective carrying pouch  
Scope monitor including cables and special case  
Case with adjustment holes  
Extended warranty  
SQC software  
P.C. interference software  
Heavy duty carrying case  
Printers  
Remote SAVE or SEND foot switch  
Side SAVE or SEND button