CEL 300 Series

Dosimeters & Sound Level Meters

Frequently Asked Questions

Casella USA is proud to announce the introduction of two new models to the CEL range of noise measurement equipment. The multi-function **CEL-320** and **CEL-360** Personal Noise Dosimeters are enhanced versions of the popular CEL-420 and 460 models that were released in 1997. These FAQ's help to give an overview of the new models, answer some of the more typical questions and describe how they fit into the overall CEL product portfolio of noise measurement instruments.

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CASELLA USA
CEL-300 SERIES DOSIMETERS
Frequently Asked Questions

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FAQ's: INTRODUCTION

How do the new instruments fit into the CEL product range?

CEL-200 Series

The simplest meters remain the CEL-200 series including the CEL-231 and 254 models featuring ANSI type 2 accuracy sound level meters with Sound Pressure Level (SPL), Maximum Noise Level (Max) and Impulse response (CEL-254 only) measurement capabilities.

CEL-300 Series

The intermediate range of convertible personal noise dosimeters or logging sound level meters is in the form of the **CEL-320** or **CEL-360**. Simply swap out the microphone inputs to convert the dosimeter into the sound level meter or vice versa. Both models feature ANSI type 2 accuracy for the overall measurements.

CEL-400 Series

The mid range sound level meters are the CEL-440 and 480 providing recording of level against time or level against frequency. The instruments are fitted with sequential frequency analysis capability in either full octave or third octave bands. Both type 1 and type 2 / datalogging or non-datalogging models are available for the CEL-400 sound level meter range.

CEL-500 Series

The top of the range meters are the CEL-553, 573 and 593 real time analyzers which feature parallel capture of level against time and frequency. A range of versatile upgrade options for such specific tasks as Rapid Data Storage, Building Acoustics, Sound Quality and Long Term Logging measurements are also available. Both type 1 and type 2 models are available.

What models are there in the new range?

Two main variants are available – the **CEL-320** and the **CEL-360**. Both are designed using the same casing and internal hardware. The difference between them is in the internal firmware programming.

FAQ's: COMPARISONS TO PREVIOUS MODELS

What is the main difference between the CEL-320 and 360?

The main difference is the addition of a comprehensive data-logging capability in the **CEL-360** models. This data-logging and the facility to use delay start and stop timers allows the instrument to be set to capture data at regular intervals to provide time history results during the whole measurement run. The new models may also be configured to record as many, or as few parameters as is needed.

Which earlier version of dosimeter now corresponds to the new models?

The earlier range consisted of 12 models including all the Intrinsically Safe versions and versions fitted with the stalk microphones instead of the cable microphones. The new models now replace these as follows;

- CEL-420 becomes the **CEL-320** (non logging dosimeter with software)
- CEL-420 becomes the **CEL-320X** (non logging dosimeter without software)
- CEL-422 remains the **CEL-422IS** (non logging IS. dosimeter with software)
- CEL-424 becomes the **CEL-320S** (non logging sound level meter with software)
- CEL-424 becomes the **CEL-320XS** (non logging sound level meter without software)
- CEL-426 remains the **CEL-426IS** (non logging IS sound level meter with software)
- CEL-460 becomes the **CEL-360** (logging dosimeter with software)
- CEL-460X becomes the **CEL-360X** (logging dosimeter without software)
- CEL-462 remains the **CEL-462IS** (logging IS. dosimeter with software)
- CEL-462X remains the **CEL-462XIS** (logging IS. dosimeter without software)
- CEL-464 becomes the **CEL-360S** (logging sound level meter with software)
- CEL-464X becomes the **CEL-360XS** (logging sound level meter without software)
- CEL-466 remains the **CEL-466IS** (logging IS. sound level meter with software)
- CEL-466X remains the **CEL-466XIS** (logging IS sound level meter without software)

Note:

- The **S** suffix designates the instrument is provided initially with the stalk microphone to use as a hand held sound level meter.
- The **IS** suffix designates that the instrument is Intrinsically Safe for use in hazardous areas.
- The **X** suffix designates that the instrument is supplied without the standard cable and download software to make up extra instruments when a multiple unit kit is required.
- All IS models remain the same as the previous specification for the equivalent CEL-422 or CEL-462 models.

FAQ's: OPERATION

How long will a standard Alkaline battery last in a CEL-320 or 360?

An alkaline 9V cell can power a **CEL-320** or **CEL-360** for up to **50 hours** continuous recording at normal room temperature. Lower temperatures will reduce useful battery life. Alkaline batteries are recommended for longest running time.

Can a rechargeable battery be used in a CEL-320 or 360?

A NiCad rechargeable battery can be used instead of an alkaline battery but will only last for about 30 hours at normal room temperature. The rechargeable battery will operate successfully down to lower temperatures than an alkaline battery. NiCad batteries may be recharged and used repeatedly in these instruments.

How can the instrument be made tamper proof?

The **CEL-320** or **CEL-360** can be configured for a run and the run started either using the keypad start key or the delay timers. The keypad can then be locked to prevent the wearer from tampering with it during the measurement. This is performed by pressing the "Up" and "Right" arrow keys simultaneously when the run has started. The keypad is unlocked by pressing the "Down" and "Left" keys simultaneously to regain control of the meter. When the keypad is locked the display shows LOCK. In this state, none of the keys on the pad will function and the instrument shows no data.

How can the instrument be simplified for a specific measurement task?

Any measurement parameters can be deselected using the supplied PC software program to reduce the displayed values to just a single noise unit if required by a competent person. The SETUP can then be saved in the PC and sent to the instrument with a lockout to prevent the operator from loading any other SETUP that may be stored in the instruments memory. For example, the meter could be set to measure just Max and Leq for a very simple measurement procedure without having to cycle through any other unwanted parameters that may not be relevant to the measurement.

Can the CEL-360 be used for outdoor measurements?

The **CEL-360** can be used with a sealed lead acid rechargeable battery pack, the CEL-16038, together with the CEL-6760 outdoor protection case for short term environmental survey work to enable measurements to be carried out for up to a week on the single power pack. The CEL-6760 enclosure features a tough, lockable case with a foam lining that will accept all of the accessories needed for the measurement. A standard 3 inch diameter windscreen protects the microphone against wind noise. At the end of the measurement the regular Profile (or period) noise values are downloaded to dB12 graphical software and the time history may be inspected. The software will allow the user to recalculate various noise parameters over sub intervals of the total run time to produce results for daily intervals etc.

FAQ's: INSTRUMENT FUNCTION

INSTRUMENT SETUP

How many SETUPs can be stored in a CEL-320 or 360?

Each instrument can store up to 20 SETUPs in its memory. The SETUPs are configurations that are available to select to start a new run without having to change the meter each time. Some SETUPs are factory configured with the correct settings to satisfy the major measurement methodologies while others are user configurable to suit a particular measurement protocol determined by local requirements. The SETUP stores the frequency weighting, the time weighting, the amplitude weighting (exchange rate or Q value), the measurement range, the Peak frequency weighting, up to two threshold levels, a single criterion level, the parameters to be measured and the time history interval for the logging in a **CEL-360**. The following factory configured SETUPs are supplied by default in the meters;

- **OSHA** for the USA Noise at Work Regulations,
- **MSHA** for the USA Mines Regulations,
- **DOD** for the USA Military Regulations,
- **ACGIH** for measurements recommended by professional US hygienists,
- **ISO85** for the European Noise at Work Regulations,
- **ISO90** for the European Noise at Work Regulations,
- **METER** to use the instrument as a basic noise logger without dose functions,
- **13 Spare** user definable SETUPs to suit local regulations or specific tasks

Do I have to select the SETUP each time before a run?

Once a SETUP has been chosen by the user, it will become the default configuration for the instrument and will be remembered the next time the instrument is switched on. It is only necessary to switch on, perform the acoustic calibration as normal and then press the start run key to begin making valid measurements.

When does a run actually start in a CEL-320 or 360?

A run will either begin on the next whole second after the start key is pressed or will wait until the next whole profile interval starts, if the collection of time history profiles has been selected in a **CEL-360**. This function is selected by using the Synchronize Timer function. When the synchronize function is deselected the run starts immediately. When the synchronize function is selected, the run starts after a variable delay to begin on an integral multiple of the profile interval so that a result will begin on the hour.

How many delayed start and stop timers are available in the CEL-360?

The **CEL-360** model has 16 sets of start and stop timers that can be set for up to 31 days, 23 hours and 59 minutes in advance. The 16 sets of delay start and stop timer pairs can be selected in the PC software and included in the configuration file sent to the instrument when it is on line. A start time can be set at the same value as the last stop time so that a continuous recording is achieved. Each start and stop timer pair causes a new run to be made and the results will be stored separately from the other runs using other start and stop times.

Is it possible to turn off a set of delay timer pairs in the instrument?
It is possible to turn off the delay timers from the keypad of a **CEL-360** if they have been loaded into an instrument but are no longer required. This is done from the OPTION menu by selecting the TIMER option and then going down until the BEG time is displayed. Press the Enter key to turn off any timers not required.

Is it possible to select the delay start and stop timers from the keypad of the CEL-360?
It is not possible to input or change the start and stop times from the keypad. It is only possible to enable or disable them if they have already been uploaded from the PC software.

How many repeats can be selected in a CEL-360?
Up to 49 repeats can be selected from the PC or from the keypad of the **CEL-360** that will cause the whole of the 16 start and stop table to be repeated if required. This allows a day to be split into "day" and "night" periods of interest and then repeated 4 times to collect measurements for a whole working 5 day week. If a single interval during the day is set using only 1 start and stop pair of timers then this can be repeated up to 49 times to fill the whole of the 50 run memories in the **CEL-360**. Example; from 0900 to 2200 hours every day for all 50 days.

Can individual runs be deleted from the instrument?
The Erase function found in the OPTION menu can be used to select individual runs and erase them completely from the memory of the instrument. Runs are numbered 1 to 50 and can be selected using the down and up arrow keys and then the Enter key. A message is displayed asking the user to confirm the deletion of the selected run and it is then permanently deleted when the Enter key is pressed again.

How many Threshold levels can be set in the CEL-320 and 360?
Two threshold levels can be set in the instruments at any integer dB value from 70 to 90 dB. If required, either one or both threshold levels can be disabled in order to include all the noise measured by the instrument.

What Criterion level can be set in the CEL-320 and 360?
A single Criterion level can be selected in integer dB steps over the range from 80 to 90 dB. Every Dose measurement must have a criterion level set to reference the percentage dose values to for the 100% value.

MEASUREMENT RANGES

What measurement ranges do the CEL-320 and 360 cover?
Both meters are equipped with three measurement ranges each covering a 70 dB dynamic range covering the overall range from 30 to 140 dB in a low, medium and high setting. The low range is 30 to 100, the medium range is 50 to 120 and the high range is 70 to 140 dB.

How many measurements can be made with the CEL-320 or 360?
Each meter can store the overall results from up to 50 separate measurements in a large memory of 512 Kbytes. The firmware uses a reserved area of this memory to save all the overall results from all 50 runs. The additional unused memory is available for the profile data point recording.

What range do the peak measurements cover?
The peak detector in the CEL-320 and 360 instruments covers the top 40 dB of each measurement range.

MEASURED PARAMETERS

What results can be stored for the whole measurement run?

The following data can be stored for the whole measurement run:

- The **start date** and **time** of the run,
- The **duration** of the run,
- The name of the **SETUP** used to collect the data during the run,
- The equivalent continuous level or **Leq**,
- The maximum RMS level or **Lmax**,
- The minimum RMS level or **Lmin**,
- The sound exposure level or **SEL**,
- The sound exposure value or **Pa2h**,
- The time weighted average level or **Lavg**,
- The impulse equivalent continuous level or **Leql**,
- The absolute peak noise level or **Lpeak**,
- The **noise dose** using the first threshold level,
- The **projected 8 hour noise dose** using the first threshold level,
- The **noise dose** using the second threshold level,
- The **projected 8 hour noise dose** using the second threshold level,
- The time weighted average level for 8 hours or **TWA**,
- The daily personal sound exposure level or **LEP,d**,
- The variable time weighted average level for 8 hours above threshold 1 **TWA,v1**,
- The variable time weighted average level for 8 hours above threshold 2 **TWA,v2**,
- The variable daily personal sound exposure level or **LEP,v**,
- The statistical percentile value for the 10% level or **LN10.0%,**
- The statistical percentile value for the 50% level or **LN50.0%**,
- The statistical percentile value for the 90% level or **LN90.0%,**
- The statistical percentile value for the 95% level or **LN95.0%,**
- The statistical percentile value for the 99% level or **LN99.0%,**

What if not all of these parameters are required for a particular measurement?

The user can select or de-select any of the potential parameters to make the instruments as comprehensive or as simple as the specific task requires. A full survey may require all parameters, but for a very simple survey only one or two noise units may be needed. The rest can be disabled from the PC software using the new dB10 or dB12 version 2.0 or higher software packages.

What additional results can be stored by the CEL-360?

The **CEL-360** can additionally store up to 10 parameters during a run at selected intervals in order to build up a picture of how the noise levels varied during the recording. These 10 parameters can be selected from the following list;

- The equivalent continuous level or **Leq,**

- The impulse equivalent continuous level or **Leql**,
- The maximum rms level or **Lmax**,
- The minimum rms level or **Lmin**,
- The sound exposure level or **SEL**,
- The time weighted average level or **Lavg**,
- The absolute peak noise level or **Lpeak**,
- The statistical percentile value for the 10% level or **LN10%,**
- The statistical percentile value for the 50% level or **LN50%,**
- The statistical percentile value for the 90% level or **LN90%,**
- The statistical percentile value for the 95% level or **LN95%,**
- The statistical percentile value for the 99% level or **LN99%,**

What rms frequency weightings are available in the CEL-320 and 360?
Two broadband frequency weightings are provided for the collection of the rms noise levels – the 'A' and 'C' weightings according to the international standards defined in IEC-651 and ANSI S1.4. Tolerances for these weightings are as specified in the type 2 category of these documents.

What frequency weightings are available for peak measurements in the CEL-320 and 360?
Two broadband frequency weightings are provided for the collection of the peak noise levels namely the 'Lin' and 'C' weightings according to the international standards defined in IEC-651 and ANSI S1.4.

What time weightings are available in the CEL-320 and 360?
Both instruments are equipped with the Slow, Fast and Impulse time weightings to suit all requirements for general-purpose noise and personal noise dose measurements.

What exchange rates or Q values are available in the CEL-320 and 360?
The exchange rate Q=3 is always available in the meters and it is possible to select one other value from 4 or 5 or 6 depending on the requirements of the relevant standards. These are provided for the collection of noise dose results to satisfy the US Noise at Work regulations as specified in the OSHA, MSHA or DoD relevant documents.

How can the calculation of LEP,d be made for non standard working days?
A variable time can be entered as part of a SETUP file sent to the instrument to calculate the daily noise exposure level for working days of other than exactly 8 hours. This can be entered from 00:00 to 23:59 hours only via the PC software. The measured Leq for the actual duration of the run will be extrapolated to the working time entered by the user and this will then be normalized to the standard 8 hour working day required by international regulations. This measurement is shown as the LEP,v to show that it is the variable value.

How can the calculation of TWA be made for non standard working days?
A variable time can be entered as part of a SETUP file sent to the instrument to calculate the daily noise exposure level for working days of other than exactly 8 hours. This can be entered from 00:00 to 23:59 hours only via the PC software. The measured Lavg for the actual duration of the run will be extrapolated to the working time entered by the user and this will then be normalised to the standard 8 hour working day required by international regulations. This measurement is shown as the TWA,v

to show that it is the variable value. Two values of this TWA,v will be calculated for each of the different threshold levels set by the user.

What is the difference between LEP,d and LEP,v?

LEP,d calculations in the **CEL-320** and **CEL-360** dosimeters assume that the total run contains all of the noise exposure that a worker will receive during his shift. This information is then normalised to the standard 8 hour daily dose. Therefore, if the dosimeter is worn for less than the whole working day it will not have enough time to collect all of the noise energy and the LEP,d will be lower than the true value.

On the other hand, by specifying the expected working duration of an operator prior to a run the dosimeter will measure the noise exposure for a shorter representative period. This can be only a few minutes in some circumstances and the instrument will then expand that short measured noise to the full working time and then normalise that value to the standard 8 hour daily dose. In this case a shorter than full day will always produce the right LEP,d as long as the short measurement is completely representative of the normal working day.

What is the difference between TWA and TWAv?

TWA calculations in the **CEL-320** and **CEL-360** dosimeters assume that the total run contains all of the noise exposure that a worker will receive during his shift. This information is then normalized to the standard 8 hour daily dose. Therefore, if the dosimeter is worn for less than the whole working day it will not have enough time to collect all of the noise energy and the TWA will be lower than the true value.

On the other hand, by specifying the expected working duration of an operator prior to a run the dosimeter will measure the noise exposure for a shorter representative period. This can be only a few minutes in some circumstances and the instrument will then expand that short measured noise to the full working time and then normalise that value to the standard 8 hour daily dose. In this case a shorter than full day will always produce the right TWA as long as the short measurement is completely representative of the normal working day.

When the amplitude weighting (exchange rate Q) is set at 4, 5 or 6 the dosimeters use the 2 threshold levels to produce TWA,v1 & TWA,v2 ignoring any noise below the selected threshold values.

TIMERS & RUN LENGTH

What time intervals are available for measuring the profiles in the CEL-360?

The following intervals for collecting time history profiles are available in the **CEL-360** logging version of the meter;

- 1, 2, 5, 10, 15, 20, 30 seconds,
- 1, 2, 5, 10, 15, 20, 30 and 60 minutes

What fixed durations are available for the overall run time in the CEL-360?

Once a run is started it will finish automatically at the end of the fixed time duration and save the overall results plus any time history profiles that may have been selected. The following fixed times are available for measurement runs in the logging version of the meter;

- 5, 10, 15, 30, 60 minutes,
- 2, 4, 8, 10, 12, 24 hours

Can the Synchronise Timer function be selected from the keypad?

The Synchronise Timer function can be selected from the keypad of the **CEL-360** by going to the OPTION menu and selecting Timers On and then selecting the required choice. If the Synchronise Timer function is selected the Wait message will be displayed in the display of the instrument showing the wait time counting down to the start of a run. This can be as short as 1 sec or up to a maximum of 59 min and 59 sec if a 1 hour profile interval is selected.

What is the shortest run duration that can be stored in the CEL-320 and 360?

The shortest run length that can be stored is 2 seconds rather than 1 minute as in the earlier CEL-420 and 460 models.

What is the longest run duration that can be stored in the CEL-320 and 360?

The longest run that can be stored and correctly annotated is 99 days 23 hours and 59 minutes rather than 99 hours 59 minutes and 59 seconds in the earlier CEL-420 and 460 models.

FAQ's: ACCURACY & RESULTS

What accuracy are the instruments designed to fulfil?

The various versions and variants of the **CEL-320** and **CEL-360** instruments comply with the international standards in the type 2 category that classifies them as general-purpose instruments. This specifies an overall expected accuracy of +/- 2 dB under normal measurement conditions. Use of the instruments as dosimeters may produce wider tolerances than this depending on how the microphone is mounted on the wearer's body.

What results can be calculated and displayed in the SLM mode?

The following parameters can be calculated and displayed in the SLM mode of both instruments;

- Sound pressure level or **SPL**,
- **Duration** of the measurement run,
- Maximum rms. Level or **Lmax**,
- Minimum rms. Level or **Lmin**,
- Equivalent continuous level or **Leq**,
- Single event level or **SEL**,
- Impulse weighted equivalent continuous level or **Leql**
- Time average level or **Lavg**,
- Absolute peak level or **Lpeak**

Any of the above parameters can be disabled so that the smallest number of parameters that will be displayed are the SPL and the measurement duration. Some parameters that can be displayed will depend on the selection of the amplitude weighting (or Q factor) and the time weighting. The SLM mode uses the Run key to Pause the collection of noise levels during a measurement and the Stop key to reset the calculated results. All results will be reset to zero when the Stop key is pressed including the run duration time and the equivalent continuous noise level etc.

Are results saved when using the SLM mode?

Results are not saved in the instrument when the SLM mode is used. This mode is intended to allow the instruments to be used as a simple integrating sound level meter for quick hand held surveys. Use the DATA (DOSE) recording mode to store results and save the measurements in one of the 50 available memories in either of the two instrument models.

How many profile points in total can be stored in the CEL-360?

Up to a maximum of 220,000 time history profiles can be stored altogether in a **CEL-360**.

How many profiles can be stored in a single run in a CEL-360?

Up to 99,999 profile points can be stored and annotated in a single run in a **CEL-360**. After that time the noise levels will be added to the overall value calculations but the **CEL-360** will not collect any more profile results in that particular run. Additional runs can use the remaining profile memory space up to the maximum of 220,000 data points in total.

How long does the memory last when recording profiles in a CEL-360?

If all 10 parameters are selected in a **CEL-360** when a run is in progress the amount of recording time this represents is shown below for the following time intervals selected by the user;

- at 1 second recording the duration is 333 m or 5.55 h
- at 2 second recording the duration is 666 m or 11.1 h
- at 5 second recording the duration is 1666 m or 27.75 h
- at 10 second recording the duration is 54.5 h
- at 15 second recording the duration is 83.3 h or 3.5 d
- at 20 second recording the duration is 109 h or 4.5 d
- at 30 second recording the duration is 7 d
- at 1 minute recording the duration is 14 d
- at 2 minute recording the duration is 28 d
- at 5 minute recording the duration is 2.3 m
- at 10 minute recording the duration is 4.6 m
- at 15 minute recording the duration is 6.9 m
- at 20 minute recording the duration is 9.2 m
- at 30 minute recording the duration is 13.8 m
- at 60 minute recording the duration is 27.6 m or 2.3 y

If only 1 parameter is selected in a **CEL-360** when a run is in progress the amount of recording time this represents is shown below for the following time intervals selected by the user;

- at 1 second recording the duration is 99,999 s or 1,666 m or 27.75 h
- at 2 second recording the duration is 333.3 m or 55.5 h
- at 5 second recording the duration is 138.75 h or 5.8 d
- at 10 second recording the duration is 277.75 h or 11.5 d
- at 15 second recording the duration is 17.4 d
- at 20 second recording the duration is 21 d
- at 30 second recording the duration is 34.8 d
- at 1 minute recording the duration is 69.4 d
- at 2 minute recording the duration is 138.8 d
- at 5 minute recording the duration is 347 d
- at 10 minute recording the duration is 694 d or 23 m
- at 15 minute recording the duration is 1040 d or 34.7 m
- at 20 minute recording the duration is 46 m
- at 30 minute recording the duration is 69 m or 5.75 y
- at 60 minute recording the duration is 4166 d or 138.9 m or 11.5 y

The overall recording duration will also depend on the power supply available for the run.

FAQ's: APPLICATIONS

What markets are the instruments designed for?

There are three main markets for the **CEL-320** and **CEL-360**.

- a simple workplace personal noise monitor
- a general purpose sound level meter
- a comprehensive environmental noise logging meter

How are these markets catered for by the CEL-320 and 360?

Fitting the remote cable microphone to either instrument enables it to be used for personal noise measurements for almost any workplace noise survey. The **CEL-320** provides information on the overall levels of noise whilst the **CEL-360** can additionally be set to store results during the measurement at regular intervals to enable a more comprehensive picture of the noise level changes to be inspected.

Using either of the **CEL-320** or **CEL-360** instruments with the optional CEL-425 stalk microphone enables simple noise surveys to be undertaken in the form of a hand held sound level meter.

When the **CEL-360** is used with the CEL-6760 outdoor weather protection kit case a low cost solution to environmental noise surveys can be realised lasting up to a week of continuous recording.