TC 42

TIMER/PULSE COUNTER/ DIGITAL ELECTRONIC POWER LIMITER

User Manual

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PREFACE

This manual contains the information necessary for the product to be installed correctly and also instructions for its maintenance and use; we therefore recommend that the utmost attention is paid to the following instructions and to save it.

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Ascon Tecnologic S.r.l. and its legal representatives do not assume any responsibility for any damage to people, things or animals deriving from violation, wrong or improper use or in any case not in compliance with the instrument features.

Whenever a failure or a malfunction of the device may cause dangerous situations for persons, thing or animals, please remember that the plant has to be equipped with additional devices which will guarantee safety.

1. INSTRUMENT DESCRIPTION

1.1 General description

TC42 is a microprocessor based **digital timer/pulse counter/power limiter**.

The instrument used as a **timer** offers the possibility to program: up to **3 timings** (Set point), **6 operating modes** for **OUT1** output, **10 operating modes** for **OUT2** output, **4 time scales** (which allow a count from a maximum of 9999 hours to a minimum of 0.01 seconds), **6 counting enabling functioning modes** and **2 counting modes** (**UP** or **DOWN**).

The instrument used as a **pulse counter** offers the possibility to program: up to **2 Set points**, **3 operating modes** for **OUT1** output, **4 operating modes** for **OUT2** output and offers the possibility of **counting division**.

Moreover, the instrument can also be used as a **power limiter** by programming a **duty-cycle** from **0 ÷ 100%** and a **total cycle time** from **1 ÷ 900 s.**

The **upper 4-digit display normally** shows the **counting status** while the **lower 4-digit display** the **selected set point**. The **status of the outputs** is shown by **2 LEDs**.

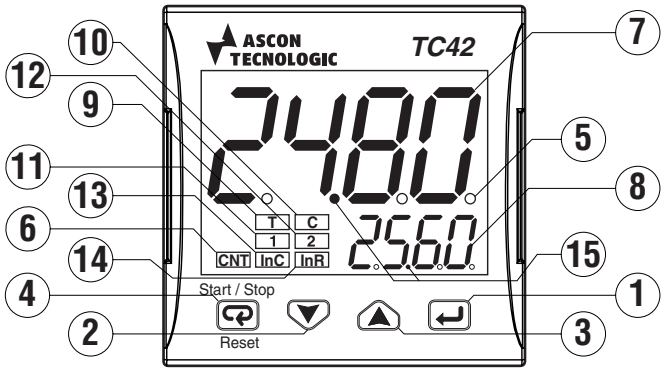
The instrument has **1 counting/counting enabling input** (**CNT**) and **1 digital input** with **programmable operation** (**RESET** or **reverse counting**) whose signals can come from **free of voltage contacts**, from devices with **NPN** or **PNP** transistor output. It can have up to **2 relay outputs** or for driving **Solid State Relays** (SSR).

The instrument can be equipped with an **internal** or **external buzzer** (connected to the **Out2 output**) to signal the counting end.

The **instrument programming** can be done through **3 front keys** where there is also the **programmable key** for the **Start/Stop/Reset** commands.

The operating parameters programming **can take place**, as well as from the keyboard, also through the **A01 device** connected to the **TTL port** (standard) or through an **NFC communication device** (optional).

1.2 Front panel description



1 **:** Pressed and released allows to set the time delays (if programmed with t.Ed parameter). Pressed for 5 s enters the parameters program mode, pressed again accesses the parameters edit mode and confirms values. In programming mode can be used together with the key to change the parameters programming level. When the keyboard is locked, and keys hold pressed together for 5 s, unlock the keyboard;

2 **:** In parameteres program mode is used to decrease the setting values and to select the parameters;

3 **:** In parameteres program mode is used to increase the setting values and to select the parameters. In programming mode can be used together with key to change parameters level. Pressed together with the key for 5 s allows the keyboard unlock;

4 **Start/Stop/Reset:** Can be used for Start/Stop/Reset count commands as programmed using the t.UF parameter;

5 **LED SET:** In normal operating mode lights up when a key is pressed to signal the key pressure. In programming mode is used to indicate the parameter programming level;

6 **LED CNT:** Indicates: count in progress (flashing with a 1 s frequency if used as timer, steady ON if counter), count interrupted (steady ON if used as timer) or the reset status (OFF);

7 **CNT Display:** Shows the value of the count in progress;

8 **SET Display:** Shows the Active Set point value;

9 **LED T:** When lit the instrument is used as a **Timer**;

10 **LED C:** When lit the instrument is used as a **Counter**;

11 **LED 1: Out1** output status: ON (lit), OFF (not lit);

12 **LED 2: Out2** output status: ON (lit), OFF (not lit);

13 **LED InC: CNT** input status;

14 **LED InR: RST** input status;

15 **Timer separator point:** Indicates the separation between hours and minutes, minutes and seconds, seconds and hundredths of a second when the instrument operates as a **Timer**.

2. PROGRAMMING

2.1 Set Points programming

The normal programming mode of the Set Points occurs by pressing and releasing the key, the upper display starts showing SP 1 (if the instrument is working as a Timer) or SC 1 (if the instrument is working as a Counter)and the lower display shows programmed value.

To change the value press the key to increase the number shown or to decrease it. These 2 keys normally act in one digit steps a time, but if kept pressed for more than 1 s the value increases or decreases faster and after 2 more seconds in the same condition, the speed further increases in order to quickly reach the desired value. However, through t.Edt parameter (**Timer**) or t.EdC (**Counter**) it is possible to define if and which Set Points can be set with the short key. A further option provides the setting of SP 1 or SP2 (**Timer**)/SC 1 or SC2 (**Counter**) Set Point value only, using the / keys without pressing in advance the key (t.Ed = **8**/**9**).

t.Ed parameter can assume a value between **oF** and **9**:

oF No Set Point can be set with the short key (if pressed and released, the key has no effect);

1 Only SP 1/SC 1 Set Point can be set with this procedure;

2 Only SP2/SC2 Set Point can be set with this procedure;

3 Both SP 1 and SP2/SC 1 and SC2 Set Points can be set with this procedure;

4 Only SP3/SPr Set Point can be set with this procedure;

5 SP 1 and SP3/SC 1 and SPr Set Points can be set with this procedure;

6 SP2 and SP3/SC2 and SPr Set Points can be set with this procedure;

7 SP 1, SP2 and SP3/SC 1, SC2 and SPr Set Points can be set with this procedure;

8 SP 1/SC 1 Set Point value can be set directly using /;

9 SP2/SC2 Set Point value can be set directly using /.

For example, in case the parameter t.Edt or t.Edt = **1** or **3**, the procedure is the following:

– Press and release the key, the display shows SP 1/SC 1 alternated to its value.

– To change the Set Point, press the key to increase the value or to decrease it.

– If t.Ed/t.Edt = **1**, once the desired value has been set, press the button to exit the fast programming mode. If t.Ed/t.Edt = **3**, pressing and releasing again the button the display shows SP2/SC2 alternated to its value. To change the value use the / keys as for the SP 1 value.

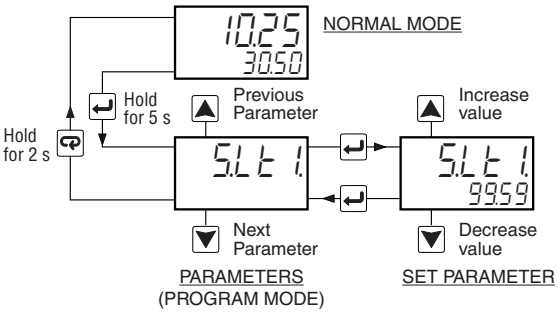
– Once the Set Point time has been programmed, press the key to exit the Set Point programming mode.

To exit the fast Set Point programming mode press the key after the last Set Point time has been displayed or pressing no buttons for about 10 s, after which the display returns to normal operation.

2.2 Standard mode parameters setting

To access the instrument functionning parameters when password protection is disabled, press the ↵ key for 5 s, after which the display shows the code that identifies the first programmable parameter, at this point use the ▲/▼ keys to select the parameter that is to be changed, then press the ↵ key, the upper display shows the parameter code and the lower one its value that can be changed with the ▲ and ▼ keys. Once the desired value has been set, press the key ↵ again: the new value is stored and the upper display shows only the code of the modified parameter.

Pressing the ▲ or ▼ keys, it is possible to select another parameter and change it as described. To exit the programming mode, press no keys for about 30 s or keep the PRG key pressed for 2 s, the timer returns showing the actual count value.



2.3 Parameter protection using a password

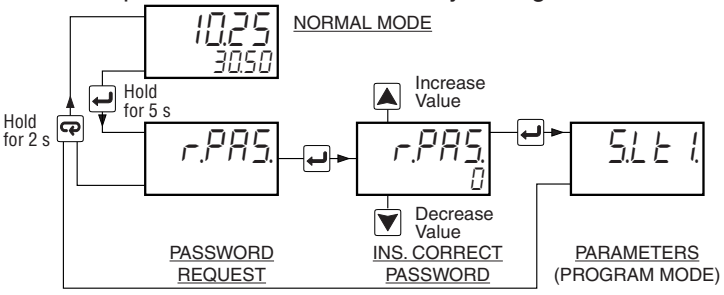
The instrument has a parameter protection function using a password that can be personalised through the PPP parameter.

To protect the parameters, set the desired password number at parameter PPP and exit the programming mode.

When the protection is active, press the ↵ key for 5 s after which the display shows rP. Press the ↵ key again, the display shows 0. Using ▲/▼ keys, insert the programmed password number and press the ↵ key again.

If Password is correct the upper display shows the code of the first programmable parameter. Now is possible to program the instrument in the same way previously described.

Password protection can be disabled by setting PPP = **oF**.



Notes: 1. All parameters are configured by default as "**protected**" so that by simply setting the PPP parameter they are all protected by the Password.

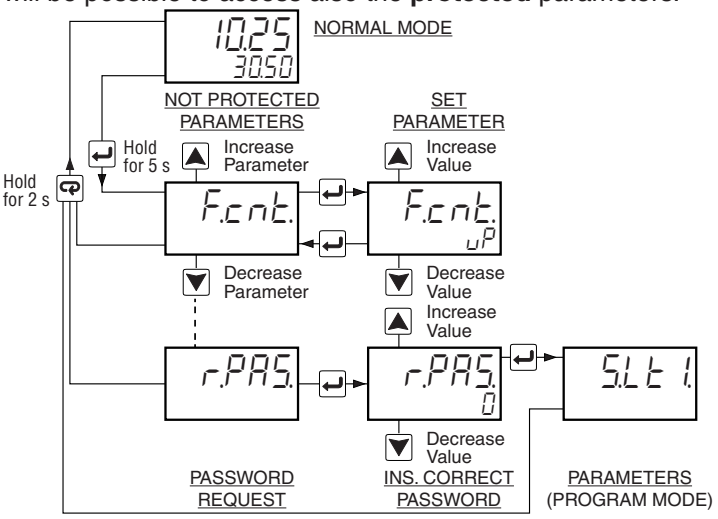
2. If the Password gets lost, just **switch OFF** then **ON the instrument**, push ↵ key during the initial test keeping it pressed for 5 s. In this way it is possible to access all the parameters, verify and modify the parameter PPP.

2.4 Customized mode parameter programming (parameters programming level)

When activated, the password protection acts on all parameters. If, once enabled the Password through the PPP parameter, it is necessary to make certain parameters programmable without protection while keeping the protection on the others, follow the procedure below:

– Enter the programming mode using the PPP Password and, with ▲/▼ keys, select the parameter that must be accessible (not password protected).
– Once the parameter is selected, if the **SET** LED **flashes**, the parameter **is programmable only entering the password** (*protected*). If **SET** LED **is steady ON** the parameter **is programmable without password** (*unprotected*).
– To change the parameter visibility, press the ↵ key and, keeping it pressed, press also the ▲ button.
– The **SET** LED **changes its state** indicating the new level of the parameter accessibility (**ON** = *Not protected*; **Flashing** = *Password protected*).

In case some parameters are set as **Not protected**, accessing the programming mode the display **first** shows the **Not protected** parameters, then the rP parameter through which will be possible to access also the **protected** parameters.



2.5 Reset parameters to default value

The instrument allows to reset all parameters to those values programmed in factory as default. To restore the default parameters value, answer -48 to rP password request. Therefore, to make the reset to default parameters, enable the Password protection using the PPP parameter so that the rP setting is requested, at this point insert -48 instead of the programmed access password. Once confirmed the password with the ↵ key the display shows "---" for 2 s, then the instrument resets all the parameters to factory default setting.

2.6 Keyboard lock function

It is possible to completely lock the keyboard. This function is useful when the controller is used in an accessible area and unauthorized changes must be avoided.

To activate the keyboard lock, program the parameter tLo to a value different from **oF**. The tLo value is the keys inactivity time after which the keyboard is automatically locked.

When the keyboard is locked, if any of the key is pressed, the display shows Ln to indicate that the lock is active. To unlock the keyboard, press contemporarily ↵ + ▲ keys and keep them pressed for 5 s, after which the label LF appears on the display and all the key functions will be available again.

3. USAGE WARNINGS

3.1 Allowed Usage

The instrument has been projected as measure and control device, built according to EN61812-1 for the altitudes operation below 2000 ms.

Using the instrument for applications not expressly permitted by the above mentioned rule must adopt all the necessary protective measures.

The instrument **must not be used in dangerous environments** (flammable or explosive) without adequate protections.

The installer must ensure that the EMC rules are respected, also after the instrument installation, if necessary using proper filters.

4. INSTALLATION WARNINGS

4.1 Mechanical Mounting

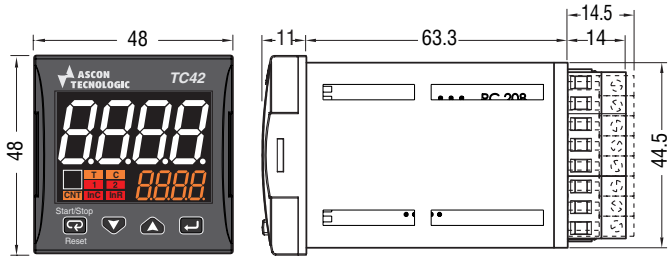
The instrument, in 48 x 48 mm case, is designed for flush-in panel mounting. Make a 45 x 45 mm hole and insert the instrument, fixing it with the provided special brackets.

To obtain the declared front protection degree (IP65) the dedicated gasket (optional) must be used.

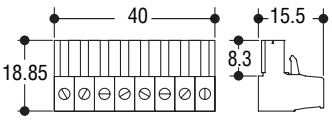
– Avoid installing the instrument in places with high humidity which can generate condensation or with dirt which can lead to the introduction of conductive substances into the instrument.
– Ensure the adequate ventilation to the instrument and avoid the installation within boxes where are placed devices which may overheat or have, as a consequence, the instrument functioning at temperature higher than allowed and declared.
– Connect the instrument as far as possible from source of electromagnetic disturbances so as motors, power relays, relays, electrovalves, etc..

4.1.1 Mechanical Dimensions [mm]

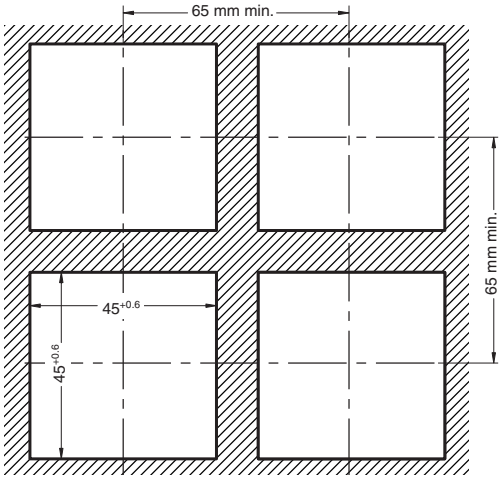
Instrument dimensions



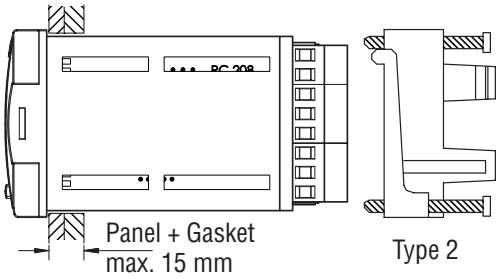
Removable terminals



Panel cutout



Mounting brackets



4.2 Electrical connections

Carry out the electrical wiring by connecting only one wire to each terminal, according to the following diagram, checking that the power supply is the same as that indicated on the instrument and that the load current absorption is no higher than the maximum electricity current permitted.

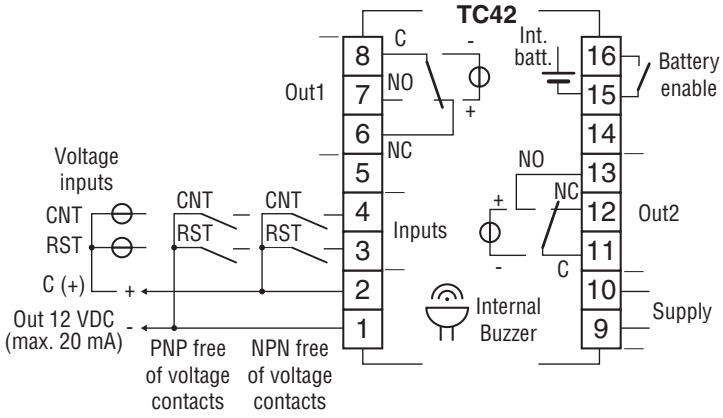
As the instrument is built-in equipment with permanent connection inside housing, it is not equipped with either switches or internal devices to protect against current overloads: the installation will include an overload protection and a two-phase circuit-breaker, placed as near as possible to the instrument and located in a position that can easily be reached by the user and marked as **instrument disconnecting device** which interrupts the power supply to the equipment.

Further reccomendations:

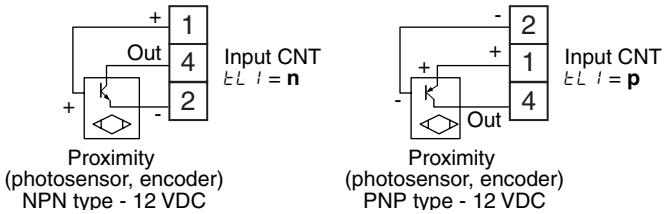
– The supply of all the electrical circuits connected to the instrument must be properly protected using devices (ex. fuses) proportionate to the circulating currents;
– Use cables with proper insulation, according to the working voltages and temperatures;
– Make sure that the input sensor cables are kept separate from line voltage wiring in order to avoid induction of electromagnetic disturbances;
– If some cables are shielded, the protection shield must be connected to ground at only one side;
– When the instrument has a 12 VAC/DC power supply (Order Code **A** = **F**) it is recommended to use an external TCTR transformer, or with equivalent features (class II insulation) and to use only one transformer for each instrument because there is no insulation between supply and input

We recommend that a check should be made that the parameters are those desired and that the application functions correctly **before connecting the outputs to the actuators** so as to avoid malfunctioning that may cause irregularities in the plant that could cause damage to people, things or animals.

4.2.1 Electrical connection diagram



4.2.2 L-type CNT input connection to devices with transistor output



5. OPERATING MODE

5.1 Operation selection as: Timer, Pulse counter or Power limiter

Using parameter t.C it is possible to select the instrument's operating mode as **Timer** (t), as **Counter** (C) or as **Power limiter** (P).

Depending on the value programmed for t.c parameter, the instrument shows only the parameters related to the selected operation mode (see the table of parameters).

As soon as this parameter is changed, the instrument resets itself and goes into the new mode.

The selected mode is indicated by the switching ON of the relative LED: T (**Timer**), C (**Counter**) or by the switching OFF of both LEDs (**Power limiter**).

5.2 Operation as a timer

5.2.1 Timer display operation

CNT LED is used to indicate:

– Count in progress (flashing with 1 s period);

– Count enderd or **stopped before the end** (steady on);

– Reset status (OFF).

After Reset the display shows 0000 when counting mode is **UP** (F.Cnt = **uP**) or the **Set point** value if the counting mode is **DOWN** (F.Cnt = **dn**).

While counting, the display shows the time that elapses: increasing if F.Cnt = **uP** or decreasing if F.Cnt = **dn**.

For functions that require a **Cycle end** (Fo It = **1**, **2**), at the end of the count the display shows: 0000 if F.Cnt = **dn** or the **Set point** value if F.Cnt = **uP**.

At **Count end**, the **Display flashes** when parameter Endt = **0** or can be **Steady ON** when parameter Endt = **1**.

The lower display instead shows the Set point value established by the t.ddn parameter:

0 Active set point during counting;

1 St 1;

2 St 2;

3 St 3.

If the back-up mode foresees the continuation of the count even in the event of a power failure, the display is turned OFF keeping only the CNT LED flashing in order to limit the battery absorption as much as possible.

5.2.2 Timer counting commands

Counting can be enabled/disabled using the **-Start/Stop** key or via the (remote) digital inputs **CNT** and **RST**.

The operating mode of the **-Start/Stop** key is established by parameters t.UFt and iFct, the operating mode of **CNT** input is established by iFct parameter while the **RST** input always acts as a **Reset**, i.e. **blocks** and **resets** the count when it is activated and also has priority over the other commands (while **RST** is active, the count cannot start).

The counting **Start** signal can therefore be given by the **-Start/Stop** key, which normally has bistable (toggle) operation, or via the **CNT** count enable digital input.

The operating mode of the **CNT** input can be programmed using the iFct parameter to operate in different modes:

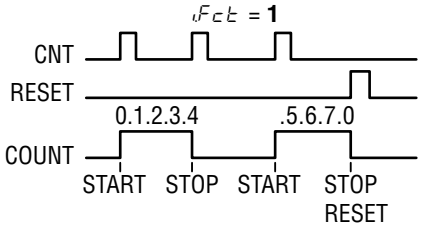
iFct = **1 - Bistable Start/Stop**

By activating the **CNT** input the count starts and it is therefore possible to deactivate the input.

Activating **CNT** again, the count stops on the value reached (without disabling the output if it was activate), the next **CNT** impulse resumes the count from the point it stopped and so on until the end of the count or the **Reset** signal.

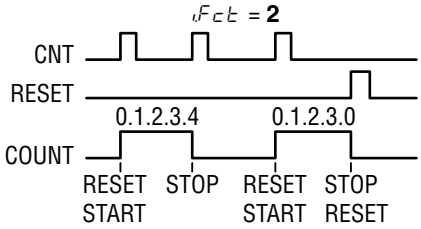
In this mode, the front **-Start/Stop** button (if t.UFt = **2**) acts exactly in the same way as the **CNT** input with the addition that, when kept pressed for 2 s during the counting, carries out the **Reset** command.

If the counting is finished, pressing the key carries out the **Reset-Start** command at the same time.



,FcE = 2 - Bistable Reset-Start/Stop

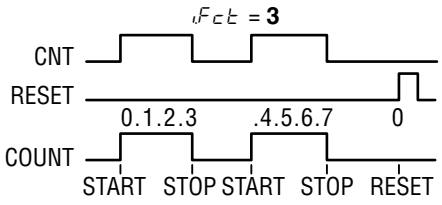
At 1st impulse on the **CNT** input the timer is reset and started, at the 2nd impulse, if given before the end of the count, the count is stopped (disabling the output if active) and the 3rd impulse starts a new cycle, otherwise, if the 2nd impulse should arrive after the end of the count it starts directly a new cycle. In this mode, the front **-Start/Stop** button (if tUFt = **2**) acts in exactly the same way as the **CNT** input.



,FcE = 3 - Monostable Start/Stop

Activating the **CNT** input and **keeping it active**, the count is started; the count stops on the value reached when the input is disabled (without disabling the output if active); re-activating the **CNT** input, the count restarts from the value reached and so on until the **Reset** signal.

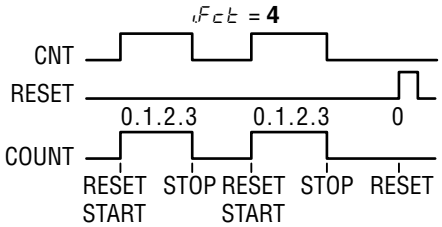
In this operating mode, the front **-Start/Stop** key (if tUFt ≠ **oF**) only acts as a **Reset**.



,FcE = 4 - Monostable Reset-Start/Stop

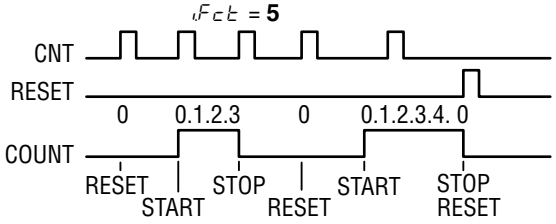
Activating the **CNT** input and **keeping it active**, the timer resets and starts counting, disabling the **CNT** input the count stops disabling the output if active.

This operating mode is similar to the one of the traditional timers in which counting is enabled when the instrument is powered while the **Reset** occurs when power supply is removed. In this operating mode, the front **-Start/Stop** key (if tUFt ≠ **oF**) only acts as a **Reset**.



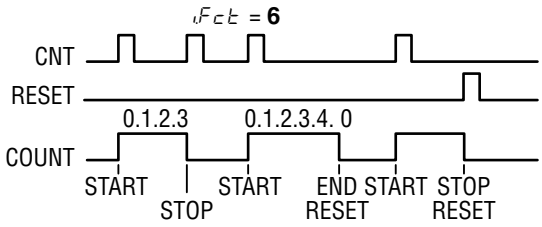
,FcE = 5 - Reset/Start/Stop

At 1st **CNT** impulse the timer is reset, at the 2nd the count starts, at the 3rd impulse the count stops disabling the output if active and so on. In this mode, the front **-Start/Stop** button (if tUFt = **2**) acts in exactly the same way as the **CNT** input.



,FcE = 6 - Bistable Start/Stop-Reset

At 1st **CNT** impulse the count is started, while at the 2nd impulse, if given **before** the end of the count, the count is stopped disabling the output if active and reset, otherwise, if the 2nd impulse should arrive **after** the end of the count it starts directly a new cycle. In this mode, the front **-Start/Stop** button (if tUFt = **2**) at St 1 time end acts exactly in the same way as the **CNT** input.

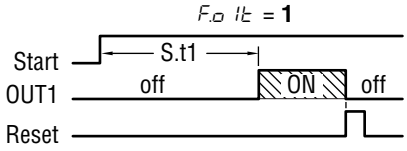


5.2.3 Timer Out1 operating mode

The Output 1 operation can be programmed in **6 different modes** through the Fo 1t parameter:

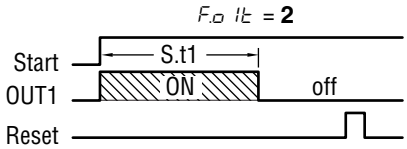
Fo 1t = 1 - ON DELAY

Received the **Start** signal, instrument starts counting and, at the end of St 1 time, activates the **Out1** output. The output is disabled by the **Reset** signal.



Fo 1t = 2 - Feed-through

Received the **Start** signal, the instrument starts counting and activates the **Out1** output; **Out1 is disabled** when St 1 time has elapsed. The output can be reactivated only after a **Reset** and a new **Start** signal.

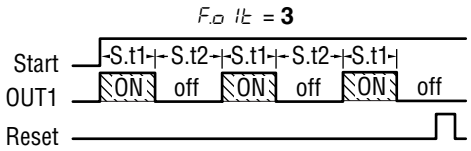


Fo 1t = 3 - Asymmetrical oscillator with start ON

This operating mode requires the setting of both St 1 and St2 Set points.

Received the **Start** signal, **Out1** is enabled for the St 1 time then disabled, reactivated at the end of St2 time and so on until the **Stop**/**Reset** signal has been received.

St 1: **Out1 ON time**, St2: **Out1 OFF time**.

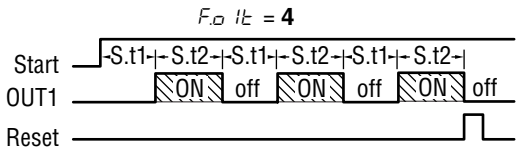


F.o 1t = **4** - **Asymmetrical oscillator with start OFF**

This operating mode implies the setting of both S.t 1 and S.t 2 Set points.

Received the **Start** signal, **Out1** remains disabled for the S.t 1 time then is activated for the time set at S.t 2 and so on until the **Stop**/**Reset** signal has been received.

S.t 1: **Out1 OFF time**, S.t 2: **Out1 ON time**.



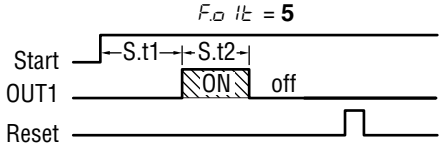
F.o 1t = **5** - **Asymmetrical oscillator with start - OFF 1 cycle**

This operating mode operates as F.o 1t = **4** but executes **only 1 Start/Pause** cycle.

Received the **Start** signal, **Out1** remains disabled for the S.t 1 time then is activated for the time set at S.t 2.

The cycle can be repeated only after a **Reset** signal and a new **Start** command have been received.

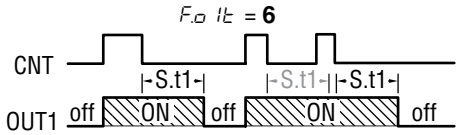
S.t 1: **Out1 OFF time**, S.t 2: **Out1 ON time**.



F.o 1t = **6** - **Delay in lack of excitation (or delay in de-excitation)**

On the rising edge of the **CNT** input **Start signal**, **Out1 is energized**. When the **CNT** signal **is removed**, **Out1 remains energized** and **starts the** S.t 1 **count** elapsed which **Out1 is de-energized**. If, during the S.t 1 count, a signal is detected on the **CNT** input, the **time is reset** and **will be restarted** when **signal ceases**.

Note: This functioning mode operates in this way **regardless** the rFct parameter setting. **Out2** output (if used) in this operating mode **can only operate** in F.o2t = **1** or **2** modes.



5.2.4 Timer Out2 operating mode

The Output 2 operation can be programmed in **10 different modes** with F.o2t parameter:

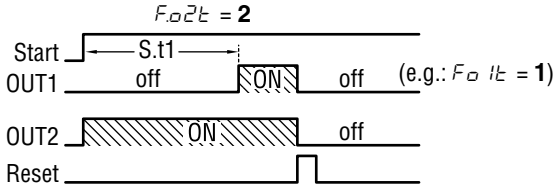
F.o2t = **oF - Out2 Output disabled**

F.o2t = **1** - **Out2 works like Out1**

Out2 output operates exactly like **Out1** output in order to have a double output contact.

F.o2t = **2** - **Out2 output works as an instant contact** (ON during count)

Out2 is activated during the counting phase and remains active until the **Reset** command has been received.



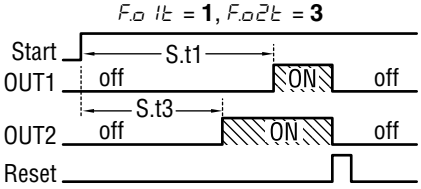
F.o2t = **3** - **Out2 works as Out1 (with S.t 1 time) but with an absolute S.t 3 time**

This operating mode requires the setting of S.t 1 and S.t 3 Set points. S.t 3 has the same time range and cannot be longer than S.t 1.

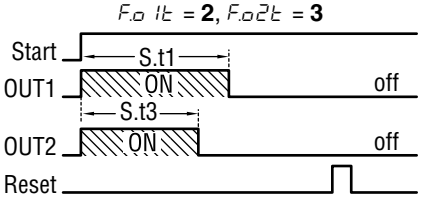
Received the **Start** command, instrument starts counting and operates on **Out2** output in the same mode it operates on **Out1** (as F.o 1t).

If F.o 1t = **1**, **4**, **5**, **Out2** operates with **ON delay** function and S.t 3 of Set point, when instead F.o 1t = **2**, **3** **Out2** operates with **Feed-through** function and S.t 3 of Set point.

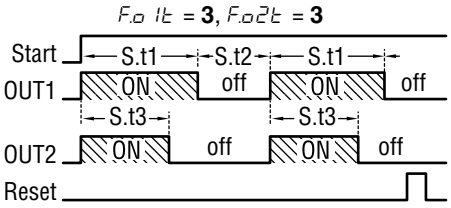
F.o 1t = **1**, F.o2t = **3**



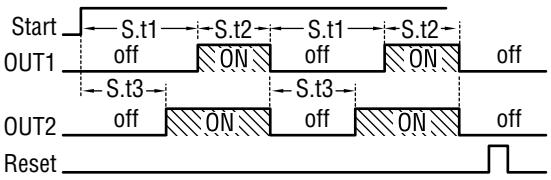
F.o 1t = **2**, F.o2t = **3**



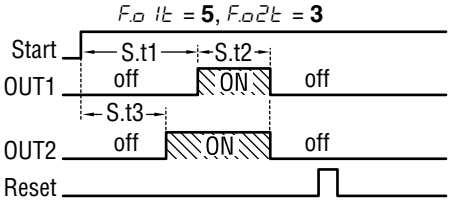
F.o 1t = **3**, F.o2t = **3**



F.o 1t = **4**, F.o2t = **3**



F.o 1t = **5**, F.o2t = **3**



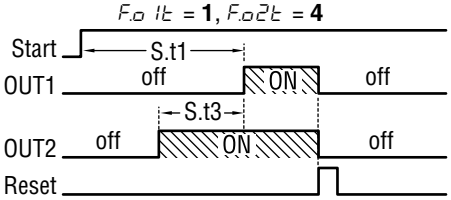
F.o2t = **4** - **Out2 works as Out1 (with S.t 1 time) but with a relative S.t 3 time in advance**

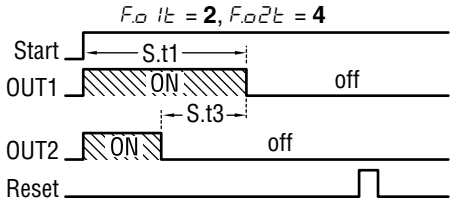
This operating mode requires the setting of S.t 1 and S.t 3 Set points. S.t 3 has the same time range and cannot be longer than S.t 1.

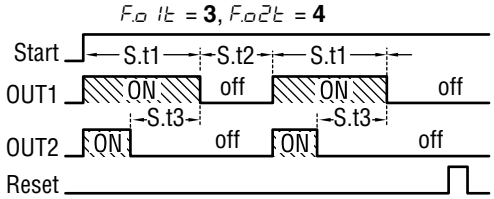
Received the **Start** command, instrument starts counting and operates on **Out2** output in the same mode it operates on **Out1** (as F.o 1t).

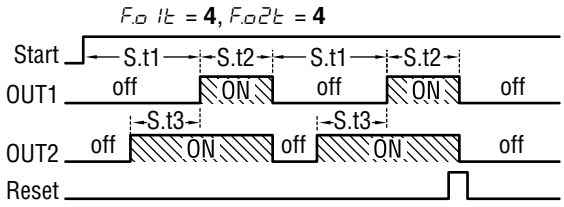
If F.o 1t = **1**, **4**, **5**, **Out2** operates with **ON delay** function and [S.t 1 - S.t 3] of Set time, when instead F.o 1t = **2**, **3**, **Out2** operates with **Feed-through** function and [S.t 1 - S.t 3] of Set point.

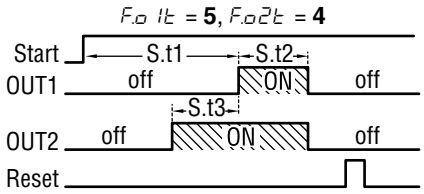
F.o 1t = **1**, F.o2t = **4**





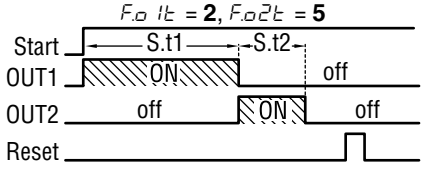






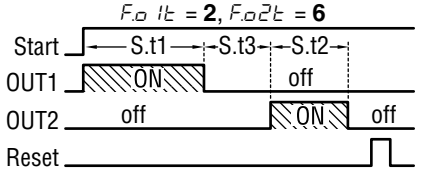
F.o2t = **5** - **Out2 works as the internal buzzer with** F.buF **= 2**

Out2 works as the internal buzzer to manage an external acoustic or luminous signalling device.



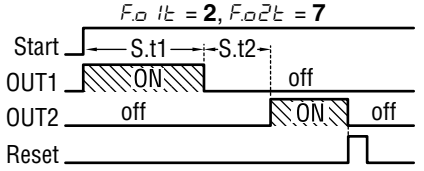
F.o2t = **6 - Activation at** S.t 1 **count end with** S.t3 **delay for** S.t2 **time**

Out2 thus configured is activated, as for F.o2t = **5**, when S.t 1 count has elapsed for the time S.t2 but with a settable delay S.t3. This function is intended to be used with F.o 1t = **2** only. In this case, the display shows the t 1 time count, elapsed which it switches to display the t3 time and then the time t2.



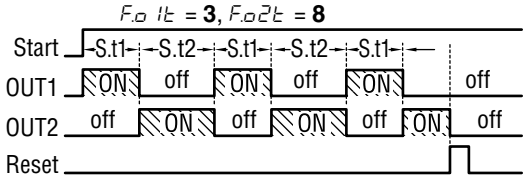
F.o2t = **7 - Activation at the end of** S.t 1 **count with delay** S.t2

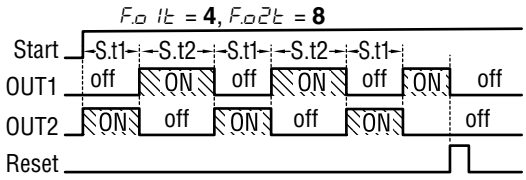
Out2 thus configured is activated when S.t 1 count has elapsed with a settable delay S.t2. This function is intended to be used with F.o 1t = **2** only and can be used to create a **star-delta starter** where the time S.t 1 is the **Star operating time** while S.t2 is **the Star-Delta transfer time**.



F.o2t = **8 - Counting operation negated with respect to Out1**

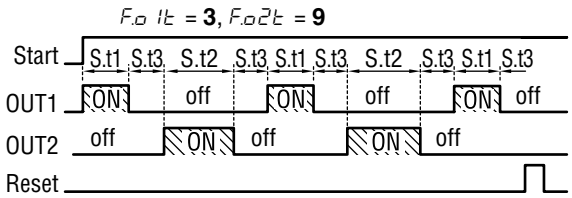
Out2 output thus configured is activated, during the count, with the opposite logic to **Out1**. This function is intended to be used with F.o 1t = **3** or **4** only (oscillator mode functioning) in order to obtain the alternated operation of the two outputs. In this mode the display shows the time count in progress (t 1 or t2).

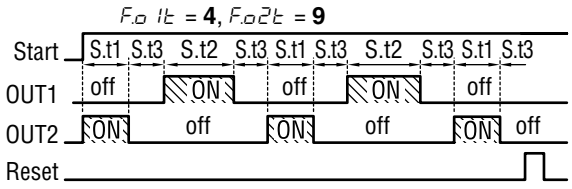




F.o2t = **9 - Counting operation negated with respect to Out1 but with an** S.t3 **dead time**

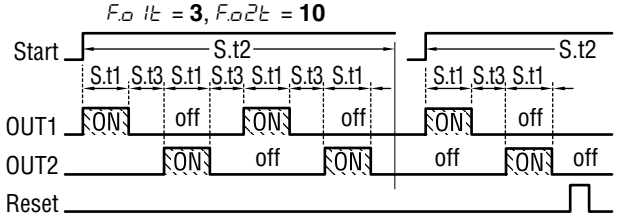
As in F.o2t = **8**, while counting **Out2** output is activated with the opposite logic to **Out1**, but with an S.t3 intermediate settable dead time. Also in this case, this function is intended to be used with F.o 1t = **3** or **4** only (oscillator mode functioning) in order to obtain the alternated operation of the two outputs, but with a dead time between the activations. In this mode the display shows the time count in progress (t 1, t2 or t3).

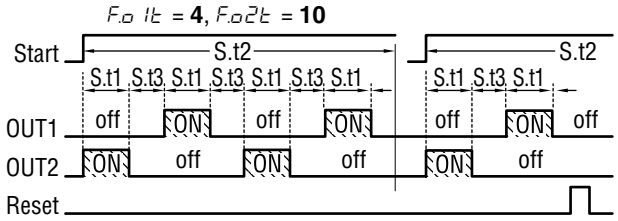




F.o2t = **10 - Symmetrical denied operation with respect to Out1 with dead time** S.t3

As in F.o2t = **9** mode, while counting **Out2** output is activated with the opposite logic to **Out1**, with an S.t3 intermediate settable dead time, but with the same active time of S.t 1. Also in this case, this function is intended to be used with F.o 1t = **3** or **4** only (oscillator mode functioning) in order to obtain the alternated operation of the two outputs with a dead time between the activations, but with the possibility to establish the total duration of the cycle through the time S.t2 (for example for a washing, cleaning, polishing or similar treatment cycle). In this mode the display always shows the t2 counting time as it is the total time of the cycle.





5.2.5 Timer internal buzzer operation

The internal buzzer can be programmed using the *F.buF* parameter to operate in the following ways:

oF Internal buzzer disabled;

1 Activated at end of *St 1* time for *St2* period; sounds also when keys are pressed. If a **Reset** command is given (with key or digital input), the buzzer is silenced immediately. This mode is only active for operations that normally do not involve the usage of the *St2* time because *St2* is used in work-pause operations that would not have substantially a well determined cycle end;

2 Activated at *St 1* end for *St2* time; no sound when keys are pressed;

3 Sounds only when the keys are pressed:

4 Only external buzzer (if configured on **Out2** with *Fo2t* = **5**) with operation at the end of *St 1* time for a period of *St2*.

5.2.6 Timer Operation in case of power supply failure (backup)

F.but parameter establishes the instrument behavior when power supply returns after a power supply failure during the current count:

1 Resets the count;

2 Stops the count by storing the value reached (when the power returns, it therefore waits for a command to restart);

3 Stores the reached value and, when the power returns, the count restarts from that value if the conditions for restarting are present (e.g. the instrument was counting with a bistable command when the power was lost);

4 The count continues if the internal battery is present and enabled by connecting terminals **15** and **16**.

5.3 Operation as a Pulse counter

5.3.1 Counter display operation

CNT LED is used to indicate:

– Count in progress (steady on);

– Count enderd and **Reset status** (OFF).

In particular, the **count is considered in progress at the first impulse acquired after the Reset**.

After **Reset** the upper display shows *0000* when counting mode is **UP** (*F.CnC* = **uP**) or the **Set point** value if the counting mode is **DOWN** (*F.CnC* = **dn**).

The lower display instead shows the Set point value established by the *C.ddn* parameter which can be set as:

0 Active counting set point;

1 *SC 1*;

2 *SC2*;

3 *Str*.

The upper display at the end of the count can be flashing if *EndC* = **0** or steady ON if *EndC* = **1**.

5.3.2 Counter counting commands

At the **first impulse** received from the **CNT** input, the counter enters the counting state, which is signaled by switching ON the LED **CNT**.

While the count is in progress it is possible to view and modify the Set point, but it is not possible to access the parameter programming.

In this case, to access parameter programming, the count must be reset using the **RST** input or the **RESET** button if operational (*t.UFC* = **1**).

The **count** and the **output status Reset** occurs **automatically** if the type of operation is *Fo 1C* = **1** (**Restart**) or *Fo 1C* = **2** (**Restart-lap**) or it can be done **manually** in any case through the **RST** input if suitably configured (*inrC* = **1**) or by means of the **RESET** key if operative (*t.UFC* = **1**).

Depending on the frequency of the signal supplied to the **CNT** input, it is advisable to appropriately set the software filter with the *inFn* parameter which allows to select the maximum acceptable input frequency for counting and thus avoid unwanted counts (often caused by contact bounces).

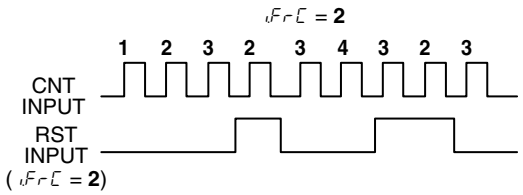
In particular, for those instruments supplied by alternated current and with **voltage signal inputs** (**V type** inputs), it is recommended not to set the parameter *inFn* **> 3** as the device could count the pulses deriving from the mains frequency.

Through the *id iC* parameter it is possible to **multiply the number of pulses received** at the input and then use the result as the instrument count value, of course, both for the display and for the output operation.

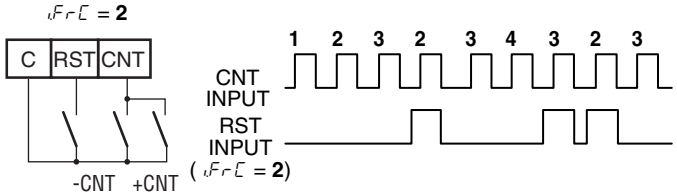
Counting inversion

Using the *FrC* = **2** parameter it is possible to configure the **RST** input to operate as a **count inversion command**. With this setting, while the **RST** signal is active, the count is inverted and therefore the pulses acquired by the **CNT** input are **subtracted** when counting **UP** (*F.CnC* = **1**) or **added** when counting **DOWN** (*F.CnC* = **2**).

With this type of operation, however, it is necessary to pay attention to the counting speed as the **RST** input **intervenes with a delay of about 15 ms** and therefore the **count inversion is not instantaneous**. For this reason it is recommended to use the count inversion function only when the input frequency signal is low.



Using a contact that closes earlier than another to which it is connected, it is possible, for example, to create the following bidirectional counting application.



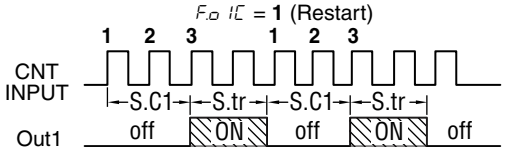
With **bidirectional counting applications**, however, it is to be remembered that **the count cannot assume negative values** and therefore once the value **0** (count **UP**) or the **Set point** value (count **DOWN**) has been reached, any inversion count pulse will not be acquired.

5.3.3 Counter Out1 Operating mode

The instrument can be programmed using the *Fo 1C* parameter to operate in **3** different ways:

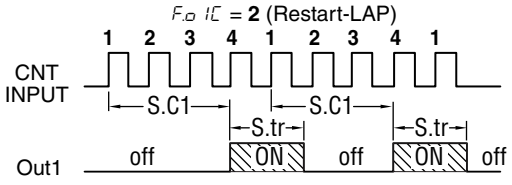
Fo 1C = **1** - **Automatic cycle counting (Restart)**

When the **Set point** (counting **UP**) or **0000** (counting **DOWN**) is reached **Out1** output **is activated and remains activate** for the **time set** in parameter *St r*, the upper display shows the value reached and the instrument does not counts any impulse received during *St r* time. Elapsed the *St r* time, the output is deactivated, the instrument automatically resets the count, prepares for a new cycle and then restarts counting the pulses received.



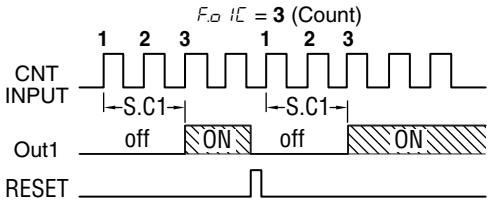
Fo 1C = **2** - **Automatic cycle counting with pulse recovery (restart-lap)**

The operation is similar to *Fo 1C* = **1** with the difference that, while counting the *St r* time, the instrument continues displaying the value reached, keeps the output active and counts any pulses received. At the end of *St r* time, therefore, the output will be deactivated and the count will continue from the value reached during the *St r* time. The count Reset occurs when the Set point (*SC 1*) is reached, while the output is Reset once elapsed the *St r* time.



Fo 1C = 3 **- Single cycle counting (count)**

Upon reaching the **Set point** (**counting UP**) or **0000** (**counting DOWN**), the output is activated and remains active until a manual Reset command is detected. The Reset command can be given by the remote input or the front key.



5.3.4 Counter Out2 Operating mode

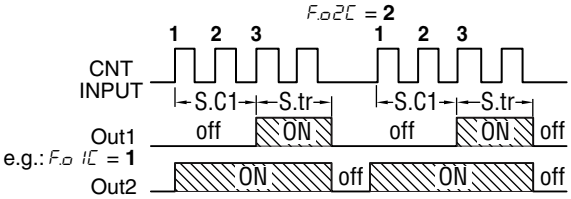
The instrument can be programmed using the *Fo2C* parameter to operate in **4** different ways:

Fo2C = 1 **- Out2 output functions as Out1**

Out2 output works exactly like Out1 output in order to have a double output contact.

Fo2C = 2 **- Out2 output functions as a count in progress signal**

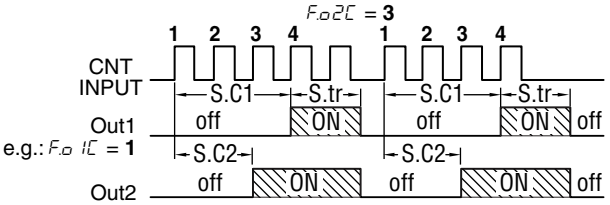
Out2 is activated at the **1st count pulse** and remains active until **Reset**.



Fo2C = 3 **- Same function as** *Fo 1C* **but with absolute** *SC2* **counting set point**

The choice of this operating mode also implies the setting of the *SC2* Set point (which cannot be greater than *SC 1*). In this operating mode, the instrument operates on the **Out2** output in the same way that *Fo 1C* function operates on **Out1** output but based on *SC2* Set point.

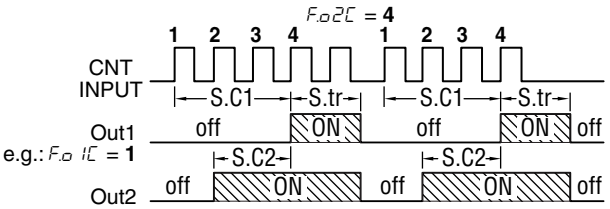
Note: It should be noted that in this operating mode, upon reaching the Set point *SC2*, **Out2 remains active until the end of the cycle, even if the count is inverted and the Set point is exceeded**.



Fo2C = 4 **- Same function as** *Fo 1C* **but with relative** *SC2* **counting set point subtract to** *SC 1*

The choice of this operating mode also implies the setting of the *SC2* Set point (which cannot be greater than *SC 1*). In this operating mode, the instrument operates on the **Out2** output in the same way that *Fo 1C* function operates on **Out1** output but based on [*SC 1* - *SC2*] Set point.

Note: It should be noted that in this operating mode, upon reaching the Set point [*SC 1* - *SC2*], **Out2 remains active until the end of the cycle, even if the count is inverted and the Set point is exceeded**.



By setting *Fo2C* = **oF**, the **Out2** output is always **disabled** or can operate as an **external buzzer** if *FbuC* = **4**.

5.3.5 Counter internal buzzer operation

The internal buzzer can be programmed using the *FbuC* parameter to operate in the following ways:

oF Internal buzzer disabled;

1 Activated at the **end of count** for *St r* period; **sounds also when keys are pressed**. If a **Reset** command is given, the buzzer is silenced immediately;

2 Activated at the **end of count** for *St r* period; **no sound when keys are pressed**;

3 Sounds only when the keys are pressed:

4 Only external buzzer activated at the **end of count** for *St r* period on Out2 output (*Fo2C* = **oF**).

5.3.6 Counter operation in case of power supply failure (backup)

FbAC parameter establishes the instrument behavior when power supply returns after a power supply failure during the current count:

1 Resets the count;

2 Stops the count and stores the value reached.

5.4 Operation as a Power limiter

5.4.1 Power limiter display operation

The CNT LED is used to signal that the **Power limiter is activated** (**flashes with a 1 s period**) or that the **Power limiter is not active** (**not lit**).

The upper display shows the value of the power set, while the **lower one** in normal operation is **not lit**.

5.4.2 Operation of the Power limiter enabling commands

The setting of the power to be implemented is done directly with ▲ and ▼ keys.

The operation of the Power limiter can be activated by closing the **CNT** digital input or by using the suitably programmed **Start/Stop** front key.

When parameter *t.UFP* = **oF**, the front key **Start/Stop** is disabled and to start the Power limiter it is necessary to use the **CNT** input. Once the **CNT** input is deactivated the Power limier functioning is interrupted and the outputs immediately disabled.

By setting *t.UFP* = **1**, the operation can be started from the front **Start/Stop** key or via the **CNT** input, which in this case, has a bistable operation (toggle).

This means that at the first press of the **Start/Stop** key (or at the first activation of the **CNT** input) the Power limiter operation is started while at the second press of the **Start/Stop** key (or at the second activation of the **CNT** input) the Power limiter operation is stopped.

5.4.3 Power limiter Out1 operating mode

The instrument can be programmed using the *Fo 1P* parameter to operate in **2** different ways:

Fo 1P = 1 **- Start ON**

When the operation is **turned ON**, **Out1** is activated for the time calculated based on the **cycle time** and the **power set** and **then** it is **deactivated until** the **cycle time expires** and **so on until the operation is turned OFF**.

And more precisely, **Out1** will be activated for the time:

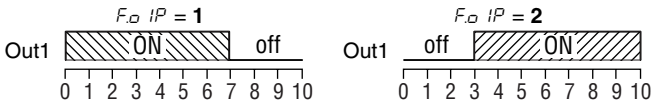
[*St.c* x **P/100**]

and deactivated for the time:

[*St.c* - (*St.c* x **P/100**)];

Fo 1P = 2 **- Start OFF**

When the operation is **turned ON**, **Out1** remains **not active** for the time calculated based on the **cycle time** and the **power set** and **then** it is **activated until** the **cycle time expires** and **so on until the operation is turned OFF**.



Examples with St.c = **10 s** *e SSP* = **70%**.

5.4.4 Power limiter Out2 operating mode

The instrument can be programmed using the *Fo2P* parameter to operate in **3** different ways:

Fo2P = 1 **- As Out1**

Out2 functions exactly as **Out1**;

Fo2P = 2 **- As Out1 with negated logic**

Out2 functions as **Out1** but with inverted logic;

Fo2P = 3 **- Out2 active**

Out2 is active when the Power limiter is active.

6. ACCESSORIES

The instrument is equipped with a 5-pole connector which can be used to link some external accessories that allow to perform some functions in “off-line” mode.

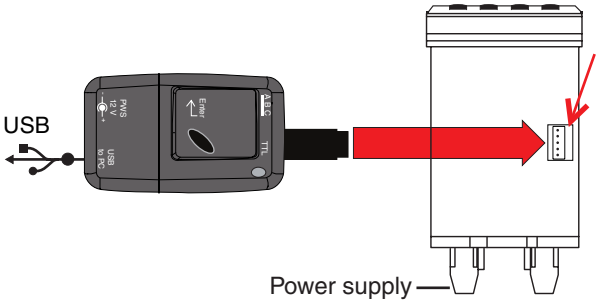
6.1 Parameters configuration with A01

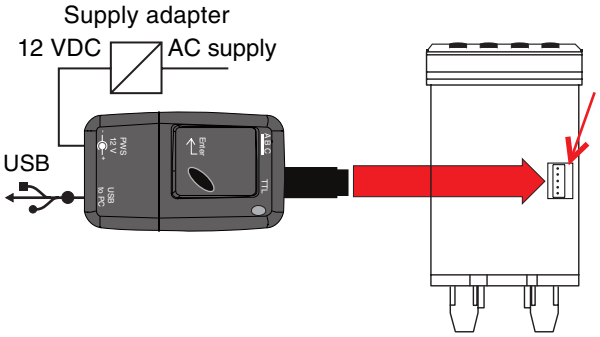
The instrument is equipped with a 5 poles connector that allows the transfer from and toward the instrument of the functioning parameters through the device **A01**.

A01 is mainly usable for the **serial programming** of **some instruments** which need to **have** the **same parameters configuration** or **to keep a copy of the parameters setting** of an instrument and allow its rapid retransmission.

The same device allows to **connect a PC** via USB with which, through the “*AT UniversalConfig*” configuration software the operating parameters can be configured.

To use the device **A01** it is necessary that **the device or instrument** are being **powered directly or through the key**.



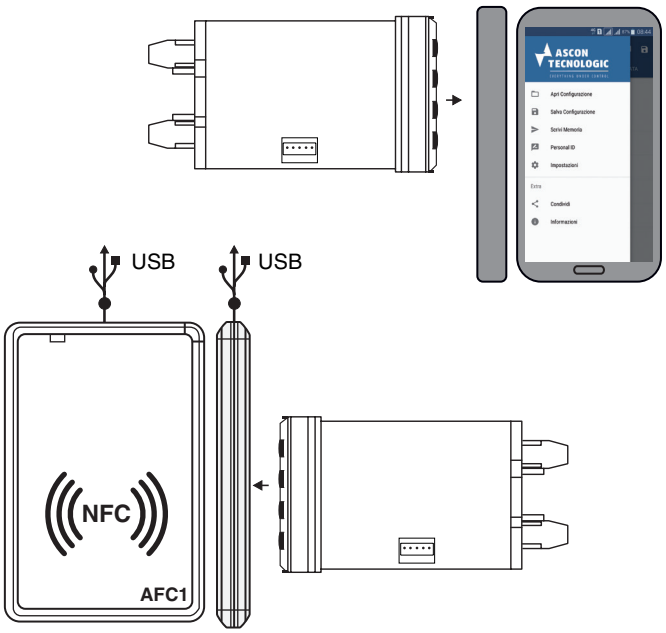


For additional info, please read the “*A01 Instruction Manual*”.

6.2 Parameters configuration with AFC1

When the instrument is equipped with the **NFC** communication option, the parameter configuration performed with the "*AT UniversalConfig*" program (see previous paragraph) can be transferred to the instrument also through the **AFC1** device or a smartphone equipped with the **NFC** interface and the dedicated **App** *AT Conf*.

To configure the instrument with the **NFC**, it is not necessary to power the timer, but simply put its front panel on the symbol ((·)) of the **AFC1** device surface (which is powered directly by the **USB** port connected to the **PC**) or on the smartphone part on the which is the **NFC** interface (for this consult the smartphone user manual) then send the parameters to the instrument memory.

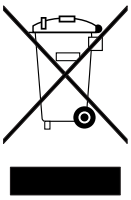


7. PROBLEMS AND MAINTENANCE

7.1 Cleaning

It is raccomended to clean the instrument only with a cloth welted with water or with a detergent neither abrasive nor containing solvents.

7.2 Disposal



The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

8. WARRANTY AND REPAIRS

The instrument is under warranty against construction vices or defected material, noticed within 18 months from delivery date. The warranty is limited to the repairs or to the substitution of the instrument. The eventual opening of the housing, the violation of the instrument or the wrong use and installation of the product means the automatic decay of the warranty.

In case of defected instrument, noticed in warranty period or out of warranty, do contact our sales department to obtain the shipment authorisation.

The defected product must be shipped to Ascon Tecnologic with the detailed description of the failures found and without any fees or charge for Ascon Tecnologic, safe different agreements.

9. PROGRAMMABLE PARAMETERS TABLE

Here below is a description of all the parameters available on the instrument. Some of them may not be present, either due to the fact they depend on the type of instrument or because they are automatically disabled as unnecessary. The Hexadecimal address is used by the serial communication.

Parameters available in TIMER mode

Parameter		Hex. address	Description	Range	Default	Note
1	SLt1	2800	St1 min. Set time	0 ÷ S.Ht1	0	
2	SHt1	2801	St1 max. Set time	S.Lt1 ÷ 9999	99.59	
3	SLt2	2802	St2 min. Set time	0 ÷ S.Ht2	0.00	
4	SHt2	2803	St2 max. Set time	S.Lt2 ÷ 9999	99.59	
5	SSt1	2806	St1 Time range	1 Hours (9999 h); 2 Hours - Minutes (99 h 59 min); 3 Minutes - Seconds (99 min 59 s); 4 Seconds - Hundreds of secons (99 s 99 1/100 s).	3	
6	SSt2	2807	St2 Time range		3	
7	St 1	2809	St1 Set time	S.Lt1 ÷ S.Ht1	1.00	
8	St 2	280A	St2 Set time	S.Lt2 ÷ S.Ht2	0.00	
9	St 3	280B	St3 Set time	S.Lt1 ÷ S.Ht1	0.00	
10	iFct	280C	**CNT input** operating mode	oF Not used; 1 Bistable START/STOP; 2 Bistable RESET-START/STOP; 3 Monostable START/STOP; 4 Monostable RESET-START/STOP; 5 Bistable RESET/START/STOP; 6 Bistable START/STOP-RESET.	2	
11	Fo1t	2810	**OUT1 output** operating mode	1 On delay; 2 Feed-through; 3 Asymmetrical oscillator with start ON; 4 Asymmetrical oscillator with start OFF; 5 Asymmetrical oscillator with start OFF (one cycle only); 6 Delay in lack of excitation (or delay in de-excitation).	1	
12	Fo2t	2811	**OUT2 output** operating mode	oF No function; 1 **Out2** operates as **Out1**; 2 Instantaneous Contact Output (ON during count); 3 **Out2** operates as **Out1** but with absolute Set time St3; 4 **Out2** operates as **Out1** but with relative Set time St3 in advance; 5 **Out2** operates as the buzzer; 6 Activation at St1 count end with St3 delay for St2 time; 7 Activation at St1 count end with St2 delay; 8 Counting operation negated with respect to **Out1**; 9 Counting operation negated with respect to **Out1** but with St3 dead time; 10 Symmetrical denied operation with respect to **Out1** with St3 dead time and St2 of total duration.	oF	
13	FCnt	2812	Count mode	uP UP; dn DOWN	uP	
14	FbuF	2813	Buzzer operating mode	oF Disable; 1 Sounds at end of St1 cycle for the St2 period + key pressure; 2 Sounds at end of St1 cycle for the St2 period; 3 Key pressure sound only; 4 External buzzer only (if configured on Output 2 with Fo2t = **5**) with end of the cycle for the St2 period.	1	
15	tUFt	2816	START/STOP/RESET button operating mode	oF No function 1 RESET only 2 RESET-START/STOP if iFct = **1** / **2**, or RESET/START/STOP if iFct = **5** / **6**	2	
16	tEdt	2817	Times visibility with Fast Set time procedure (key)	oF None; 1 St1; 2 St2; 3 St1 and St2; 4 St3; 5 St1 and St3; 6 St2 and St3; 7 St1, St2 and St3; 8 Only St1 directly using and keys; 9 Only St2 directly using and keys.	1	

Parameter		Hex. address	Description	Range	Default	Note
17	F.buE	2818	Backup operation mode	1 Resets the current count; 2 Stops the current count storing the value reached; 3 Stores the reached value and when the power returns, it restarts from that value if the conditions for restarting are present; 4 Continues the current count if the internal battery is present and enabled.	1	
18	EndC	2819	Display flashing at count end	0 Display flashing at count end; 1 Display steady ON at count end.	0	
19	t.ddn	281A	Value shown on the lower display	0 Active Set point during count; 1 SE 1; 2 SE2; 3 SE3.	0	

Parameters available in COUNTER mode

Parameter		Hex. address	Description	Range	Default	Note
20	SLC 1	281F	Min. **C1** count Set Point	0 ÷ S.HC1	0	
21	SHC 1	2820	Max. **C1** count Set Point	S.LC1 ÷ 9999	9999	
22	SLC2	2821	Min. **C2** count Set Point	0 ÷ S.HC2	0	
23	SHC2	2822	Max. **C2** count Set Point	S.LC2 ÷ S.HC1	9999	
24	SC 1	2825	**C1** count Set Point	S.LC1 ÷ S.HC1	10	
25	SC 2	2826	**C2** count Set Point	S.LC2 ÷ S.HC2	0	
26	Str	2828	Restart and Restart-Lap time	1 ÷ 999.9 s	1	
27	iHcn	2829	Max. count frequency for **CNT** input	1 2 Hz; 2 10 Hz; 3 40 Hz; 4 120 Hz; 5 200 Hz.	2	
28	iFrC	282A	**RST** input operation mode	1 Reset; 2 Reverse counting	1	
29	iH iC	282B	Count multiply	0.001 ÷ 9.999	1.000	
30	Fo 1C	282F	**OUT1 output** operating mode	1 Restart; 2 Restart-Lap; 3 Count.	3	
31	Fo2C	2830	**OUT2 output** operating mode	oF No function; 1 **Out2** operates as **Out1**; 2 Instantaneous Contact Output (ON during count); 3 Same function as Fo 1C but with absolute SC2 count; 4 Same function as Fo 1C but with relative SC2 count and subtracted.	oF	
32	FbuC	2833	Buzzer operating mode	oF Buzzer disabled; 1 Sounds at count end for the Str period + key pressure. If a Reset command is detected the buzzer is silenced; 2 Sounds at count end for the Str period only; 3 Key pressure sound only; 4 Only external buzzer activated at the end of count for Str period on **Out2** output (Fo2C = **oF**).	3	
33	FCnC	2834	Count mode	uP UP; dn DOWN.	uP	
34	FbAC	2835	Backup operation mode	1 Resets the current count operation; 2 Stops counting storing the value reached.	1	
35	tUFC	2836	START/STOP-RESET button operating mode	oF No function; 1 RESET	1	
36	tEdC	2837	Count Set point visibility with Fast Set point procedure (key)	oF none; 1 SC 1; 2 SC2; 3 SC 1 and SC2; 4 Str; 5 SC 1 and Str; 6 SC2 and Str; 7 SC 1, SC2 and Str; 8 Only SE 1 directly using and keys; 9 Only SE2 directly using and keys.	1	

Parameter		Hex. address	Description	Range	Default	Note
37	C.ddn	2838	Value shown on the lower display	0 Active Set point during count; 1 SC 1; 2 SC2; 3 Str	0	

Parameters available in POWER LIMITER mode

Parameter		Hex. address	Description	Range	Default	Note
38	SSP	2844	Output power of the power limiter	0 ÷ 100	50	
39	Stc	2845	Cycle time of the power limiter	1 ÷ 900 s	30	
40	Fo 1P	2846	**OUT1 output** operating mode	1 Start ON; 2 Start OFF.	1	
41	Fo2P	2847	**OUT2 output** operating mode	oF No function; 1 As **Out1**; 2 Negated **Out1**; 3 Active during count.	0	
42	tUFP	2848	START/STOP-RESET button operating mode	oF No function; 1 Start/Stop.	1	

Parameters common to all modes

Parameter		Hex. address	Description	Range	Default	Note
43	tLo	283E	Automatic keyboard lock	oF; 1 ÷ 9999 s.	oF	
44	tPP	283F	Password to access the functioning parameters	oF; 1 ÷ 9999.	oF	
45	tAd	2840	Serial communications address	0 ÷ 255	1	
46	tC	2841	Instrument operating mode	T Timer; C Counter; P Power limiter	t	
47	tL i	2842	Inputs logic NPN/PNP	n NPN; P PNP.	n	
48	EndC	2843	Display flashing at count end (Timer or Counter mode)	0 Display flashing at count end; 1 Display steady ON at count end.	0	

10.TECHNICAL DATA

10.1 Electrical data

Power supply: 12 VAC/VDC, 24 VAC/VDC, 100 ÷ 240 VAC ±10%;

AC frequency: 50/60 Hz;

Power consumption: About 3 VA;

Inputs: 2 digital inputs CNT (counting enable) and **RST** (reset) for voltage free contacts, or in voltage (the same as the power supply);

Outputs: Up to **2 relay outputs** or **12 VDC/15 mA for SSR drive**:

	EN 61810	EN 60730	UL 60730
Out1, Out2 - SPDT - 8A - 1/2HP 250 VAC	8 (3) A	8 (4) A	8 A Res.

12 A max. for those models with removable terminal model;

Relay output Electrical life: 100000 operations;

Overvoltage category: II;

Protection class: Class II;

Insulation: Reinforced insulation between low voltage parts (H type power supply and relay outputs) and front panel; Reinforced insulation between low voltage parts (H type power supply and relay outputs) and the extra low voltage parts (NPN/PNP inputs); Reinforced insulation between power supply and relay outputs; No insulation between type F power supply terminals and NPN/PNP inputs.

10.2 Mechanical characteristics

Housing: Self-extinguishing plastic, UL 94 V0;

Heat and fire resistance category: D;

Ball Pressure Test as described in EN60730: accessible parts 75°C; support live parts 125°C;

Dimensions: 48 x 48 mm, depth 74.3 mm (+14 or +14.5 mm depending on the type of terminals selected);

Weight: About 125 g;

Mounting: Incorporated flush in panel in a 45 x 45 mm hole, (max. panel thickness 12/29 mm);

Connections: Inputs, power supply and outputs: fixed or removable screw terminal block for 0.2 ÷ 2.5 mm^2/ AWG 24 ÷ 14 cables;

Protection degree: IP65 mounted with dedicated gasket (optional);

Pollution degree: 2;

Operating temperature: 0 ÷ 50°C;

Operating humidity: < 95 RH% with no condensation;

Storage temperature: -25 ÷ +60°C.

10.3 Functional features

Time range: 4 programmable timing scales:

- **9999** h,
- **99** h **59** min,
- **99** min **59** s,
- **99** s **99** hundreds of second;

Display resolution: Based on the time scale used:

- hours,
- minutes,
- seconds,
- hundreds of second;

Timer overall accuracy: ±0.1 fs;

Timer input delay: 15 ms max.;

Counter range: 9999;

Max. counting frequency in Counter mode: 200 Hz;

Display: 4 + 4 Digits White-Orange or Red-Green, height 15.5 mm and 7 mm;

Compliance:

Directive LV 2014/35/EU (EN 60730-1, EN 60730-2-7, EN61812-1, UL 508);

Directive EMC 2014/30/EU (EN55011: class B; EN61000-4-2: 8 kV air, 4 kV cont.; EN61000-4-3: 10V/m; EN61000-4-4: 2 kV supply and relay outputs, 1 kV inputs; EN61000-4-5: supply 2 kV com. mode, 1 kV\diff. mode; EN61000-4-6: 3V).

11.HOW TO ORDER

Model
TC42- Instruent with mechanical keys

a: NFC Programming interface
- = Not present
N = With NFC programming interface

b: Power suppply
H = 100 ÷ 240 VAC
L = 24 VAC/VDC
F = 12 VAC/VDC

c: Inputs
L = For free of voltage inputs/Input logic NPN-PNP
V = Voltage inputs (the same of power supply)

d: Out1
R = Out2 Relay SPDT 8A res.
O = Out2 VDC for SSR

e: Out2
R = Out2 Relay SPDT 8A res.
O = Out2 VDC for SSR
- = No Out2

F: Internal Buzzer
B = Internal Buzzer
- = No Buzzer

g: Internal Battery
B = Internal battery
- = No Battery

h: Terminals
V = Screw terminals (standard)
E = Complete removable screw terminals (pitch 5.00)
N = Removable screw terminals (pitch 5.00)(fixed part only)

i: Display
J = White-Orange
K = Red-Green

TC42 - a b c d e f g h i j k l mm nn

j, k, l: Reserved codes;
mm, nn: Special codes.