

# DPC20

Manometer for aerosols cans



User's guide



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## 1. INTRODUCTION

### ***1.1 Presentation of the product***

The portable manometer DPC 20 was specially designed for measurement of pressure in aerosol cans. It is particularly fit for Statistical Process Control. The DPC 20 is easy to use and perfectly suited for use in an industrial environment.

All manipulations are made by two control keys on the front panel. Its form and lightness makes it easily hand-held. Meeting the needs for speed of operation, the measured value is immediately appears on the digital display. Apart from instantaneous value, the possibility to display maximum value (or minimum value in case of negative pressure) enables reading of the value once the measurement is made, without having to maintain the device on the valve of the can.

The DPC 20 is designed to cope with the conditions of use in an industrial environment. It meets the requirements of prime importance such as rapidity, reliability and precision. Its robust receptacle is entirely made of stainless steel and aluminum, without any setting device. Its purpose conscious design and its high quality components reflect the aim to make the DPC 20 a true shop floor device.

The sensor contains only a very small amount of gas, to avoid disturbance of measurements of negative pressure. To enable cleaning, the DPC 20 is equipped with an easily accessible flush mounted membrane of stainless steel.

### ***1.2 Precautions***

- Read this manual thoroughly before using the device.
- Do not expose the device to excessive temperature (more than 35°C).
- Do not use solvents when cleaning it.
- Do not expose the liquid crystal display to direct sun light (its life-time will be shortened).
- Do not administer constraints on the membrane of the pressure gauge.
- Do not put the membrane of the pressure gauge in contact with metal objects.
- Do not over charge the CdNi accumulator. Do not leave the device in permanent charge. The CdNi accumulator lifetime would be shorted.
- This device cannot be used in hazardous atmosphere.

### 1.3 Features

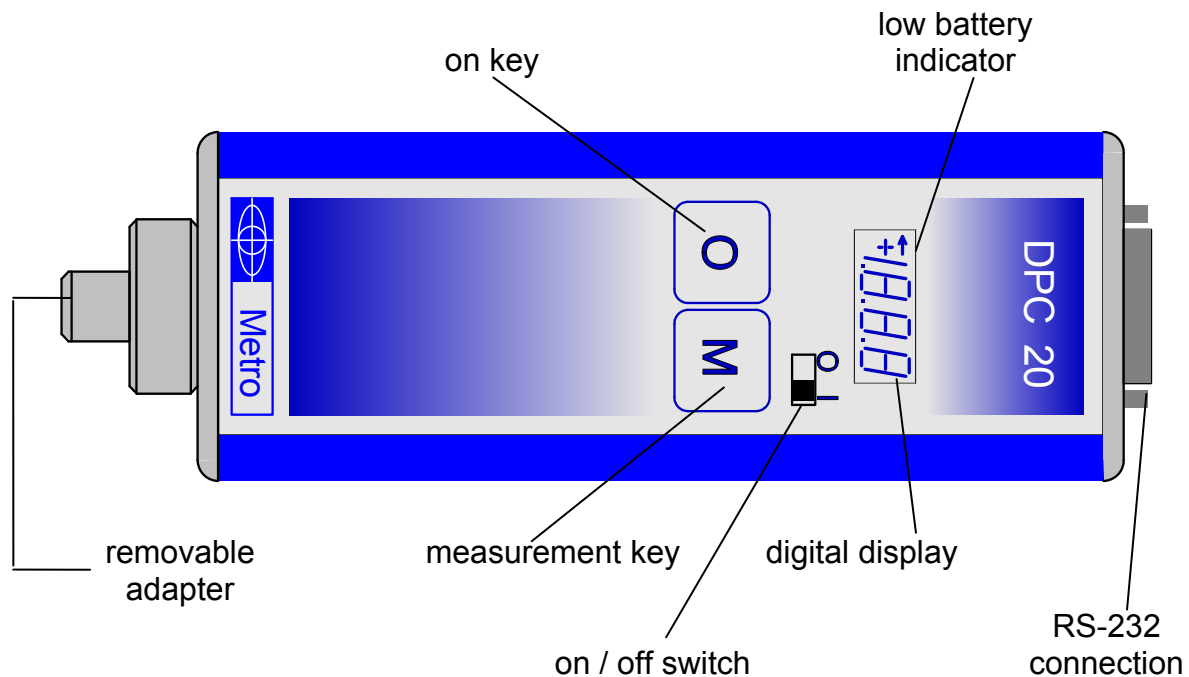
- 2000 points liquid crystal display (LCD)
- Memory capacity for recording of 20 measurements
- Configuration of parameters through two tactile keys
- 1 RS232 serial port for:
  - Release and transfer of measurements to a PC or an SPC 400 Aerosol
  - Loading of configuration parameters from a PC
- Temperature of operation: +15°C to +30°C
- Temperature sensitivity:
  - Zero [% PE/K] = 0,02
  - Sensibility [% PE/K] = 0,02
- Precision 0,1%
- Maximum relative humidity 80%
- Dimensions: diameter 50 mm, length 155 mm
- Weight: 340 g
- Measurement of pressure and vacuum with a measuring range from -1 to 20 bars
- Delivered with a male adapter (for tubes of dimensions between 3.3 and 4 mm) and a female adapter (316L stainless steel)
- Rechargeable through 220 V adapter
- Autonomy: 10 hours in operation or 100 hours on stand-by
- Flush mounted membrane pressure gauge (316L stainless steel)



**This device corresponds to the EN61010-1 safety standard and EN55022 class B, CEI 801-2 (level II), CEI 801-3 (level III), CEI 801-4 (level IV) electromagnetic compatibility.**

The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### 1.4 Front panel



### 1.5 Battery charge

The DPC 20 is delivered with a 220 V adapter for charge of the battery. In operation, the DPC 20 has 10 hours autonomy, and 100 hours in stand-by. When not used for more than 1 minute (displaying zero), the manometer is automatically set on stand-by.

When the low battery indicator light, the battery of the manometer will have to be recharged. To do this, connect the DPC 20 to the 220 V adapter and let it charge for 8 hours.

If the DPC 20 is connected to an SPC 400 Aerosol device, its charge is maintained automatically.

#### Important notice:



Using the manometer with a low battery during a long time may modify some permanent parameters. So the manometer should be out of work.

The manometer must be charged as soon as the low battery indicator is on (left corner of the LCD display)




Do not over charge the CdNi accumulator. Do not leave the device in permanent charge. The CdNi accumulator lifetime would be shorted.

Do not replace the CdNi accumulator by a battery.

## 2. CONFIGURATION OF PARAMETERS

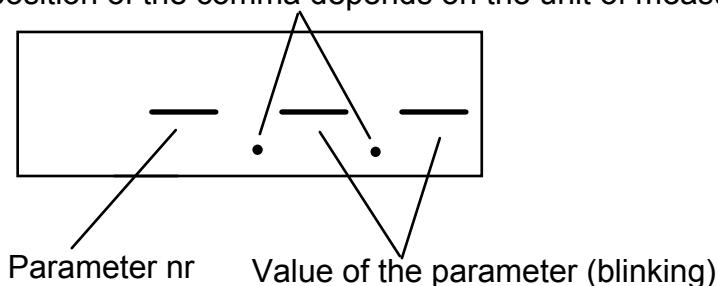
The configuration of the parameters is performed using the two keys  and . The manometer DPC 20 provides the possibility of configuring the following five parameters:



1. Unit of measure
2. Display
3. Limits of tolerance
4. Sample size
5. Mastering

To enter into configuration mode, presser the -key then the -key, while maintaining the -key pressed down. The display of (- - -) indicates that you are in configuration mode. You can then release the two keys.

On the left is displayed the number of the parameter, on the right you find the selected value (see figure below).

The position of the comma depends on the unit of measure chosen



To move from on parameter to the next, press , and to modify the selected value (blinking) press .

### 2.1 Unit of measure

Eight different units of measure are available.

Parameter N° 1: Unit of measure [0 - 7]

0: Bar	4: kg/cm <sup>2</sup>
1: PSI	5: cm/Hg
2: kPa	6: ATM
3: mH <sub>2</sub> O	7: tonf/ft <sup>2</sup>

## 2.2 Displayed value

Three different displays are available:

Parameter N° 2: Displayed value [0 - 2]

0 = instantaneous value

1 = minimum

2 = maximum

The option 0, instantaneous value, enables displaying the pressure just like an ordinary manometer. The possibility of choosing maximum or minimum value makes it easier to record and read the measured value. Displaying maximum or minimum value, makes it possible to read the manometer once the measurement is made, without having to maintain the device on the valve of the can.




## 2.3 Limits of tolerance

You can choose whether or not to define limits of tolerance. If you do, any violation of these will be indicated during display of the measured value. If the measured value is higher than the upper limit of tolerance, three blinking « H » s indicate that the value is too high. In the same way, if the measured value is lower than the lower limit of tolerance, three blinking « L » s indicate that the value is too low.

Parameter N° 3: Limits of tolerance [0 - 1]

0 = no (no limits defined)

1 = yes (limits defined)

If you wish to define limits of tolerance, set this parameter to 1 (=yes). Then, enter the lower limit of tolerance digit-by-digit beginning with the digit at the right end. The position of the comma is fixed and depends on the unit of measure chosen. To modify the selected (blinking) digit, use the -key. To move from one digit to the next at its left, press . The digit at the far left end can only take the following values: 0, 1, or -1. When this digit is set to 0, nothing is displayed at its position. The commas will blink to indicate it can still be modified. When you have finished defining the lower limit of tolerance, press  to go on to the definition of the upper limit. Proceed in the same way as for the definition of the lower limit of tolerance.

## 2.4 Sample size

Parameter N° 4: Sample size [00 to 20 parts].

The defined sample size will determine whether the measurement will be memorized or not.

1. If sample size = 0, pressing  after a measurement resets the memory and makes the manometer ready for the next measurement.
2. If sample size > 0, pressing  after a measurement will record this while displaying the corresponding part number, then resets the display and is ready for the next measurement. The number of measurements recorded depends on the sample size set.

If you wish to erase the recorded measurements press  and  at the same time. The manometer will then display 00.

## 2.5 Calibration

**IMPORTANT!** The manometer DPC 20 is calibrated at delivery. Therefore the manometer needs no calibration before you use it.

The calibration parameter is activated only when a subsequent calibration of the device is to be made. This necessitates the use of a pressure reference.

Parameter N° 5: Calibration [0 - 1]

0 = no

1 = yes

When this parameter is set to 0 (=no), pressing  will move from this parameter to the next one.

If you wish to calibrate the manometer, set this parameter to 1 (=yes), confirm your choice with  and then immediately with  &  (2 sec maxi)

After parameter N° 6 will be displayed. Calibration procedure will start when leaving parameter N°6.

Enter or confirm the value of the calibration pressure (10 to 19.99 Bars) digit-by-digit beginning with the digit at the right end. The position of the comma is fixed since calibration is always performed in Bars. To modify the selected (blinking) digit, use the -key. To move from one digit to the next at its left, press .

The calibration begins immediately:

1. The display of (- - 0) indicates that the manometer is waiting for a measurement of the atmospheric pressure. Make this measurement by pressing . While measuring the atmospheric pressure the manometer displays (- - -).
2. Next, the display of (- - P) indicates that the manometer is waiting for a measurement of the calibration pressure. Position the pressure reference and make this measurement by pressing . While measuring the calibration

pressure the manometer displays (P P P) to indicate that it is taking this value into account. Then release the **M**-key to go back to measurement mode. The calibration is over!

## 2.6 Measurement of differential pressure

Two different ways of measurement are available. The direct pressure mode shows the measured pressure. The differential pressure mode shows the difference in pressure between the two successive readings. This mode can be used to measure the pressure variation in a can, created by a draining, a change in temperature, etc.

Parameter n° 6 : differential mode [0 - 1]

0 = no

1 = yes


## 2.7 Overview of setting options for parameters Measurement of differential pressure

Parameter N°	1	2	3	4	5	6
Value	Unit of measure	Display	Limits of tolerance	Sample size	Mastering	Differential measure
0	Bar	Instantaneous value	NO	0	NO	NO
1	PSI	Minimum	YES	1	YES	YES
2	kPa	Maximum		2		
3	mH <sub>2</sub> O			3		
4	kg/cm <sup>2</sup>			4		
5	cm/Hg			5		
6	Atm			6		
7	tonf/ft <sup>2</sup>			7		
...				...		
20				20		

### 3. HOW TO MEASURE


When switched on, the manometer is automatically in measurement mode.

First of all, make sure that the manometer is provided with an adapter appropriate for the cans on which you wish to measure the pressure. To make the measurement, place the adapter firmly on the valve of the can. If the display parameter was set to «instantaneous value » (see 2.2 Display), the measured value must be read while maintaining the whole in position. If you choose to display « maximum value » or « minimum value », you can remove the manometer to read the value that remains recorded for display.



When not used for more than 1 minute (displaying zero), the manometer is automatically set on stand-by. It will be activated again, (always to be done at atmospheric pressure) by pressing , or by request from the SPC400 Aerosol (see 4.2 Walking around measurements with data download)(when receiving a character by the serial link).



The defined sample size will determine whether the measurement will be memorized or not (see 2.4 Sample size). Recording measurements is necessary if they are to be analyzed statistically.

#### **3.1 Measuring without recording of values**

If sample size is set to zero, no measurements are recorded in the DPC 20. This implies using the DPC 20 as an ordinary manometer without recording measurements. When setting sample size to zero, pressing  after a measurement resets the memory and displays a zero.



#### **3.2 Measuring with recording of values (SPC application)**

If sample size is set to a value above zero, measurements can be recorded by pressing  after each measurement. The DPC 20 will accept recording the number of measurements defined as sample size. To enable monitoring the number of values recorded, every time  is pressed, the measurement number in the current sample is displayed.

If you wish to erase the recorded measurements press  and  at the same time. The manometer will then display 00.

The recorded values can subsequently be transferred by serial link (see 4.2 Walking around measurements with data download).

### **3.3 Measurement of differential pressure.**

If the differential mode has been chosen, the manometer shows the message **P1** . You have then to measure the first pressure.. By pressing on . the result is recorded. The manometer then shows the message **P2** . You have then to measure the second pressure The difference between pressures **P2- P1**.is then shown. By pressing  again, you can, if you want, record the difference, the **P1** comes back for the following measurement.


## **4. USING THE DPC 20 WITH THE SPC400 AEROSOL**

The SPC400 Aerosol is a system for quality control designed specially for manufacture of aerosol cans. It enables analyses of data to prevent manufacture of bad parts. To use the manometer DPC 20 with the SPC400 Aerosol, they will have to be connected by the appropriate cable (reference 45310). The setup defined in the SPC400 Aerosol must include a pressure characteristic (see SPC400 Aerosol User's Guide).

**Note:** If the DPC 20 is connected to the SPC 00 Aerosol device, its charge is maintained automatically.


There are two ways of using the manometer with the SPC400 Aerosol:

### **4.1 Using the manometer permanently connected**

In this case, all measurements are made at one place, and data are transferred to the SPC400 Aerosol as the measurements are made. The sample size is set to zero (see 2.4 Sample size). According to the setup defined in the SPC400 Aerosol, the value for the pressure characteristic will be required at the appropriate time. When this happens, you just have to make the measurement with the DPC 20, and then press  to transfer the measured value. The SPC400 Aerosol will then continue the measurement cycle.

### **4.2 Walking around measurements with data download**

This method allows making a certain number of measurements without having the manometer connected to the SPC400 Aerosol. This is particularly interesting when it comes to sample cans on the production line, when for example you wish to perform statistical process control. Make sure the sample size defined in the DPC 20 corresponds to the one defined in the setup of the SPC400 Aerosol.

The first step is then to make the number of measurements defined by the sample size. At the end of each sample, the two devices have to be connected through the appropriate cable to enable download of data from the DPC 20. The download is made by pressing  on the SPC400 Aerosol each time it requires a pressure measurement. Please note that the transfer is operated from the SPC400 Aerosol. Consequently, you do not need to touch the DPC 20 to transfer data. This functioning

is true independently of the measurement mode chosen for the SPC400 Aerosol (i. e. measurements *part by part* or *characteristic by characteristic*).

**Important** : Once all pressure measurements have been downloaded to the SPC400 Aerosol, leave the manometer connected until the message « end of sample » appears on the screen. This is to allow memory reset of the DPC 20.

## 5. HOW TO USE THE SERIAL LINK (RS-232)

This interface enables release and transfer of measurements to a PC or an SPC400 Aerosol as well as loading of configuration parameters from a PC.

The protocol of communication of the manometer is as follows:

-1200 baud, 8 bits, no parity, 1 stop, no hand shake

### 5.1 The RS-232 connector

The connector is equipped with a Sub D 9 pin-plug.

#### Description of signals and assignment of pins.

Pin	Signal	Direction	Description
1			Reserved (do not connect)
2	RX	Input	Reception of data
3	TX	Output	Transfer of data
4	9V	Input	Battery power supply
5	Gnd	-	Ground
6 to 9			Reserved (do not connect)

### 5.2 Commands

NOTE: In the following examples, ' ' indicates a space character (ASCII code 32), CrLf indicates the codes Cr (code 13) and Lf (code 10). Messages containing « \*\*\*\*\* » are error messages.

You will find below a presentation of each of the commands the manometer is able to receive.

#### 5.2.1 Transfer of the measurement made on part number n

Command: nCrLf

When receiving this command, the manometer will transfer the value of measurement number n. n can assume any value between 0 and 20 expressed in ASCII code on one or two bytes:

If n = 0, the transferred value is always the one displayed !

If sample size = 0, whichever measurement number is requested, the manometer will always transfer the current measurement.

Example 1)

Command	Transferred value
00CrLf or 0CrLf	00:+05.26_unitCrLf (displayed value)
12CrLf	12:+11.31_unitCrLf (recorded value)
25CrLf	25:*****CrLf (maxi value = 20)

If sample size > 0, the manometer will transfer the value of measurement number n provided it has been recorded, otherwise an error message will be transferred.

Example 2) : sample size was set to 10 and only 6 measurements have been recorded.

Command	Transferred value
00CrLf or 0CrLf	00:+05.26_unitCrLf (displayed value)
05CrLf or 5CrLf	05:+12.30_unit CrLf(recorded value)
08CrLf or 8CrLf	08:*****CrLf (no value recorded: maxi = 6)
12CrLf	12:*****CrLf (impossible: sample size = 10)

### 5.2.2 Transfer of all memorized measurements and reset of memory

Command: SCrLf

When receiving this command, the manometer will transfer all measurements one after the other, separated by a delay of one second. Then the memory is reset.

Examples:

- 1) Sample size was set to 4 and 4 measurements have been recorded:

```

SCrLf      01:+05.36_unit CrLf   (waits for one second)
           02:+05.35_unit CrLf   (waits for one second)
           03:+05.37_unit CrLf   (waits for one second)
           04:+05.35_unit CrLf

```

The parameter « Unit » can assume one of the following values:

```

0 : Bar           4 : kg/cm2
1 : PSI           5 : cm/Hg
2 : kPa           6 : ATM
3 : mH2O        7 : tonf/ft2

```

After this operation, the memory of the manometer is empty !

- 2) Sample size was set to 4, but no measurement has yet been recorded:

```

SCrLf      S_:*****CrLf

```

- 3) Sample size was set to 0. Consequently, no measurement has been recorded:

```

SCrLf      S_:*****CrLf

```

### 5.2.3 Transfer of all memorized measurements

Command: NCrLf

When receiving this command, the manometer will transfer the number of measurements recorded:

Examples:

Command	Transferred value
NCrLf (no measurement recorded)	NP:00CrLf
NCrLf (6 measurements recorded)	NP:06CrLf
NCrLf (10 measurements recorded)	NP:10CrLf

### 5.2.4 Transfer and erasure of memorized measurements one by one

Command: DCrLf

When receiving this command, the manometer transfers and erases one by one) recorded measurements. This command is to be repeated the number of times required to transfer and erase the desired number of measurements.

Examples:

Sample size	Nbr of measurements recorded	Command	Transferred value	Remaining nbr of measurements recorded
4	4	DCrLf	04:+05.35_unit CrLf	3
4	0	DCrLf	D_:*****CrLf	0
0	0	DCrLf	D_:*****CrLf	0

### 5.2.5 Reset of all memorized measurements

Command: ZCrLf

When receiving this command, the manometer resets the number of recorded measurements:

Examples :

Sample size was set to 4 and 4 measurements have been recorded:

ZCrLf        NP:00CrLf

### 5.2.6 Imposed stand-by

Command: ICrLf

When receiving this command, the manometer is set on stand-by (imposed stand-by):  
ICrLf        no response (on stand-by)

## **6. MAINTENANCE OF THE MANOMETER**

The adapters for different valves are very easily screwed off, to enable access to the flush mounted membrane of the pressure gauge. This membrane is made of stainless steel and can be cleaned regularly using a piece of cloth with small amount of alcohol.

The adapters, also made of stainless steel, can be cleaned in the same way.

Avoid using solvent for cleaning the rest of the manometer. This might damage the cover of the front panel and tarnish the liquid crystal display. Using soaped water on a piece of cloth is preferable.

The o-ring of the gauge is made of Viton, a very resistant material which maintains its form in prolonged contact with the vast majority of products. However, if the o-ring should swell or be deformed, it would have to be replaced.

When changing adapters, it is important to make sure the Viton o-ring is well in position, to avoid damaging it when screwing it on.

The adapter is knurled to facilitate screwing it on and off by hand. Do not use a tool (pliers etc.) to manipulate the adapter.

### **Remember:**

- Do not administer constraints on the membrane of the pressure gauge.
- Do not put the membrane of the pressure gauge in contact with metal objects.

