sylvac

D90

INSTRUCTIONS FOR USE

Program version V1.0
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SWISS MADE

sylvac

CONTENTS

2 Sylvac P5, P10, P25 and P50 Probes

1.1 GENERAL DESCRIPTION

The D90 unit displays the absolute displacement of the long-travel Sylvac probes P5, P10, P25, P50. Highest resolution is 0.1 µm. Numerous integrated functions will resolve most metrological problems, be they in the workshop or laboratory. The 8200 points backlit graphic read out provides tremendous flexibility and ease of use. Similarly, it allows the unit to be used simply and in a choice of 5 languages. All readings entered are protected from erasure if the unit is switched off (when switched back on, the unit returns exactly to the point where it was switched off, and the probe's position is retained).

A 230V, 120V or 100V charging block is supplied with the unit.

1.2 FRONT OF UNIT

On/Off switch

Measure ↑1

10.920 mm

LCD display, CCFL backlight

Function keys
(sound acknowledgement)

1.3 FUNCTION KEYS

1.3.1 Summary of functions:

(7 Analog) : displays or removes analog scale.

(8 mm/in) : direct conversion mm/inch.

(On/Off) and : **(8 mm/in)** : lock/unlock the mm/inch conversion.

(2 SetUp) then : **(8 mm/in)** : choice between mm or µm / inch or mil.

(9 Resol) : choice of the resolution: 0.1 - 0.01 - 0.001 - 0.0001mm
or .01 - .001 - .0001 - .00001inch.

(1 Tol) : display or remove the classes <1 2 ...>

(2 SetUp) then **(1 Tol)** : choose the number of classes (2 to 6) and setup of limits for each class.

(0 Min/Max) : display or remove the MIN, MAX, TIR, MEAN first chosen by pressing SET UP and then Min/Max.

(2 SetUp) then **(0 Min/Max)** : choose mode to be displayed first by pressing Min/Max.

(Enter) : in MIN/MAX mode: display successively Min, Max, Tir, Mean.

(▲ Clear) : in MIN/MAX mode: clear the MIN/MAX memory to the current value.

(2 SetUp) : Setting of parameters or functions for the Tol, Enter, Min/Max, SetUp, Preset, Print and mm/in keys. These parameters are kept in memory even after disconnection (power off) of the display unit.

(2 SetUp) and **(2 SetUp)** : setting of basic parameters : external contact function, language, locking of the key board, memorizing of complete configuration (up to 12), dimension of the displayed values.

(3 Preset) : display the Preset value (zero or any value)

(2 SetUp) then **(3 Preset)** : introduction of a Preset value for the selected measure (for Preset zero, enter 0)

●Print	: printout of the measure on RS232 output.
	2 SetUp then **●Print** : setting of the RS 232C transmission parameters and of the RS 232C output format.
	On Off and **●Print** : display the program version (firmware).
*Measure	: selection of a measurement number, the measuring direction or a multiplication factor.
±Zero	: zero setting of the display
Enter	: adjustment of the display contrast : press **2 SetUp** then **Enter** and then **2 SetUp** When entering parameters: confirm numerical entry or proceed to following menu.
	2 SetUp then **Enter** : selection of mode Enter/Clear: adjustment of the contrast
	On Off and **Enter** : unlock the keyboard if inhibited
▲Clear	: adjustment of the display contrast. Quits a menu without modification.
	On Off and **▲Clear** : main reset of the unit (complete reinitialization of parameters)
On Off	: switch unit ON/OFF. All parameters will be stored after unit has been switched off.

	: can be configured for : - data transmission using the RS 232C output
	        - measurement hold
	        - new Min/Max value
	        - preset input
	        - measurement channel change
	Different combinations of the above mentioned functions can be performed.

1.3.2 General method:

All functions are directly accessible, e.g. by pressing the Tol key, tolerance indicators will be displayed. Pressing it again causes the indicators to disappear. The numbers on the function keys are used to select a menu or to enter numeric values. The Set Up key allows the input of parameters required for the various functions of the unit.

When a menu is displayed, the previously stored selection is indicated by a black rectangle: ■■

1.3.3 Entering numbers:

Numbers are entered as follows:

- The old numerical value will be displayed first.

- Should the key **Clear** be pressed before any other key has been activated, the program cycle will be set back without correcting the old value.

- Pressing the key **Enter** validates the input value and the next menu is displayed.

- All values to be input are selected in the same way as for a calculator. Plus and minus signs can be changed at any time by pressing the +/- key.

- The number of digits on the left hand side of the decimal point is max. 4 for mm and max. 2 for inch. The number of digits after the decimal point depends on the resolution.

- If the number is less than 1, the input value can be started directly with the decimal point.

- If an incorrect value is selected, press the **Clear** key and start again.

1.4   OPERATION

1/   Depending on the operating location, the independent base may be screwed onto the bottom of the unit, so that the display is presented "face-on" to the operator.

2/   Connect the charger (Section 1.8.2).

3/   Connect a P5, P10, P25 or P50 probe (refer to chapter 1.8.4).

4/   Switch on unit ⬭ **On Off** .

5/   Select language by pressingt ⬭ **2 SetUp** then ⬭ **2 SetUp** then ⬭ **2 SetUp** and then 1, 2, 3, 4 or 5 (see chap. 1.6.11). This selection is memorized permanently by the unit(along with all other datas)..

6/   Where necessary, convert from metric to imperial measurement by pressing ⬭ **8 mm in** .

7/   Specify the readout resolution by pressing ⬭ **9 Resol** and then 1, 2, 3 or 4 (Section 1.6.4)

8/   If required (refer to Section 1.6.3):
    - reverse direction of probe measurement
    - select diameter mode (*2) or any other multiplication factor
    - If more than one tolerance or preset setting is required, select the measurement channel (max. 8 channels).

9/   If required, connect a foot pedal or another external contact (refer to chapter 1.8.3) and assign its functions (refer to chapter 1.6.11). A computer or another peripheral device may be connected to the RS 232C data input/output (refer to chapter 1.8.1) and the corresponding parameters configured (refer to chapter 1.6.12).

10/   Set the display at zero by pressing the ⬭ **±Zero** key or at a previously input preset value by pressing the ⬭ **3 Preset** key. The preset value is input by pressing SetUp and then Preset key (refer to chapter 1.6.9).

11/   The displayed measurement can be accompanied by:
    - the analog scale (Section 1.6.6)
    - tolerances (Section 1.6.7)
    - min/max mode (Section 1.6.11)

12/   Once the unit has been set up, the keyboard can be locked. The external contact and Print key remain active. The mm/inch function can also be locked.

1.5. EXAMPLES OF OPERATIONS

1/ Simple measurements:
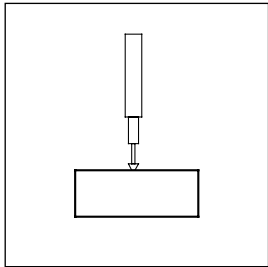
- Choose the required channel: (* Measure) + channel number

- Reverse measuring direction: (* Measure) then (±Zero)

2/ Multiplication factor

(* Measure) then (* Measure) then multiplication factor (e.g. 0.33333)

3/ Measurements and checking tolerance limits

- Enter nominal value, the upper and the lower tolerances: (2 SetUp) then (1 Tol)

(1 Tol) activates or deactivates the tolerance indicators.

1.6 FUNCTION KEYS

1.6.1   CLEAR KEY

▲ Clear

- In normal measuring mode: increases the contrast of the display if the corresponding function key has been configured (**2 SetUp** then **Enter** key)

- Operating in Min/Max mode: clears the Min/Max memory before taking a new measurement.

- Operating in Set Up input mode: cancels an input value or cancels a chosen menu without alteration.

1.6.2 ENTER KEY

Enter

- In normal measuring mode : decreases the contrast of the display if the corresponding function key has been configured

1/ Press **2 SetUp**   2/ Then press **Enter** key

The following menu will be displayed:

```
Enter/Clear =

1:  No function
2:  Contrast
```
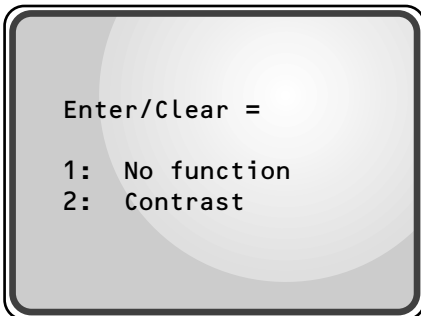
- Operating in Min/Max mode: changes the displayed value: maximum, then minimum, then max-min, then mean (max + min)/2, then maximum again...

- Operating in Set Up mode: confirms an input value or cancels a menu without alteration.

1.6.3 MEASURE KEY

Using the display unit D 90, measurements on up to 8 channels can be performed.

Each measurement may contain independent from each other :
- any selected preset value
- proper tolerance limits
- normal measuring mode or Max-/ Min-/ Difference- (Max-Min) or Mean value (Max+ Min / 2)
- a different measuring direction
- any multiplication factor, diameter measurements included

a) selection of the measuring channel:

1/ press *Measure key Measure will be displayed in negative

2/ Enter the number of the required measurement (a number from 1 to 8)

It is also possible to configure the external contact (foot pedal) for the measure channel change (refer to chapter 1.6.10).

In that case, the channel of measure goes from 1 to the number selected by the *Measure key.

b) reversing the measuring direction:

The measuring direction is indicated by the arrow preceding the measure number. An up arrow indicates that the measurement value increases when the probe moves against inside (so when it is vertical, the arrow will indicate a positive measurement direction).

1/ press *Measure 2/ then ±Zero

The arrow preceding the channel number changes its direction ↑ ⇄ ↓
To reverse the direction, repeat the sequence.

c) radius/diameter mode, multiplication factor or measure on V base:

Allows the input of any multiplication factor for the corresponding measuring probe.

1/ press *Measure 2/ then *Measure (* represents multiplication factor)

Special cases: factor = 1 —> normal mode, no coefficient

factor 2 —> diameter mode (read value will be twice the measured value)

factor 0 —> the factor will be calculated automatically (for measurements on a V base with any angle), or calibration of one channel according to gauge block.

The calibration on a V a gauge block is done as follows :

1/ select option 0

2/ check a first gauge pin on a V base and enter its value using the keyboard or set the probe on reference 0

3/ check a second gauge pin on the V base and enter its value or set the probe on a gauge block and enter its value

4/ the unit calculates automatically the multiplication factor or the scale correction factor (this factor can be displayed by pressing two times the Measure key). The order of measurements is not important.
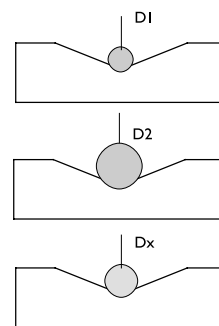
Has a multiplication factor been introduced, the symbol * will be displayed. In diameter mode, the diameter sign will be displayed.

A probe with 50 mm range (P50) can be used in diameter mode only with a highest resolution of 1µm.

1.6.4 RESOL KEY

Allows choice of resolution displayed and printed:

1/ presse the key

The following will be displayed:

```
1 : 0.000  1mm
2 : 0.001
3 : 0.01
4 : 0.1
```
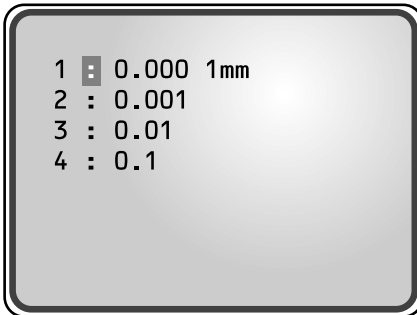
2/ Enter the number of the required resolution.

Input values (e.g. Preset or Tolerances) will be automatically input according to the resolution. Resolution is identical for all channels.

The refresh rate of the display unit D90 is higher when using it in low resolution (refer to chapter 1.11 : Technical Specifications)

1.6.5 mm/In KEY

Alternates between metric (millimeter) and English (inch) display.

Locking mm/in conversion:

1/ Switch off unit   2/Press

3/ Hold switch down and switch unit

Unlocking conversion: repeat above operation.

Selection of display resolution in thousands of mm (µm) or thousands of inch (mil) :

1/ Press   2/ Then   3/ selection of: mm (in) or 2: µm (mil)

Displays or removes the analog scale. The analog scale features an indicating range of 100 points, each one states one least significant digit of the measured value (digit at the most right of the display). Thus the range covered by analog scale is given by the working resolution:

Example: Selected resolution: 0.001 mm. One graduation is equal to 0.001 mm and the inclusive range is therefore 0.1 mm.

Example in normal mode:

In tolerance mode, the scale changes and two fixed vertical lines represent the tolerance limits:
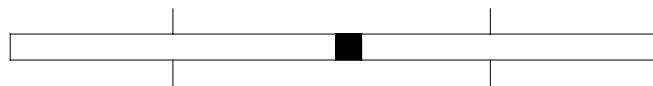
The user can then judge centering of measure with tolerances at a glance.

In min/max mode, the line opens out to indicate searching lap back:

1.6.7 TOL KEY

1 Tol

Displays or removes tolerance indicators:

● < indicates a measured value smaller than the nominal dimension + negative tolerance on the external measurement or smaller than the nominal dimension + positive tolerance on the internal measurement.

● indicates a measured value inside the limits of tolerances.

> ● indicates a measured value larger than the nominal dimension + positive tolerance on the external measurement or larger than the nominal dimension + negative tolerance on internal measurement.

Each measurement has its specific assigned tolerance limits.

Input of nominal size and tolerances :

1/ select the corresponding measuring channel for the input.

2/ press **2 SetUp**

3/ then **1 Tol**

The following will be displayed (the current nominal dimension is displayed):

```
Measure   ↑1
Enter nominal size :
   8.45 IN
```
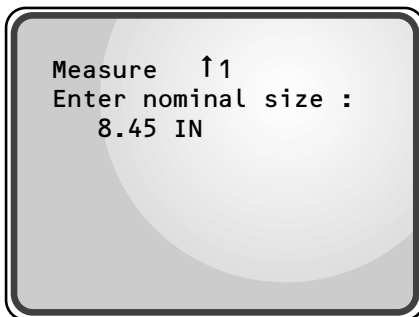
The **▲ Clear** key allows you to quit the tolerances input.

4/ input nominal dimension. Wrong value entered can be cancelled by pressing **▲ Clear**

The value is entered as described in Section 1.3.3. (Input of values).

5/ confirm by pressing **Enter**

The following will be displayed:

```
Measure   ↑1
Enter nominal size :
 12.6 IN
Tol.  + :
    0.02 IN
```
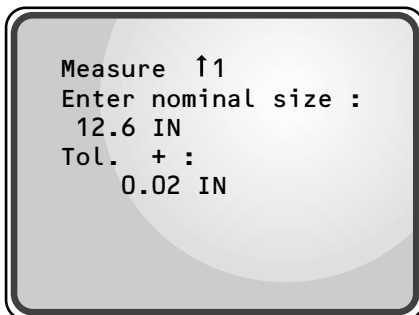
6/ input of upper tolerance. If negative, must always be greater than the lower limit.

7/ confirm the entered value : press (Enter) key

The following will be displayed:

```
Measure ↑ 1
Enter nominal size :
  12.6 IN
Tol. + :
 0.006 IN
Tol. − :
−0.004 IN
```
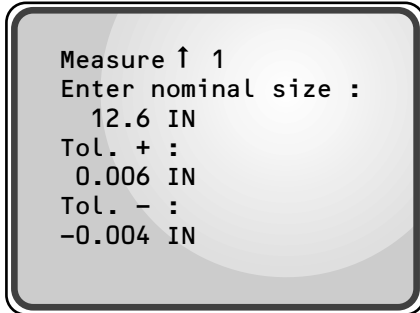
8/ enter the lower tolerance with its sign

9/ confirm the entered value : press (Enter) key

Following menu will be displayed:

```
1 : External meas.
2 : Internal   "
```
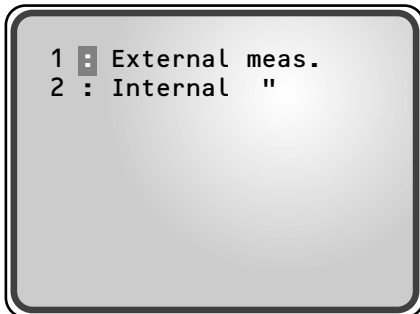
10/ enter selection 1 or 2 (depends if the probe is used for external or internal measurements). This selection is important for the identification of reject / good or rework.

External measurement: measured value too big   —> Rework
measured value too small —> Reject

Internal measurement : measured value too small —> Rework
measured value too big   —> Reject

Once back in measuring mode, tolerance indicators corresponding to measured value is displayed.

By pressing (1 Tol) , the tolerance indicators are erased. Pressing it again recalls the lights.

1.6.8 ZERO KEY

(±Zero)

Zero setting of the display.

1.6.9 PRESET KEY

Display of a previously entered preset value.

Preset value can be entered also through the configured external contact (foot pedal).

Each measurement (from 1 to 8)has its specific assigned preset value.

Input of a preset value:

1/ press 2 SetUp   2/ then 3 Preset

Following will be displayed:

```
Measure   ↑1

Enter preset value :

 0.000 IN
```
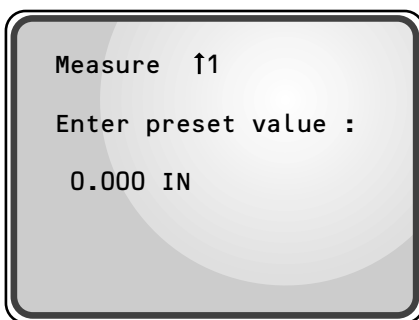
3/ the old preset value is displayed. Enter preset value according to general principle described in Section 1.3.3. To enter a preset of 0.000, simply

press 0 then Enter

After a general reset (▲ Clear + On Off), the preset values of all channels will be reset to zero.

1.6.10 SETUP KEY

2 SetUp

SetUp allows the input of parameters for following functions : Tol, Enter, Min/Max, SetUp, Preset, Print and mm/In. A description for the input will be given under the corresponding function.

General definition of instrument functions :

1/   press   2 SetUp   . 2/   then   2 SetUp   .Following will be displayed:

```
1:   Contact externe
2:   Language − Srache
     Langue − Lingua −
     Taal
3:   Clavier bloqué
4:   Configuration
5:   Grandeur chiffres
```

To exit this menu or the followings without changes,

press   ▲ Clear   or   Enter

3.1/ External contact function : the menu number 1 allows the assignment of the function(s) of the external contact (in general the optional foot pedal, nr. 904.4101). The keyboard may be locked and the unit only be operated using the foot pedal.

3.1.1/ Data transmission using the RS 232C data output; according to the Print function assigned parameters. Each time the foot pedal is pressed, the measured value is transmitted.

This choice may be combined with the following other functions:

   2 : Display locked (Hold). The display is locked as long as the foot pedal is pressed. After releasing the foot pedal, the value will be sent. In addition to this combination, the function 5(change of the measurement) can be requested.

   3 : Min/Max reset. Alternately, pressing the foot pedal initializes Min and Max registers and pressing it again sends the measured value. In addition, the function 5 (change of measurement) can be requested.

   4 : Display of the preset value.Alternately, pressing the pedal presets the display, pressing it again sends the measured value.

   5 : Change of measurement. By pressing the foot pedal, first the measured value will be transmitted and then the change of the measurement will be done.

If a combination of the second or 3rd function is not required, simply press   Enter

3.1.2/ Display locked (Hold)

This function can be combined with :

   3 : Reset for a new measurements in Min/Max function (press alternately = 1st. Reset, 2nd. Display locked). In addition, the change of measurement can be requested.

   4 : alternately with display preset.

   5 : simultaneously with change of measurement.

3.1.3/ Reset of the Min/Max memory for mode Min/Max (same function as [▲ Clear] in mode Min/Max).

This function can be combined with «change of measurement».

3.1.4/ Display of the preset value (Preset) at each external contact.

3.1.5/ Change of measurement. Each external contact leads to the next measurement. If the number of measurements, set using the [* Measure] key, is reached the unit switches automatically back to measurement 1.

3.2/ Language selection : selection nr. 2 in menu SetUp allows the language selection for the display and the RS 232C data transmission : English, German, French, Italian or Dutch.

3.3/ Keyboard locking (Hold) : using selection nr. 3 in menu SetUp, the keyboard can be locked.
No key is functional except of :

- ON/OFF switch
- Foot pedal
- Print key
- and, if required, any function key (one) of the keyboard (exception)

To recall keyboard operation, choose one of the following options:

1/ press any key for at least 5 seconds

2/ switch on unit with [Enter] key pressed

3.7/ Configuration: All unit configuration parameters (tolerances, presets, setups...) can be stored or recalled:

Give backup file number, then [Enter]

Insert name of file, in letters and numbers, max. six characters (allows for more efficient file management).

The [* Measure] key switches from numerical to alphabetic input and back.

Up to 12 complete configurations may be stored.

To recall the configuration, enter the file name and press the [Enter] key. The unit will then be programmed to the memorized configuration.

Notes :   - to clear a memory, enter 1: save and then the number of the file to be cleared then press [Enter] and then [▲ Clear]

                 - the MEM? and MEMR remote commands allow the same operation using a PC connected to the RS 232C output.

The SYLCOM program allows the data safeguard management using a computer (charged from site www.sylvac.ch)

3.5/ Height of characters : Selection of the height of displayed values.

1.6.11 MIN/MAX KEY

Allows the choice of displaying minimum, maximum, TIR (Max - Min), or mean (max + min)/2 instead of normal measurement. Entering this mode will automatically set minimum and maximum registers to measuring position. Min/Max measurements therefore start from this point.

In this mode, the preset will be given on the displayed value, i.e. on the maximum, the minimum, the TIR or the mean value.

Choice of the displayed function:

1/ press **2 SetUp**   2/ then **0 Min Max**

The following will be displayed:

```
Measure   ↑1

1 : MAX
2 : MIN
3 : Δ = MAX–MIN
4 : MEAN= (MAX+MIN)/2
```
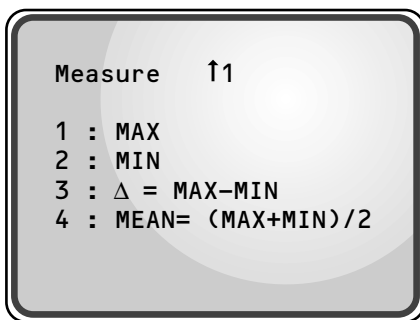
Select required displayed value (min, max, etc.).

When working in MIN/MAX mode, the **Enter** and **Clear** keys have a special function:

Clear   Set Min/Max registers to the current measuring value. All new Min/Max values start from this point.

Enter   Change the displayed value: Maximum --> Minimum --> Tir --> Mean --> Maximum...

Example: The probe is used for measuring a camshaft. The unit displays the maximum value. The camshaft is rotated and the displayed value is frozen on the maximum value recorded. The preset value is entered, for example 10,000 mm.

Min/Max registers are initialized by pressing **Clear**

A new measurement of the camshaft will now display a maximum value of 10,000 mm.

1.6.12 PRINT KEY

The displayed value will be transmitted through the RS 232C data output, previously configured according requirement. Various print-out formats are available : computer, 80, 40 or 15 columns.

During the RS 232C data transmission, a **P** in negative format will be shortly displayed at the right top side of the display. If there is no probe connected (display of «no probe»), the value 999.99 will be transmitted.

An external contact (e.g. foot pedal) may also be configured to perform the RS 232C data transmission (refer to chapter 1.6.10).

Selection of the RS 232C transmission parameters and the print-out format :

1/ press **2 SetUp**   2/ then **Print**

The following will be displayed:

```
Enter the choice :

1 : RS232 config.
2 : Peripheral
```
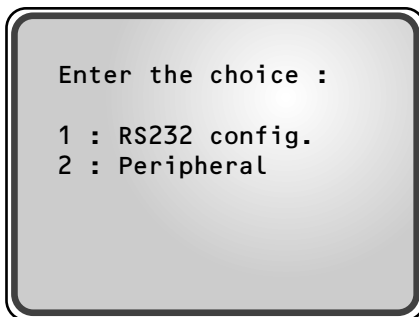
The 1st menu sets RS-232-C transmission parameters.

The 2nd menu selects the RS-232-C output format according to which peripheral is being used.

2.1/ RS232 input/output parameters:

Default parameters (after a reset): 4800 bps, 7 bits, even parity, CR

2.1.1/ transmission speed: 300, 600, 1200, 2400, 4800, 9600 and 19200 bps.

By pressing the **Clear** key the preceding menu will be displayed.

By pressing the **Enter** key the next menu will be displayed (without changing previous choice).

2.1.2/ word length: on 7 or 8 bits.

2.1.3/ parity control: No parity, even or odd.

2.1.4/ end characters: CR (Carriage Return) or CR + LF (Carriage Return + Line Feed) or LF only. A printer with auto LF mode needs only CR. If CR + LF is sent in this case, a supplementary empty line is printed at each carriage return. With a connection to a PC select CR only.

2.2/ Peripheral choice, the following menu will appear:

```
Enter the choice:

1 : Computer
2 : 80 col. Printer
3 : 40  "      "
4 : 15  "      "
```
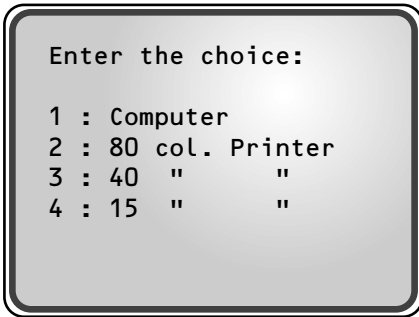
These different choices modify the output format for the RS232 output.

Remote command of the unit will not be modified.

80 and 40 column formats allow the header to be printed following the user's parameters.

2.2.1/ Connection to a computer. This is the most simple transmission format allowing easy processing of values.

The measurement is transmitted as it appears on the display:

a/ In mm:

SIGN 10^2 10^1 10^0 DP 10^{-1} 10^{-2} 10^{-3} 10^{-4} CR   LF
or 10^3

= space if positive sign   DP = decimal point   LF only if requested

10^2 et 10^1 =space if zero 10^{-4}, 10^{-3} and 10^{-2} only with resp.
resolutions 0.1 µm, 1 µm and 10 µm.

The sign always immediately precedes the 1st digit.

b/ In inch:

SIGN 10^1 10^0 DP 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5} CR   LF

10^1 = space if zero 10^{-5}, 10^{-4} and 10^{-3} only with resp.
resolutions 0.00001, 0.0001 and 0.001 in

2.2.2/ 80 column print-out format : provided for letter format printer.

If a header is required, the unit will ask for company name and will then switch to alpha-numerical input mode, as shown below:

```
Factory name
?
  AB   CD   EF
  GH   IJ   KL
  MN   OP   QR
  ST   UVW  XYZ   ALPHA
                  NUM
```
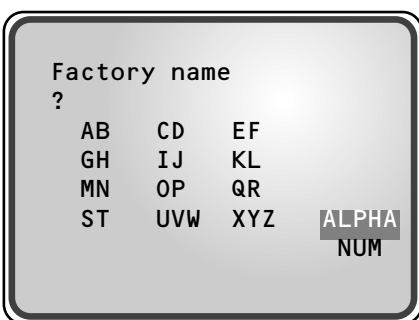
Press ▲ Clear if no company name has to be printed

Otherwise an alpha-numerical name may be entered (using figures & letters up to 20 characters).

The table opposite shows the alphabetic input display. The 12 left-hand keys of the keyboard each now represent 2 or 3 letters. The position of letters on the display correspond: to the position on the keyboard. Pressing once on a key selects the first letter of 2 or 3, pressing a second time on the same key selects the second letter, pressing again selects the first letter again (or the third letter for the last 2 keys) and so on. Another couple of letters may also be selected, until confirmed with the Enter key. Continue to input letters and figures and confirm the word thus entered with Enter .

In the case of an error, press ▲ Clear and restart.

The (* Measure) key allows to switch from numerical to alphabetic input order or reverse.

```
┌─────────────────────────┐
│ ┌─────────────────────┐ │
│ │                     │ │
│ │  Factory name       │ │
│ │  ?                  │ │
│ │   7   8   9         │ │
│ │   4   5   6         │ │
│ │   1   2   3         │ │
│ │   0   .   space ALPHA│ │
│ │                 NUM │ │
│ │                     │ │
│ └─────────────────────┘ │
└─────────────────────────┘
```
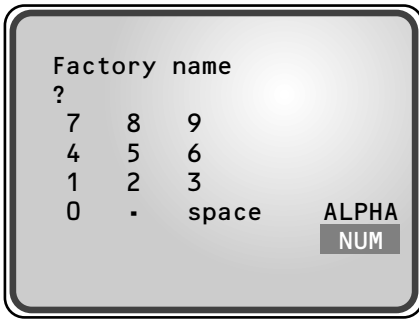
The keys are also represented graphically. It is possible to insert a blank space (…).

Continue inserting different letters and numbers and confirm the word entered by (Enter)

Example: in alpha mode, 1st depression of key 7—> selects letter A, 2nd depression —> selects letter B, 3rd depression —> return to letter A, and so on…Confirm letter with Enter key.

When company name is entered, the unit asks for:

- drawing number

- workstation

- workpiece identification: - at heading
                              - at each printing. This allows each measured workpiece to be identified.
- print-out of the date

If one line of the heading is not filled (question mark instead of word) it will not be printed.

To print header again: press (•Print)   longer than two seconds.

Following pages show printing examples in 80 column format. If tolerances mode is not activated, only the channel number (with min/max indication) and measurement are printed. In tolerance mode, we have the nominal value, upper and lower tolerances, dispersion i.e. difference between nominal value and measurement, out of tolerance value (if there is one), External (E) or Internal (I) measurement indication, and finally if the measurement is within tolerances (=), under (<) or over (>).

a/ Example : print-out with heading, without tolerance indication :

SYLVAC SA

```
Piece ident.    :   SHAFT
Drawing nbr     :   PM230.010.412
Work station    :   L 201

Date :   12/11/1998
```

MEASUREMENT	MEAS. VALUE
1	8.383
1	8.354
1	8.382
1	8.381
1	8.375
1	8.371

b/ Example : print-out of 4 measurements with heading and tolerance indications :

SYLVAC SA

```
Piece ident.    :   SHAFT
Drawing nbr     :   PM230.010.412
Work station    :   L 201

Date : 12/11/1998
```

MEASUREMENT	MEAS.VALUE	NOM.SIZE	UPPER TOL	LOWER TOL	DEVIATION	OUT OF TOL	<=>
1	8.379	8.350	0.020	-0.010	0.029	0.009	E >
2	5.092	5.100	0.000	-0.010	-0.008		E =
3	12.284	12.220	0.050	0.000	0.064	0.014	I >
4	7.004	7.000	0.050	-0.050	0.004		E =

2.2.3/ 40 column print-out format : for smaller printers with paper width of approx. 80 to 120 mm.

Printing time per line may be entered, as small printers often have a limited input buffer.

As for the 80 col. Printer, a header can be added at the start of the printing process. This is carried out as described in the previous section. A new printout of the header can be activated by pressing the PRINT key for two seconds.

a/ Example : print-out with heading and tolerance indication:

```
                    SYLVAC SA
─────────────────────────────────────────
  Piece ident.    : SHAFT
  Drawing nbr     :  PM230.010.412
  Work station    :  L 201

  Date :  12/11/1998

─────────────────────────────────────────

MEASUREMENT   MEAS.VALUE   DEVIATION   OUT OF TOL =
─────────────────────────────────────────

     1         13.421       5.071       5.051 E>
     1         13.369       5.019       4.999 E>
     1         13.405       5.055       5.035 E>
     1         13.393       5.043       5.023 E>
```

b/ Example : print-out of 4 measurements and tolerance indication (heading has not been completely entered) :

```
                    SYLVAC SA
─────────────────────────────────────────
   Piece ident.    : SHAFT

   Date : 12/11/1998

─────────────────────────────────────────


MEASUREMENT    MEAS.VALUE   DEVIATION    OUT OF TOL =
─────────────────────────────────────────

     1           8.385       0.035       0.015  E>
     2           5.098      −0.002              E=
     3          12.235       0.015              I=
     4           7.010       0.010              E=
```

2.2.4/ 15 column print-out format : for small portable, mainly battery powered printers..

As already mentioned, the unit will ask for the printing time of one line. In this case, the input of a heading is not possible.

The values will be printed according to printer defined data format and they include the number of the current measurement. If the tolerance mode is activated, the difference between the nominal size and the actual size will be displayed.

```
1      9.716
2+3    15.434
```

3/ Remote commands (computer controlled) : nearly all functions of the display unit D90 can be controlled by a computer connected to the 232C port according to following basic rules :

- the first 3 letters of functions are used for the remote command. For example, if a measured value is required from the computer, the first 3 letters of Print are transmitted, i.e. PRI.

- any number of spaces can be inserted anywhere, except inside numbers.

- command characters may be in upper or lower case (the latter are ASCII coded).

- On/Off functions like analog scale or tolerances indicators are activated with the first 3 letters of the function, followed by ON or 1. They are disabled with OFF or 0 (= zero and not the letter O).

For example TOL ON displays tolerances indicators, as does TOL 1.

There should be no delay between characters in remote command word.

Words used for remote commands:

ANA0 or ANA OFF	= no analog display.
ANA1 or ANA ON	= displays analog scale.
CHA+ (MEASURE)	= selects the positive measuring direction for the displayed value (arrow showing to the top)
CHA-	= selects the negative measuring direction for the displayed value (arrow showing to the bottom)
CHA3	= selection of measurement 3
CHA-2	= selection of measurement 2 in negative measuring direction
CHA*2	= activates the diameter measuring mode (x 2) of the displayed value
CHA*1	= activates the radius measuring mode
CHA*1.5	= activates the multiplication factor of 1.5 for the displayed measurement
CHA? or CHA PRI	= unit sends the measuring direction and the number of the activated measurement
DIS (DISPLAY)	= displays max. a 20 character message on the first line of the D90. The end of message is given by CR (Carriage Return). This message is cleared by pressing any key on D90 unit or by sending DIS only followed by CR.
EXT 0	= allocates data transmission function to external contact (foot pedal). Refer to Section 1.6.11.
EXT 1	= display hold.
EXT 2	= reset Min/Max registers.
EXT 3	= preset display
EXT 4	= allocates the function of change of measurement
EXT 7	= status transmitted automatically.
EXT 8	= status transmitted on request.
EXT 9	= transmission of values + display hold.
EXT 10	= new Min/Max then transmission of values.
EXT 11	= preset then transmission of values.
EXT 12	= transmission of values + change of measurement
EXT 17	= new Min/Max then hold.

EXT 18	= preset then hold.
EXT 19	= hold function + change of measurement
EXT 24	= new Min/Max (when available), then hold and change of measurement
EXT 25	= new Min/Max, then data transmission and change of measurement
EXT 26	= new Min/Max and change of measurement
EXT 27	= data transmission then hold and change of measurement

EXT ?	= request status of external contact (corresponding to EXT 8): - the unit transmits 0 (zero) if no external contact. - the unit transmits 1 if an external contact has occurred (status is automatically reset to 0).

IDE or ID? (IDENTIFICATION)	= unit identification ⟶ the unit answers with «SYLVAC D90»
VER? (VERSION)	= eprom version and date

KEY0	= keyboard locked.
KEY1	= keyboard unlocked.

MAX	= selects max function.
MIN	= selects min function.
DEL	= selects TIR function (max - min).
MEA	= selects mean function (max + min/2).
CLE	= re-initializes min/max registers when unit is in max, min, TIR or mean modes.
ENT	= displays in succession Max - Min - TIR - Mean... in Min/Max mode.
NOR	= re-establishes normal measuring function.
MOD?	= the unit sends its measuring mode: NOR, MAX, MIN, DEL or MEA.

MEM?	= requests memory configuration of unit. All 5001 parameters are transmitted in one block, without Xon/Xoff protocol, at 9600 bps, 8 bits, no parity.
MEMR	= restores memory configuration of unit, same transmission parameters as above.

MM (MILLIMETER)	= selects metric unit..
IN (INCH)	= selects inch unit.
UM (MICROMETER)	= sets the unit to the range of thousands (µm)
MIL	= sets the unit to the range of mil-inch

OUT 1 (OUTPUT MODE)	= activates the automatic data transmission (each displayed value will be sent to the RS 232C data output) The transmission speed with 9600 baud rate is as follows : in 0.0001 mm/0.000 01 IN = 3 trans. per sec. in 0.001 mm/0.000 1 IN = 7 trans. per sec. in 0.01 mm/0.001 IN = 12 trans. per sec. in 0.1 mm/0.01 IN = 13 trans. per sec.
OUT 0	= disables this mode.

PRE (PRESET)	= displays the stored preset value.
PRE 123.4567	= memorize and display preset value.
PRE ?	= unit sends memorized preset value.

PRI or ? or P (PRINT)	= print out of the displayed value. In scanning mode: output of scanned values.

RES1 (RESOLUTION)		= selects resolution of 0.0001 mm or 0.00001 IN.					
RES2		= selects resolution of 0.001 mm or 0.0001 IN.					
RES3		= selects resolution of 0.01 mm or 0.001 IN.					
RES4		= selects resolution of 0.1 mm or 0.01 IN.					

RST (RESET) = general reset of the unit (return to initial status).

SET ? (SETUP) = the unit displays the basic parameter :

	MM	RES 1	ANA 0	TOL 0	STO 0	KEY 0
or	IN	2	1	1	1	1
OR	UM	3				
OR	MI	4				

Note : STO 0/1 shows if the hold function is active or not.

TOL0 = no display of tolerances indicators.
TOL1 = displays tolerances indicators.
TOL 10.2 0.1 -.05 I = input of nominal size 10.2, upper tolerance 0.1, lower tolerance -0.05 and internal measurement (= I).
TOL? = output of memorized tolerances values: for example 10.000 0.005 -0.003 E.

Errors codes transmitted by the D90 unit:

- ERR 1 = parity error of received message
- ERR 2 = syntax error of received message
- ERR 3 = content of RAM memory lost

Sylvac propose different help programs to be used for computer programming. It is possible to obtain these application possibilities through the site www.sylvac.ch.

Pinout of RS232 connector: refer to Sections 1.8.1.

Various RS232 connection cables are available from Sylvac (refer to Section 1.14).

1.7 Calibration of the display unit D90

1.7.1 General calibration

The D90 units are calibrated at the factory. However if a recalibration is required, proceed as follows:

1/ Attach a P5, P10, P25 or P50 probe to a vertical support.

2/ Select a resolution of 0.0001 mm/0.00001 in.

3/ With the probe in its fully extended contact-free position, reset display to zero (Preset key).

4/ Mechanically position probe under reference base so that readout indicates a measurement:
- for P5, between 0.7 & 0.8 mm
- for P10, between 0.4 & 0.5 mm
- for P25, between 0.8 & 0.9 mm
- for P50, between 1.0 & 1.2 mm

5/ Switch the unit off and on again by pressing the (* Measure) key simultaneously during 4 seconds.

Following menu will be displayed :

```
Last calibration date
             12/10/01
Ref. 0 ?

      0.000 mmm
```
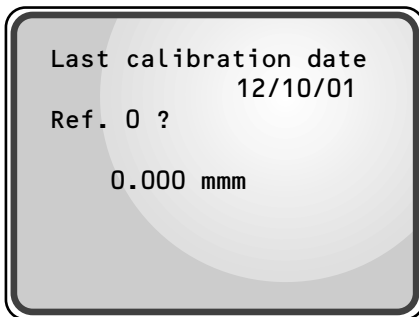
The last calibration date will be displayed

6/ Place probe on reference base (value 0). Press (Enter)

7/ Slide a 5 mm gauge block under the probe insert of a P 5 probe, a 10 mm one under a P 10, a 25 mm one under a P 25 and a 50 mm one under a P 50.

8/ Enter exact value of pad on keyboard: 5, 10, 25 or 50 mm,
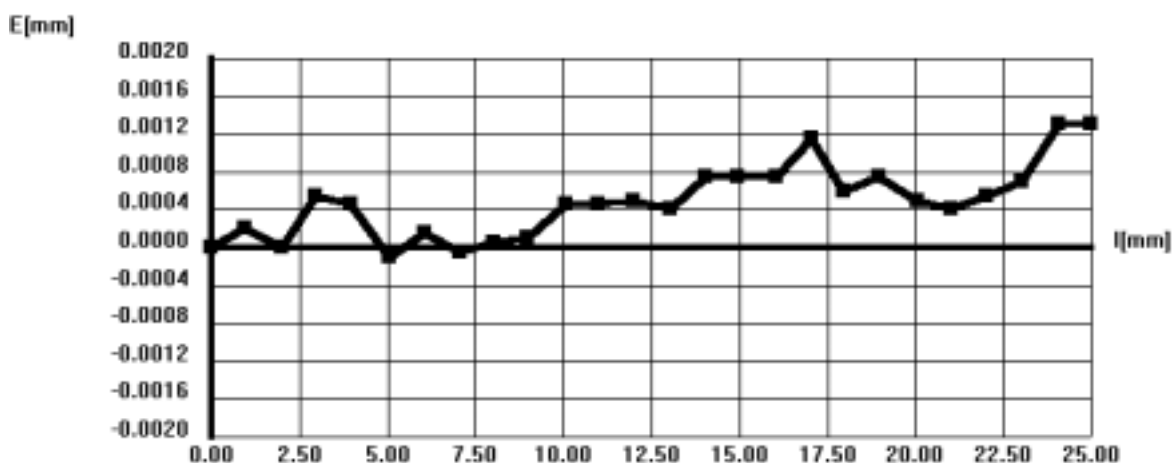
then press (Enter)

The calibration value is automatically stored and can only be deleted by a new calibration (changing lithium module does not effect the calibration).
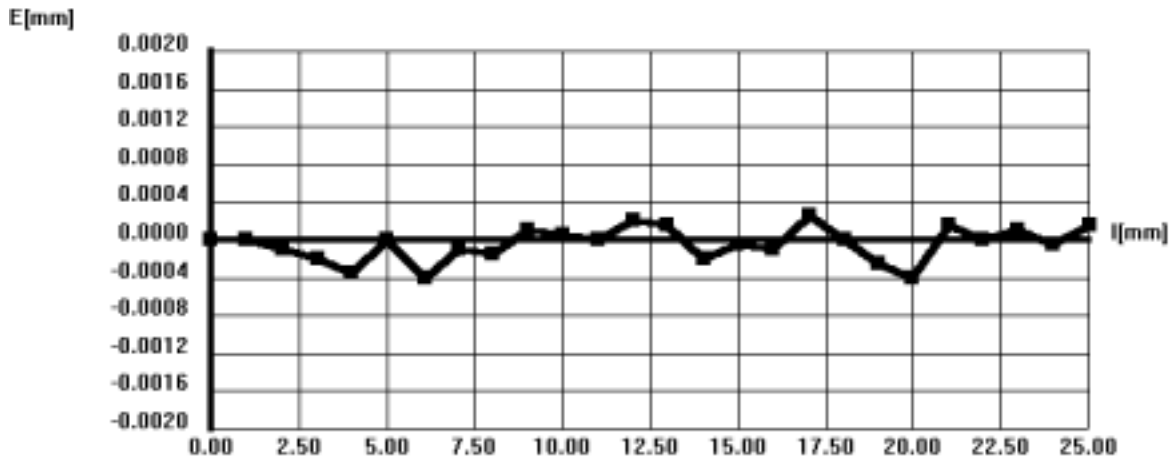
1.7.2 Coupling probe to unit

The user can couple the probe-unit couple and correct from 2 to 25 points linearly.

Example of correction:

1/ Probe P25 with D90 without correction max. error 1.4 µm:

2/ Same instruments, but with correction of 10 points (every 2.5 mm) max. error 0.7 µm:

Introduction of correction: probe out to probe in.

1/ Switch unit D90 off .

2/ Switch the unit on again by pressing the **0 Min Max** key simultaneously during 5 seconds.

3/ If relevant, the date of old correction is displayed.

4/ Insert value of first reference in keyboard, normally 0. In theory, this point is the probe travel stroke, approx. 0.8 mm for a P25. Confirm by pressing **Enter** .

5/ Then enter correction points. Gauge blocks may be used, whose exact value is known. With probe in position on the gauge, insert its exact value on keyboard and confirm by pressing **Enter** .

6/ Continue in same way for all correction points, with 1 point min. and 25 points max.

7/ When the final correction point is reached, e.g. 5, press the **Clear** key and this will exit correction mode (otherwise you will move to the next point).

- Correction is indicated by an E on the display (E for Extended accuracy).
- This value cannot be deleted, even if you restart the unit (Reset).
- If you wish to delete the effect of the multiple correction, briefly press **0 Min Max** when switching the unit on.

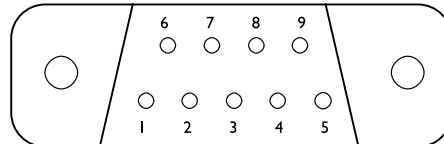- To reconfirm this correction, repeat the same sequence as above.
- The correction is unique for all measurement channels of the D90.

1.8   REAR PANEL

1.8.1   RS-232-C Input/output

9 pin D-sub female connector (external view):

Pin 1:   Charger output **8.5 V/300 mA** non-regulated (current limit protection). Output only with charger connected.
Pin 2:   **RXD** = RS-232-C output when Print key or foot pedal (if configured) is pressed, or by remote command.
Pin 3:   **TXD** = RS-232-C input for remote command from computer.
Pin 4:   **DTR** (Data Terminal Ready): not used.
Pin 5:   **SG** = Signal ground.
Pin 6:   **DSR** (Data Set Ready) = not used.
Pin 7.8:   Unconnected.
Broche 9 : Output of **6 to 8 V / 150 mA** max., non-regulated (protected by power limitation)

To configure the RS-232-C transmission parameters, press **2 SetUp**   puis   **• Print**   (refer to "PRINT key" Section 1.6.12).
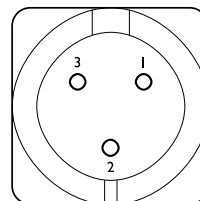
1.8.2   Socket for charging unit

May be connected to either 2 or 3.

Before insertion: ensure socket polarization is at 12 o'clock.

1.8.3   Socket for external contact, e.g. foot pedal

May be connected to either 2 or 3.

The external contact may be configured for different functions, refer to Section 1.6.10.

1- Ground

2- Power input/charger + 8.5 V

3- External contact input (signal = 0 V)

1.8.4   Probe input

Probe input.

For best connection, screw the plug into the socket.

1.9   IN CASE OF PROBLEMS

1.9.1   No display after having switched on the unit

Check whether the contrast has been adjusted correctly : press (2 SetUp) then (Enter) then (2 SetUp) and
then the (Clear) key a little longer.

1.9.2   General Reset (parameter setting) of the unit

In case of problems, or if the operator so wishes, it is possible to completely reset the unit (will not work if keyboard is locked):

1/ switch off the unit (On Off)   2/ press (Clear)

3/ while holding the (Clear) , key down, switch on the unit (On Off)

A Reset clears all previously entered parameter and functions and initialises the unit to the following basic parameters:

- selects the measurement 1, a resolution of 0.0001 mm and the measuring unit in mm
- sets all measurements (1 to 8) in positive measuring direction (ingoing probe insert)
- sets all tolerance and preset values at zero
- configure the external contact for print-out
- selects communication with a computer and the following transmission parameters: 4800 baud, 7 bits/char, even parity and 1 stop bit, CR at the end of the message.

Reset may also be remote controlled by sending the characters 'RST' to the RS232 input.

Memory for twelve configuration saves is not deleted.

1.9.3   Loss of memory content.

If the following message appears on the screen when the unit is switched on:

```
ERR 3

        OUT OF MEMORY
```
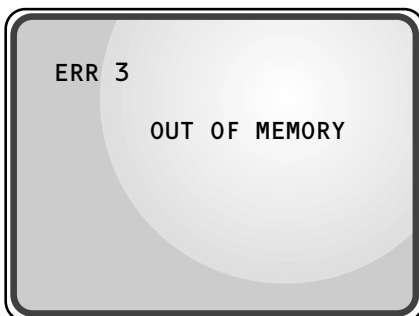
This means that the data back-up lithium module is flat (average life 10 years). It is therefore necessary to change this module as per the instructions in Section 1.10.

1.9.4 Software version

The software version (Software or Firmware) will be displayed as follows :

1/ switch the unit off **On Off**   2/ press **• Print**

3/ keep it pressed when switching on **On Off**

Then any key will return you to normal measuring mode.

1.9.5 Special symbols

Meaning of symbols that may appear on the screen:

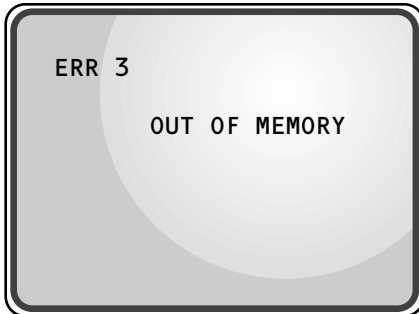**K**   Indicates locked keyboard (to unlock: Enter + On/Off or a long pressure (5 sec.) on any key).

P   Indicates a current RS 232C data transmission

?   Indicates an unacceptable probing action

1.10   REPLACING THE LITHIUM MODULE

If the following message appears on the screen when the unit is switched on:

ERR 3

OUT OF MEMORY

This means that the data back-up lithium module is flat (average life 10 years). It is possible to use unit D90 with a "flat" lithium module, but all parameters and functions entered by the operator will be lost each time the unit is switched off.

The module is replaced as follows.

  - After obtaining a new lithium module from your Sylvac representative place the unit on a table and remove the 4 retaining screws of the cover.

  - Touch a water pipe or other object connected to ground to release any static build-up (the inside of the unit is sensitive to electrostatic discharges).

  - Remove yellow cover.

  - Remove lithium module with a screwdriver:
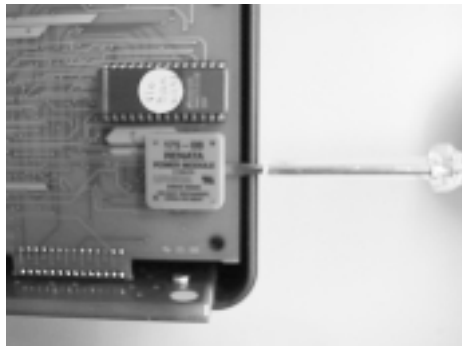
- Insert new lithium module, replace cover and replace the 4 cover retaining screws.

- When the unit is switched on again, the memory contents lost message will appear once more.

1.11   TECHNICAL SPECIFICATIONS

Enclosure:	in terblend plastic (= ASA + polycarbonate): - resistant to alcohol, glycols, most oils and greases, diluted acids and water. - non-resistant to aromatic hydrocarbons, esters, ethers, ketones, concentrated mineral acids, ammonia gas and its dilutions.
	Polyester front panel.
	Aluminum varnish rear panel.
Keyboard :	Silicon and epoxy protection
Dimensions:	Width 227 mm, depth 132 mm, height 77 mm without stand (87 mm with stand).
The stand is adjustable:	vertical or inclined at 13°. A complementary base (supplied with the unit) allows an inclination of 35°.
Degree of IP protection :	IP 40 (according to IEC 529 directions)
Weight of the unit :	0.8 kg (1.7 lbs)

Accuracy of measurement for D90 + probes: interchangeability of probes and unit guaranteed as follows:

Probe type	D90 error	Probe error	Mean error
P5	1.0 µm	2.0 µm	2.2 µm
P10	1.2 µm	1.0 µm	1.6 µm
P25	1.5 µm	1.5 µm	2.1 µm
P50	3 µm	4 µm	5 µm

Repeatability (+/- 2s):	- for P5: 0.3 µm - for P10: 0.2 µm - for P25: 0.2 µm - for P50: 0.4 µm
Operating temperature:	between + 5° and + 40°C
Storage temperature:	between -20° and + 45°C

Measuring frequency:

	probe in	probe out
- for P10	between 170 and	205 measurements per sec.
- for P25/P50	between 130 and	205 measurements per sec.

The value measured is filtered digitally for the display, according to the resolution:

- 0.0001 mm or 0.00001 in:	approx. 3 readouts per sec. (= 3 analog outputs per sec.)
- 0.001 mm or 0.0001 in :	approx. 5 readouts per sec.
- 0.01 mm or 0.001 in :	approx. 12 readouts per sec.
- 0.1 mm or 0.01 in :	approx. 15 readouts per sec.

In Min/Max mode there is no filtering and thus maximum conversion speed is obtained.

Display:	LCD, STN type (Super Twisted Nematics) graphics 128 X 64 dots.Viewing area 66 X 33 mm. CCFL backlighting.

Output :	RS 232C for connection to a printer or computer
Input :	- 1 external contact, e.g. foot pedal - RS 232C for remote control using a computer
Charger:	- country specific, supplied in one of the following 4 types: - European standard plug 230V +/- 10 % 50-60 Hz - US standard plug 120V +/- 10 % 50-60 Hz or for Japan: 100 V +/- 10 % 50-60 Hz - UK standard plug 240V +/- 10 % 50-60 Hz For all 4 models: output 8.5 V/700 mA or 1100 mA
Data back-up:	Lithium module 3 V 175 mAh Renata type 175-OB. Lifetime approx. 10 years.

1.12 DELIVERY

Synthetic material packaging includes:

Packaging in synthetic material		Order No
- D90 unit (with accumulator)		904.1090
- 1 charger	European 230 V	904.4010
	UK 240 V	904.4011
	US 120 V	904.4012
	Japanese 100 V	904.4013

- 1 base (to increase incline)

- 1 instruction manual

1.13 ACCESSORIES

		Order No
- Foot pedal for external contact		904.4101
- Sylvac SP2 printer		926.1808
- PC AT computer (Dsub 9p cable socket), 3m length		925.5609
- same as above but length 2m		925.5608
Adapters	- 9M/25M adapter for computers with 25 pin female connector	925.5626
	- 9M/9M adapter for computer with 9 pin female connector	925.5627
- Lithium module		331.005

2 SYLVAC PROBES P5, P10, P25 AND P50

2.1 GENERAL DESCRIPTION

Sylvac long travel probes are of compact design and are distinctive by their stability and consistent measuring accuracy. In addition they are absolute, i.e. having been disconnected then connected again or after switching off the unit, they still display the same measuring value. They have no speed limit, so that they never lose their absolute value.

The built-in preamplifier allows the use of long cables without intermediate amplification. The probe is not affected by magnetic fields.

P5 (L) : probe with effective measuring range of 5 mm. L indicates right-angled output cable.

P5 (L) V: as above, but intended for vacuum lifting.

P10   : probe with effective measuring range of 10 mm

P10 L : as above but with output cable at a right angle
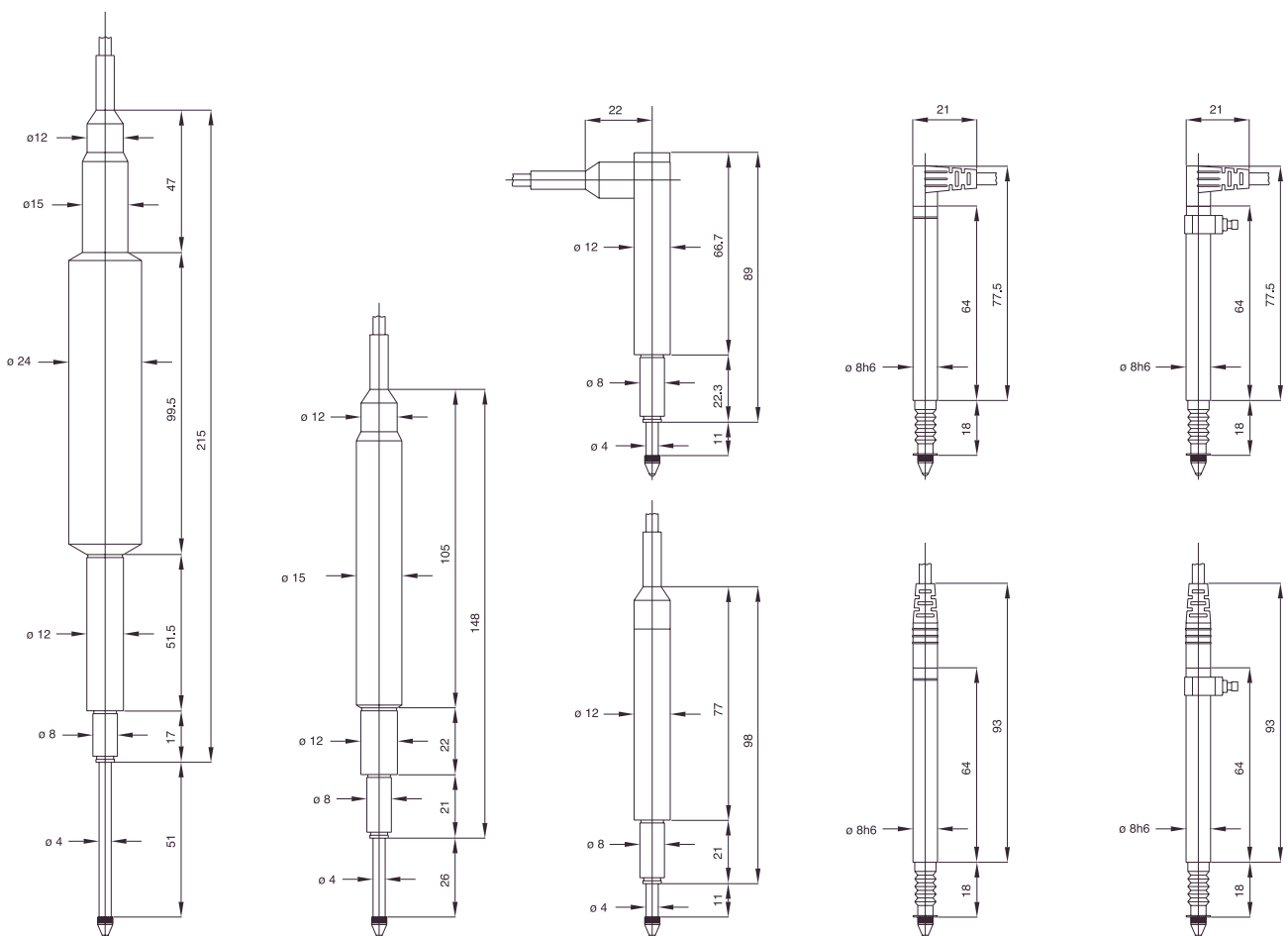
P25   : effective measuring range 25 mm

P50   : effective measuring range 50 mm

Different lifting methods are available for the various probes:
- by photocable
- by foot pedal and cable
- by pneumatic lifter and pneumatic foot pedal
- Vacuum retractor only for P5 and vacuum foot pedal

4.2 PROBE DIMENSIONS

2.3 USE

2.3.1 Precautions

- To ensure optimum measurement precision avoid all lateral pressure when presenting the probe contact to the object to be measured. Ideally, a mechanical retracting lifter should be used.

- Carefully clamp the fixing bearing of the probe in the holder. Fixing too tight can influence the measurement.

- Avoid any impact on the probe spindle.

2.3.2 Changing the contact point

The probe spindle has an ISO M 2.5 thread in the end allowing replacement of the contact points. When changing the contact point, the probe spindle should be in the outermost position.

2.4 MAINTENANCE

This has been reduced to a simple operation. When the measuring spindle no longer slides with complete ease and precision, clean it with a dust free cloth and lightly lubricate with a fine oil.

2.4.1 Replacing the connection cable, for P10, P25 and P50
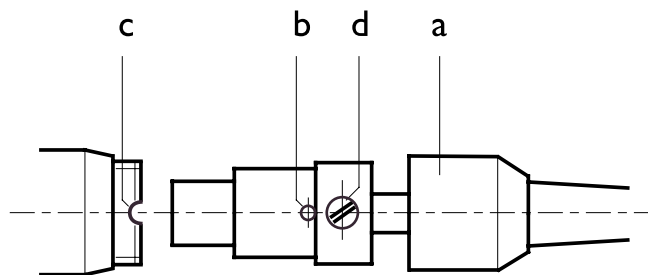
- unscrew the cap (a)

- pull out the cable

- plug in the new cable, locate the pin (b) of the cable sleeve (d) in the slot (c)

- screw on the cap (a)

Notes: - use connection cable for the corresponding probe (P10-P25-P50).

               - for the P5 model: the cable is connected to the probe by means of a sealed connector.

2.5 TECHNICAL SPECIFICATIONS

SPECIFICATIONS	CODE NUMBERS			
	P5(L) / P5(L) V	P10 / P10L	P25	P50
Construction	Plunger gage	Plunger gage	Plunger gage	Plunger gage
Type of bearing for measuring plunger	Friction bearing	Friction bearing	Friction bearing	Friction bearing
Moving mass (without measuring contact)	3.2 g / 0.11 oz	3.2 g / 0.11 oz	8.7 g / 0.31 oz	14.6 g / 0.51 oz
LINEAR MEASURING RANGE	5 mm / 0.2''	10 mm / 0.44''	25 mm / 1''	50 mm / 2''
Total range	6.5 mm / 0.26''	10.8 mm / 0.43''	25.8 mm / 1.02''	52..2 mm / 2.06''

Limit of travel
  - upper stop
  - lower stop
	5.7 mm / 0.22''
	0.7 - 0.8 mm
		10.4 mm / 0.41''
		0.4 - 0.5 mm
			25.8 mm / 1.02''
			0.8 - 0.9 mm
				51 mm / 2.01''
				1.0 - 1.2 mm

Accuracy over the measuring range	2 um / 0.00008''	1 um /0.00004''	1.5 um / 0.00006''	4 um / 0.00016

Measuring force
  - without pressure
  - low pressure
  - high pressure
(Tolerance +/- 15%)
	0.45-0.65 N
	-
	0.3 - 0.5 N
	0.75 - 1.05 N
		0.6 - 0.9 N
		0.1 N
		0.2 - 0.4 N
		0.8 - 1.8 N
			0.6 - 1.2 N
			0.15 N
			0.2 - 0.4 N
			0.8 - 1.8 N
				0.6 - 1.4 N
				-
				-
				-

Increase of measuring force	0.04 N/mm	0.03 N/mm	0.024 N/mm	0.016 N/mm
Permissible lateral force	0.7 N	0.6 N	0.3 N	0.25 N
Repetability	0.3 um/0.000012''	0.2 um/0.000008''	0.2 um/0.000008''	0.4 um/0.000016''
Zero drift	0.01 um/deg. Cmm	0.01 um/deg.Cmm	0.01 um/deg.Cmm	0.01 um/deg.Cmm
Protection according to IEC529 - with rubber boot	- IP64	IP40 IP50	IP40 IP50	IP40 IP50
Lifting lever	Vacuum	Pneumatic lifter	Pneumatic lifter	Pneumatic lifter
Temperature range	0 - 50 deg. C			
Cable length	1 m 50 / 59''			
Extension cables	up to 20 m / 787''			
Direct cable special length	up to 20 m / 787''			
Interchangeable measuring contact	M 2.5			

Accuracy using extension cables:

These measuring errors are applicable only when using D90 unit without recalibration:

| Normal cable + extension	up to 5 m	: additional error	1.5 μm approx.
Normal cable + extension	up to 10 m	: additional error	3 μm approx.
Normal cable + extension	up to 15 m	: additional error	6 μm approx.
Normal cable + extension	up to 25 m	: additional error	8 μm approx.
Direct cable	up to 5 m	: additional error	3 μm approx.
Direct cable	up to 10 m	: additional error	6 μm approx.
Direct cable	up to 15 m	: additional error	10 μm approx.

This is a progressive error margin and recalibration of D90 unit can considerably reduce the error.

2.6 ACCESSORIES

Standard measuring tip with 2 mm diameter ball (supplied with each probe)
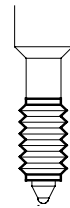
Order No: 905.2204
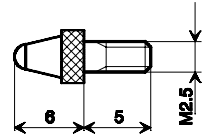
Ordinary comparator tips, with standard M2.5 thread, may be attached to Sylvac probes.

Rubber boot set for P10 and P10L   Order No 901.2003

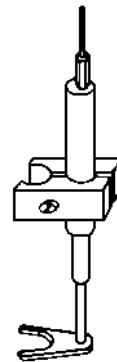Rubber boot set for P25 (19 mm travel)   Order No 901.2004

Lever with photocable, for P, P10 and P25 probes: Order No 901.2005

For P50 probe   Order No 901.2006

Pneumatic lifting jack:

- for P10 and P25 probes, mounted on 12 mm diameter. Lifting stroke 30 mm

Order No 901.2010

- for P50 probes (dimensions in brackets). Lifting stroke 55 mm

Order No 901.2011

Input pressure is 2 to 3 bar (dry, filtered air). The jack does not affect the probe's measuring pressure. The unit is fully sealed and requires no maintenance.

$C\,E$