



NDT Supply.com, Inc.
P.O. Box 7350
Shawnee Mission, KS 66207-0350 U.S.A.

913-685-0675, fax: 913-685-1125 www.ndtsupply.com e-mail: sales@ndtsupply.com

Guide to selecting a ultrasonic thickness gauge

If you trying to figure out which ultrasonic thickness gauge will best meet your needs, we would like to help you make an educated decision.

Please consider gauges by Dakota Ultrasonics. Dakota is a small California based company that is dedicated to making ultrasonic thickness gauges. We have found them to be very responsive to our customers' needs with prompt and reliable service. Their quality is better, with far less service and quality issues, than we have experienced from Krautkramer and StressTel.

Dakota Ultrasonics offers a number of models from the simple MX-1 to the full-featured MVX and PVX models, so there is a good chance they have the right one for your needs.

First, do you need a Precision or Corrosion Gauge?

Precision gauges use a single element delay line transducer, which gives them the ability to precisely measure smooth materials with parallel surfaces. Typical applications include: plastic and glass containers, metal and plastic sheets, aircraft parts, etc. Accuracy and resolution in the order of +/- 0.0001" are possible with a minimum thickness of 0.010" or better.

Corrosion gauges use a dual element transducer, which allows measurements to be made on rougher surfaces and/or when the back wall is not a perfect reflector. These gauges are used to detect internal corrosion, erosion and pitting in pipes, tanks, etc. Corrosion gauges are also used as general-purpose gauges. Typical accuracy is in the order of +/- 0.002". Applications include measuring castings, pipe and tanks, ship hulls, cell towers, cement trucks etc.

We believe that most customers are happier with the simplest and least expensive gauge that will handle their range of testing applications. Some people think that they need to spend more money to get a quality product. In the case of Dakota gauges, this is simply not the case. The same high quality components and workmanship goes into every gauge offered. Spending more money on features unneeded features only adds cost and complexity and does not add to the quality or reliability of an instrument.

Dakota gauges are "World Class" Instruments with a "World Class" Warranty of 5-YEARS on basic gauges and 2 years on the large display gauges.

If from the above you determined that a Corrosion Gauge should meet your needs, now let's figure out which set of features you require.



NDT Supply.com, Inc.

P.O. Box 7350

Shawnee Mission, KS 66207-0350 U.S.A.

913-685-0675, fax: 913-685-1125 www.ndtsupply.com e-mail: sales@ndtsupply.com

Guide to selecting a ultrasonic thickness gauge

The simplest and least expensive gauge is the [MX-1](#). The MX-1 is pre-calibrated for one material (typically steel). All you need to do is "Probe Zero" by coupling the probe to the built-in Zero Block, and you are ready to measure bare (uncoated) materials. Typical accuracy is in the order of +/- 0.002". The MX-1 keeps it simple, inexpensive and even avoids the need for a calibration block.

The [MX-2](#) is similar to the MX-1 but with 5 preset material velocities.

The [MX-3](#) has two features to be considered.

- Adjustable velocity. This allows precise calibration to the velocity of the material you will be measuring.
- Scan Mode. This feature increases the number of tests per second. This improves the ability to detect small internal pits. The instrument "remembers" the thinnest measurement encountered when scanning the area of interest. This is an important feature to consider if you will be inspecting pipeline before doing a "hot-tap" or measuring the bottom of a tank trailer, as well as other corrosion detection applications.

The [MX-5](#) adds high/low alarms and a differential mode to the MX-3.

The [MMX-6](#) offers everything on the MX-5 plus "Thru-Coating" measurement using an Echo-Echo measuring technique. The Echo-Echo technique allows you to measure painted and coated pipe and tanks without the need to remove the coating.

Please note that it is important to have both the Zero-to-First Echo (the standard measurement mode) and Echo-Echo capabilities on a Thru-Coating thickness gauge, as the Echo-Echo mode does not work well on heavily corroded material. If you encounter a measurement point where the measurement is "jumpy", you need to remove the coating and retest in the standard mode. This is the main fault of Cygnus and other gauges with "Multiple-Echo" mode.

If you also need data recording, the [MX-5](#) and [MMX-6](#) can be ordered as a "DL" version with on-board data recording capabilities. Data Logging is also standard on the MVX and PVX instruments. Unlike some other brands, Dakota includes the interface cable and software at no extra cost when you buy any of their "DL" models. This is about a \$300 savings.

The [MVX](#) is the top of the Dakota Corrosion product line. Features include: B-Scan display, which is a graphical presentation of the materials cross-section. It is very helpful to quickly understand the cause of the thin measurement. You



NDT Supply.com, Inc.

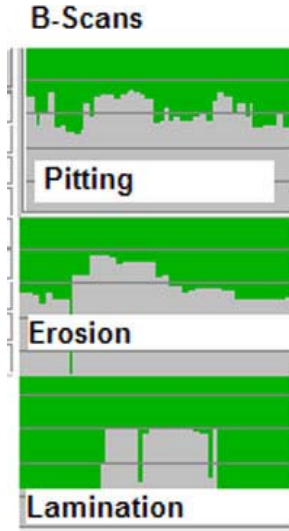
P.O. Box 7350

Shawnee Mission, KS 66207-0350 U.S.A.

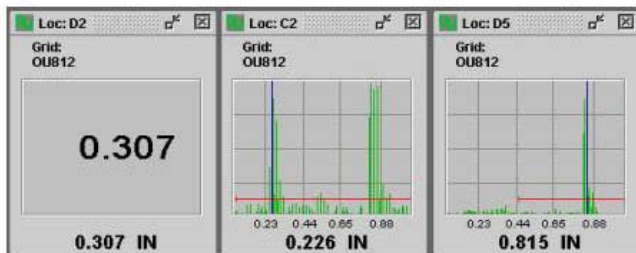
913-685-0675, fax: 913-685-1125 www.ndtsupply.com e-mail: sales@ndtsupply.com

Guide to selecting a ultrasonic thickness gauge

can easily identify laminations, pitting and general corrosion. This feature is easy to use and highly intuitive.



The “A” scan display shows the signal being measured. This is a helpful feature for testing noisy materials such as cast iron and “dirty” steels. Large grains and metallurgical inclusions such as stringers, which are not uncommon in pressure vessel steels, can give false thin measurements. With the MVX’s “A” scan display, the inspector can easily see that the instrument is detecting an inclusion while the “back-echo” remains undisturbed, and he can ignore the false thin reading. Digital Thickness Gauges would show this material to be thin. We have seen a number of instances where good material was erroneously rejected. This could have been avoided by a trained inspector with a “A” scan thickness gauge.



Digital
Readout

A-Scan
Signals from
Inclusion
and
Back Wall

A-Scan
Signals from
Back Wall



NDT Supply.com, Inc.

P.O. Box 7350
Shawnee Mission, KS 66207-0350 U.S.A.

913-685-0675, fax: 913-685-1125 www.ndtsupply.com e-mail: sales@ndtsupply.com

Guide to selecting a ultrasonic thickness gauge

In addition to the above, all the features of the MMX-6 are offered an enhanced data logger.

A	B	C	D
0.079	0.110	0.231	
0.177	0.049	0.225	
0.501	0.185	0.802	
0.499	0.217	0.851	
0.970			
0.970			
0.970			
0.116			
0.113			

Grid File with Beak Points

Precision Gauges:

The [PX-7](#) is a digital precision thickness gauge used in manufacturing to make sure that the product is within tolerance. It can measure most metals, plastics, glass, etc. to +/- 0.0001", measure down to 0.006" in steel or aluminum and 0.003" in plastics. Remember that a smooth test surface is required as well as parallel walls for a Precision Gauge to work properly.

The [PVX](#) adds the ability to use "Pencil" probes for measuring in tight radii, very thin walls or for other reasons that may make a part difficult to measure. The PVX Universal Precision Thickness Gauge allows fine-tuning of all test parameters as well as a greater selection of transducer designs. A-Scan, B-Scan and Data Logging are standard with the PVX.

Guidelines for choosing a probe for a Corrosion Gauge:

We have found that a [1/4" 5 MHz](#) probe will meet that needs of the majority of testing requirements and is included with the standard instrument package. BUT IT WILL NOT DO EVERYTHING!

If you need more power to penetrate a thick or coarse-grained material,

- a- Increasing the probe diameter from 1/4" to 1/2" increases the active area of the probe by a factor of 4. This will solve most "penetration" problems.
- b- Still need more power? By lowering the probes frequency from 5 MHz to 2.25 or even 1 MHz, you will also increase the penetrating power. The combination of the lower frequency and larger diameter is what is often required to measure coarse-grained, highly attenuative castings and forgings.



NDT Supply.com, Inc.
P.O. Box 7350
Shawnee Mission, KS 66207-0350 U.S.A.

913-685-0675, fax: 913-685-1125 www.ndtsupply.com e-mail: sales@ndtsupply.com

Guide to selecting a ultrasonic thickness gauge

- c- Please note that using a lower probe frequency results in an increase in minimum measurable thickness and lower sensitivity to small pits.

Need to get more repeatable measurements on small diameter and thin walled materials?

- a- Consider using a [3/16" diameter probe](#). The smaller diameter will better match your materials surface and have less "wing space". Wing space is where a thick bead of couplant forms between the probe surface and the pipe surface. This creates jumpiness to the reading. A thinner layer of couplant will result in an increase accuracy and reading stability, and you will also have a much lower chance of your reading being doubled*.
- b- Consider using a higher probe frequency. Increasing the frequency reduces wave length, which has the following effects:
- Increases accuracy
 - Increases pitting detectability
 - Permits measuring thinner materials
 - Increases repeatability
 - Decreases the chance of doubling.

Thru-Coating measurements with the MMX-6 and MVX requires using a "highly-damped" transducer. These are provided as standard when these gauges are ordered. The MMX-6 is also offered in an extended-range version which includes a 3.5 MHz x 1/2" diameter highly-damped transducer and is tuned to measure 1/8" to 4" of steel in a Echo-Echo mode through coatings as thick as 0.060". If your application is similar to this, specify that you want the extended-range MMX-6 – no extra charge! The MMX-6 beat out all the competitors (including Krautkramer's extended range DM4EDM) in U.S. Navy competition for a gauge to measure submarine hulls (and it cost \$315 less).

* Doubling is when the gauge cannot resolve the first returned echo and reads a subsequent echo from a multiple of the material's thickness. All dual probes and all gauges will double at some point. You can minimize the chance of doubling by the use of a smaller diameter/higher frequency transducer. You should also periodically test your probe(s) to determine at what thickness doubling occurs. This can be done with a set of heavy feeler gauges. Once you determine the doubling point for a probe, consider all readings that are 2x and less than the doubling point to be a potentially doubled reading.



NDT Supply.com, Inc.
P.O. Box 7350
Shawnee Mission, KS 66207-0350 U.S.A.

913-685-0675, fax: 913-685-1125 www.ndtsupply.com e-mail: sales@ndtsupply.com

Guide to selecting a ultrasonic thickness gauge

A good transducer kit for to cover a broad range of applications would include a:

[1/4" 5 MHz](#) fingertip probe

[3/16" 10 MHz](#) findertip probe

1/2" 2.25 MHz as a [fingertip](#) or [High temperature](#) probe design*

The HT design uses a top-mounted probe cable in a 5" long cylindrical housing that is easy to hold (even with gloves) and allows you to reach through thick insulation.

Notes on Thru-Coating measurements:

A measurement made on a coated material will equal the material thickness plus 2-3 times the coating thickness.

Example: a 1/2" thick steel plate with 0.010" of epoxy paint will measure .520 - .530".

If this error is known (or within your accuracy requirements), simply deduct the known error from the measurement.

The 0-1st Echo mode is more sensitive to back-wall pitting (even through coatings) than the Echo-Echo mode.

Also note that if the paint is too thick, the instrument will detect the paint/steel interface and present an erroneous thin measurement. Also, the coating must be well bonded to the material or an erroneous measurement will result.

Note that we are discussing coatings on the test surface. Coatings on the opposite surface and the contents of a pipe or vessel will only in rare circumstances effect the measurement.

I hope you found the above guide helpful. If you have any questions, or would like to place an order please call me.

Neil Breslow
NDT Supply.com, Inc.
Phone: 913-685-0675
Cell: 913-226-3404
e-mail: neil@ndtsupply.com