sylvac

DIGITAL INDICATOR WITH PLC CONNECTOR !

The digital indicator **S_Dial** PLC : full of Swiss technology, with special connector allowing direct connection to most of PLC.



S_Dial PLC

- **Max. error 4µm for 12.5mm**
- Resolution 0.01/0.001mm
- **Low measuring force**
- Powered by PLC (9...24VDC)
- **With PLC connector & RS485, RS232/USB Proximity**
- Clamping diameter 8h6 mm

IP67

SWISS MADE

sylvac



TECHNICAL SPECIFICATIONS

Specifications	805.7301	805.7201	805.7501	805.7401
Measuring range	12.5mm	12.5mm	25mm	25mm
Resolution	0.001	0.01	0.001	0.01
Max error fe (0.001mm)	4µm	10µm	5µm	10µm
Repeatability	2µm			
Nb measuring/sec	100/s			
Connection	PLC cable, RS485 compatible, RS232/USB Proximity			
Data bus	RS485 compatible, charge 1/256 (Protocole MODBUS, ASCII or ORBIT)			
Measuring force	0.65-0.9N		0.65-1.15N	
IP rating	IP67	IP54	IP67	IP54
Clamping	Ø8h6, interchangeable anvil probe M2.5			
Standard functions	Measurement direction, favourite function, multiplier, preset, Min/Max/Delta, change of resolution			



PLC DIAL GAUGE **E**

COMPARATEUR PLC **F**

PLC MESSUHR **D**

INSTRUCTIONS

MODE D'EMPLOI

BEDIENUNGSANLEITUNG

E

Introduction

Using its digital outputs the PLC comparator supplies a high performance measurement tolerance judgment to an external automatic controller(good part, rework or scrap). Two configurable digital inputs permit the instrument to be reinitialised for a new measurement. Tolerances and other measurement parameters can be configured directly with the instrument buttons. A USB/RS232 (Proximity) connection and a field bus connection (MODBUS / ASCII / ORBIT) allow direct dialogue with the automatic controller or with another data acquisition application (SPC).

1 . Operating features of the instrument

- MODE The instrument has two operating modes: basic functions (direct access) and advanced functions. In addition to the configuration functions, 2 working reference functions can be accessed, in MIN, MAX and DELTA (TIR) mode, plus tolerance dispay or input of multiplication factor other than 1:1 (see chaps. 3 and 4)

- The «favourite» key gives direct access to the function used most often (see chap. 6)

- SET Sets a Preset value, resets the MIN/MAX mode, verifies a selection, and controls switching off the instrument.

- Personalising the functions

It is possible to activate or de-activate certain functions of the instrument via RS232 (see chap. 9)

- Data transmission parameters (RS-232 port, default values)

4800Bds, 7 bits, even parity, 2 stop bits

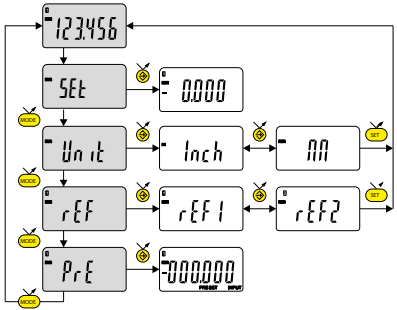
Data transmission parameters (RS-485 port, default values)

128'000Bds, 8 bits, even parity, 1 stop bit

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2. Basic functions

Each short press on MODE gives direct access to the basic functions :



.....Normal mode: Zero setting

.....Units selection (mm or Inch)

.....Choice of reference (REF1 ou REF2)

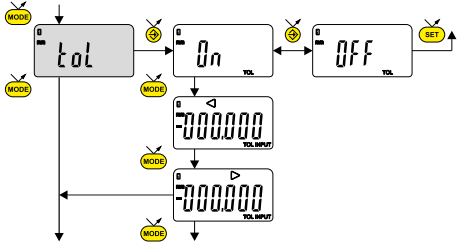
.....Inputting a Preset value

next digit SET 0...9 MODE save PRESET

Note : It is possible to assign a different preset value to each of the 2 References. Similarly, different tolerance limits can be assigned to References 1 and 2.

4. Inputting tolerance limits

To input or modify the tolerance limits, tol → On mode should be selected, followed by a short press on MODE :



.....Input the lower tolerance limit ◁

.....Input the upper tolerance limit ▷

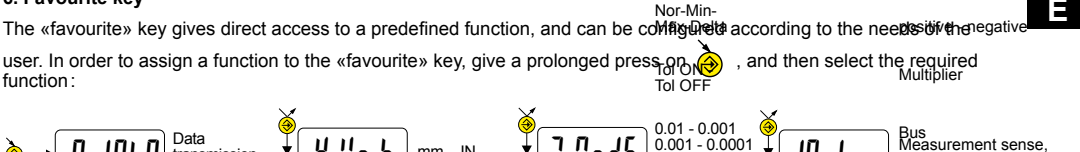
next digit SET 0...9 MODE save Tolerances

Note :

- For measuring internal dimensions, the red and yellow indicators can be switched over by reversing the order in which the tolerance limits are input (lower limit > upper limit).
- It is possible to input different tolerances on REF1 and REF2.

6. Favourite key

The «favourite» key gives direct access to a predefined function, and can be configured according to the needs of the user. In order to assign a function to the «favourite» key, give a prolonged press on , and then select the required function:



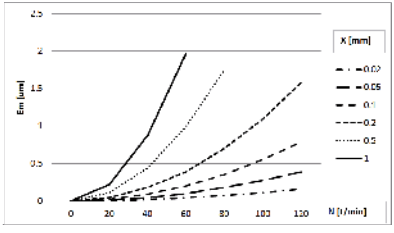
Validation of selection: By a prolonged press on or a short press on SET or MODE

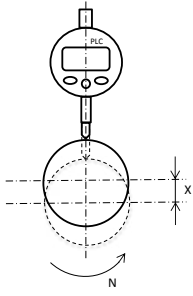
Note: a function can also be assigned via RS232 using the command <FCT + Function No.>
example: Change of Unit = **<FCT4>**

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7. Dynamic measurements

The PLC comparator executes 100 measurements / sec.
The maximum cosine error Em of an eccentric cylinder, calculated over one rotation, is given in the graph below.





8. Re-initialising the instrument

The initial instrument settings can be restored at any time by a prolonged press (>4 sec) simultaneously on MODE and SET until the message rESEt is displayed.

9. Personalising the instrument

Access to the functions of your instrument can be personalised, for more information see manufacturer's website (requires you to connect your instrument via a Proximity cable (RS or USB).

Possibilities:

- De-activate or active the required functions
- Modify access to the advanced functions (direct access)

10. Connecting the instrument

The instrument can be connected to a peripheral via a Proximity cable (RS232 or USB), or via one of the RS485 buses.

10.1 RS-232 or USB connection

Measured values can be transmitted and the instrument driven using predefined commands (see chap. 12 for a list of the main retro-commands)

Note:

The result of the toleranced measurement is added to the position measurement (remote command?) in the form of a symbol.
= : the value is within the tolerances
< : The value is too small
> : The value is too large

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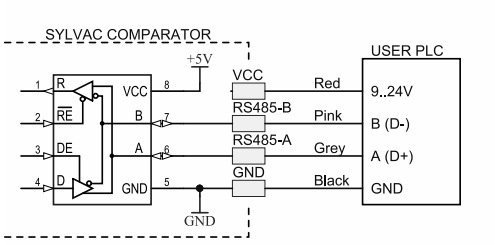
10.2 RS-485 databus

The instrument can be connected to a field bus, via the link cable. See page 2 for connection of the cables.
The data exchange between a master and the slave PLC comparator(s) is defined by a protocol (MODBUS by default). See the table of transactions and variable addresses in the appendix.

Important note : The RS-485 lines are not galvanically isolated from the Power Supply. The reference Ground of the RS-485 Master must be tied to the Ground of the Power Supply

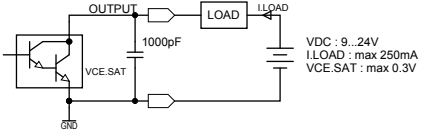
10.3 Field bus address configuration

The comparators do not have pre-defined addresses. They therefore do not reply to any bus request. Before being able to dialogue with a comparator it must be configured with a unique bus address. Configuration can be done either by SLA remote command, or by the SLA menu. Assigning a zero address causes deconfiguration of the comparator.



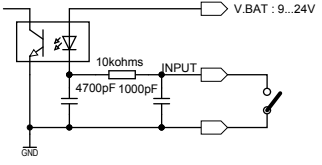
10.4 Digital outputs

3 digital outputs permit a decision on the current measurement (outside upper tolerance, outside lower tolerance, between the 2 tolerances). The activation delay for the outputs is a maximum of 25 ms after the measurement.
Type of outputs: Inactive -> open circuit. Active -> closed circuit to GND.



10.5 Digital inputs

1 digital input permits Preset/Zero recall.
1 digital input permits execution of the Favourite button function. Factory configuration: data transmission.
The duration of the input pulse is a minimum of 40 ms
Input type: Without supply (activation by closure to GND).



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11. List of the main commands

Selection and configuration

CHA+ / CHA-	Change measurement direction
FCT0 ...9...A...F	Assign «favourite» function
MM / IN	Change measurement unit
KEY0 / KEY1	Lock / unlock keypad
MUL [+/-]xxx.xxxx	Modify multiplication factor
PRE [+/-]xxx.xxx	Modify preset value
REF1 / REF2	Change active reference
STO1 / STO0	Activate / de-activate HOLD
TOL1 / TOL0	Activate / de-activate tolerances
LCAL dd.mm.yy	Modify last calibration date
NCAL dd.mm.yy	Modify next calibration date
NUM xxxxxxxxxx	Modify the instrument number
TOL +/-xxx.xxx +/-yyy.yyy	Inputting tolerance limits
RS232 baud, N, P, S [CRLF]	RS-232 port parameter selection
RS485 baud, N, P, S [CRLF]	RS-485 port parameter selection
BUS MODBUS/ASCII/ORBIT	Protocol selection
SLA aaa	MODBUS address selection
MIN /MAX /DEL /NOR	Selecting MIN, MAX, Delta, Normal mode
CLE	Re-initialisation of MIN, MAX or Delta
UNI1 / UNI0	Activate / de-activate change of units
OUT1 /OUT0	Activate / de-activate contin. data transmission
PRE ON / PRE OFF	Activate / de-activate Preset function
PRE	Recall Preset
SET	Zero reset
RES2 / RES3	Change of resolution

Interrogation

CHA?	Measurement sense?
FCT?	«favourite» function active?
UNI?	Measurement unit active?
KEY?	Keypad locked?
MUL?	Multiplication factor?
PRE?	Preset value?
REF?	Reference active?
STO?	Status of HOLD function?
TOL?	Current tolerance limit values?
LCAL?	Date of last calibration?
NCAL?	Date of next calibration?
NUM?	Instrument number ?
?	Current value (mode Tol, value followed by <=>)
RS232?	RS-232 port parameter?
RS485?	RS-485 port parameter?
BUS?	RS-485 bus protocol?
SLA?	MODBUS address?
MOD?	Active mode (MIN, MAX, Delta or Normal)?
SET?	Main instrument parameters?
ID?	Instrument identification code?

Maintenance functions

OFF	Switch-off (wake up using a button or RS)
RST	Re-initialisation of the instrument
VER?	Version No. and date of firmware

A. Annexe MODBUS Protocol

Default RS485 configuration for Modbus protocol :

128’000bauds

8 bits

Even parity

1 stop

D

A.1 Modbus transactions

The master issues a Query Modbus frame on the bus. The addressed salve answers (except for broadcast requests) with a Response Modbus frame. The salve answer can be a correct answer or an Exception in case of error.

For better data throughput, Sylvac modules always use the RTU transmission mode. For more details on Modbus protocol, refer to the MODBUS Application Protocol.

http://www.modbus.org/docs/PI_MBUS_300.pdf

A.3. Adresses of the Modbus variables

The access to the addressed variables is possible through the functions 1..6, 15, 16. Function 7 allows a fast access to know if there is a new data sensor position.

Note: In the following description, all adresses of variables are given in decimal, not in hexadecimal.

Two independent memory areas containing 10,000 addresses are overwritten for bit access or word access. Access to an address not defined by Sylvac returns an error. All the addresses are between 0 and 9999.

Access to a variable may be:

- Read and write (R/W)
- Read only (RO)
- Write only (WO)
- R/W* indicates that a variable can be read but always returns 0.
- RO∆ indicates that the value can only be read once (reading causes the variable to be reset to zero)

Access to a sensor position variable while the sensor is in error returns the code -1 (not a number, NAN in the usual IEEE754 float format).

A.3.1 Adress of the Modbus bit variables (function codes 01, 02, 05, 15)

Function	Address (decimal)	Nb of bits	Access type	Comment
Freezes the measurement	0000	1	R/W	0 to release
Min., max. and delta reset to zero	0001	1	R/W*	
Preset recall	0002	1	R/W*	
Preset recall on min value	0003	1	R/W*	
Preset recall on max value	0004	1	R/W*	
Measurement in inches	0065	1	R/W	0 for measurement in mm
Negative measurement direction	0067	1	R/W	0 for positive direction

Function	Address (decimal)	Nb of bits	Access type	Comment
Activated tolerances	0068	1	R/W	0 for disabled tolerances
Active diameter mode	0070	1	R/W	0 for inactive diameter mode
Low resolution	0071	1	R/W	0 for low resolution
2nd reference	0075	1	R/W	0 for 1st reference
Mult Factor activation	0076	1	R/W	0 for inactive (forced to 1.0)
Keys locked	0077	1	R/W	0 to lock the Keys
Auto OFF	0078	1	R/W	0 to disable Auto OFF
User reset	9024	1	R/W*	
Factory reset	9025	1	R/W*	
Configuration procedure starts (see Modbus address configuration)	9536	1	R/W	0 to end the configuration procedure

A.3.2 Adresses of the Modbus word variables (function codes 03, 04, 06, 16)

F32 means a Float value coded according to IEEE754.

Function	Address (decimal)	Nb of bits	Access type	Comment
Instrument position	0002	32	RO	In 1/10th of µm
Information bits 1	0004	8+8	8RW+8RO	Bit 0: Frozen measurement Bit 1: Reset min/max/delta to 0 Bit 2: Preset recall Other bits reserved for future use
Information bits 2	0005	16	RO	Bit 0: Inch unit Bit 1: Negative direction Bit 2: - Bit 3: resolution Bit 4: Bit 5: - Bit 6: Min. mode Bit 7: Max. mode Bit 8: Delta mode Bit 9: Frozen measurement Bit 10: Tolerances Other bits reserved for future use

A.3.3 Frame example

To read the current position of an instrument whose slave address is 03, send it the following frame :

03 04 00 02 00 02 CRC16, where

03 : The SLAVE address of instrument

04 : The Read n Register command

00 02 : The address of the 1st register to be read

00 02 : The number of registers to read

The answer will be :

03 04 04 xx xx xx xx CRC16, where

03 : The SLAVE address of instrument

04 : The Read n Register command

04 : The number of read data bytes

xx xx xx xx : The 4 read bytes

B.2 Frame description

Command frame format

Address field (3..5 bytes)	Command field (any number of bytes)	End of Frame (1 byte)

Where :

Address field : The slave number (1...247, 0=reserved for broadcast)
Format : #NNN# (NNN=1..3 ascii digits)

Note : if address field is fully omitted, the slave assumes it is the only one on the bus. If its own address is 0, it also answers without any address field, allowing a dialog compatible with Proximity commands, but on the RS485 bus. An answer is send on the bus in response to a bus request (not from keyboard, digital inputs or proximity).

Command field : Same as RS232-Proximity commands (see chapter 11)
End of Frame : Ascii CR (0x0D) or CRLF (0x0D, 0X0A)

Answer format

Address field (3..5 bytes)	Response field (any number of bytes)	End of Frame (1 byte)

Where :

Address field :	The slave number (same as Command)
Response field :	Same as RS232-Proximity answers (see chapter 12)
End of Frame :	Ascii CR (0x0D) or CRLF (0x0D, 0X0A)

C. Annexe ORBIT Protocol

Default RS485 configuration for Orbit protocol:
187'500 bauds
8 data bits
Odd parity
1 stop bit

C.1 ORBIT Transactions

The master issues an Orbit command frame on the bus. The addressed slave may or may not answer, depending of the command. For further details about the Orbit protocol, refer to the Solartron© ORBIT Protocol.

C.2 ORBIT Frames description

Command frame format

Break	Function code (1 byte)	Address field (1 byte)	Data (0..n bytes)

Break : The break condition of RS485 line (at least 11 bits @ 0)
Function code : See following table for supported Orbit functions

Address field : The slave number (ASCII 1..247, 0 = reserved for broadcast)
Data : 0..n bytes

Normal response frame format

Function code (1 byte)	Data (n bytes)

Exception response frame format

"!" (ASCII 0x21)	Exception code (1 byte)

Broadcast answer frame format
If the master issues a broadcast command, it doesn't expect an answer. The only exception is the Notify command "N" (see next page).

Example of PLC answer

Commands (ascii byte)	Parameters	Exemple	Explanation
“B”	4-bytes-module-type 2-bytes-hardware-type 2-bytes-resol 32-bytes-info	“LE25” 0x0001 0x0064 “V102P[-xx] 01.02.16” “MMR3D+D0F1”	Linear Encoder 25mm type 1 In nm x 10 -> 100 x 0.01um = 1um Firmware version[-options] date 2 characters for each of up to 7 options MM or IN or MO or IO (mm/inch or only) R2 or R3 or R_ (0.001um/0.1um/no resol) D+ or D- or D_ (Direction +/-/ no dir) D0 or D1 or D_ (Radius/Diameter/no diam) F1 or F2 or F_ (Reference 1/2/no ref)
“G”	1-byte-error 2-bytes-status		See Exceptions codes for 1-byte-error See Status codes for 2-bytes-status
“I”	10-bytes-ID 12-bytes-dev-type 5-bytes-version 2-bytes-stroke	“9#L1” “yywwnn” “SYL289-LE095” “102P ” 0x0019	Sylvac instrument Year week number Sylvac PM289-Linear Encoder type .950 Firmware version Stroke in mm (or inch)
“L”	“L” 4-byte-probe-position	Returns a 32 bits float value expressed in um	Returns 0x7FFFFFFF in case of sensor error
“N”	10-bytes-ID	“9#L1” “yywwnn”	Sylvac instrument Year week number (the instrument sends its ID only if probe has moved more than 1mm)

CERTIFICATE OF CONFORMITY
We certify that this instrument has been manufactured in accordance with our Quality Standard and tested with reference to masters of certified traceability by the National Office of Metrology.

CERTIFICAT DE CONFORMITE
Nous certifions que cet instrument a été fabriqué et contrôlé selon nos normes de qualité et en référence avec des étalons dont la traçabilité est reconnue par l'office national de métrologie.

QUALITÄTSZEUGNIS
Wir bestätigen, dass dieses Gerät gemäss unseren internen Qualitätsnormen hergestellt wurde und mittels Normalen mit anerkannter Rückverfolgbarkeit, kalibriert durch das Nationalamt für Metrologie, geprüft worden ist.

CERTIFICATO DI CONFORMITÀ
Con il presente si certifica che questo strumento è stato prodotto secondo il nostro standard sulla qualità e controllato rispetto a campioni di riferibilità riconosciuta dall'ufficio nazionale di metrologia

CERTIFICADO DE CONFORMIDAD
Certificamos que este instrumento ha sido fabricado conforme a nuestras normas de calidad y ha sido controlado en relación con patrónes de trazabilidad reconocida por la oficina nacional de metrología.

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EU DECLARATION OF CONFORMITY (DoC)

We, Sylvac SA, hereby declare under our sole responsibility that the product

Name	S_Dial WORK PLC
Description	Digital Indicator PLC
Part Numbers	805.7201, 805.7301, 805.7401, 805.7501

has been submitted to a conformity assessment and fulfils the essential requirements of the following European directives

2001/95/EC	General product safety
2014/30/EU	EMC
2011/65/EU & 2015/863/EU	RoHS

and complies with the following harmonized standards or other normative documents

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Person authorized to compile the technical file and issue the declaration of conformity: Eric Schnyder

Place and date of issue	Yverdon-Les-Bains, September 12, 2019
Name (position)	Eric Schnyder (CEO)
Signature	

