

# DX.230-305 FIELD SERVICE TEST SET

## FOR DX230 AND DX240 SMOKEMETERS

### OPERATING INSTRUCTIONS

The DX.230-305 Test Set allows some simple diagnosis of Sampling Head faults and permits the resetting of calibration potentiometer VR1 (gas temperature). It is powered from the RPM socket of the Interface Unit. Note that the Test Set will not assist with diagnosing Interface Unit faults and it is essential that any such faults are corrected first.

#### PROCEDURE

##### **A Preliminary Tests**

- 1 Warm up the DX.230/DX.240 system and observe reported fault.
2. Substitute 'Test' Sampling Head. If fault is still apparent then the Interface Unit is faulty, otherwise the Customer's Sampling Head is faulty.
3. Repair Interface Unit if necessary and recheck.

Note : The Interface Unit has no internal adjustments and failures are rare. Fault finding is generally confined to checking the fuses. There is a mains fuse in the rear panel and 3 others on the PCB (F1 and F3 protect the PCB electronics/RPM 24V supply, F4 protects the Sampling Head 30V AC supply) If there are no other obvious faults (loose connectors etc) then the PCB should be replaced.

##### **B Connecting the Test Set**

- 1 Switch OFF DX.230/DX.240
2. Remove the Inner Assembly from the Sampling Head case.  
**Note:** The 3 heatsinks on the PCB can get very hot, take care not to touch them.
3. Disconnect the End Cap and Fan Assembly from the Sampling head PCB and connect to the Test Set horizontal 4 way "Klippon" (orange) connector. (NB. Fan remains disconnected)
4. Connect the Sampling Head PCB 4 way input connector to the Test Set vertical 4 way "Klippon" (orange) connector using cable No. 1.
5. blank.
6. Remove covers from LED and Photodiode lens housings and disconnect both Molex plugs.
7. Connect Photodiode to Test Set '**PD**' connection using cable No. 2.  
NB: The lugs on the Molex plug should face the outside of the Photodiode housing.
8. Connect LED to Test Set '**LED**' connection using cable No.3.

NB: The lugs on the Molex plug should face the outside of the LED housing.

9. Clean both lenses and re-insert the LED and Photodiode lens housings into the Measuring Unit Assembly.
10. Connect Sampling Head PCB 9 way Molex connector to Test Set '**PCB**' connection using cable No. 4.
11. Connect Interface Unit RPM socket to Test Set '**INTERFACE**' connection using cable No. 5.
12. Connect Photodiode cable (attached to Sampling Head PCB) to Test Set upper 4 pin Molex connector.
13. Connect LED cable (attached to Sampling head PCB) to Test Set upper 6 pin Molex connector.
14. Connect Measuring Unit Assembly to Test Box upper 9 pin Molex connector.
15. Ensure that the 4 Test Set lower Molex connectors are joined to the 25way 'D' and 3 pin 'Din' connectors at the left hand end using cables 6 and 7. (These cables may be left permanently connected)
16. Connect Test Set to a calibrated DVM switched to 0-20 V DC range.
17. Switch on DX.230/DX.240.  
Note: The fan will not run since it is no longer connected.
18. Connect Interface Box to a PC running in DOS mode.
19. Insert the DX230 Test Code Disk (Part No. DSK.042) into the A drive and enter the path A:\DX230\_01.EXE to obtain the Test Code menu screen.  
(NB this program is intended for desktop PC's only and may not run on a laptop).

## **C Using the Test Set**

1. Observe DVM reading to check supply voltage from Interface Unit. (30V AC rectified/smoothed and divided by 4)  
Acceptable Reading: 9.5 to 11.5V (DX230)  
8.8 to 10.5V (DX240)  
If outside tolerance check: Power supply to Interface Unit.  
Fuse F4 inside interface Unit  
Sampling Head cable
2. Hold down "**SUPPLY**" switch to check supply voltage from Sampling Head PCB (24V DC divided by 2.) Observe DVM reading.  
Acceptable Reading: 11.25 to 12.75V.  
If outside tolerance: PCB power supply has failed possibly caused by an internal short in the LED or Photodiode housing. Before changing PCB investigate as follows:  
  
Turn power OFF  
Set DVM to 2kohm resistance scale  
Locate J2 on PCB (photodiode end)

Check resistance between : blue and yellow wires  
blue and green wires  
Reading in both cases should be in excess of 3000ohms.  
A reading of 0 indicates an internal short in the LED or  
Photodiode housing. (To determine which is faulty,  
disconnect each in turn by removing connector from  
inside of housing and recheck reading.)

Replace the LED or Photodiode as required.

Replace Sampling Head PCB.

**Note : Do not change the PCB without carrying out the above investigation of the LED/Photodiode first or a repeat failure could occur.**

3. Hold down "**SET VALUE**" switch to test Gas Diode. Observe DVM reading.  
Acceptable Reading: Typically 0.6 to 0.75V (depends on temperature)  
If outside tolerance: below 0.1V = Short Circuit  
above 12.5V = Open Circuit  
Replace Cross Tube Assembly containing Gas Diode.  
(NB. Remember to transfer new gas diode value to  
outside of measuring unit)
4. Hold down "**LENS HEATER/THERM VOLTS**" switch to check LED thermistor. Observe  
DVM reading.  
Acceptable Reading: Typically 0.25V (warm) to 2.0V (cold)  
If outside tolerance: below 0.1V = Short Circuit.  
above 11V = Open Circuit.  
Replace LED.
5. Hold down "**LED RES**" switch to check LED heater resistance. Observe DVM reading.  
Acceptable Reading: 0.9 to 1.1V  
If outside tolerance : low = Short Circuit.  
high = Open Circuit.  
Replace LED.
6. Hold down "**PD RES**" switch to check Photodiode heater resistance. Observe DVM  
reading  
Acceptable reading: 0.9 to 1.1V  
If outside tolerance: low = Short circuit  
high = Open circuit  
Replace Photodiode
7. Hold down "**LENS HEATERS/HTRS OFF**" to check voltage across LED/Photodiode  
heaters. Observe DVM reading  
Acceptable reading: 11.2 to 12.8V  
If outside tolerance: Replace Sampling Head PCB
8. Hold down "**LENS HEATERS/HTRS ON**" to check voltage across LED/Photodiode  
heaters. Observe DVM reading  
Acceptable reading: -11.5 to -14.5V  
If outside tolerance: Replace Sampling Head PCB
9. Hold down "**TUBE HEATERS/THERM VOLTS**" to check the Measuring Tube  
Thermistor. Observe DVM reading.

Acceptable reading: Depends on temperature, see Appendix 1  
If outside tolerance: Below 0.1V = short circuit  
Above 9.5V = open circuit (see note)  
Replace thermistor

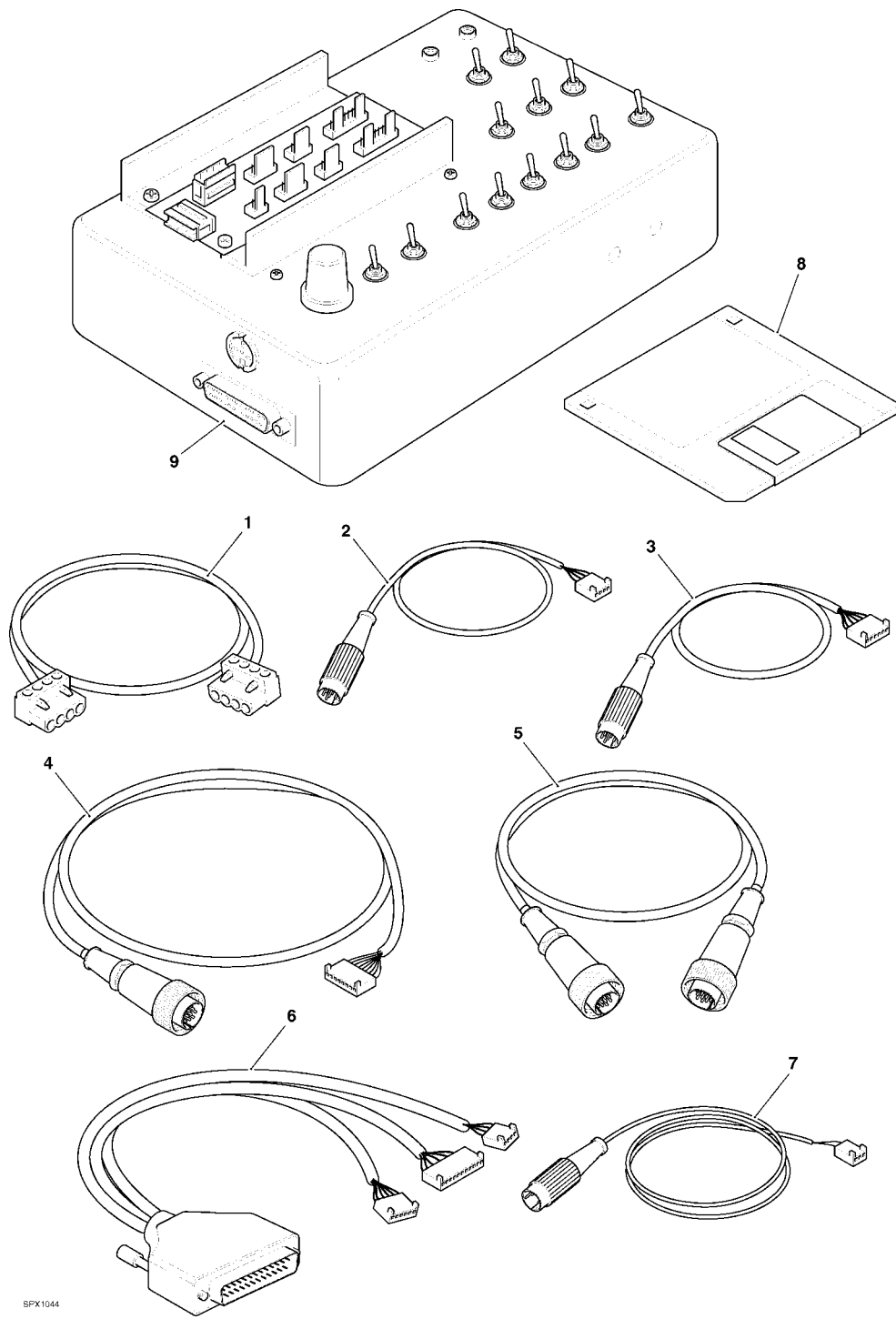
Note: Tube temperatures below 15°C will give a reading of 9.5V and should not be confused with an open circuit thermistor.

10. Hold down "**LONG END**" switch to check tube heaters at smoke outlet end. Observe DVM reading.  
Acceptable Reading: 0.9 to 1.1V (DX230)  
1.4 to 1.7V (DX240)  
If outside tolerance: low = Short circuit  
high = Open Circuit.  
Replace heaters/wiring
11. Hold down "**SHORT END**" switch to check tube heaters at smoke inlet end. Observe DVM reading.  
Acceptable Reading: 0.9 to 1.1V (DX230)  
1.4 to 1.7V (DX240)  
If outside tolerance: low = Short circuit.  
high = Open Circuit.  
Replace heaters/wiring
12. Hold down "**TUBE HEATERS/HTRS OFF**" to check the heater controller on the PCB.  
Acceptable Reading: Both Test Set LED's should go out (if not already out)  
If outside tolerance: Replace Sampling Head PCB
13. Hold down "**TUBE HEATERS/HTRS ON**" to check the heater controller on the PCB.  
Acceptable Reading: Both Test Set LED's should light (if not already on)  
If outside tolerance: Replace Sampling Head PCB
14. Hold down "**GAS DIODE**" and "**SET VALUE**" together. Use the "**GAS TEMPERATURE POT**" on the Test Box to give a DVM display equal to the number written on the Measuring Unit plastic tube.
15. Hold down "**GAS DIODE**" and "**SET VALUE**" together. Display Gas Temperature by selecting 'F' from the Test Code menu and adjust VR1 on Sampling Head PCB until display is 50 +/-2 °C . Re-seal VR1.  
Note : The previous 2 operations are interactive and should be repeated as necessary
16. Remove LED. Observe green light  
If not illuminated: Check connections  
Fit new LED
17. Clean and refit both lens assemblies
18. Select 'P' from Test Code menu. Observe Sampling Head ID code  
Acceptable Reading: 0 to 15

- If outside tolerance: No reply = no communication with Sampling Head  
Check Sampling Head Cable  
Replace Sampling Head PCB
19. Select 'A' from Test Code menu. Observe range setting  
Acceptable Reading: 0  
If outside tolerance: Clean lenses  
Check LED and Photodiode connections  
Check value of "Select on Test" resistor R22 on Sampling Head PCB  
By substitution determine whether LED, Photodiode or Sampling Head PCB is faulty. Replace as required.
20. Select 'B' from Test Code menu. Observe transmission value.  
Acceptable reading 75 to 95%  
If outside tolerance: low = autorange circuit faulty, change Sampling Head PCB  
high = incorrect value for Sampling Head PCB resistor R22
21. Select 'B' then 'C' then 'D' from Test Code menu and record the three percentage values obtained. Calculate the calibration transmission value  $100(D - C)/(B - C)$   
Acceptable reading 59.5 to 65.5% (ie nominal 62.5%)  
If outside tolerance Check LED and Photodiode connections  
Check value of "Select on Test" resistor R22 on Sampling Head PCB  
By substitution determine whether LED, Photodiode or Sampling Head PCB is faulty. Replace as required.
22. Switch OFF, and reassemble the Sampling Head.
23. Select 'G' from Test Code menu to turn fan ON.
24. Select 'K' from Test Code menu. Observe fan current.  
Acceptable reading 25 to 75mA  
If outside tolerance Check connection to fan  
Change fan  
Change Sampling Head PCB
25. Select 'H' from Test Code menu to turn fan OFF.

**Table 1.**

Tube Thermistor °C	Reading V	Tube Thermistor °C	Reading V
15	9.5	45	4.9
20	8.7	50	4.3
25	7.9	55	3.8
30	7.1	60	3.3
35	6.3	65	2.9
40	5.6	70	2.5



SPX1044

Item	Part No.	Description	Quantity
1	DX.230-305/1	LEAD - DX230 PCB 4 WAY KLIPPON	1
2	DX.230-305/2	LEAD - DX230 PD 4 WAY MOLEX	1
3	DX.230-305/3	LEAD - DX230 LED 6 WAY MOLEX	1
4	DX.230-305/4	LEAD - DX230 PCB 9 WAY MOLEX	1
5	DX.230-305/5	LEAD - DX230 RPM 10 WAY VIDEO	1
6	DX.230-305/6	LEAD - 25 WAY D TO 4, 6 & 9 WAY MOLEX	1
7	DX.230-305/7	LEAD - 3 WAY DIN TO 3 WAY MOLEX	1
8	DSK.042	DISK, DX230 TEST CODE	1
9	DX.230-305/9	TEST SET	1

IN.1901

