M 92B LOGGERS OF PHYSICAL QUANTITIES, EVENTS, TIME INTERVALS

In the DIRECTIVE 2006/42/CE, relating to MACHINERY, in the ANNEX I, point 1.6 MAINTENANCE, 1.6.1 Maintenance of machinery, it is stated that: “For automated machines and, where applicable, for other machines, a connection device, which allows the mounting of a FAILURE DETECTOR, must be provided”. On the basis of this statement, the family M 92B X-Y of LOGGERS OF PHYSICAL QUANTITIES (V / I / T ...), OF EVENTS (SET POINT OVERCOMINGS (I / T ...) AND OF TIME INTERVALS (TOTAL WORKING TIME ....) was created. The family M 92B….. is made up of 10 devices, 5 basic models and 5 models that have the possibility to download the logged data via MODBUS. The data are also visible on the front of the devices through 2 sets of 14 + 14 (green and red) leds. The devices are mounted in an electrical PANEL and connected using MALE/FEMALE connectors to facilitate the removal and the analysis of the logged data in a suitable environment. The use of LOGGERS will provide DATA on the operation of an automatic system (e.g., an electric MOTOR for LIFTING of LOADS, for PUMPS, for SUBMERSIBLE PUMPS, etc..). This will allow to understand the "HISTORY" of the automatic system and to obtain the REMOTE DIAGNOSIS useful to know if a PREVENTIVE INTERVENTION is necessary and thus to reduce downtimes.

TAB. A

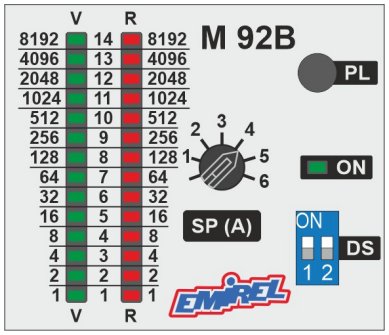
CODE	INPUT QUANTITIES	POWER SUPPLY	CONTROLS	MODB. READ.	GREEN COLUMN	RED COLUMN	2-WAY DIP SW.
M 92B-V-MB	THREE-PHASE V. 100/600V	24 VAC/DC PINS 8-9 3-PHASE V.	COUNTING OF MOTOR STARTS/HOUR with V	YES	It indicates the address of the CELLS P1÷P14	It indicates the VALUE of the content of the CELL Pi that has the address displayed by the GREEN COLUMN.	10
			TOTAL MOTOR WORKING TIME (TTL)		TOTAL NUMBER OF ALL STARTS	TOTAL WORKING TIME, it displays the value contained in the CELL dedicated to the TTL.	00-11
			VOLTAGE VALUES IN 10 INTERVALS V1÷V10		It indicates the address of the CELLS V1÷V10	The content of the CELL Vi addressed by the GREEN COLUMN is displayed.	01
M 92B-V	“	“	“	NO	“	“	“
M 92B-I-MB	MOTOR CURRENT (FS=5A)	24 VDC/AC PINS 8-9	COUNTING OF MOTOR STARTS/HOUR with I	YES	It indicates the address of the CELLS P1÷P14	It indicates the VALUE of the content of the CELL Pi that has the address displayed in the GREEN COLUMN.	10
			TOTAL MOTOR WORKING TIME (TTL) DURATION (IN HOURS)		TOTAL NUMBER OF STARTS	TOTAL WORKING TIME, it displays the value contained in the CELL dedicated to the TTL.	00-11
			OVERCOMINGS NUMBER AND DURATION OF OVERCOMING OF THE SET POINT 20%÷120% SET (FS=5A)		It indicates the address of the CELLS A1÷A14	The content of the CELL Ai addressed by the GREEN COLUMN is displayed.	01
M 92B-I	“	“	“	NO	“	“	“
M 92B-CP-MB	VOLTAGE-FREE CONTACTS C1, C2	24 VDC/AC PINS 8-9	C1: COUNTING OF STARTS / 1 HOUR for C1	YES	ADDRESS OF THE CELLS P1÷P14	CONTENT OF THE CELL Pi	10
			C1: TTL1 Total Working Time (in HOURS)		TOTAL NUMBER OF STARTS	CONTENT OF THE CELL TTL1 TOTAL WORKING TIME, HOURS	11
			C2: COUNTING OF STARTS / 1 HOUR for C2		ADDRESS OF THE CELLS K1÷K14	CONTENT OF THE CELL Ki	01
			C2: TTL2 Total Working Time (in HOURS)		TOTAL NUMBER OF STARTS	CONTENT OF THE CELL TTL2 TOTAL WORKING TIME, HOURS	00
M 92B-CP	“	“	“	NO	“	“	“
M 92B-V-T-MB	100/600V THREE-PHASE V. PTC / CLICSON	24 VDC/AC PINS 8-9 3-PHASE V.	STARTS NUMBER in 1 HOUR with THREE-PHASE V.	YES	ADDRESS OF THE CELLS P1÷P14	CONTENT OF THE CELL Pi addressed by the GREEN COLUMN	10
			TM OVERCOMINGS NUMBER and DURATION		ADDRESS OF THE CELLS T1÷T14	CONTENT OF THE CELL Ti addressed by the GREEN COLUMN	11
			VALUE of V in 14 INTERVALS V1÷V10		ADDRESS OF THE CELLS V1÷V10	CONTENT OF THE CELL Vi addressed by the GREEN COLUMN	01
			(TTL) Total Working Time		TOTAL STARTS NUMBER	TOTAL TIME (HOURS)	00
M 92B-V-T	“	“	“	NO	“	“	“
M 92B-PA-MB	H_2O PRESENCE	24 VDC/AC PINS 8-9	H_2O PRESENCE in OIL CHAMBER	YES	IT INDICATES THE ADDRESS OF THE CELL P1÷P8 WITH P. BUTTON	IT INDICATES THE VALUE CONTAINED IN THE CELL Pi addressed by the GREEN COLUMN with P.	00-01-10-11
M 92B-PA	“	“	“	NO	“	“	“

The CODES of the devices are shown in the first column of the TAB. A.
The physical quantities, used in the devices and shown in the INPUT QUANTITIES column, are:
V Three-Phase Voltage
I Alternating Current
CP Voltage-Free Contacts
T Temperature (PTC/CLICSON)
PA H_2O Water Presence
Power supply: 24 VDC/AC pins 8, 9.
The CONTROLS carried out on the input physical quantities, shown in the 4th column, are:
- COUNTING of the "starts" in 1 hour.
- TTL Total Working Time of the "Application".
- Alternating Voltage value.
- COUNTING of the OVERCOMINGS of a current SET POINT.
- COUNTING of STARTS and TTL from VOLTAGE-FREE CONTACTS (not from physical quantities).
- COUNTING of the OVERCOMINGS of a TM Temperature value (PTC/CLICSON).
- H_2O presence in oil chamber (submersible pumps or motors in hard-to-access places).

The MODBUS presence or absence is showed in the 5th column. The use of the columns of 14 + 14 (green and red) leds is showed in the 6th and 7th column. The programs to be chosen with the DIP SWITCH DS, to display the considered "quantity", are showed in the 8th column.

CE

Compatibilità Elettromagnetica *Electromagnetic Compatibility* CEI-EN 61326-1
"BASSA TENSIONE" - LVD *LVD - "LOW VOLTAGE"* CEI-EN 61010-1



PREMISE

DESCRIPTION OF THE FRONT

In the FRONT there are:
- **V** COLUMN of 14 GREEN LEDS
- **R** COLUMN of 14 RED LEDS

} The "weights" of the single LEDS (1÷8˙192), when they are on, are indicated on the left and right; the numbering 1-14 of the single LEDS (see TAB. 1) is showed in the center.

- **SP** (SET POINT) (1-6A): adjustment of the triggering value (only in some models).
- **PL** BUTTON: it allows to increase the address of the (GREEN) memory CELLS and to verify their content expressed by the RED LEDS on.
- **ON**: GREEN LED, it is on if the device is supplied.
- **DS** 2-WAY DIP SWITCH: it allows to choose among 4 PROGRAMS 11, 10, 01, 00 (the SLIDER, in the "ON" position, fixes the value "1", in the other position it fixes the value 0).

REMARK: in the first page the "CONTROLS" column shows the QUANTITIES that a device measures and logs, for example the M 92B-V, during the time it is on:
- it counts the number of starts in 1 HOUR and it loads the cells P1÷P14
- it measures the TTL (Total Working Time) and it loads the cell TTL
- it measures the value of V and it loads the cells V1÷V10

These operations occur independently of the PROGRAMMING set with the dip-switch DS.
Instead the display of the data depends on the COMBINATION selected with the DS (so the VISUAL CHECK occurs for one QUANTITY at a time).

RESET: With supplied device, it is necessary to: select PROG. 00, press PL for 3÷4 seconds (the leds switch off and all data memories are cleared).
The RESET clears all MEMORIES so it erases all logged history. Without RESET, the memories are cleared only when the numerical content reaches the limit; for example, 99999 + 1 = 00000, then the counting restarts.
When ordering, the RESET may not be equipped. In this case, the memories cannot be erased by the operator.

DIMENSIONS: 50x90x75 mm for DIN rail **WORKING TEMPERATURE**: 0÷70°C **WEIGHT**: 0,200 kg - **COLOUR**: grey

POWER SUPPLY: PINS 8, 9 24VAC/DC 2VA 50-60Hz. **When the THREE-PHASE V is present (M 92B-V - M 92B-V-T), the LOGIC is supplied from the THREE-PHASE V, so the 24V SUPPLY can be saved.**

INSTALLATION: (Wiring to an electrical board with a differential relay and a sectionalizing switch).
The length of every wiring must be less than 30m.

General remark: The wiring diagrams do not show the fuses installed on the power supplies and on the voltmetric inputs.
The electric wirings must be carried out with device and electrical panel in off condition.

For cleaning use a cloth soaked with detergents without: Denatured Alcohol, Benzene, Isopropyl alcohol.

USE OF GREEN AND RED LED

TAB. 1

LED	WEIGHT	SUM OF THE WEIGHTS FROM 1 to …
1	1	1
2	2	3
3	4	7
4	8	15
5	16	31
6	32	63
7	64	127
8	128	255
9	256	511
10	512	1˙023
11	1˙024	2˙047
12	2˙048	4˙095
13	4˙096	8˙191
14	8˙192	16˙383
	TOTAL	16˙383

The value contained in a MEMORY CELL is expressed by the number of LEDS on, from 1 to 14, giving a different "WEIGHT" to each led (see TAB. 1).

Example: the LEDS 1, 4 and 10 are on, the corresponding value is 1+8+512=521.
All lit LEDS correspond to 16˙383. In the case of the TTL, they are HOURS.
16˙383 min / 60 min. = 273,05 hours / 24 hours = 11,37 days.
When the maximum counting is exceeded, the memory is cleared and the counting restarts from zero.

Modifying the PROGRAM of the internal microprocessor, it is possible to obtain longer TIMES.

M 92B-V

From V the operator obtains:
- The number of “starts” in 1 hour.
- The “TTL” Total MOTOR Working Time.
- The value of the Voltage applied to the MOTOR.
- The total number of motor starts.

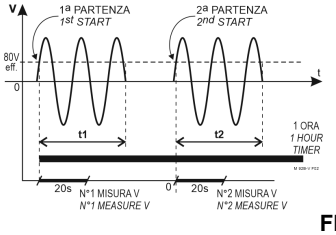


FIG. 2

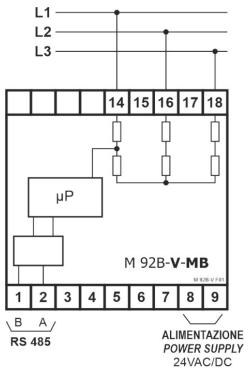


FIG. 1

TAB. 1

CELLS	VOLTAGE INTERVAL
V1	100-150V
V2	150-200V
V3	200-250V
V4	250-300V
V5	300-350V
V6	350-400V
V7	400-450V
V8	450-500V
V9	500-550V
V10	550-600V

TAB. 2

CELLS	STARTS NUMBER in 1 HOUR
P1	1
P2	2
P3	3
P4	4
P5	5
P6	6
P7	7
P8	8
P9	9
P10	10
P11	11
P12	12
P13	13
P14	N° ≥14

With the DIP SWITCH DS, 3 different PROGRAMS can be selected: 10 / 00-11 / 01.

PROG. 10: COUNTING of the STARTS in 1 HOURS starting from the first start. The STARTS correspond to “rising edges” of the Voltage V after the power supply (see Fig. 2).
The device has 14 MEMORY CELLS, P1÷P14, for the COUNTING of the STARTS NUMBER occurred in the interval of 1 HOUR from the FIRST START.
When the V (Three-Phase Voltage) occurs, a TIMER of 1 HOUR ±10% starts and the device counts how many times has the V occurred, at the end of the hour, if this number is for example 5, it adds a “1” to the cell P5. If the number is ≥ 13, it adds a “1” to the cell P14 (see TAB. 2).
The LOADING of the CELLS P1÷P14 occurs at the end of the time t = 1 HOUR, regardless of whether the voltage is still present or not.
If the device is powered off before the end of the HOUR, the information is lost.
In the GREEN COLUMN the operator chooses the address 1÷14 of the memory CELL P1÷P14 using the PL button, the RED COLUMN shows the VALUE contained in the addressed CELL, that is: how many times have N starts occurred in 1 HOUR, with N = address of the CELL.
Example: the cell 1 contains the number of times that 1 START occurred in 1 HOUR
the cell 2 contains the number of times that 2 STARTS occurred in 1 HOUR etc.. etc..
The address of the CELL is chosen with the PL button, pressing PL 5 times the led V5 will switch on and, on the RED COLUMN, the red LEDS, which indicate the value of the content of the CELL 5, will switch on; for example, if it is 7, the leds 1, 2, 3 (1+2+4=7) will switch on.
The presence of the Voltage is detected when the value exceeds 80Veff.
Given that the Voltage at 50Hz or 60Hz may contain harmonics and noises, the set point overcoming of 80V may occur together with other overcomings and this could increase the number of STARTS.
For this reason, the set point overcoming of 80V has a HYSTERESIS such that 2 STARTS must be more than 2 seconds apart to be counted as 2 starts.

PROG. 00-11: the two programs carry out the COUNTING of the TTL (Total Working Time).
The device has the CELL TTL where it added the times t1, t2, ….. of each cycle in which the V occurred, this sum is the TTL expressed in HOURS.
The GREEN COLUMN shows the Total of all starts.
The RED COLUMN shows the value of the TTL, in HOURS.

PROG. 01: the device has 10 MEMORY CELLS V1÷V10 to measure the amplitude of the voltage V.
The 10 cells V1÷V10 will be dedicated to the value of V (TAB. 1).
The Voltage value is measured at every START, after 20 seconds; for example, if 385V are measured, a “1” is added to the content of the cell V6.
In the various cells V1÷V10 the operator will found the number of times that a Voltage value, within the voltage limits showed in TAB. 1 for each cell, was measured.
- The GREEN leds show the ADDRESS 1÷10 of the 10 CELLS V1÷V10.
- The RED leds show the content of the CELL whose address is indicated by the GREEN LEDS. The content indicates the number of times that a Voltage value occurred within the limits attributed to each cell, for example: if the CELL V6 (350-400V) contains the VALUE 3, it means that a Voltage value between 350V and 400V was measured for 3 times.

INPUTS:
- THREE-PHASE VOLTAGE: pins 14, 16, 18 (Rin = 1,5 Mohm)
- POWER SUPPLY: the internal LOGIC can be supplied by the three-phase voltage which is on test, so the auxiliary power supply 24 VAC/VDC (pins 8-9) may not be used.
  If there is the MODBUS (pins 1-2) the auxiliary power supply must be used (pins 8-9), this power supply will also be used to measure the three-phase voltage.

COME ORDINARE / *HOW TO ORDER* M 92B-V					
GRANDEZZA FISICA *PHYSICAL QUANTITY*	MODBUS	RESET	ALIMENTAZIONE *POWER SUPPLY*	INDIR. MODBUS *MODBUS ADDR.*	VERSIONE *VERSION*
V ■ 100 - 600VAC	S ■ YES N □ NO	S □ YES N ■ NO	24V ■ 24VAC/DC	1÷128	□ □ □ □
Esempio: *Example:*	M 92B- V - S - N - 24V - 100 - □				

MODBUS it is a serial communication Protocol, used to transmit data between electronic devices (PLC, COMPUTER, etc..).
Its operation is based on the principle MASTER / SLAVE, it is considered OPEN and it is used in various industrial environments.
It is transmitted on SERIAL line.
The simplest set up is: a cable that connects a MASTER and a SLAVE.
The MODBUS - RTU(Remote terminal unit) uses RS 485 lines with limited distances (less than 1˙000 m) and limited number of devices (max 128).
This instruction allows to request the "value" of some quantities contained in the internal registers of the M 92B…..

100	3	ADDH	ADDL	NH	NL	CRCH	CRCL

100: address of the M 92B…..
3: request to read the status of the internal registers of the M 92B…..
ADDH - ADDL: addresses of the internal registers
NH - NL: they indicate the number of quantities that the operator wants to receive (up to 50)
CRCH - CRCL: MODBUS - RTU transmission control data

The ADDH and ADDL values for the quantities of the M 92B-V are shown below.

ADDH	ADDL	QUANTITY (2 bytes)	REMARKS
00	01	TTL (min.)	Total Working Time MAX 16˙383
00	03	TOTAL STARTS	
00	05	NUMBER of TTL REPORTS MAX 14	
00	07	NUMBER of TOTAL STARTS REPORTS MAX 14	
		CELLS	**STARTS NUMBER / HOUR**
00	09	P1	NUMBER of "1 START / HOUR"
00	10	P2	NUMBER of "2 STARTS / HOUR"
00	11	P3	NUMBER of "3 STARTS / HOUR"
00	12	P4	NUMBER of "4 STARTS / HOUR"
00	13	P5	NUMBER of "5 STARTS / HOUR"
00	14	P6	NUMBER of "6 STARTS / HOUR"
00	15	P7	NUMBER of "7 STARTS / HOUR"
00	16	P8	NUMBER of "8 STARTS / HOUR"
00	17	P9	NUMBER of "9 STARTS / HOUR"
00	18	P10	NUMBER of "10 STARTS / HOUR"
00	19	P11	NUMBER of "11 STARTS / HOUR"
00	20	P12	NUMBER of "12 STARTS / HOUR"
00	21	P13	NUMBER of "13 STARTS / HOUR"
00	22	P14	NUMBER of ">14 STARTS / HOUR"
		TAB. 1	
		CELLS	**RANGE**
00	23	V1	100-150V
00	24	V2	150-200V
00	25	V3	200-250V
00	26	V4	250-300V
00	27	V5	300-350V
00	28	V6	350-400V
00	29	V7	400-450V
00	30	V8	450-500V
00	31	V9	500-550V
00	32	V10	550-600V
00	33		
00	34		
00	35		
00	36		

REMARKS:
Number of times that the value of V entered the interval shown in the TAB. 1.

M 92B-I CURRENT

The device controls the CURRENT I 1,2A÷6A of a phase connected to the pins 5, 6 through an internal CT (see Fig. 1).

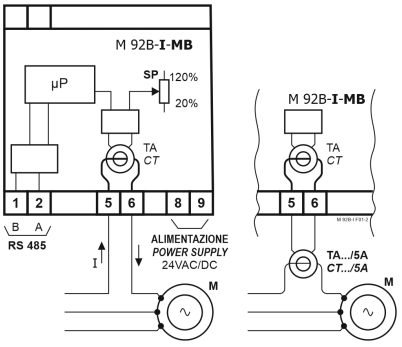


FIG. 1

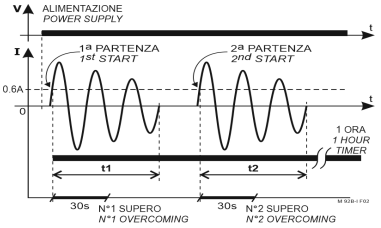


FIG. 2

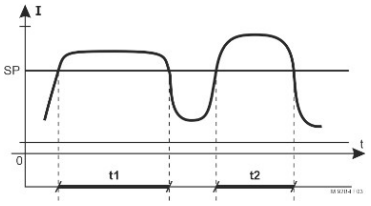


FIG. 3

The COUNTING of STARTS number in 1 HOUR is obtained.
The TTL (Total Working Time) is calculated.
A SET POINT 1-6A is set and the number of times that this set point is overcome and the overcoming DURATION are detected.
The first measurement is carried out 30 seconds after the "start" to exclude the "peak" that occurs in the motors current.

TAB. 1

CELLS	STARTS NUMBER in 1 HOUR
P1	1
P2	2
P3	3
P4	4
P5	5
P6	6
P7	7
P8	8
P9	9
P10	10
P11	11
P12	12
P13	13
P14	N° ≥14

TAB. 2

CELLS	DURATION OF SP OVERCOMING
A1	0÷15'
A2	15'÷30'
A3	30'÷60'
A4	60'÷120'
A5	120'÷240'
A6	>240'
A7	SUM OF THE NUMBER OF OVERCOMINGS

With the DS, 3 different PROGRAMS can be selected: 10, 10-11, 01.

PROG. 10: COUNTING of the STARTS in 1 hour. "START" means the "rising edge" of the I greater than 0,6A after the power supply (see Fig. 2).
The device has 14 memory CELLS P1÷P14 for the COUNTING of the STARTS in 1 hour from the FIRST START.
When the I occurs for the first time (see Fig. 2), a TIMER of 1 HOUR ±10% starts and the device counts how many times has the I occurred, at the end of the HOUR, if the number of STARTS was 6, it adds a "1" to the cell P6. If the number is ≥ 14, it adds a "1" to the cell P14 (see TAB. 1).
The loading of the CELLS P1÷P14 occurs at the end of the time of 1 hour, regardless of whether the current is still present or not.
If the device is powered off before the end of the HOUR, the information is lost.
The address P1÷P14 of the CELL Pi is chosen with PL in the GREEN COLUMN, the RED COLUMN displays the VALUE of the content of the addressed CELL, that is how many times have N starts occurred in 1 HOUR, with:
N° = address of the CELL Pi.
EXAMPLE:

- CELL 1: contains the number of times that "1 START occurred in 1 HOUR".
- CELL 2: contains the number of times that "2 starts occurred in 1 HOUR" etc.. etc..

The address of the CELL is chosen with PL, pressing PL 5 times the led V5 will switch on and, on the RED COLUMN, the RED LEDS, which indicate the value contained in the CELL V5, will switch on. For example, if it is 7, the LEDS 1, 2, 3 (1+2+4=7) will switch on.
The presence of the I is detected when I ≥ 0,6A. Given that the I may contain harmonics and noises, the overcoming of 0,6A may occur together with other "ANOMALOUS" overcomings which would falsely increase the number of the starts.
HYSTERESIS: for this reason, the overcoming has a HYSTERESIS in amplitude and time, in order that 2 starts must be more than 2 seconds apart to be counted.

PROG. 00-11: the two programs carry out the COUNTING of the TTL (Total Working Time) in HOURS.
The device has the CELL TTL where it added the times t1, t2 ….. (see Fig. 2) of each cycle in which the CURRENT I was present.
This sum is the TTL, expressed in HOURS.
The GREEN COLUMN shows the TOTAL of all STARTS of I.
The RED COLUMN shows the value of the TTL, in HOURS.

PROG. 01: COUNTING of SET POINT OVERCOMINGS and THEIR DURATION.
The value of the I is detected 30 seconds after the presence of the I, to avoid the initial current peak of the ELECTRIC MOTORS.
The device has 7 CELLS A1÷A7 for the COUNTING of SP OVERCOMINGS and of their DURATIONS, in minutes.
The TAB. 2 matches the order number of the CELLS with the number of OVERCOMINGS and with their DURATIONS.
Example: if there is the value 4 in the CELL A3, it means that 4 SP overcomings, with a DURATION between 30 and 60 minutes, were occurred.
The address of the CELL Ai (which coincides with its order number: "i") can be set with PL in the GREEN COLUMN.
In the RED COLUMN the lit leds indicate the value of the content of the cell Ai.
If the content is 3, the RED leds 1+2=3 will be on.
The CELL A7 contains the total number of all OVERCOMINGS.

Examples of amperometric controls:

I_M = 8A > 6A a CT 50/5A is necessary
50A / 8A = 6,25 → 6 windings with the wire of the CURRENT through the CT hole
8A x 6 = 48A → 96% of 50A
I_{SEC} = 96% of 5A = 4,8A

With 4 wire windings through the CT hole
8A x 4 = 32A → 64% of 50A
I_{SEC} = 0,64 x 5 = 3,2A
Setting SP = 6A, practically almost 200% of I_M is set

To recognize the doubling of 8A
With 3 wire windings through the CT hole
16A x 3 = 48A → 96% of 50A
I_{SEC} = 96% of 5 → 4,8A
Setting SP ≃ 5A, 200% of I_M is set

INPUTS: 5, 6 (6A MAX)
POWER SUPPLY: 8, 9 24 VAC/DC 2 VA
MODBUS: 1, 2 (B-A)

COME ORDINARE / *HOW TO ORDER* M 92B-I

GRAND.FISICA (AC) *PHYSICAL Q.TY (AC)*	MODBUS	RESET	ALIMENTAZIONE *POWER SUPPLY*	INDIR. MODBUS *MODBUS ADDR.*	VERSIONE *VERSION*
I-5A ■ 5A	S ☐ YES N ■ NO	S ☐ YES N ■ NO	24V ■ 24VAC/DC	1÷128	☐ ☐ ☐ ☐

Esempio: *Example:* **M 92B-** [I-5A] - [N] - [N] - [24V] - [90] - [ ]

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It is transmitted on SERIAL line.
The simplest set up is: a cable that connects a MASTER and a SLAVE.
The MODBUS - RTU(Remote terminal unit) uses RS 485 lines with limited distances (less than 1˙000 m) and limited number of devices (max 128).
This instruction allows to request the "value" of some quantities contained in the internal registers of the M 92B…..

100	3	ADDH	ADDL	NH	NL	CRCH	CRCL

100: address of the M 92B…..
3: request to read the status of the internal registers of the M 92B…..
ADDH - ADDL: addresses of the internal registers
NH - NL: they indicate the number of quantities that the operator wants to receive (up to 50)
CRCH - CRCL: MODBUS - RTU transmission control data

The ADDH and ADDL values for the quantities of the M 92B-I are shown below.

ADDH	ADDL	QUANTITY (2 bytes)	REMARKS
00	01	TTL1 (min.)	Total Working Time MAX 16˙383
00	03	TOTAL STARTS	
00	05	NUMBER of TTL1 REPORTS MAX=14	
00	07	NUMBER of STARTS REPORTS MAX=14	
		CELL	**STARTS NUMBER / HOUR**
00	09	P1	NUMBER of "1 START / HOUR"
00	10	P2	NUMBER of "2 STARTS / HOUR"
00	11	P3	NUMBER of "3 STARTS / HOUR"
00	12	P4	NUMBER of "4 STARTS / HOUR"
00	13	P5	NUMBER of "5 STARTS / HOUR"
00	14	P6	NUMBER of "6 STARTS / HOUR"
00	15	P7	NUMBER of "7 STARTS / HOUR"
00	16	P8	NUMBER of "8 STARTS / HOUR"
00	17	P9	NUMBER of "9 STARTS / HOUR"
00	18	P10	NUMBER of "10 STARTS / HOUR"
00	19	P11	NUMBER of "11 STARTS / HOUR"
00	20	P12	NUMBER of "12 STARTS / HOUR"
00	21	P13	NUMBER of "13 STARTS / HOUR"
00	22	P14	NUMBER of "≥14 STARTS / HOUR"

TAB. 2

		CELL	DURATION OF SP OVERCOMING	REMARKS
00	23	A1	0÷15'	**REMARKS:** Number of times that the DURATION of the OVERCOMING stayed within the limits established by the TAB. 2.
00	24	A2	15'÷30'	
00	25	A3	30'÷60'	
00	26	A4	60'÷120'	
00	27	A5	120'÷240'	
00	28	A6	>240'	
00	29	A7	SUM OF THE NUMBER OF OVERCOMINGS	
00	30			
00	31			
00	32			
00	33			
00	34			
00	35			
00	36			

M 92B-CP VOLTAGE-FREE CONTACTS

The device controls the status of 2 VOLTAGE-FREE CONTACTS: C1 and C2 (without potential), usually of CONTACTORS or RELAYS, connected to the pins 5, 3 and 6, 3 (see Fig. 1).

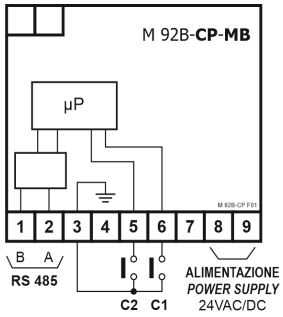

FIG. 1

For each contact the number of contact closures, in 1 HOUR ±10% from a first closure, and the TTL (Total Working Time) are counted.
There are 14 memory CELLS P1÷P14 and the TTL1 for C1.
There are 14 memory CELLS K1÷K14 and the TTL2 for C2.
HYSTERESIS: to avoid any contact bounces altering the number of the starts, the contact closure detector has a HYSTERESIS in amplitude and time, in order that 2 starts must be more than 2 seconds apart to be counted.

With the DS, 4 different PROGRAMS can be selected: 10, 11, 01, 00.

PROG. 10 for C1: COUNTING of the “closures of C1” that occur in 1 HOUR from the first closure (see Fig. 2).

TAB. 1

CELL	STARTS NUMBER / 1 HOUR
P1	NO. 1 START / HOUR
P2	NO. 2 STARTS / HOUR
P3	NO. 3 STARTS / HOUR
P4	NO. 4 STARTS / HOUR
P5	NO. 5 STARTS / HOUR
P6	NO. 6 STARTS / HOUR
P7	NO. 7 STARTS / HOUR
P8	NO. 8 STARTS / HOUR
P9	NO. 9 STARTS / HOUR
P10	NO. 10 STARTS / HOUR
P11	NO. 11 STARTS / HOUR
P12	NO. 12 STARTS / HOUR
P13	NO. 13 STARTS / HOUR
P14	TOTAL > 14 STARTS / HOUR

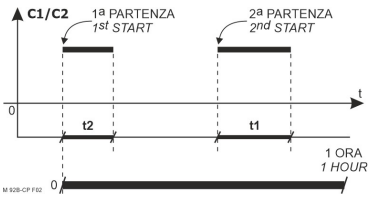

FIG. 2

N number of starts is stored at the end of the HOUR, for example N=4, a “1” is added to the content of the CELL P4 (see TAB. 1) and the DURATIONS t1…t2 are added in the content of the CELL: TTL1 (Total Working Time for C1).
The address of the cell Pi can be selected with the PL button in the GREEN COLUMN; in the RED COLUMN the red leds, indicating the content of the cell i-th, switch on, for example if the content is 3, the red leds 1 and 2 switch on.

PROG. 11 for C1: it displays the content of the CELL TTL1 where all DURATIONS t1…t2 of the closures of C1 were added, even those that occur after the HOUR.
The TOTAL number of STARTS is shown in the GREEN COLUMN.
The Total Working Time, in HOURS (TTL1) (minimum reading 1 HOUR), is shown in the RED COLUMN.

PROG. 01 for C2: as stated in the PROG. 10 replacing the CELLS Pi with the CELLS Ki.

PROG. 00 for C2: as stated in the PROG. 11 replacing the CELL TTL1 with the CELL TTL2.

INPUTS: 6-3 CONTACT C1
5-3 CONTACT C2
POWER SUPPLY: 8, 9 24 VAC/DC 2 VA
MODBUS: 1, 2 (B-A)

COME ORDINARE / *HOW TO ORDER* M 92B-CP

CONTATTO *CONTACT*	MODBUS	RESET	ALIMENTAZIONE *POWER SUPPLY*	INDIR. MODBUS *MODBUS ADDR.*	VERSIONE *VERSION*
C1 ☐ C1 C2 ☐ C2 C1-C2 ■ C1-C2	S ■ YES N ☐ NO	S ■ YES N ☐ NO	24V ■ 24VAC/DC	1÷128	☐☐ ☐☐

Esempio: *Example:*
M 92B-CP- [C1-C2] - [S] - [S] - [24V] - [80] - [ ]

MODBUS it is a serial communication Protocol, used to transmit data between electronic devices (PLC, COMPUTER, etc..).
Its operation is based on the principle MASTER / SLAVE, it is considered OPEN and it is used in various industrial environments.
It is transmitted on SERIAL line.
The simplest set up is: a cable that connects a MASTER and a SLAVE.
The MODBUS - RTU(Remote terminal unit) uses RS 485 lines with limited distances (less than 1˙000 m) and limited number of devices (max 128).
This instruction allows to request the "value" of some quantities contained in the internal registers of the M 92B…..

100	3	ADDH	ADDL	NH	NL	CRCH	CRCL

100: address of the M 92B…..
3: request to read the status of the internal registers of the M 92B…..
ADDH - ADDL: addresses of the internal registers
NH - NL: they indicate the number of quantities that the operator wants to receive (up to 50)
CRCH - CRCL: MODBUS - RTU transmission control data

The ADDH and ADDL values for the quantities of the M 92B-CP are shown below.

ADDH	ADDL	QUANTITY (2 bytes)	REMARKS
00	01	TTL1 for C1 (HOURS)	MAX Total Working Time 16˙383
00	02	TTL2 for C2 (HOURS)	MAX Total Working Time 16˙383
00	03	1 TOTAL START for C1	
00	04	2 TOTAL STARTS for C2	
00	05	NUMBER of TTL1 OVERCOMINGS MAX 14	
00	06	NUMBER of TTL2 OVERCOMINGS MAX 14	
00	07	NUMBER of OVERCOMINGS of 1 START MAX 14	
00	08	NUMBER of OVERCOMINGS of 2 STARTS MAX 14	
		CELLS	**STARTS NUMBER / HOUR**
00	09	P1	NUMBER of "1 START / HOUR" for C1
00	10	P2	NUMBER of "2 STARTS / HOUR" for C1
00	11	P3	NUMBER of "3 STARTS / HOUR" for C1
00	12	P4	NUMBER of "4 STARTS / HOUR" for C1
00	13	P5	NUMBER of "5 STARTS / HOUR" for C1
00	14	P6	NUMBER of "6 STARTS / HOUR" for C1
00	15	P7	NUMBER of "7 STARTS / HOUR" for C1
00	16	P8	NUMBER of "8 STARTS / HOUR" for C1
00	17	P9	NUMBER of "9 STARTS / HOUR" for C1
00	18	P10	NUMBER of "10 STARTS / HOUR" for C1
00	19	P11	NUMBER of "11 STARTS / HOUR" for C1
00	20	P12	NUMBER of "12 STARTS / HOUR" for C1
00	21	P13	NUMBER of "13 STARTS / HOUR" for C1
00	22	P14	NUMBER of "≥14 STARTS / HOUR" for C1
00	23	K1	NUMBER of "1 START / HOUR" for C2
00	24	K2	NUMBER of "2 STARTS / HOUR" for C2
00	25	K3	NUMBER of "3 STARTS / HOUR" for C2
00	26	K4	NUMBER of "4 STARTS / HOUR" for C2
00	27	K5	NUMBER of "5 STARTS / HOUR" for C2
00	28	K6	NUMBER of "6 STARTS / HOUR" for C2
00	29	K7	NUMBER of "7 STARTS / HOUR" for C2
00	30	K8	NUMBER of "8 STARTS / HOUR" for C2
00	31	K9	NUMBER of "9 STARTS / HOUR" for C2
00	32	K10	NUMBER of "10 STARTS / HOUR" for C2
00	33	K11	NUMBER of "11 STARTS / HOUR" for C2
00	34	K12	NUMBER of "12 STARTS / HOUR" for C2
00	35	K13	NUMBER of "13 STARTS / HOUR" for C2
00	36	K14	NUMBER of "≥14 STARTS / HOUR" for C2

M 92B-V-T PTC/CLICSON

The device receives the three-phase input voltage V (PINS 14, 16, 18) and it is connected to a group of 3-6 PTC or CLICSON (PINS 3, 5) connected in series and located in the motor to be controlled (see Fig. 1).

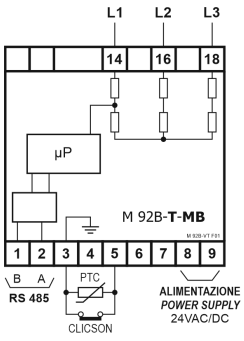

FIG. 1

TAB. 2

CELLS	STARTS NUMBER in 1 HOUR
P1	1
P2	2
P3	3
P4	4
P5	5
P6	6
P7	7
P8	8
P9	9
P10	10
P11	11
P12	12
P13	13
P14	≥14

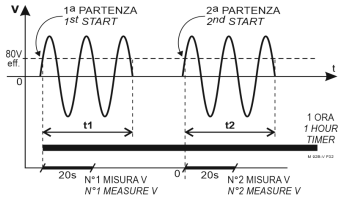

FIG. 2

With the DIP-SWITCH DS, 4 different PROGRAMS can be selected:

PROG. 10: COUNTING of the STARTS that occur in one HOUR ±10% starting from the first START. The STARTS correspond to "rising edges" of the voltage V (see Fig. 2). **The presence of the voltage is detected when V>80Veff.**
The device has 14 memory cells P1÷P14 to count the number of STARTS occurred in the interval of 1 HOUR from the first start.
When the V (three-phase voltage) occurs, a TIMER of 1 HOUR starts and the device counts how many times has the V occurred, at the end of the HOUR, if this number is 5 for example, it adds a "1" to the cell P5.
If the number is > 13, it adds a "1" to the cell P14.
The loading of the CELLS P1÷P14 occurs at the end of the timer of 1 HOUR, regardless of whether the voltage is still present or not. If the device is powered off before the end of the hour, the information is lost.
The address 1÷14 of the memory CELL P1÷P14 is chosen through the PL button in the GREEN COLUMN, the RED COLUMN displays the value of the content of the addressed CELL, that is how many times have N starts occurred, in 1 hour, with N = address of the CELL.
Example: the cell 1 contains the number of times that 1 START occurred in 1 HOUR, the CELL 2 contains the number of times that 2 starts occurred in 1 HOUR etc.. etc..
The PL button is used to choose the CELL address and to know the CELLS content. Example:
pressing PL 5 times, the green led V5 will switch on in the GREEN COLUMN and, on the RED COLUMN, the red leds, corresponding to the content of the cell V5, will switch on; for example content 7, the red leds 1, 2, 3 (1+2+4=7) switch on. For the value to be attributed to the LEDS refer to the REMARKS at page 2 (TAB. 1).

PROG. 11: COUNTING of TM OVERCOMINGS and OVERCOMINGS DURATION.
TM is the temperature that characterizes the PTC and CLICSON sensors. If the temperature exceeds the value TM, the PTC sensors increase the value of their ohmic resistance and the CLICSON sensors, which are normally closed (R=0Ω), open and the system detects the "overcoming" of TM.
It has 7 memory CELLS T1÷T7 to count the NUMBER of TM OVERCOMINGS and OVERCOMINGS DURATIONS (see TAB. 3).
The address 1÷7 of the MEMORY CELL T1÷T7 is chosen through the PL button in the GREEN COLUMN, the RED COLUMN shows the content of the CELL, that is how many times OVERCOMINGS, whose DURATION stays within the LIMITS indicated in the TAB. 3, occurred.

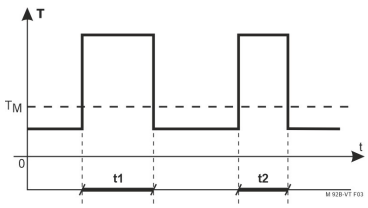

FIG. 3

TAB. 3

CELL	DURATION OF SP OVERCOMING
T1	0÷15'
T2	15'÷30'
T3	30'÷60'
T4	60'÷120'
T5	120'÷240'
T6	>240'
T7	SUM OF OVERCOMINGS NUMBER

At each OVERCOMING of TM, the duration t1 ...t2 of the OVERCOMING is measured (Fig. 3) and, as a function of the value, a "1" will be added in the CELL Ti characterized by the time interval that contains the value t1 ...t2 (see TAB. 3).
Example: if a TM OVERCOMING of 11 minutes is measured, a "1" will be added to the content of the CELL T1 (see TAB. 3).
The overcomings with duration > 4 hours are counted in T6.
All OVERCOMINGS contained in the cells are counted in T7.
The times are measured in HOURS.

PROG. 01: MEASUREMENT of the value of the Voltage V, depending on the measured value, one UNIT is added in the corresponding CELL V1÷V10, as per TAB. 1.

TAB. 1

CELLS	VOLTAGE INTERVAL
V1	100-150V
V2	150-200V
V3	200-250V
V4	250-300V
V5	300-350V
V6	350-400V
V7	400-450V
V8	450-500V
V9	500-550V
V10	550-600V
V11-14	————

The device uses 10 memory cells V1÷V10 to measure the value of the Voltage V.
After 20 seconds since a "rising edge" of V occurred, the measurement of V is carried out and, based on the detected value, a "1" is added in the CELL Vi which has the interval containing the measured value (see TAB. 1).
The address of the MEMORY CELL is chosen with the PL button in the GREEN COLUMN, the RED COLUMN will show the content of the CELL, that is how many times has a value, within the limits indicated in the TAB. 1, occurred.

PROG. 00: it measures the TTL (Total Working Time).
The device has a CELL TTL (TOTAL WORKING TIME) where all times "ti" of presence of the V are added, in HOURS (see Fig. 1).
The green column shows the TOTAL NUMBER of all Starts.
The red column shows the Total Time of Presence of the V in HOURS, that is the Total Working Time (TTL).

INPUTS:
- THREE-PHASE VOLTAGE: pins 14, 16, 18 (Rin = 1,5 Mohm)
- PTC/CLICSON: pins 3, 5
- POWER SUPPLY: the internal LOGIC can be supplied by the three-phase voltage which is on test, so the auxiliary power supply 24 VAC/VDC (pins 8-9) may not be used.
  If there is the MODBUS (pins 1-2) the auxiliary power supply must be used (pins 8-9), this power supply will also be used to measure the three-phase voltage.

COME ORDINARE / *HOW TO ORDER* M 92B-VT

GRANDEZZA FISICA *PHYSICAL QUANTITY*	MODBUS	RESET	ALIMENTAZIONE *POWER SUPPLY*	INDIR. MODBUS *MODBUS ADDR.*	VERSIONE *VERSION*
VT ■ 100 - 600VAC PTC/CLICSON	S ■ YES N □ NO	S ■ YES N □ NO	24V ■ 24VAC/DC	1÷128	□ □ □ □

Esempio: *Example:* M 92B- VT - S - S - 24V - 70 - □

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The simplest set up is: a cable that connects a MASTER and a SLAVE.
The MODBUS - RTU(Remote terminal unit) uses RS 485 lines with limited distances (less than 1˙000 m) and limited number of devices (max 128).
This instruction allows to request the "value" of some quantities contained in the internal registers of the M 92B…..

100	3	ADDH	ADDL	NH	NL	CRCH	CRCL

100: address of the M 92B…..
3: request to read the status of the internal registers of the M 92B…..
ADDH - ADDL: addresses of the internal registers
NH - NL: they indicate the number of quantities that the operator wants to receive (up to 50)
CRCH - CRCL: MODBUS - RTU transmission control data

The ADDH and ADDL values for the quantities of the M 92B-V-T are shown below.

ADDH	ADDL	QUANTITY (2 bytes)	REMARKS
00	01	TTL1 (min.)	Total Working Time MAX 16˙383
00	03	TOTAL STARTS	
00	05	NUMBER of TTL1 OVERCOMINGS MAX 14	
00	07	NUMBER of STARTS OVERCOMINGS MAX 14	
		CELL	**STARTS NUMBER / HOUR**
00	09	P1	NUMBER of "1 START / HOUR"
00	10	P2	NUMBER of "2 STARTS / HOUR"
00	11	P3	NUMBER of "3 STARTS / HOUR"
00	12	P4	NUMBER of "4 STARTS / HOUR"
00	13	P5	NUMBER of "5 STARTS / HOUR"
00	14	P6	NUMBER of "6 STARTS / HOUR"
00	15	P7	NUMBER of "7 STARTS / HOUR"
00	16	P8	NUMBER of "8 STARTS / HOUR"
00	17	P9	NUMBER of "9 STARTS / HOUR"
00	18	P10	NUMBER of "10 STARTS / HOUR"
00	19	P11	NUMBER of "11 STARTS / HOUR"
00	20	P12	NUMBER of "12 STARTS / HOUR"
00	21	P13	NUMBER of "13 STARTS / HOUR"
00	22	P14	NUMBER of "≥14 STARTS / HOUR"

TAB. 1

		CELLS	RANGE	
00	23	V1	100-150V	**REMARKS:** Number of times that the value of V stayed within the limits of the TAB. 1.
00	24	V2	150-200V	
00	25	V3	200-250V	
00	26	V4	250-300V	
00	27	V5	300-350V	
00	28	V6	350-400V	
00	29	V7	400-450V	
00	30	V8	450-500V	
00	31	V9	500-550V	
00	32	V10	550-600V	
00	33			
00	34			
00	35			
00	36			

TAB. 3

		CELL	DURATION OF SP OVERCOMING	
00	37	T1	0÷15'	**REMARKS:** Number of times that the DURATION of TM OVERCOMING stayed within the limits of the TAB. 3.
00	38	T2	15'÷30'	
00	39	T3	30'÷60'	
00	40	T4	60'÷120'	
00	41	T5	120'÷240'	
00	42	T6	>240'	
00	43	T7	SUM OF OVERCOMINGS NUMBER	
00	44			
00	45			
00	46			
00	47			
00	48			
00	49			
00	50			

M 92B - PA (WATER presence)

PRESENCE OF H_2O IN OIL CHAMBER

The M 92B-PA produces a voltage of about 2V, peak-to-peak frequency 7 Hz to the pin 6, to supply the SENSOR R_{AB} which is submerged in the oil contained in the CHAMBER. If there is not H_2O in the CHAMBER, the resistance present across the SENSOR will be high, so a voltage much lower than 2V will reach the pin 5.
If there is H_2O in the CHAMBER, the resistance of the SENSOR will be lower and a higher voltage will reach the PIN 5.

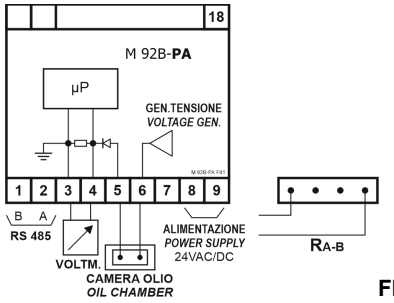


FIG. 1

FIG. 2

TAB. 1

	CELLS	INTERVAL OF THE V
LITTLE H_2O	P1	1,7-1,93V
	P2	1,93-2,18V
	P3	2,18-2,43V
	P4	2,43-2,68V
	P5	2,68-2,93V
	P6	2,93-3,18V
A LOT OF H_2O	P7	3,18-3,43V
	P8	>3,43V

The received signal is amplified, filtered and sent to the microprocessor and to the output pins 4 and 3 as well, so it can be displayed with a voltmeter DVD 08.
The voltage value at the pins 4-3 contains the information on the quantity of H_2O present with the OIL.
The SENSOR of H_2O presence must be installed in the floor of the OIL CHAMBER (for example, of a SUBMERSIBLE PUMP), and this must be carried out before final installation.
Measuring the V4-3, with NEW OIL, values close to 1,8V should be detected (little H_2O present) but it is clear that, if the oil contains conductive particles, the detected value will be higher than 1,8V.
The value detected with NEW OIL must be logged because it will have to be compared with the values that will be detected over time, to determine if an infiltration of H_2O has occurred.
Values of V4-3 close to 3,43V indicate the presence of a lot of H_2O, but without knowing the conductivity of infiltrated water, a correlation V4-3 ⟷ Quantity of H_2O in the OIL cannot be established, also because over time, there may be conductive particles from the oil (the old oil is generally dark……).
The values provided by the device must therefore be detected over time and compared with each other to have the situation under control otherwise this situation would be completely unclear.
When the M 92B-PA is powered, it carries out the measurement continuously, and the value V4-3 must be stored with a frequency that depends on the programming of DS (see TAB. 2).

TAB. 2

DS 1	DS 2	t1 (±10%)	NUMBER OF STORAGES PER DAY
1	1	2h	1÷13
1	0	4h	1÷7
0	1	8h	1÷4
0	0	24h	1

The device carries out the measurement of the voltage at the terminals 4-3 after 1 minute from the arrival of the power supply at the terminals 8-9.
The power supply can be:
1) without daily interruption (Fig. 3)
2) with daily interruption (Fig. 4)

In the first case, the PROG. 00 (TAB. 2), which fixes the value of the time t1 (interval between 2 storages), will be used, with t1=24h one storage per day will be done and the value 16˙383 will be reached after 44,88 years (16˙383/365=44,88).
In the second case (daily interruption), one of the programs 11-10-01 will be used to choose the frequency of the storages.
Ex.: motor that is turned on in the morning and turned off in the evening, if the PROG. 01 is chosen, one storage after 1 minute from the (cold) start and a second storage 8 hours later (warmed-up motor) will be obtained.
With 2 storages per day, the value 16˙383 will be reached after 22 years (16˙383/365x2=22,44).
If the PROG. 10 is chosen, one storage 1 minute after the power supply, a second storage after 4 hours and a third storage after 8 hours, that is 3 storages per day, will be obtained; it reaches 16˙383 after 14 years.
The TAB. 2 shows the programs that the operator can choose based on the type of power supply of the system and a forecast of the control duration can be obtained through the Fig. 5.

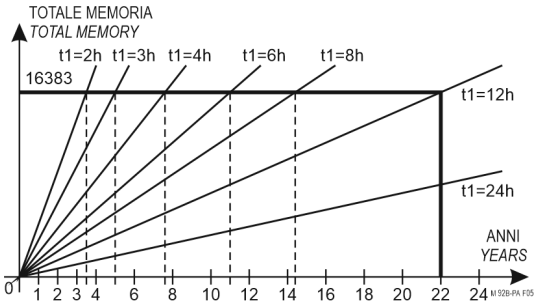


FIG. 5

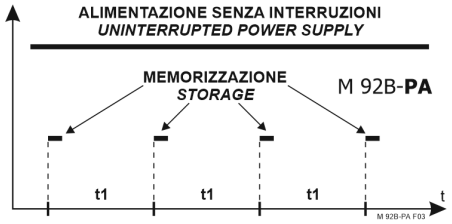


FIG. 3

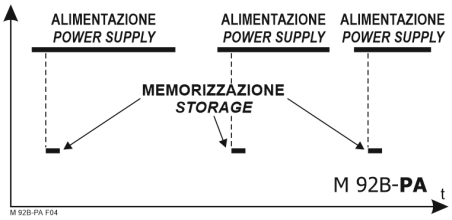
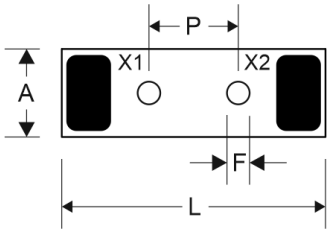


FIG. 4

The cells P1…….P8 are used for the storage of the value V4-3. The V4-3 can have values from 1,7V to about 3,43V.
In the TAB. 1 an INTERVAL of values was assigned to each CELL.
If the V4-3 had the value 2,50V at the time of the STORAGE, the value 1 is added in the cell P4.
If the number 10 is in the cell P6 during the reading of the CELLS contents, it means that values of V4-3 between 2,43V and 2,68V were measured for 10 times.

REMARK: The number contained in the CELLS is the NUMBER of the MEASUREMENTS carried out.
To know the TOTAL TIME, the NUMBER of the MEASUREMENTS will have to be multiplied by the time of repetition of the MEASUREMENTS (see TAB. 2).

The comparison between the values detected over time and the value with NEW OIL should clarify if the situation is stationary or increasingly dangerous.
When the system is stopped, the oil will be stationary in the OIL CHAMBER and any H_2O will be under the oil.
When the system is in motion, the oil will be in motion and the water will be emulsified in the oil, so the value of V4-3 will be different in the two cases mentioned.



SENSORE/*SENSOR* RA-B

CODICE *CODE*	In millimetri *In millimeters*			
	L	A	P	F
RAB-4	40	10	10	2,5
RAB-3	30	10	10	2,5

- **SPESSORE/*THICKNESS*: 1,6 mm**
- **X1, X2: ZONE DI SALDATURA DEI FILI DI COLLEGAMENTO AI PIN 5-6 di M 92B-PA *WELDING AREAS OF THE CONNECTING WIRES TO THE PINS 5-6 of M 92B-PA***

When ordering, one of the two models will be chosen.

COME ORDINARE / *HOW TO ORDER* M 92B-PA

GRANDEZZA FISICA *PHYSICAL QUANTITY*	MODBUS	RESET	ALIMENTAZIONE *POWER SUPPLY*	INDIR. MODBUS *MODBUS ADDR.*	VERSIONE VERSION
PA ■ PRES. H_2O	S ■ YES N □ NO	S ■ YES N □ NO	24V ■ 24VAC/DC	1÷128	□□ □□

Esempio: *Example:* **M 92B-** PA - S - S - 24V - 60 - □

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MODBUS it is a serial communication Protocol, used to transmit data between electronic devices (PLC, COMPUTER, etc..).
Its operation is based on the principle MASTER / SLAVE, it is considered OPEN and it is used in various industrial environments.
It is transmitted on SERIAL line.
The simplest set up is: a cable that connects a MASTER and a SLAVE.
The MODBUS - RTU(Remote terminal unit) uses RS 485 lines with limited distances (less than 1˙000 m) and limited number of devices (max 128).
This instruction allows to request the "value" of some quantities contained in the internal registers of the M 92B…..

100	3	ADDH	ADDL	NH	NL	CRCH	CRCL

100: address of the M 92B…..
3: request to read the status of the internal registers of the M 92B…..
ADDH - ADDL: addresses of the internal registers
NH - NL: they indicate the number of quantities that the operator wants to receive (up to 50)
CRCH - CRCL: MODBUS - RTU transmission control data

The ADDH and ADDL values for the quantities of the M 92B-PA are shown below.

ADDH	ADDL	QUANTITY (2 bytes)	REMARKS
00	01		
00	03		
00	05		
00	07		

TAB. 1

		CELL	INTERVAL OF THE V4-3	
00	09	P1	1,7-1,93V	**REMARKS:** Number of times that the V4-3 stayed within the limits of the TAB. 1.
00	10	P2	1,93-2,18V	
00	11	P3	2,18-2,43V	
00	12	P4	2,43-2,68V	
00	13	P5	2,68-2,93V	
00	14	P6	2,93-3,18V	
00	15	P7	3,18-3,43V	
00	16	P8	>3,43V	▼ **A LOT OF H_2O**
00	17			
00	18			
00	19			
00	20			
00	21			
00	22			