![METRIX]

MX2040, DYNAMIC SIGNAL CHECKER
Instruction Manual

CONTENTS

1. Warnings

The instruction manual is an integral part of the product. Please read the instruction manual carefully before using the product, and keep it available for future reference. The measuring system should only be operated by qualified personnel who have read this instruction manual. In case of doubt, the prevailing conditions of the area of application and the resulting requirements have to be examined by an expert before operation can be commenced.

Correct transportation, appropriate storage and professional assembly, operation and maintenance must be provided in order to ensure proper functioning. Safety instructions concerning the battery can be found under section 5 on page 5 of this manual.

2. Scope of Delivery (ordering code MX2040-001)

•   Handheld control unit with battery
•   Vibration simulator
•   Battery charger with charging cable
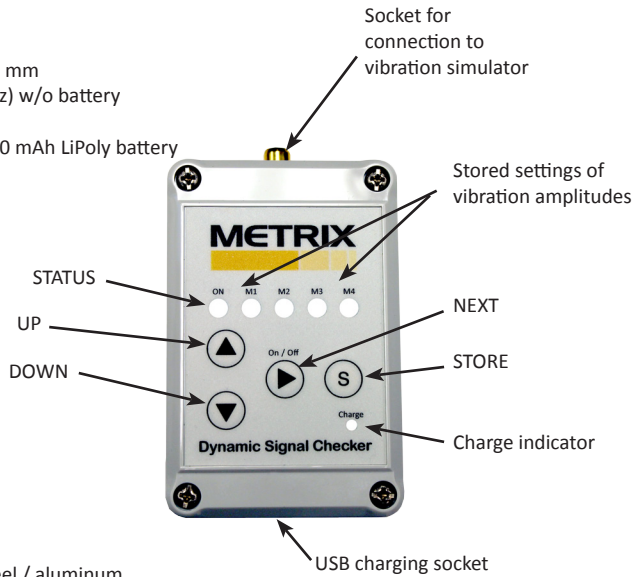•   Instruction manual

3. Technical Data

3.1 Handheld Control Unit
The device has to be fully charged before the first operation. In order to do this, connect the power adapter to the control unit with the aid of the charging cable. When the device is fully charged, the charge indicator lamp goes off.

The battery should always be charged when storing the device over longer periods of time. When the battery is discharged, the simulation unit can be operated via the provided USB power adapter.
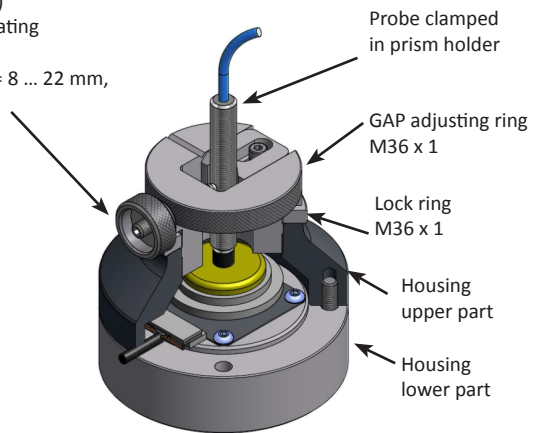
3. <u>Technical Data (cont.)</u>

Dimensions: 98 x 64 x 40 mm
Weight: 150 g (5.2 oz) w/o battery
Protective class: IP 54
Battery: 3.7 volt 1000 mAh LiPoly battery
Charging socket: USB Mini-B

Socket for connection to vibration simulator

Stored settings of vibration amplitudes

STATUS
UP
DOWN

NEXT
STORE
Charge indicator

USB charging socket

3.2 Vibration Simulation

Material: stainless steel / aluminum
Weight: approx 2 kg (4.4 lbs)
Cable: Coaxial cab, PVC coating
Dimensions: 94 mm x Ø 90 mm
Probe mounting: Prism holder for D = 8 … 22 mm,
                      M6 locating screw

Probe clamped in prism holder

GAP adjusting ring M36 x 1

Lock ring M36 x 1

Housing upper part

Housing lower part

4. <u>DESCRIPTION OF TEST PROCEDURE</u>

4.1 General

Rotor or shaft vibrations are usually measured by means of non-contact eddy-current displacement probes. You measure the relative motion between rotor and the installed probe. With the **Dynamic Signal Checker** the functionality of such systems can be tested on the basis of realistic simulations of vibrations.

The **Dynamic Signal Checker** consists of a compact housing which contains an electrically driven vibrator. After the probe to be tested is clamped in the prism holder, use the GAP adjustment ring to obtain the necessary voltage (typically 8 to 10 VDC). In combination with the compact, battery driven, handheld control unit the checker can be set into defined oscillations with 112 Hz and different amplitudes.

With this, the **Dynamic Signal Checker** enables a function test of the entire loop (that is the probe, driver/transmitter function, wiring, indications and alarms) in one step.

The battery-powered handheld control unit can be attached comfortably by means of the magnet on the back of the device. The rechargeable batteries enable operation up to several hours.

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4.2 Vibration Amplitudes

After having determined the loop sensitivity (probe, cable, driver/transmitter) by means of a suitable static calibration unit (e.g. the 9060-001) and a calibrated voltmeter, the Dynamic Signal Checker vibration amplitudes can be simulated precisely. The accuracy of the simulation goes hand-in-hand with the accuracy of the used voltmeter. With this, the complete system (probe, driver/transmitter function, wiring, indications, alarms) gets tested.

Basic description of the measuring principle:

The Dynamic Signal Checker creates a clean sinusoidal signal with constant frequency (112 Hz) and variable amplitude, which is picked up by the proximity probe. At the buffered-out of the driver/transmitter or monitor this vibration can be measured as RMS value by means of a common voltmeter set to "AC".

This RMS value can be converted accurately into a peak to peak value, using following formula:

$$S\,[\mu m\,pp] = \frac{RMS\,[mV] * 2 * \sqrt{2}}{sensitivity\,\left[\frac{mV}{\mu m}\right]} \qquad S\,[mils\,pp] = \frac{RMS\,[mV] * 2 * \sqrt{2}}{sensitivity\,\left[\frac{mV}{mil}\right]}$$

Example:

Reading buffered-out: 0.2263 VAC = 226.3 mV AC
Typical sensitivity: 7.87 mV/µm (200mV/mil)
Vibration amplitude [µpp]:   226.3 * 2 * 1.414 / 7.87 = 81.3µm pp,
                             226.3 * 2 * 1.454/200 = 3.2 mils pp

Simplified formula for the typical measuring loop sensitivity of 7.87 mV/µm (200mV/mil):
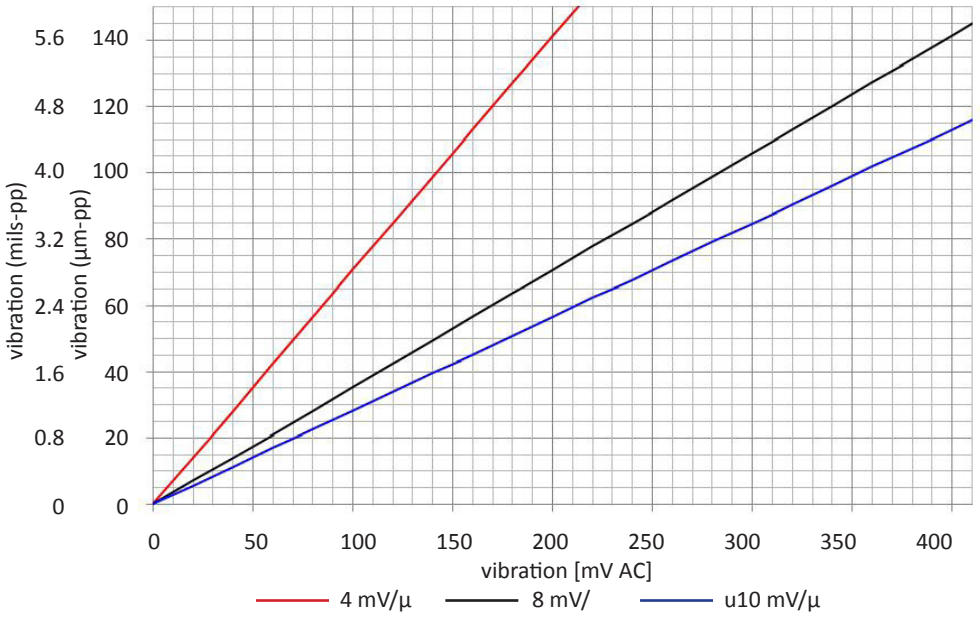Spp [µm] = 0.359 * RMS [mV]
Spp [mils] = 0.0141 * RMS [mV]

As alternative to this calculating procedure, correspondingly calculated values can be taken from the following table or diagram
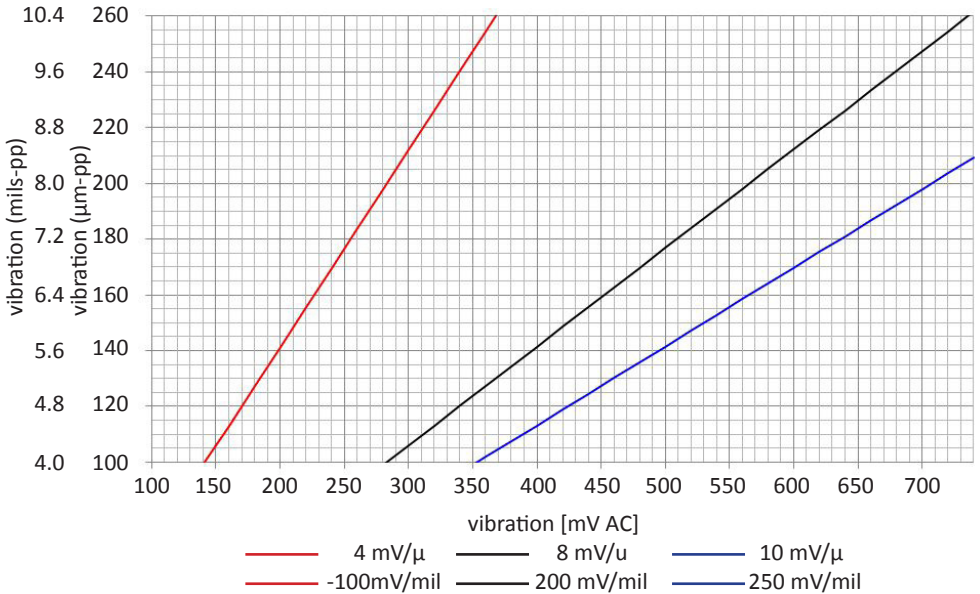
Conversion Table
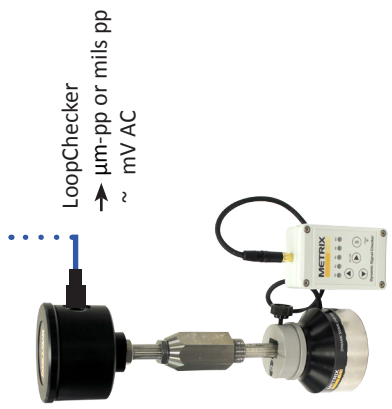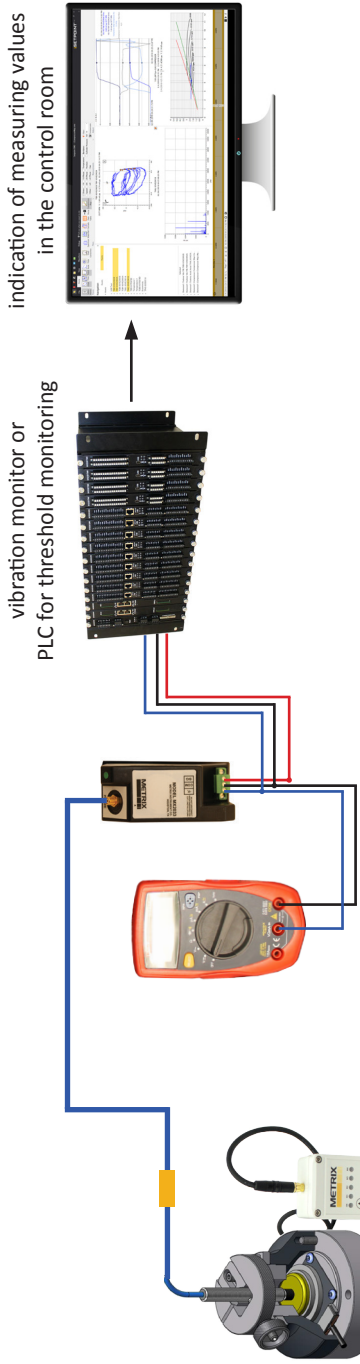Valid for 7.87 mV/µm (200 mV/mil)

Vibration mV RMS	Vibration µ - pp	Vibration mils -pp	Vibration mV RMS	Vibration µ - pp	Vibration mils -pp
0	0	0.0	400	144	5.6
20	7	0.3	420	151	5.9
40	14	0.6	440	158	6.2
60	22	0.8	460	165	6.5
80	29	1.1	480	172	6.8
100	36	1.4	500	180	7.1
120	43	1.7	520	187	7.3
140	50	2.0	540	194	7.6
160	57	2.3	560	201	7.9
180	65	2.5	580	208	8.2
200	72	2.8	600	216	8.5
220	79	3.1	620	223	8.7
240	86	3.4	640	230	9.0
260	93	3.7	660	237	9.3
280	101	3.9	680	244	9.6
300	108	4.2	700	252	9.9
320	115	4.5	720	259	10.2
340	122	4.8			
360	129	5.1			
380	137	5.4			

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Conversion "mV AC" ⟷ "peak to peak [μm or mils]

Legend: 4 mV/μ · 8 mV/ · u10 mV/μ

Conversion "mV AC" ⟷ "peak to peak [μm or mils]

Legend: 4 mV/μ · 8 mV/u · 10 mV/μ · -100mV/mil · 200 mV/mil · 250 mV/mil

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indication of measuring values
in the control room

vibration monitor or
PLC for threshold monitoring

conversion table
mV → μm-pp or mils pp

mils, pp	μ-pp	mV AC
0.8	20	57
1.6	40	114
-	-	-
-	-	-
10.2	260	742

LoopChecker
↑ μm-pp or mils pp
~ mV AC

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4.4 Test Procedure

1. Before the dynamic test with the **Dynamic Signal Checker** the measuring loop sensitivity has to be determined, since deviations from the specified sensitivity influence the accuracy and indication. Using a static calibrating unit like the METRIX 9600-001 and a calibrated voltmeter you can verify that probe, cable and driver match the specification
(typically: 7.87 V/mm, 200mV/mil).

2. Place the Dynamic Signal Checker on a solid surface.

3. Screw the GAP adjusting ring + lock ring up to about 1 mm into the upper part of the housing.

4. Connect probe including extension cable with driver/transmitter.

5. Connect the voltmeter with the driver/transmitter. Set the voltmeter on "DC" in order to read out the GAP voltage.

6. Carefully insert the probe or the probe holder with reverse-mount probe, into the GAP adjustment ring and clamp it in the prism holder at a gap signal of about 10 VDC. **Avoid contact with the vibrator in order to not damage vibrator or probe tip.** Fine adjustment can be achieved by turning of the adjusting ring; then fix it with the lock ring.
The prism holder is suitable for probe diameters of 8 … 22 mm.

7. Connect the simulation unit to the handheld control unit.

8. After pressing the ON/OFF ("▶") button once, the device performs a self-test (flashing of all 5 LEDs). As soon as the "ON" status indicator lights up, the device is ready for operation.

9. By further pressing of the "▶" button one by one up to 4 stored default amplitude values (see 11. for adjustment) can be selected. The amplitude can be read from the voltmeter as RMS voltage signal [mV] and converted to [μm pp, mils pp] via calculation formula (p. 4), conversion table (p. 5) or diagram (p. 6).

10. If the vibration indicated in the control room doesn't correspond with the mV signal of the voltmeter, this may be due to one of the following causes:
- The wiring of the measuring loop is not correct or even broken.
- The vibration driver/transmitter is defective or calibrated with a wrong measuring range.
- The limit monitoring in the PLC downstream of the transmitter is calibrated with a wrong measuring range.
- The input card of the vibration monitor is defective or falsely adjusted, thus a wrong value is transferred to the monitor.
- The measuring range of the vibration indication is falsely adjusted.

11. In order to adjust individual default values (possible within the range of 0 … 250 μm, 0 to 10 mils) following steps are necessary:
- Connect a calibrated voltmeter to the buffered-out of the existing driver/transmitter or monitor and set it to "VAC".
- Read the corresponding mV value of the desired vibration amplitude from the table (p. 4) or diagram (p. 5).
- Adjust the vibration amplitude according to the mV value by means of pushing the buttons "▲" resp. "▼". You can choose between holding the buttons (fast change of values) or just tapping the buttons (slow change of values for rather sensitive adjustment).
- The adjusted value is to be compared with the operation indications.

4.4 Test Procedure

- In order to save the individually adjusted value, as shortcut level for future adjustments, select one of the 4 storage positions (green LEDs) with the button "▶". By pressing of the button "S" the stored value will be replaced by the new selected value. Note that, depending on the battery status (14.) and the position (2.) of the Dynamic Signal Checker the actual amplitude corresponding to the stored values may slightly differ over time. The correct setting can be updated anytime.

12. In order to switch the device off manually, the ON/OFF ("▶") button has to be pressed for > 2 seconds. If no operation is performed over a period > 30 minutes, the device switches off automatically.

13. If the "ON" indicator blinks, the device has to be charged. Before damaging exhaustive discharge starts, the device is automatically switched off; 5 seconds ahead all LEDs start blinking.

14. In case of low battery the device can be powered using the USB charging cable.

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5. RECHARGEABLE BATTERY

In order to charge the device, connect the charging socket with the provided USB power adapter. As soon as the battery has reached its full capacity, the charge indicator lamp goes off. The battery should always be charged when storing the device for longer periods of time.

SAFETY INSTRUCTIONS FOR LITHIUM ION POLYMER BATTERIES (LiPoly batteries)

LiPoly batteries are rechargeable accumulators that feature an extremely high level of energy density. This type of battery has to be handled with particular care when in use and when charging/discharging. Mishandling can lead to a premature wear out or defect, or permanent damage.

Self-Discharge:
LiPoly cells have an extremely low self-discharge rate (approx. 0.2% per day), which is why they can be stored over longer periods of time without any problems. If the voltage drops below 2.5 volt/cell, it is imperative that the cell is recharged.

An exhaustive discharge is to be avoided, otherwise the cell can suffer permanent damage in the form of capacity loss.

Durability:
The theoretical durability or lifespan of a cell with low levels of discharge currents lies at around approx. 500 charging/discharging cycles. A used battery has to be disposed of correctly!

Battery Disposal:
Never throw used batteries in the regular garbage. In order to help protect the environment, defective and used batteries have to be handed in at the appropriate collection points and in a discharged condition. Collection points can be found at the sales outlets for batteries or at municipal collection points for hazardous waste. Please mask the bare contacts with adhesive tape in order to avoid short circuiting.

SAFETY INSTRUCTIONS FOR LITHIUM ION POLYMER BATTERIES (LiPoly batteries) (cont.)

DISCLAIMER
Due to the fact that Metrix cannot monitor the handling of the batteries, any liability and warranty is expressly disclaimed with regard to incorrect charging / discharging or handling.

6. ENVIRONMENTAL INFORMATION

This electronic equipment was manufactured according to high quality standards to ensure safe and reliable operation when used as intended. Due to its nature, this equipment may contain small quantities of substances known to be hazardous to the environment or to human health if released into the environment. For this reason, Waste Electrical and Electronic Equipment (commonly known as WEEE) should never be disposed of in the public waste stream. The "Crossed-Out Waste Bin" label affixed to this product is a reminder to dispose of this product in accordance with local WEEE regulations. If you have questions about the disposal process, please contact Metrix Customer Services.

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