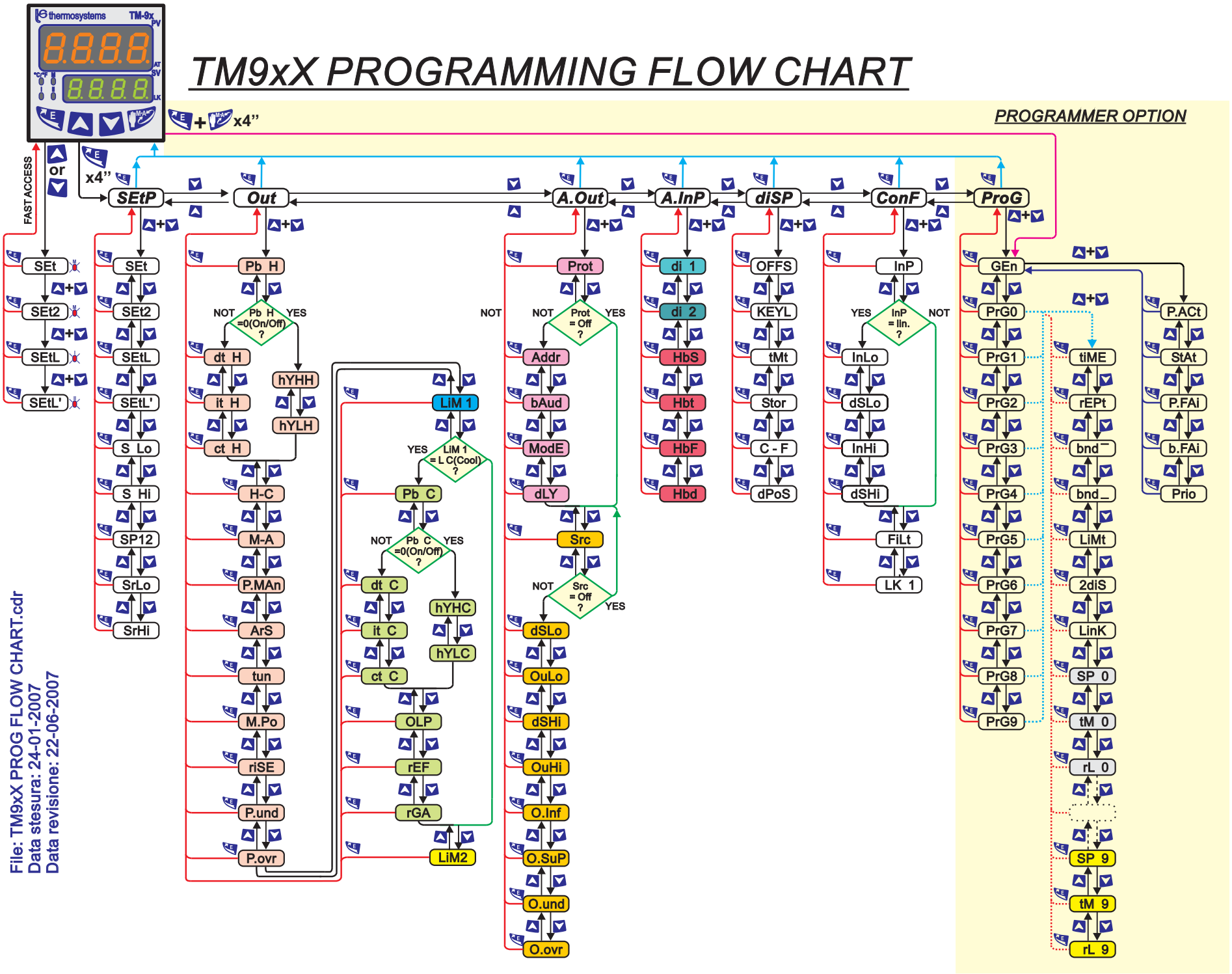
TM9xX PROGRAMMING FLOW CHART
PROGRAMMER OPTION
thermosystems
TM-9x
FAST ACCESS
or
x4"
+
x4"
SEtP
Out
A.Out
A.InP
diSP
ConF
ProG
SEt
SEt2
SEtL
SEtL'
S_Lo
S_Hi
SP12
SrLo
SrHi
Pb_H
dt_H
it_H
ct_H
H-C
M-A
P.MAn
ArS
tun
M.Po
riSE
P.und
P.ovr
hYHH
hYLH
NOT Pb H =0(On/Off) ? YES
LiM 1
YES LiM 1 = L C(Cool) ?
Pb_C
dt_C
it_C
ct_C
NOT Pb C =0(On/Off) ? YES
hYHC
hYLC
OLP
rEF
rGA
LiM2
Prot
NOT Prot = Off ? YES
Addr
bAud
ModE
dLY
Src
NOT Src = Off ? YES
dSLo
OuLo
dSHi
OuHi
O.Inf
O.SuP
O.und
O.ovr
di_1
di_2
HbS
Hbt
HbF
Hbd
OFFS
KEYL
tMt
Stor
C - F
dPoS
InP
YES InP = Iin. ? NOT
InLo
dSLo
InHi
dSHi
FiLt
LK_1
GEn
PrG0
PrG1
PrG2
PrG3
PrG4
PrG5
PrG6
PrG7
PrG8
PrG9
tiME
rEPt
bnd_
bnd_
LiMt
2diS
LinK
SP_0
tM_0
rL_0
SP_9
tM_9
rL_9
P.ACt
StAt
P.FAi
b.FAi
Prio
File: TM9xX PROG FLOW CHART.cdr
Data stesura: 24-01-2007
Data revisione: 22-06-2007

NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "SEtP" per TM9Xx

"SetP" MENU RELATED FUNCTIONS for TM9Xx

"**SEtP**" menu is oriented to various Set-Points.
Secutity key is from 9000 to 9999.
For the access to the instrumental configuration push 'E' at least for 4 sec.

Proposed parameter are :

MAIN Set-Point	(1)	SEt	0050	values and limits in accord to selected input
Secondary Set-Point	(2)	SEt2	0050	values and limits in accord to selected input
LIMIT I Set-Point	(L1)	SEtL	0050	values and limits in accord to selected input
LIMIT II Set-Point	(L2)	SEtL'	0050	values and limits in accord to selected input
MINIMUM Set-Point		* S Lo	0000	values and limits in accord to selected input
MAXIMUM Set-Point		* S Hi	0500	values and limits in accord to selected input
Set-Point 1 or 2 or rem. switch		* SP12	SEt1	SEt1 – SEt2 – SEtr (if present)
Remote SetPoint start of scale		* SrLo	xxxx	-1999 ÷ 9999 but values and limits in accord to selected input
Remote SetPoint full of scale		* SrHi	xxxx	-1999 ÷ 9999 but values and limits in accord to selected input

Setting values meaning is:

SEt is the typical working set-point.
When setting up SEt the led 'M' flashes.

SEt2 represents a second Set-Point and is available to meet particular requirements such as the quick recipe exchange (processing) or the savings during breaks or other processing.
When setting up Set2 the led 'M' flashes.

SEtL is the Set-Point of the first alarm (I = L1) and in accordance with the selected type of alarm determine the action of output associated with it. When setting up SEtL the led 'I' flashes.

SEtL' is the Set-Point of the second alarm (II = L2) and in accordance with the selected type of alarm determine the action of output associated with it. When setting up SetL' the led 'II' flashes.

S Lo here can be set the the minimum value of Set-Point, so as to limit possible mistakes by users. They are directly affected SEt, SEt2, SEtr (if any remote Set-Point) and alarms (if absolute).

S Hi here can be set the the maximum value of Set-Point, so as to limit possible mistakes by users. They are directly affected SEt, SEt2, SEtr (if any remote Set-Point) and alarms (if absolute).

SP12 this parameter determines wich is the operative Set-Point.
You can choose between SEt, SEt2 and SEtr (if any remote Set-Point).

SrLo minimum value of remote Set-Point (only if remote Set-Point is available).

SrHi maximun value of remote Set-Point (only if remote Set-Point is available).

ANNOTATION RELATED TO REMOTE SET-POINT:
Remote Set-Point related electrical parameters (e.g. 4÷20mA, 0÷1Vdc, 0÷5Vdc, …) must be defined at order time and will be reported on instrument identification label.
Examples:

Remote Set-Point input 4÷20mAdc,	scale 0÷ 500°C:	SrLo = 0	SrHi = 500
Remote Set-Point input 0÷ 1 Vdc,	scale 50÷ 450°C:	SrLo = 50	SrHi = 450
Remote Set-Point input 0÷ 5 Vdc,	scale 0÷1000°C:	SrLo = 0	SrHi = 1000

* these parameters will be masked if setting value 'LK1' (menu 'ConF') is 'YES'.

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NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "Out" per TM9Xx
"Out" MENU RELATED FUNCTIONS for TM9Xx

"Out" menu provides the fundamental parameters for controller adjustment, including alarms.
Are accessed by holding down the key 'E' for at least 4 "and then acting on the button 'DOWN' to 1 time.
Security key is from 8000 to 8999.

The parameters that appear are as follows:

Proportional Band Heating	Pb H	010.0	000.0 ÷ 999.9	(if Pb H=0 → On/Off)
Derivative Time Heating	dt H	001.0	000.0 ÷ 009.9	(only if Pb H>0)
Integral time Heating	it H	0004	0000 ÷ 0020	(only if Pb H>0)
Cycle time Heating	ct H	0010	0000 ÷ 0099	(only if Pb H>0)
Superior Hysteresys Heating	hyHH	0000	0000 ÷ 0099	(only if Pb H=0)
Inferior Hysteresys Heating	hyLH	0001	0001 ÷ 0099	(only if Pb H=0)
Heating / Cooling selection	H-C	F-h	F-h - F-c	
Automatic / Manual selection	M-A	Aut	Aut - MAn	
Manual Power	P.MAn	0000	0000 ÷ 0100	
Anti Reset Window	ArS	0030	0000 ÷ 0100	
Tuning model	tun	St	St - At	
Max Power Limiting (economy)	M.Po	0100	0000 ÷ 0100	
Power-on rising time (ramp)	riSE	0000	0000 ÷ 0099	
Underrange -power	P.und	0000	0000 ÷ 0100 - nAt	
Over range power	P.ovr	0000	0000 ÷ 0100 - nAt	
Limit 1 type (function)	LIM 1	L08	L00 ÷ L07 L08 L09 L10 HbM L-C L20 ÷ L27 L30 ÷ L37 L40 ÷ L47	
Proportional Band Cooling	Pb C	004.0	000.0 ÷ 099.9	(only if LIM1=L-C) (if Pb L=0 → On/Off)
Derivative Time Cooling	dt C	001.0	000.0 ÷ 009.9	(only if LIM1=L-C) (only if Pb L>0)
Integral time Cooling	it C	0004	0000 ÷ 0020	(only if LIM1=L-C) (only if Pb L>0)
Cycle time Cooling	ct C	0010	0000 ÷ 0240	(only if LIM1=L-C) (only if Pb L>0)
Superior Hysteresys Cooling	hyHC	0000	0000 ÷ 0099	(only if LIM1=L-C) (only if Pb L=0)
Inferior Hysteresys Cooling	hyLC	0001	0001 ÷ 0099	(only if LIM1=L-C) (only if Pb L=0)
Overlap heating/cooling bands	OLP	0000	-0100 ÷ 0100	
Cooling reference	rEF	Air	Air Oil H2O	
Cooling Gain Loop	rGA	01.00	00.20 ÷ 01.00	
Limit 2 type (function)	LIM 2	L'08	L'00 ÷ L'07 L'08 L'09 L'10 HbM L'20 ÷ L'27 L30 ÷ L37 L40 ÷ L47	

Setting values meaning is :

Pb H is the Proportional Band for heating and is expressed in % related to the range for selected input.
eg.1 InP=J → scale 0÷900°C ; if Pb H=010.0 (10,0%) → Pb H is 90,0°C (10% of 900).
eg.2 InP=P → scale -199÷500°C ; if Pb H=010.0 (10,0%) → Pb H is 69,9°C (10% of |-199+500|).
eg.3 InP=1V → scale dSHi-dSLo=500punti ; if Pb H=010.0 (10,0%) → Pb H is 50,0 points (10% of 500).
If Pb > 0 the function is PID type (thermoregulator) which can be set separately proportional action (Pb H), derivative action (dt H) and the integral action (it H).
If Pb = 0 the function is ON-OFF type (thermostat) for which you can set higher hysteresis (hYHH) and lower (hYLH) independently (see parameters below).

dt H represents the derivative action time (in minutes).

it H represents the integral action time (in minutes).

ct H is the cycle time (tON + tOFF) that is the time available to supply power.
For example, if regulator calculates required power equal to 30% with a cycle time set to 10" will output 'on' for 3" and turn 'off' for 7" but with a cycle time set to 1" will activate the output for 0.3" and 0.7" for the off. Obviously, low cycle times allow better result in control but stress output devices and then have the prerogative static outputs (in case is used ct H = 1") and longer cycle times comply with components that do not like to be requested too frequently (ct H = 20 "or 30" for contactors or power relays).
Special case 'continuous output' where ct H=0"(maximum speed ~ 0.1")..

hyHH upper heating hysteresis (only with ON-OFF function).
The value here set is in addition to Set-Point value to determine the exact point of output switch.
(eg Set-Point = 50°C, hyHH = 4°C, the output switches at 54°C).

hyLH lower heating hysteresis (only with ON-OFF function).
The value here set must be subtracted to Set-Point to determine the exact point of output switch.
(eg Set-Point = 50°C, hyHH = 4°C, hyLH = 3°C, the output is triggered at 54°C and returned to 47°C).

H-C heating or cooling function.
By selecting 'H' output is active for input lower than set point while with 'C' for higher values.

M-A MANUAL / AUTOMATIC function. Normally the instrument operates in AUTO but for special needs you can operate in MANUAL forcing power (set in P.Man).
You can rapid access to ‘MANUAL’ function pressing M/A key for 8" while ‘AUTO’ function can be reach simply acting on M/A key.
CAUTION: 'MANUAL' working is potentially dangerous and should be made only with knowledge of the facts.

P.MAn is the supplied power in 'MANUAL' condition.

ArS Anti-Reset Window : percentage of proportional component forced to Set-Point corresponding and allows definition of proportional power value with null deviation
Systems characterized by high losses require higher values.

tun here provides the 'Tuning Model' that will use the controller to be launched in case the AUTOTUNING.
St: non-intrusive model that is activated only once at launch and the parameters are determined self.
At: non-intrusive model that is based on St but some parameters are recalculated continuosly.

M.Po Max Power Limiting **(ECONOMY)**: allow power limitation related with max system power controlled.
This feature is important when there are oversized systems and for energy saving.

riSE Power-on rising time (**ramp = SOFT-START**): allow supply energy in gradual mode (ramp).
When the instrument switch on the power output is gradually increased until the power calculated in the time set here (useful for resistance heating that will be not stressed, etc..)

P.und Underrange Power: allows you to set the desired power in a underrange condition.
’nAt’ (natural) assumes a scale where there is extensive underrange and behaves accordingly.

P.ovr Overrange Power: allows you to set the desired power in a overrange condition.
’nAt’ (natural) assumes a scale where there is extensive overrange and behaves accordingly.

LIM 1 Setting 'type' (function) for the desired LIMIT 1 (alarm 1) [see chart].

L00	=	band alarm	relative	direct (outside active)
L01	=	maximum alarm	relative	direct (outside active = after)
L02	=	minimum alarm	relative	direct (outside active = before)
L03	=	maximum alarm	absolute	direct (outside active = after)
L04	=	band alarm	relative	inverse (inside active)
L05	=	maximum alarm	relative	inverse (outside active = before)
L06	=	minimum alarm	relative	inverse (outside active = after)
L07	=	maximum alarm	absolute	inverse (outside active = before)
L08	=	OFF alarm (no alarm)		
L09	=	dedicated alarm to ‘step’ relay (only for programmer version)		
L10	=	dedicated alarm to ‘band alarm’ (only for programmer version)		
HbM	=	dedicated alarm to ‘HbM’ function (see A.InP group)		
L-C	=	dedicated alarm to ‘cooling’ function.		

L20 ÷ L27 as L00 ÷ L07 but with 'intelligent' function in that the alarm does not play unless you have created a situation 'appropriate' in the terms to be analyzed.
Typical is the case of an minimum alarm (heating process, etc..), where with type L02 alarm at swith-on there is immedistely ON alarm output but would be more correct if the alarm occur only in presence of fall of temperature (alarm type L22) once in regulation and so on. etc. .
L30 ÷ L37 as L00 ÷ L07 but with memory function.
In practice, once activated the alarm can be disabled if you stopped the condition that caused it and after a RESET the alarm itself.
The reset can be obtained by key pressing (show the Set of alarm in question and press the ENTER and DOWN buttons simultaneously).
L40 ÷ L47 as L20 ÷ L27 but with memory function.
In practice, once activated the alarm can be disabled if you stopped the condition that caused it and after a RESET the alarm itself.
The reset can be obtained by key pressing (show the Set of alarm in question and press the ENTER and DOWN buttons simultaneously).

Pb C is the Proportional Band for cooling and is expressed in % related to the range for selected input.
If Pb > 0 the function is PID type (thermoregulator) which can be set separately proportional action (Pb C), derivative action (dt C) and the integral action (it C).
If Pb = 0 the function is ON-OFF type (thermostat) for which you can set higher hysteresis (hYHC) and lower (hYLC) independently (see parameters below).

dt C represents the derivative action time (in minutes).

it C represents the integral action time (in minutes).

ct C is the cycle time (tON + tOFF) that is the time available to supply power (see above ct H).

hyHC upper cooling hysteresis (only with ON-OFF function).
The value here set is in addition to Set-Limit value to determine the exact point of output switch.
(eg Set-Limit = 60°C, hyHC = 4°C, the output switches at 64°C).

hyLC lower cooling hysteresis (only with ON-OFF function).
The value here set must be subtracted to Set-Limit to determine the exact point of output switch.
(eg Set-Point = 60°C, hyHC = 4°C, hyLC = 3°C, the output is triggered at 64°C and returned to 57°C).

OLP overlapping (overlap / dead zone) is the percentage of proportional component of the cooling power of forced at the Set-Limit (equivalent to Ars for heating) .

rEF allows you to set the type of used refrigerant and has a direct impact on 'ct C' and 'rGA'.

rEF = **Air**	ct C = 10	rGA = 1.00
rEF = **OiL**	ct C = 4	rGA = 0.80
rEF = **H2O**	ct C = 2	rGA = 0.40

rGA Gain on Cooling: parameter that directly affects the cooling proportional band.
The report will be 'effective cooling Pb' = Pb C / rGA.

LIM 2 Setting 'type' (function) for the desired LIMIT 2 (alarm 2) [see chart LIMIT 1].
All as' LIM 1 'with the exception of type' LC' that is not available.

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NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "A.Out" per TM9Xx – sez. SERIALE

"A.Out" MENU RELATED FUNCTIONS for TM9Xx – SERIAL sect.

"**A.Out**" menu is dedicated to serial communication port and to retransmitted output (mutually exclusive).
Security key is from 7000 to 7999.
For the access to the instrument configuration, push 'E' for 4 sec., then push DOWN key twice.

"SERIAL COMUNICATION PORT" SECTION

Serial communication output must be correctly configured with five related parameters:

Communication Protocol	Prot	OFF	ASC o Mdb (see ordering details)						
Serial Address	Addr	0001 ÷ 0255							
Baudrate	bAud	0300	0600	1200	2400	4800	9600	19.2	38.4
Local / Remote Mode (Loc/rem)	ModE	LOC	rEM						
Delay rx/tx [msec]	dLY	0001	0002	0003	0004	0005	0006	0008	0010

Here details about it:

Prot serial protocol must be set to "ASC" or "Mdb", in order to use the serial comunication port.
"**OFF**" serial communication disabled (not working). In this case you can use retransmitted output.
"ASC" or "Mdb" serial communication activeted (working), ASCII protocol (related to request version).
serial communication activeted (working), MODBUS protocol (related to request version).

Addr corresponding to univocal address assigned to the instrument (default=0001).
It is very important that with the same network there aren't any other instruments with the same address so that no conflicts will take place.

bAud communication baud-rate with the instrument. It must be chosen from these values:

"300"	baud-rate =	300	baud
"600"	baud-rate =	600	baud
"1200"	baud-rate =	1200	baud
"2400"	baud-rate =	2400	baud
"4800"	baud-rate =	4800	baud
"**9600**"	baud-rate =	9600	baud (default)
"19.2"	baud-rate =	19.200	baud
"38.4"	baud-rate =	38.400	baud

ModE it corresponds to the operating mode of the instrument, if in Local or Remote status.
Loc If in 'Local' state, it is only possible to "read" the parameters from the instrument
rEM If in 'Remote' state it is possible to "read" the parameters from the instrument and to "write" them in it.

dLy this is the desidered delay time between reception and transmission in serial communication protocol.
You should choose from 1, **2** (default), 3, 4, 5, 6, 8 and 10 mSec.
This parameter is very important to correct handshake in old and new PCs, different operating systems, various hardwares, fast and slow systems.
Longer times offer best compatibility but communication will be slower.

NOTE: - Refer to the 'serial communication manual' for all explanations concerning correct use and protocol grammar.
- Refer to 'serial communication manual' for some examples of software communication by "C" and "BASIC", both for ASCII protocol and MODBUS protocol.

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NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "A.Out" per TM9Xx – sez. RITRASMESSA

"A.Out" MENU RELATED FUNCTIONS for TM9Xx – RETRANSMITTED sect.

After serial communication protocol parameters, related retransmitted output, are shown (N.B. mutually exclusive).

"RETRASMITTED ANALOG OUTPUT" SECTION

Retransmitted analog output must be correctly programmed with 9 related parameters (5 necessary).

Source	Src	OFF diS SEt SEL SEL' Pot
Displays Low	dSLo	-1999 ÷ 9999 (default 0000)
Output Low	OuLo	0000 ÷ 9999
Displays High	dsHi	-1999 ÷ 9999 (default 9999)
Output High	OuHi	0000 ÷ 9999
Analog Output minimum [%]	O.InF	0000 ÷ 0110
Analog Output maximum [%]	O.SuP	0000 ÷ 0110
Analog Output % for UnderRange	O.und	0000 ÷ 0110 e nAt
Analog Output % for OverRange	O.ovr	0000 ÷ 0110 e nAt

Explanation about the parameters:

Src SOURCE: variable unit source which should be retransmitted
"**OFF**" retransmitted output disabled (not working). In this case you can use serial communication port.
"diS" process variable retransmission
"SEt" main output set-point retransmission
"SEL" limit L (= L1 = I) output set-point retransmission
"SEL'" limit L' (= L2 = I I) output set-point retransmission
"Pot" power output retransmission

dSLo DISPLAYS LOW : this parameter indicates the visualization value to which the analog output minimum corresponds (-1999÷9999).

OuLo ANALOG LOW : it corresponds to analog output minumum (0÷9999)

dSHi DISPLAYS HIGH this parameter indicates the visualization value to which the analog output maximum corresponds (-1999÷9999).

OuHi ANALOG HIGH : it corresponds to analog output maximum (0÷9999)

NOTE: - Retransmitted output is 0÷10V; if different values (eg. 2÷10V) or different units (eg. 0÷20mA) were used, they should correspond to 0÷10V.
- If inverse retransmitted output were necessary (output decreases if the value increases and vice versa, eg. 20÷0mA) just set in "OuLo" a value which is higher than the one set in "OuLHi", in order to achieve the intended condition.

EXAMPLES: e.g. 1 Output 0÷10V display range 0÷1000
Setting "dSLo"=0; "OuLo"=0; "dSHi"=1000; "OuHi"=9999

e.g. 2 Output 0÷20mA display range 0÷100
Setting "dSLo "=0; "OuLo "=0; "dSHi"=100; "OuHi"=9999

e.g. 3 Output 4÷20mA display range 100.0÷500.0
Setting "dSLo "=100.0; "OuLo "=2000; "dSHi"=500.0; "OuHi"=9999

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O.InF ANALOG OUTPUT MINIMUM [%] with this parameter is defined, in percent, the minimum desired output.
For example in case of 0÷20mA output if you want to have as a minimum output current set to 2mA you should impose O.InF=10% (100% / 20mA*2mA=10%) → setting O.InF=0010.

O.SuP ANALOG OUTPUT MAXIMUM [%] with this parameter is defined, in percent, the maximum desired output.
For example in case of 0÷20mA output if you want to have the maximum output current set to 21mA you should impose O.SuP=105% (100% / 20mA*21mA=105%) → setting O.SuP=0105.

O.und ANALOG OUTPUT for UNDERRANGE [%] with this parameter is defined, in percentage, the value of output in presence of the condition of UnderRange.
Under natural conditions (= nat) there is the extension of scale set in the parameters relating to the retransmitted output dSLo/OuLo and dSHi/OuHi (eg. in case of 4÷20mA output in the 0÷500°C range for UnderRange it will outgoing to 0mA).
If percentages values of O.und is set, the output behavior will be forced to the desired value.
Note that the parameter O.InF dominates O.und and if you set a value of O.und less than O.InF the value available in output will be set to O.Inf .
Also the parameter O.SuP dominates O.und and if you set a value of O.und more than O. SuP the value available in output will be set to O.SuP.

O.ovr ANALOG OUTPUT for OVERRANGE [%] with this parameter is defined, in percentage, the value of output in presence of the condition of OverRange.
Under natural conditions (= nat) there is the extension of scale set in the parameters relating to the retransmitted output dSLo/OuLo and dSHi/OuHi (eg. In case of 4÷20mA output in the 0÷500°C range for OverRange it will leaving more than 20mA).
If percentages values of O.ovr is set, the output behavior will be forced to the desired value.
Keep present that the parameter O.SuP dominates O.ovr parameter and if you set a value of O.ovr more than O. SuP value available in the output will be set to O.SuP.
Also the parameter O.InF dominates O.ovr and if you set a value of O.ovr less than O.InF the value available in the output will be set in O. InF.

NOTE: From all above it is clear that the four parameters related to retransmitted output offer practical solutions, and elegant at the same time, for various problems of application, expanding the possibilities of performance and the ability to interface with these instruments.
All this allows to fully meet the requirements of safety operations and at the same time requests for components present in the retransmission chain.

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NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "A.InP" per TM9Xx – sez. ING. DIGITALI

"A.InP" MENU RELATED FUNCTIONS for TM9Xx – DIGITAL INP. sect.

"**A.InP**" menu is oriented to digital inputs (if present) and to HBM [Heater Break Monitor] (if present).
Security key is from 6000 to 6999.
For the access to the instrumental configuration push 'E' at least for 4 sec., then push 'DOWN' key 3 times.

"DIGITAL INPUT" SECTION

Digital inputs allow to directly operate without using the front keyboard and its related menu and sub menu.
They can be activated by electromechanical devices (eg. switch, buttons) and by electrical dc signals.
They allow interaction with external automatism.

Related parameters are:

Dig.Inp 1	**di 1**	**OFF**	**kEy**	**HLd**	**ChS**	**L-r**	**PrG**
Dig.Inp 2	**di 2**	**OFF**	**kEy**	**HLd**	**ChS**	**L-r**	**PrG**

Here, details about Dig.Inp 1 (di 1) and Dig.Inp 2 (di 2) setup:

OFF digital input disable (not working)

kEy by-pass keyboard lock
(if digital input has been activated, key value is forced to '0' → all function free)

HLd Hold measuring function
(display input value will be freezed: controller action consequently operates).
N.B. this operative condition can be very dangerous).

ChS switch set point from SEt to SEt2
(if digital input has been deactivated Set-Point 'SEt' is operative
if digital input has been activated Set-Point 'SEt2' is operative)

L-r switch local/remote operating Set-Point
(if digital input has been deactivated, the operating one is the LOCAL Set Point
if digital input has been activated, the operating one is REMOTE Set Point)

PrG Reserved functions for instruments in programmer version:
Dig.Inp 1 corresponds to **START** input (N.B.: the same function can be activated by keyboard).
When signal goes low (internal pull-up respected higher than internal reference [0]) the function is executed.
Signal can be temporary (pushbutton) or stable (switchbutton).
Dig.Inp 1 is the one with the lowest priority.
Dig.Inp 2 corresponds to **STOP** input (or PAUSE) (N.B.: the same function can be activated by keyboard).
When signal goes low (internal pull-up respected higher than internal reference [0]) the function is executed.
It can be temporary (pushbutton) or stable (switchbutton).
Dig.Inp 2 is the one with the higher priority (thus it controls START).
Dig.Inp 1 + Dig.Inp 2 corresponds to **RESET** function (N.B.: the same function can be activated by keyboard).
When both signals go low (internal pull-up respected higher than internal reference [0]) the function is executed.
They can be temporary (pushbutton) or stable (switchbutton) signals.
Dig.Inp 1 + Dig.Inp 2 have the highest priority inputs, (independently of START and STOP).

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NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "A.InP" per TM9Xx – sez. HBM

"A.InP" MENU RELATED FUNCTIONS for TM9Xx – HBM sect.

After showing the parameters concerning DIGITAL INPUT, HBM (Heather Break Monitor)-parameters are presented (only if HBM function is present).
They correspond to integrated control, executed by current transformer (CT), and to load efficiency (heating etc.).

"HBM – Heather Break Monitor" SECTION

HBM parameters are:

f.s. Inp. Amper.	**HbS**	**0001 – 0200**
delay time Inp. Amp.	**Hbt**	**0000 – 0999 (def. 0030)**
alarm funct. Inp. Amp.	**HbF**	**OnH OFH OrH OnC OFC OrC**
current display	**Hbd**	**OFF cOn cOF**

Here, explanations of the related parameters:

HbS amperometer input full scale
(the data about the primary current transformer (CT) in use must be placed here).
The secondary one of current transformer must be 100mA f.s.
Example for TA 100Af.s. → TA 100/0,1 Example for TA 10Af.s. → TA 10/0,1)

Hbt HBM alarm delay: it corresponds to alarm output delay time in case of change of alarm condition.
Current Set corresponds to HBM alarm Set-Point.
N.B. HBM alarm type must be selected.

HbF alarm function

OnH	On-state heating current is too high
OFH	Off-state heating current is too high
OrH	On-state or Off-state heating current is too high
OnL	On-state cooling current is too high
OFL	Off-state cooling current is too high
OrL	On-state or Off-state cooling current is too high

Hbd current display

OFF	lower display function is standard
cOn	lower display shows On-state current
cOF	lower display shows Off-state current

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NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "diSP" per TM9Xx
"diSP" MENU RELATED FUNCTIONS for TM9Xx

"**diSP**" menu have parameters related to global instrument configuration.
Security key is from 5000 to 5999.
For the access to the instrumental configuration push 'E' at least for 4 sec., then push 'DOWN' key 4 times.

Current following parameters are:

Offset	**OFFS**	**0000**	**-99 ÷ 99**
Protection/security key	**kEyL**	**0000**	**0000 ÷ 9999**
Keyboard Time-Out	**tMt**	**5**	**5 – 10 – 20 – 30**
Parameters auto-store	**Stor**	**no**	**no - yES**
°C - °F selection	**C-F**	**°C**	**°C - °F**
Decimal-point position	**dPoS**	**9999**	**9999 – 999.9 – 99.99 – 9.999**

Setting values meaning is:

OFFS **0000** The stored value of this function will be algebraically added to the displayed value. It allows to correct inaccuracy, misalignment and improper indication at pleasure. Acceptable values will be between -99 and +99 popints, disregarding decimal point

kEyL **0000** By keylock, it is possible to restrict the access to the functions programming to avoid tampering or wrong setting by not qualified personnel. In use it will be possible to see and inspect all menu and relate parameters but will be prevent possibility to modify parameter's value (if parameter is protected led "LK" flashing).
If key is activated "LK" led is ON (bottom on right of lower display group).
Defaul value is '0000'.
Thanks to setting value is enable or inhibit parameters modification in accord to:

9000÷9999	menù **SEtP**	(Set-Point)
8000÷8999	menù **Out**	(outputs)
7000÷7999	menù **A.Out**	(auxiliary outputs)
6000÷6999	menù **A.InP**	(auxiliary inputs)
5000÷5999	menù **diSP**	(display)
4000÷4999	menù **ConF**	(configuration)
3000÷3999	menù **ProG**	(programmer)

Logically higher value lock all lower menù (e.g. 8000 allow free only and solely SEtP menù meanwhile all other menù will be interdicted for setting/modify).

tMt **5** It determines the keyboard time-out, that is for how long the instrument will stay in programming mode even if no key will be pressed.
The following choices expressed in seconds are available: '5', '10', '20', '30'. Default value is 5".

Stor **no** It determines if the parameter under modification will be automatically updated or not at keyboard time-out

no Modified parameters will not be updated (if not confirmed with ENTER key)
yES Modified parameters will be automatically updated (if within the admissible limits) at keyboard time-out without confirmation with ENTER key.
A short (250 ms) turn-off of all displays will confirm the storage in memory.

C-F **°C** This parameter allows to select the measurement unit to work with: °C or °F
The frontal indicator (°C/°F led) shows the current selection.
If turned off, you are working with °C, if turned on you are working with °F.
The relationships between the two measurement units are: °F=(°Cx 9/5)+32 and °C=(°F-32) x 5/9

dPoS **9999** It allows to set the decimal point position, if required, for linear input (not for temperature ranges).
The selection will be among the following choices: 9999 - 999.9 - 99.99 - 9.999 .

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NOTE APPLICATIVE ***APPLICATION NOTES***

FUNZIONI RELATIVE AL MENU' "ConF" per TM9Xx

"ConF" MENU RELATED FUNCTIONS for TM9Xx

"**ConF**" menu allow instrument base configuration (input type, display range, etc.).
Security key is from 4000 to 4999.
For the access to the instrumental configuration push 'E' at least for 4 sec., then push 'DOWN' key 5 times.

Proposed parameter are :

Input	**InP**	**J**	**P – P. – J – J. – K – K. – L – L. – n – n. – t – t. – r – S – b – 0.05V – 1V – 10V – 0.02A**
Minimum input (start scale)	**InLo**	**000.0**	**000.0 ÷ 999.9**
Minimum display	**dSLo**	**0000**	**0000 ÷ 9999**
Maximum input (end scale)	**InHi**	**999.9**	**000.0 ÷ 999.9**
Maximum display	**dSHi**	**9999**	**0000 ÷ 9999**
Filter	**FIL**	**0004**	**0001 ÷ 0020**
Menù 1 Key (SEtP)	**LK 1**	**no**	**no - yES**

Setting values meaning is:

InP J Corresponding to information for controller about input signal type (direct probe or normalized current or voltage signal).

P	Temperature transducer	Pt100 range	-0199	÷	0500	°C	(-328	÷	932	°F)
P.	Temperature transducer	Pt100 range	-199,9	÷	400,0	°C	(-199,9	÷	752,0	°F)
J	Temperature transducer	Tc 'J ' range	-0000	÷	0900	°C	(32	÷	1652	°F)
J.	Temperature transducer	Tc 'J ' range	-000,0	÷	400,0	°C	(32,0	÷	752,0	°F)
K	Temperature transducer	Tc 'K ' range	-0000	÷	1300	°C	(32	÷	2372	°F)
K.	Temperature transducer	Tc 'K ' range	-000,0	÷	400,0	°C	(32,0	÷	752,0	°F)
L	Temperature transducer	Tc 'L ' range	-0000	÷	0900	°C	(32	÷	1652	°F)
L.	Temperature transducer	Tc 'L ' range	-000,0	÷	400,0	°C	(32,0	÷	752,0	°F)
n	Temperature transducer	Tc 'N ' range	-0000	÷	1300	°C	(32	÷	2372	°F)
n.	Temperature transducer	Tc 'N ' range	-000,0	÷	400,0	°C	(32,0	÷	752,0	°F)
t	Temperature transducer	Tc 'T ' range	-0000	÷	0400	°C	(32	÷	752	°F)
t.	Temperature transducer	Tc 'T ' range	-000,0	÷	400,0	°C	(32,0	÷	752,0	°F)
r	Temperature transducer	Tc 'R' range	0000	÷	1.760	°C	(32	÷	3.200	°F)
S	Temperature transducer	Tc 'S' range	0000	÷	1.760	°C	(32	÷	3.200	°F)
b	Temperature transducer	Tc 'B' range	0000	÷	1.810	°C	(32	÷	3.290	°F)
0,05V	continuous voltage input	0 ÷ 50mV	range	0000	÷ 9999 points					
1V	continuous voltage input	0 ÷ 1Vdc	range	0000	÷ 9999 points					
10V	continuous voltage input	0 ÷ 10Vdc	range	0000	÷ 9999 points					
0,02A	continuous voltage input	0 ÷ 20mAdc	range	0000	÷ 9999 points					

EXAMPLES:

- **resistence Pt100 input**	scale 0÷200.0°C	setting: 'InP'= P.	'C - F' ("diSP") = °C			
- **thermocouple K input**	scale: 0÷1100°F	setting: 'InP'= k	'C - F' ("diSP") = °F			
- **Input 5÷35,4mVdc**	reading: 050.0÷700.0	setting: 'InP'=0,05V	'InLo'=0500	'dSLo'=0500	'InHi'=3540	'dSHi'=7000
- **Input 0÷0,75 Vdc**	reading: 000.0÷750.0	setting: 'InP'= 1V	'InLo'=0000	'dSLo'=0000	'InHi'=7500	'dSHi'=7500
- **Input 4÷20,0mAdc**	reading: 000.0÷100.0	setting: 'InP'=0.02A	'InLo'=0400	'dSLo'=0000	'InHi'=2000	'dSHi'=1000

NOTES:

- for temperature input, the selection of a different measuring unit (°C, °F, k) will cause the automatic re-calculation of the values.
- all temperature transducers are linearized with theoretical precision best of 0,01°C for temperature resistance detector Pt100 and best of 0,1°C for thermocouple.
- during configuration decimal point "." position is not meaningful and depend from 'dPoS' parameter ("dISP" group).

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InLo	**000.0**	Parameter accessible only for voltage or current input (linear scale). The 'InLo' function corresponds to the minimum value of the input variable.
dSLo	**0000**	Parameter accessible only for voltage or current input (linear scale). The 'dSLo' function corresponds to value displayed minimum.
InHi	**999.9**	Parameter accessible only for voltage or current input (linear scale). The 'InHi' function corresponds to the maximum value of the input variable.
dSHi	**9999**	Parameter accessible only for voltage or current input (linear scale). The 'dISHi' function corresponds to value displayed maximum.
FILt	**0004**	It is the number of readings used to calculate the algebraic average and then to display the result. Admissible values are between 1 and 20. Setting it at 1, we get the max response speed because every correct reading is displayed. Setting it at 25, we have the max steady state of reading , even with noisy signals.
LK 1	**no**	Special key for hide some available setting for "SetP" menù so that it can be very simple and functional in use.
	no	"SEtP" menu available with all functions.
	yES	"SEtP" menu available in short form.

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NOTE APPLICATIVE ***APPLICATION NOTES***

TM9x VERSIONE PROGRAMMATORE *TM9x PROGRAMMER VERSION*

UTILIZZO DELLA TASTIERA					
ENTER (CNF)	**UP**	**DOWN**	**FUNCTION (F)**	**standing**	**action**
	*			immediate	Set-Point adjustement
		*		immediate	Set-Point adjustement
			*	8''	switch in MANUAL function (release immediate)
*				4''	menù parameters adjustement (IV lelev : serial, filter, …)
*			*	4''	menù REGULATOR / PROGRAMMER parameters
*	*			immediate	Selftuning / Autotuning ON – OFF
*		*		4 ''	default parameters loading
*		*		immediate	Manual Alarm Reset (in concerned Set Alarm)
	*		*	immediate	START PROGRAMMER (time counter unlock … and reset if first time)
		*	*	immediate	STOP PROGRAMMER (time counter lock …)
	*	*	*	immediate	RESET PROGRAMMER (point to setting program, step 0, time 0 and time counter lock …)

NOTES:
- action on the key is achieved on release of the keys themselves.
- to start the "active" program (set in the function P.Act of the group "GEn"), you make a RESET and then a START .
- to pause the countdown impose a STOP, START to resume ...

STRUCTURE OF PROGRAMS

The programs are structured in a simple and straightforward logic.
Ten (10) programs are provided, numbered from 0 to 9.
Each program consists of 10 steps (segments) numbered from 0 to 9.
For each step must be defined:
- final set-point value (initial set-point corresponds to the finish set-point of the previous step and in the case of step "0" corresponds to local set-point of controller).
- duration of step (time, according to the selected units of measurement in the parameter 'time' of each program).
- pass relay(s) status (if desired).
- the selected program (function P.ACt) will be run from a minimum of 1 to a maximum of 99 times according to the parameter 'rEPt' (repetition).

SHORTS PROGRAMS

If the desired program does not employ all 10 steps is typical enough to set time zero (0) to final step.at which you want to stop the execution of the program.
The set-point will be maintained corresponding to the set-point of step where you have defined time zero.
It is easy to understand the great freedom of choice that allows this type of structure.

SHORTS PROGRAMS example:

	local Set-Point	=	50°C			
step 0	Set-Point 0	=	150°C	time 0	=	10'
step 1	Set-Point 1	=	150°C	time 1	=	60'
step 2	Set-Point 2	=	200°C	time 2	=	30'
step 3	Set-Point 3	=	30°C	time 3	=	00'

Description of behavior (with parameter 'REPT' = 1):
To beginning the program starts with a Set-Point of 50 ° C and in 10 minutes and reaches 150 ° C.
Remains at 150 ° C for one hour (60 ') and then in 30' up to 200 ° C.
Here ends the execution of the program (time 3 = 00 ') and the instrument retains the setting to 30 °C.
Description of behavior (with parameter 'REPT' = 3):
To beginning the program starts with a Set-Point of 50 ° C and in 10 minutes and reaches 150 ° C.
Remains at 150 ° C for one hour (60 ') and then in 30' up to 200 ° C. End of the first cycle.
The program continues with a Set-Point of 200 ° C and 10 minutes to reach 150 ° C.
Remains at 150 ° C for one hour (60 ') and then in 30' up to 200 ° C. End of the second cycle.
The program continues with a Set-Point of 200 ° C and 10 minutes to reach 150 ° C.
Remains at 150 ° C for one hour (60 ') and then in 30' up to 200 ° C. End of the third cycle.
Here ends the execution of the program (time 3 = 00 ') and the instrument retains the setting to 30 °C.
It follows then that the latest step (with time 0) is never executed during rehearsals but only after the last repetition.
Therefore it must be considered both as a step of signaling the end of the program itself (time zero) and as a definition of the final Set-Point.

LONG PROGRAMS

If the profile requires a number of steps over 10 traditional just setting the parameter 'links' (Links) to' YES ' and the program will 'paste' to the following to obtain the availability of the required steps.
Repeating this approach for programs in basic 10 steps you get the availability of the required steps.
The maximum obtainable is a single large program made up of 100 steps.
Basis for the program who does not take all 10 steps available that is what it says about 'SHORTS PROGRAMS'.

LONG PROGRAMS example (parameter 'Link' = YES):

		local Set-Point	=	50°C			
step 0	program X	Set-Point 0	=	150°C	time 0	=	10’
step 1	program X	Set-Point 1	=	150°C	time 1	=	60’
step 2	program X	Set-Point 2	=	200°C	time 2	=	30’
step 3	program X	Set-Point 3	=	200°C	time 3	=	60’
step 4	program X	Set-Point 4	=	250°C	time 4	=	30’
step 5	program X	Set-Point 5	=	250°C	time 5	=	60’
step 6	program X	Set-Point 6	=	300°C	time 6	=	30’
step 7	program X	Set-Point 7	=	300°C	time 7	=	60’
step 8	program X	Set-Point 8	=	350°C	time 8	=	30’
step 9	program X	Set-Point 9	=	350°C	time 9	=	60’
step 0	program X+1	Set-Point 0	=	400°C	time 0	=	30’
step 1	program X+1	Set-Point 1	=	400°C	time 1	=	60’
step 2	program X+1	Set-Point 2	=	450°C	time 2	=	30’
step 3	program X+1	Set-Point 3	=	30°C	time 3	=	00’

Description of behavior (with parameter 'rEPt' = 1):
to beginning the program starts with a Set-Point of 50 ° C and in 10 minutes and reaches 150 ° C.

I. Remains at 150 ° C for one hour (60 ') and then in 30' up to 200 ° C.
II. Remains at 200 ° C for one hour (60 ') and then in 30' up to 250 ° C.
III. Remains at 250 ° C for one hour (60 ') and then in 30' up to 300 ° C.
IV. Remains at 300 ° C for one hour (60 ') and then in 30' up to 350 ° C.
V. Remains at 350 ° C for one hour (60 ') and then in 30' up to 400 ° C.
VI. Remains at 400 ° C for one hour (60 ') and then in 30' up to 450 ° C.

Here ends the execution of the program (time 3 = 00 'of the X +1) and the instrument retains the setting to 30 °C.

Description of behavior (with parameter 'REPT' = 3):
to beginning the program starts with a Set-Point of 50 ° C in 10 minutes and reaches 150 ° C.
Performs the operation described above I. II. III. IV. V. VI. End of the first cycle.
The program continues with a Set-Point at 450 ° C and 10 minutes to reach 150 ° C.
Performs the operation described above I. II. III. IV. V. VI. End of the second cycle.
The program continues with a Set-Point at 450 ° C and 10 minutes to reach 150 ° C.
Performs the operation described above I. II. III. IV. V. VI. End of the third cycle.
Here ends the execution of the program (time 3 of the X+1 = 00') and the controller maintains the adjustment at 30 °C
It follows then that the latest step (with time 0) is never executed during rehearsals but only after the last repetition.
Therefore it must be considered both as a step of signaling the end of the program itself (time zero) and as a definition of the final Set-Point.

GRAPHICAL EXAMPLES

PROGRAM 0							
step	°C		h	min	sec	step rel 1	step rel 2
Set-Point 0	100	time 0	0	10	0	OFF	OFF
Set-Point 1	100	time 1	0	20	0	ON	OFF
Set-Point 2	200	time 2	0	30	0	OFF	ON
Set-Point 3	200	time 3	0	40	0	ON	ON
Set-Point 4	250	time 4	0	50	0	OFF	OFF
Set-Point 5	200	time 5	0	50	0	ON	OFF
Set-Point 6	200	time 6	0	40	0	OFF	ON
Set-Point 7	100	time 7	0	30	0	ON	ON
Set-Point 8	100	time 8	0	20	0	OFF	OFF
Set-Point 9	50	time 9	0	0	0	OFF	OFF