

COMPACTION METER CM-2.

TROUBLESHOOTING MANUAL.

Contents :	page
-----	-----
System configuration.....	2
Test equipment.....	3
Compaction meter processor self test.....	3
Checking the system :	
1. Power supply voltage to compaction meter system :.....	5
2. CMV-instrument, resistance.....	5
3. CMV-instrument, reading.....	5
4. Power to sensor.....	5
5. Power to recorder or computer CCS-RA.....	5
6. Power to sensor.....	5
7. Sensor output signal, Vdc.....	5
8. Sensor output signal, Vac.....	5
9. Vibration amplitude output from the processor.....	6
10. Vibration frequency output from the processor.....	6
11. Frequency pulse output from the processor.....	6
12. CMV-signal to the instrument.....	6
13. CMV-signal to the recorder / computer CCS-RA.....	6
14. Sensor with ULFIA FA-meter 24-0010.....	6
Connections to the processor.....	7
Figure 1,2,3.	

ATTENTION !!

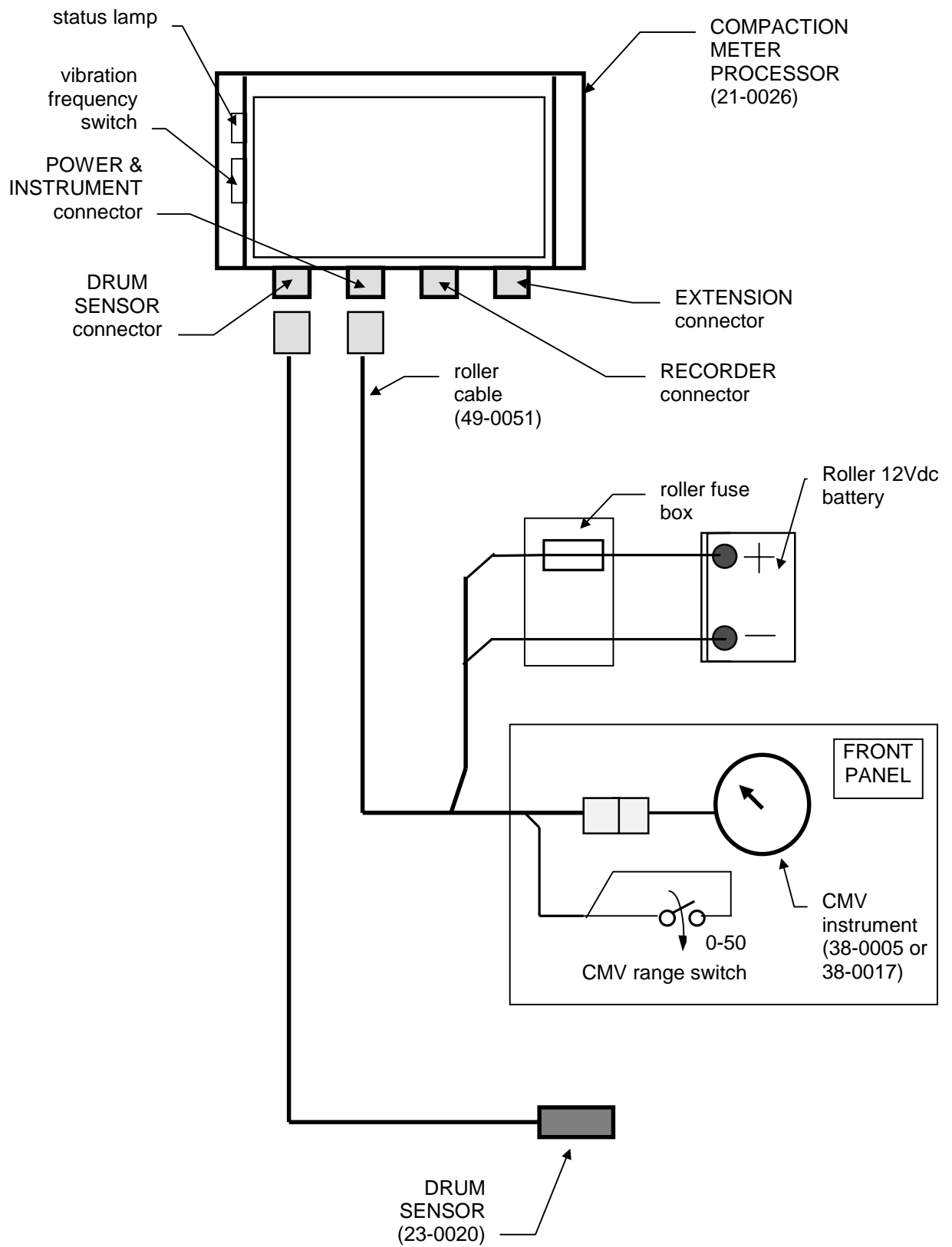
Please check that you have set the frequency switch to the correct position before you start to troubleshoot !!

Introduction

This manual describes how to troubleshoot the compaction meter system CM-2, used on vibratory rollers.

All the used units in the system could be checked, including

- drum acceleration sensor
- processor
- CMV instrument
- interconnection cables.
- amplitude and frequency of the vibrating drum



You will need the following test equipment:

DMM (Digital MultiMeter)

The DMM should be able to measure DC-voltage(Vdc), AC-voltage(Vac) and resistance(ohm).
The internal resistance of the multimeter should be $\geq 10\text{Mohms}$.

Battery 1.5V

This battery is used for checking the CMV-instrument.

For testing the system we recommend you to use the CMT-2 Compaction Meter Test box, ULFIA 24-0025.

This unit could also be used for simulating a sensor signal with different CMV- and bouncing-levels to test the processor.

For measuring the vibration amplitude and frequency of the drum and checking the sensor, we recommend you to use the FA-meter ULFIA 14-0006 or 14-0007.

Power on self test :

When the power is switched on, the CMV-instrument should indicate the following sequence of values if the processor and instrument works correctly.

1. The CMV-instrument needle is set to 150.
The BOUNCING- and CMV-range(0-50) lamp is switched on.
2. The CMV-instrument will be set to a value corresponding to 10x the position of the frequency selection rotary switch, e.g. position 4 will give $\text{CMV}=40$.
The STATUS lamp on the processor will flash,
one long flash and then a number of short flashes (1 to 12), that indicates the position of the frequency selection rotary switch.
3. The BOUNCING- and CMV-range lamp is switched off.
4. The STATUS-lamp on the processor will go ON to indicate that the CMP-2B unit is ready for operation.
5. The CMV-instrument goes to 0 (zero).

Vibration is switched on :

When vibration is switched on, the STATUS-lamp should start pulsing as long as the drum is vibrating.

When the drum is placed on soft ground material, the CMV-value should be about 0(zero).

If the drum is placed on a stiff material there should be a reading higher than 20.

The STATUS-lamp on the processor is also used to indicate error conditions for the CMP-2B unit. The meaning of the flashing codes are also explained on the front panel label.

The following errors are indicated :

flash sequence : **S**=short flash --- = pause ... = the flashing sequence is repeated

SS ---SS---... : code 2 : wrong DC-voltage-signal from the drum acceleration sensor
SSS---SSS---... : code 3,4 : internal hardware error (3 or 4 flashes)
SSSSS---SSSSS---... : code 5-9 : internal software error (5 to 9 flashes)

If the CMP-2B is indicating an error condition, try the following for the different errors:

STATUS-lamp is not pulsing when the drum is vibrating :

check that the : sensor is connected to the CMP-2B unit,
 sensor is correctly mounted on the roller,
 amplitude and frequency of the drum is correct
 (use the FA-meter (Frequency Amplitude) from ULFIA, part no. 14-0006 or
 14-0007)

Flash-code 2 :

check that the : sensor is connected to the CMP-2B unit,
 cable to the sensor is not damaged,
 the power supply voltage to the CMP-2B is correct.

Flash-code 3,4 :

Switch off the power and then on again several times. If the error message still exists, check that the power voltage to the CMP-2 is correct.

If the voltage is correct, the unit should be replaced, because there is something wrong with the electronics inside the unit.

Flash-code 5 to 9 :

Switch off the power and then on again several times. If the error message still exists, the unit should be replaced, because there is something wrong with the electronics inside the unit.

ATTENTION :

Please check that you have set the frequency switch to the correct position before you start to troubleshoot!

The following measurements (test no.) should be done,

See figure 1 : step (see drawing 11-0027-7301-63)

- 1 Power supply voltage to compaction meter system.**
 To check the battery voltage, fuses and interconnections to the roller's electrical system.
 Voltage with roller engine shut off (no charging of battery): 11.5 - 12.5 Vdc.

- 2 CMV-instrument on the front panel.**
 To check the instrument and interconnections to the instrument.
 Measure the resistance for the CMV signal input:
 for instrument 38-0005 = 490 - 510ohms.
 for instrument 38-0017 = 950 -1050ohms.

- 3 CMV-instrument on the front panel.**
For instrument 38-0005:
 Connect the 1.5V battery to the roller cable connector POWER&INTRUMENT,
 + to pin 4 and – to pin 5.
 The instrument should indicate 45 – 50 on the 0 – 150 CMV-scale.

For instrument 38-0017:
 This instrument must also be powered with 12Vdc.
 Connect **pin 2 to pin 1** and **pin 5 to pin GND**(in center) on roller cable connector
 POWER&INTRUMENT to get power to the instrument.
 Connect the 1.5V battery to the roller cable connector POWER&INTRUMENT,
 + to pin 4 and – to pin 5.
 The instrument should indicate 45 – 50 on the 0 – 150 CMV-scale.

- 4 Power supply voltage from the processor to the sensor.**
*The sensor is **not** connected.*
 To check the internal power circuitry of the processor.
 Voltage with roller engine shut off (no charging of battery) : 10.8 – 11.2 Vdc.

- 5 Power supply voltage from the processor to recorder or onboard computer.**
 To check the internal power circuitry of the processor.
 Voltage with roller engine shut off (no charging of battery) : 11 – 11.5 Vdc.

See figure 2 : step (see drawing 11-0027-7302-63)

- 6** **Power supply voltage from the processor to the sensor.**
The sensor is connected to the processor and the roller engine is shut off.
For checking the internal power circuitry of the processor.
To measure with the sensor connected, please unscrew (counter clockwise) the hood of the cable connector.
Voltage : 10.3 – 10.7 Vdc.
- 7** **Sensor output signal, DC- voltage.**
The sensor is connected to the processor and the roller engine is shut off.
For checking the internal circuitry of the sensor.
To measure with the sensor connected, please unscrew (counter clockwise) the hood of the cable connector.
Voltage : 2.9 – 4.0 Vdc.
- 8** **Sensor output signal, AC- voltage.**
The sensor is connected to the processor, the drum is placed on a soft material, e.g. a tire and the vibration is switched on.
For checking the internal circuitry of the sensor.
To measure with the sensor connected, please unscrew (counter clockwise) the hood of the cable connector.
Voltage : 0,4 – 1,2Vac.
- 9** **Vibration amplitude DC-voltage output from the processor.**
The sensor is connected to the processor, the drum is placed on a soft material, e.g. a tire and the vibration is switched on.
For checking the internal circuitry of the processor and sensor.
Please use a cable so that you could do this measurement some distance away from the roller.
The DC-voltage is scaled to 0.5mm/Vdc.
0.6Vdc = 0.3mm 1Vdc = 0.5mm 1.5Vdc = 0.75mm
2Vdc = 1.0mm 3Vdc = 1.5mm 4Vdc = 2.0mm
Please see the specification on the roller for the correct amplitude.
- 10** **Vibration frequency DC- voltage output from the processor.**
The sensor is connected to the processor, the vibration is switched on.
For checking the internal circuitry of the processor and sensor.
Please use a cable so that you could do this measurement some distance away from the roller.
The DC-voltage is scaled to 20Hz/Vdc.
1Vdc = 20Hz 1.5Vdc = 30Hz 2Vdc = 40Hz 2.5Vdc = 50Hz 3Vdc = 60Hz
Please see the specification on the roller for the correct frequency.

- 11** **Vibration frequency pulse output from the processor to the recorder/computer.**
The sensor is connected to the processor and the vibration is switched on.
For checking the internal circuitry of the processor.
Voltage : approx. 8.7Vac.
- 12** **CMV-output from the processor to the CMV-instrument.**
The sensor is connected to the processor, the drum is placed on different material and the vibration is switched on.
For checking the internal circuitry of the processor and sensor.
The CMV-instrument should indicate a CMV-value depending on how stiff the material is.
On soft material, e.g. a tire, the CMV-reading should be about 0.
On stiff soil the reading should be > 20.
- 13** **CMV-output from the processor to the recorder/computer.**
The sensor is connected to the processor, the drum is placed on different material and the vibration is switched on.
For checking the internal circuitry of the processor.
Output voltage : CMV=0 Vdc=0, CMV=45 Vdc=1.5, CMV=75 Vdc=2.5,
CMV=150 Vdc=5.
When bouncing (bouncing lamp is on): >6.5V

See figure 3 : step (see drawing 11-0027-7303-63)

- 14** **Testing the sensor with FA-meter ULFIA FAM-1(14-0006) or FAM-2(14-0007).**
For this test you will need a special adapter cable ULFIA 79-0170.
With the FA-meter you read the correct vibrating frequency and amplitude, if the sensor is working properly.

POWER & INSTRUMENT :

=====
 Cable connector : female 7 pins, Amphenol C16-1 part no. T3105-001

PIN		SIGNAL NAME
-----	-----	-----
pin GND :	power supply voltage input, (-)	POW:GND
pin 1 :	power supply voltage input, (+)	POW+
pin 2 :	output voltage supply to indicators	IND+
pin 3 :	output to CMV range indicator	RANGE:IND
pin 4 :	output to analog CMV instrument,(+)	CMV:INSTR+
pin 5 :	ground terminal to instruments	GND:INSTR
pin 6 :	output to bouncing indicator	BOUNC:IND

DRUM SENSOR :

=====
 Cable connector : male 4 pins, Amphenol C16-1 part no. T3108-001

pin GND :	power- and signal ground output (-)	SENS:GND
pin 1 :	sensor supply voltage output, (+)	SENS:POW
pin 2 :	sensor cable shield	SHIELD
pin 3 :	sensor signal input	SENS:SIG

RECORDER :

=====
 Cable connector : female 4 pins, Amphenol C16-1 part no. T3109-001

pin GND :	supply- and signal ground output (-)	GND:REC
pin 1 :	CMV analog output	CMV:REC
pin 2 :	frequency pulse output	FREQ:REC
pin 3 :	recorder supply voltage output, (+)	POW:REC

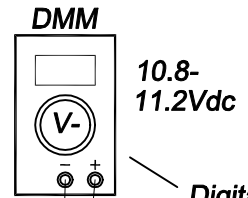
EXTENSION :

=====
 Cable connector : male 7 pins, Amphenol C16-1 part no. T3104-001

pin GND :	signal ground output (-)	GND:EXTEN
pin 1 :	vibration amplitude switch input	AMPL:SWITCH
pin 2 :	CMV range switch input	RANGE:SWITCH
pin 3 :	output to analog amplitude instrument,(+)	AMPL:INSTR+
pin 4 :	output to analog frequency instrument,(+)	FREQ:INSTR+
pin 5 :	output to bouncing indicator	BOUNC:IND
pin 6 :	output to CMV range indicator	RANGE:IND

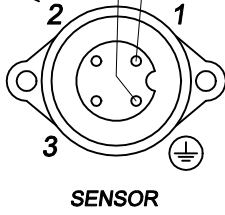
Test sequence number **4**

Power to sensor



Digital Multimeter Instrument (DMM)

pin identification

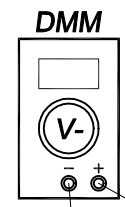


SENSOR

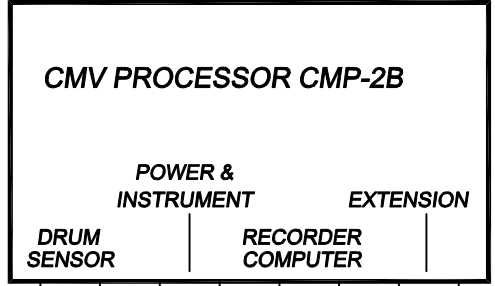
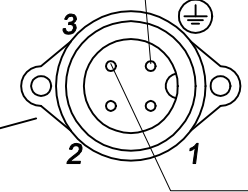
Power to recorder or CCS-RA

5

11-11.5Vdc

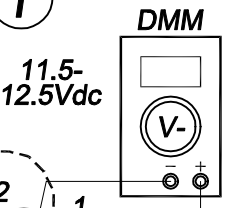


RECORDER

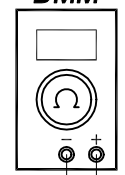


Roller battery voltage (no charging)

1

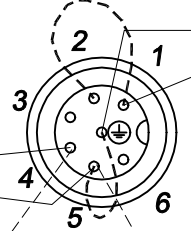


Resistance of CMV-instrument DMM



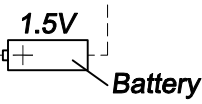
38-0017
950-1050ohm

38-0005
490-510ohm

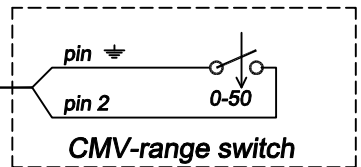


Roller cable connector supply & instrument

3

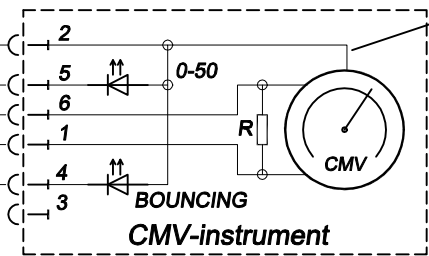


CMV-reading 40-50 on 0-150 scale



CMV-range switch

- pin 2: IND+
- pin 3: RANGE:IND
- pin 4: CMV:INSTR+
- pin 5: GND:INSTR
- pin 6: BOUNC:IND
- pin 1: POW+
- pin ⏏ : POW:GND



Power +12Vdc only for 38-0017

Resistor R:	
38-0005	38-0017
500 ohm	1000 ohm

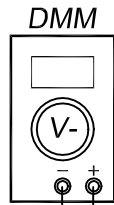
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COMPACTION METER CM-2.		
System troubleshooting instruction		
Figure 1(3)		
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File: 110027731R10.DWG	Date: 2003-01-22	
Doc.no: 11-0027-7301-63	Rev: 10	

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DC voltage from sensor
(no vibrations)

7

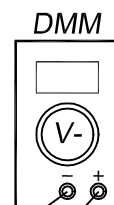
+2.9 -
+4.0Vdc



Power to sensor
(battery voltage=12Vdc)

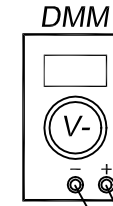
6

10.3-
10.7Vdc

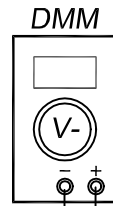


Vibration amplitude
0.5mm/Vdc

9

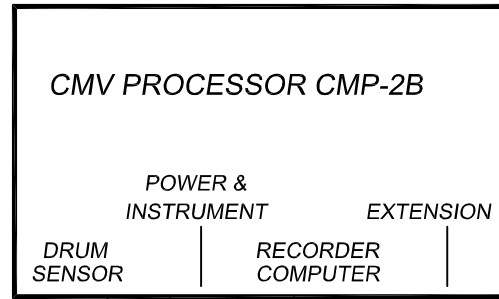
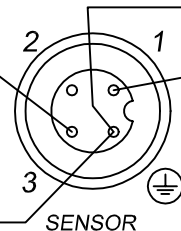


10 Vibration
frequency
20Hz/Vdc

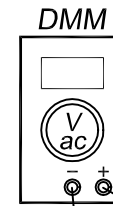


AC voltage
from sensor
(with vibrations)
0.4-1.2Vac

8

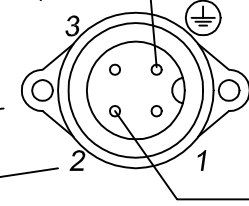


approx. 8.7Vac



11

Frequency pulse output
(with vibrations)



pin identification



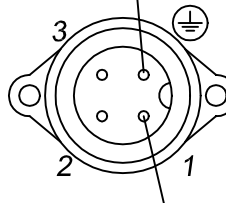
Turn to loosen
(counter clockwise)

CMV-output
(with vibrations)

13

0 CMV = 0Vdc
75 CMV = 2.5Vdc
150 CMV = 5Vdc

bouncing >6.5Vdc



RECORDER



CMV-instrument

pin 4
pin 5

pin 1 : supply +

pin ⏏ : supply -

+12V / 0V from roller battery

Doc.name:

COMPACTION METER CM-2.
System troubleshooting instruction.

Figure 2(3)

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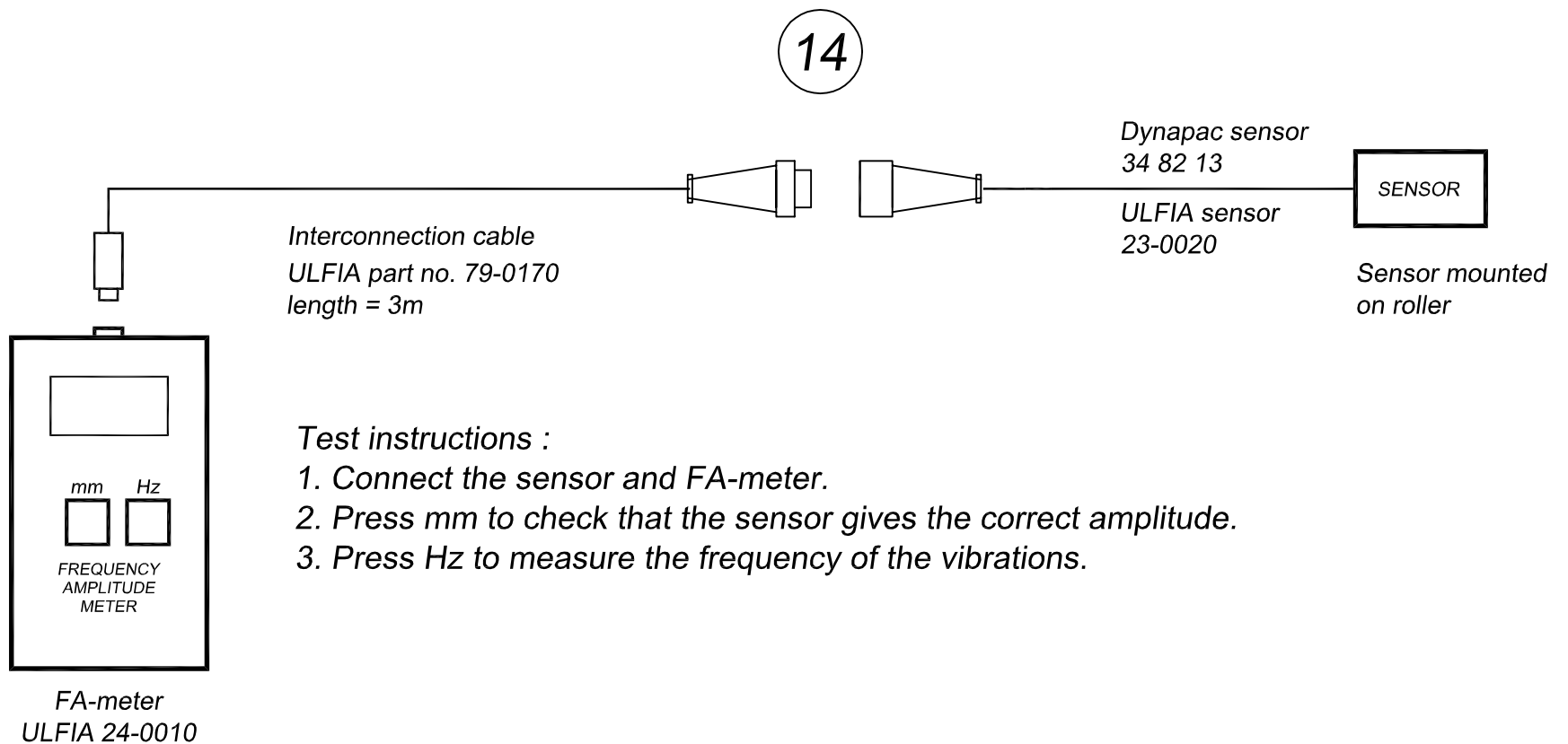
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Doc.no: 11-0027-7302-63 | Rev: 9

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Test setup for checking sensor with FA-meter.

14



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COMPACTION METER CM-2. System troubleshooting instruction. <i>Figure 3(3)</i>		
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Doc.no: 11-0027-7303-63	Rev: 9	

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