Temperature-Compensating Development Timer

CONTENTS

INTRODUCTION

Welcome to the Compensating Development Timer from DLG Electronics.

The Compensating Development Timer will help take the hit-and-miss out of timing the development of photographic film and paper under off-nominal temperature conditions. By measuring the temperature of the developing solution continually during development, and adjusting the timer rate accordingly, correct development is assured even as temperatures vary during development.

TEMPERATURE COMPENSATION BACKGROUND

Photographic development, like most chemical processes, is temperature-dependent, with the rate of development increasing at higher temperatures and decreasing at lower temperatures. For this reason development times are generally specified at 20°C.

In practice, it is not always feasible to achieve a development temperature of 20°C. Therefore, time-temperature tables are available. For each development the temperature of the solution is taken and the appropriate development time determined from the tables. However, apart from the inconvenience of following the procedure and the possibility of errors, it makes no allowance for temperature varying during the development itself.
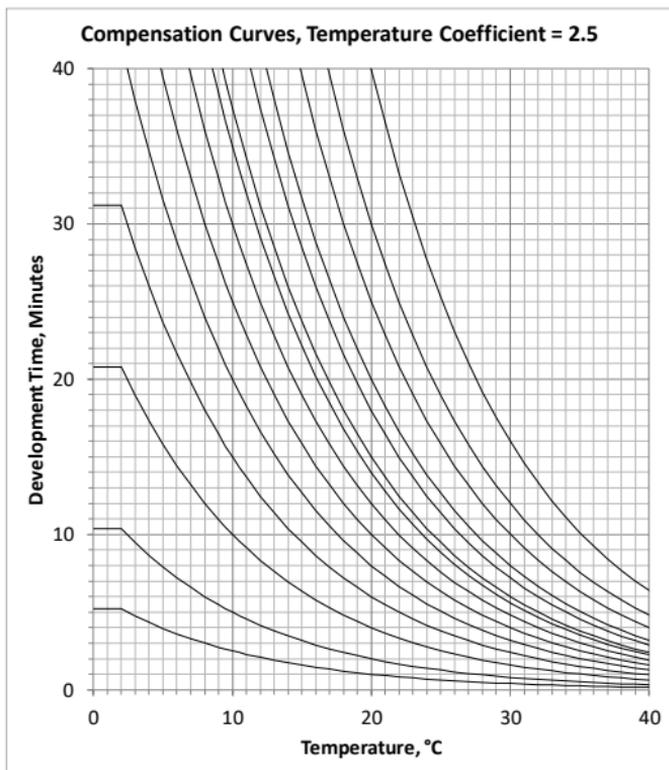
The temperature compensating timer simplifies the process and ensures that the development time always correctly accounts for the temperature of the developer. A timer runs, counting minutes and seconds, at a rate determined by the temperature of the developing solution. At 20°C it runs at "real time" rate, whereby and indicated one second is equal to a real one second. At higher temperatures the timer runs faster, to allow for the more rapid development. Conversely, at lower temperatures, the timer rate is slowed to allow for the slower development. Therefore, if, say, five minutes development is required at 20°C, developing to an indicated time of five minutes on the compensating development timer will give the correct development time, irrespective of the temperature of the developer solution.

TEMPERATURE COEFFICIENTS AND COMPENSATION CURVES

The compensating development timer provides compensation for a temperature co-efficient of 2.5. This is equivalent to the use of the popular "Ilford" time-temperature charts. The implemented compensation curves are shown below.

The curves are implemented over a wide temperature range of 2°C to 60°C, with full specified accuracy achieved over the range 10°C to 40°C.

For specialist applications the Compensating Development Timer can be ordered with a factory-programmed temperature co-efficient of your choice.

Compensation Curves, Temperature Coefficient = 2.5

OPERATING THE TEMPERATURE COMPENSATING TIMER

- Fit two AA batteries in the battery compartment in the base of the unit. The unit is supplied without batteries due to shipping company regulations.

- Fit the temperature sensor to tank or tray as desired.

- Connect the sensor to the timer via the left-hand socket on the bottom edge of the timer unit.

- If hands-free operation of the run-reset switch is required, connect the foot switch to the footswitch connection.
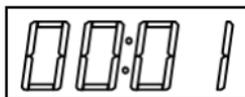
Controls

Power Switch

Time/Temp Display

Display Brightness
ON – OFF - DIM

Compensation
ON – OFF

RUN - RESET

Footswitch Connection

Temperature Sensor Connection

Timer Operation

When the unit is first switched on, it displays the measured temperature in degrees C.

$$20°C$$

Pressing the run/reset switch starts the timer running.

$$00:01$$

Pressing again stops the timer. The final time is displayed. Note that the display colon is extinguished to provide an immediate visual indication that the timer is not running.

$$0430$$

If the run/reset switch is pressed again, the timer resets to zero and the count is restarted.

If no further presses are made in the next few seconds, the timer reverts to a temperature display while it waits for further presses of the run/reset switch.

$$20°C$$
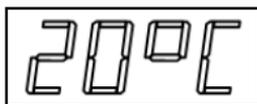
Compensation On/Off

The timer can used in either temperature-compensated mode (compensation "on") or real-time mode, independent of temperature (compensation "off").

Display Brightness

The display brightness switch allows choice of:

- display "on", for normal operation in room lighting

- "dim" for darkroom use. The "dim" setting is designed to be sufficiently dim to minimise fogging risk to panchromatic emulsions for limited periods of exposure, whilst still being readable by dark-adjusted eyesight in the darkroom.

- "off" completely blanks the display. When the timer is running, an audible "beep" is emitted every thirty seconds

With the display "off", the run/reset switch operates as usual even though there is no visible indication.

Note that with display off, there is no visual indication that the meter is switched on. However, power consumption in the display "off" state is so low that battery drain is negligible if the unit is inadvertently left switched on (several thousand hours battery life with display "off").

Wall Mounting

The wall bracket option provides a convenient way to hold the timer to the wall. The timer unit can lifted in and out of the wall bracket when required. Hold the bracket to the wall and mark the screw positions through the screw holes in the bracket. Drill and secure the bracket to the wall with suitable screws and fixings (screws and wall plugs provided).

Tank Fitting

For tank use, the sensor can be inserted in the thermometer hole, or, for inversion agitation, the sensor can be sealed into a hole cut into the tank lid.

To seal the sensor into the tank lid, cut a 12mm diameter hole. Fit the gland and insert the temperature sensor. Do not overtighten the gland nut – finger tight is adequate to achieve a satisfactory seal.

Tray fitting

The tray clamp allows the sensor to be secured to a tray. Do not over-tighten the securing screw – finger-tight is adequate.

For tray use, ensure that the tip of the sensor is immersed in the developer solution. It is not necessary for the entire sensor to be submerged however the bottom ¼" / 6mm should be immersed in the solution as a minimum.

Foot Switch

The footswitch duplicates the function of the run-reset switch. Connect to the footswitch connection on the timer. When the footswitch is connected, the run-reset switch continues to function meaning that either the footswitch or the pushbutton switch on the timer may be used to start/stop the timer.

The footswitch is fitted with 2m of cable. This may be extended if required using a 3.5mm stereo (3-pole) extension.

Other switches may be connected. Switches should have normally-open momentary-action contacts and the switch contacts should be wired to a 3.5mm stereo 3-pole jack between the outer ("ground") and centre poles of the jack plug. The tip connection should be left disconnected.

Temperature Sensor

The temperature sensor is a precision thermistor in a 150mm long / 6mm diameter stainless steel housing, and is fitted with 1m cable terminated in a 3.5mm jack plug.

The cable may be extended if necessary using a 3.5mm stereo (3-pole) jack extension cable.

Additional sensors of different length (100mm / 4-inch and 50mm / 2-inch) are available on request.

No recalibration is required when changing sensors due the precision sensor used.

SPARES AND ACCESSORIES

Spares and accessories, available from our website www.dlgelectronics.com or your distributor:

-       Replacement/additional temperature sensor

-       Alternative shorter sensors (4" and 2") are available on request

-       Footswitch

-       Wall bracket

-       Tray Clamp

-       Tank Gland

SPECIFICATION

Temperature co-efficient (compensation on)

      2.5 / 10°C

Temperature co-efficient (compensation off)

      1.0

Time display

      0 seconds to 1 hour, resolution 1 second.

      After one hour, count continues from zero

Temperature display

      0 to 54 °C, resolution 1°C

Operating temperature range

      0 to 54 °C

Accuracy

      Better than ±0.5°C equivalent, 10°C to 40°C

      Better than ±2°C, 2°C to 54°C

Sensor type

      Stainless steel encapsulated precision thermistor

Measurement frequency

      2 Hz

Analogue-to-digital conversion

      10-bit accuracy

Power consumption

      Display "on" 20 mA

      Display "dim" ~1 mA

      Display "off" <1 mA

Battery life

      ~2000 hours (display "dim" with good quality alkaline batteries)

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