

# Calibration Service Options For Engine Exhaust CPCs And Reference Instruments



# CALIBRATION SERVICE OPTIONS FOR ENGINE EXHAUST CPCs

TSI service, performed on an annual basis, helps to keep your Engine Exhaust CPC (EECPC) in proper working order and delivering accurate measurements. The value of our standard Clean & Calibrate and Repair, Clean & Calibrate services is described in the Service Options Cards for our 3790A and 3790A-10 EECPCs. These standard services include preventive and corrective maintenance, as well as instrument calibration that is compliant with both UNECE PMP (Particle Measurement Programme) requirements as described in current European Regulations UNECE No. 49 and No. 83, and with the guidelines of ISO 27891 (Aerosol particle number concentration – Calibration of condensation particle counters).

In addition to the standard service, TSI offers an ISO 17025 accredited calibration for EECPCs. The ISO17025-accredited calibrations are also compliant with PMP and ISO 27891.

In all cases, TSI calibration services are always traceable to National Standards and Metrology Institutes (NIST or NPL UK) and other accepted values of physical constants. TSI is also registered to ISO 9001:2015.

## PMP-COMPLIANT CALIBRATION

The UNECE (United Nations Economic Commission for Europe) PMP group has established the requirements for CPCs in particle number counting systems, which are used to demonstrate that particle emissions comply with European legislation for light duty vehicles and heavy duty engines. These requirements include specific instrument design features and performance specifications such as counting efficiency at specific particle sizes, concentration accuracy and linearity across the operating range.

EECPC calibrations are PMP-compliant by default. Compliance with a standard such as ISO 27891 (as described below) is recommended by the PMP group, so TSI's PMP-compliant calibration also follows the guidelines of ISO 27891.

PMP calibrations are also available for reference counting instruments: Models 3750, 3772, and 3068B. In the case of reference instruments, the goal of the PMP calibration is that these units can then serve as reference units in a customer's PMP-compliant EECPC calibration bench.

### **Available for:**

Engine Exhaust CPCs  
+ 23 nm models: 3790, 3790A, 3791 and 3792  
+ 10 nm models: 3790A-10 and 3792E,  
plus 3790, 3791 and 3792 upgraded to 10nm

## ISO 17025-ACCREDITED CALIBRATION

ISO 17025 accreditation means that a calibration laboratory meets the Quality Management and Technical Requirements of ISO 17025. Accredited calibrations provide a higher quality level of technical calibration competence, and accurate test results that are mutually acceptable between governmental and regulatory organizations. For example, ISO 17025 requires a detailed analysis of the measurement uncertainty of the calibration results.

In short, ISO 17025 accreditation provides the highest possible quality that can be achieved for a specific type of calibration. ISO 17025 accredited calibrations of engine exhaust CPCs are also PMP and ISO 27891 compliant, but under the umbrella of the ISO 17025 standard.

Additionally, 'as-found' tests are included with all of TSI's ISO17025-accredited services.

### **Available for:**

Engine Exhaust CPCs  
+ 23 nm models: 3790, 3790A, 3791 and 3792  
+ 10 nm models: 3790A-10 and 3792E,  
plus 3790, 3791 and 3792 upgraded to 10nm

# CALIBRATION SERVICE OPTIONS FOR NUMBER CONCENTRATION REFERENCE INSTRUMENTS

For those interested in maintaining an EECPC calibration (or verification) bench, it's important to have properly calibrated reference instruments. TSI recommends CPC Models 3750 and/or 3772<sup>1</sup> be used as a Reference CPC. If a reference electrometer is preferred or required, TSI recommends Aerosol Electrometer Model 3068B.

## CALIBRATION OF REFERENCE INSTRUMENTS USED IN A PMP CALIBRATION

Calibrations that follow the requirements of PMP and the guidelines of ISO 27891 are available for CPC Models 3750 and 3772. Additionally, a PMP service is available to calibrate the Aerosol Electrometer Model 3068B for use as a reference counter in a PMP-compliant EECPC calibration bench. These services for reference counters are not ISO 17025 accredited.

Compared to the standard calibrations of these instruments, PMP calibrations for reference counters include additional tests:

- + Counting efficiency measurement at several sizes, down to 23 nm (3772 and 3750) or 10 nm (3068B)
- + Linearity checks for concentration accuracy over a range of concentrations (range varies by instrument model)

In all cases, TSI calibration services are always traceable to National Standards and Metrology Institutes (NIST or NPL UK) and other accepted values of physical constants. TSI is also registered to ISO 9001:2015.

### **Available for:**

- + 3750
- + 3772
- + 3068B

## WHAT MAKES TSI SERVICE VALUABLE?

As a result of TSI service, you are returned an optimally performing and updated instrument. The service is performed by TSI's experienced technicians for a fixed price. This simple service process allows you to stay focused on the work that is important to you.

These TSI services come with a 90-day warranty on labor performed, or parts used, during the service.

<sup>1</sup> Model 3772 is an older, discontinued CPC. While Model 3772 may be used as a reference CPC, Model 3750 is the recommended replacement.

# REQUEST SERVICE

TABLE 1:

Calibration offerings for TSI Engine Exhaust CPCs.

CPC Models*	D50**	Service Type	Order	PMP - ISO 27891	ISO 17025	Description of Service
3790, 3790A	23 nm	Clean & Calibrate	CL-379X	X		Standard clean and calibrate
			CA-379X	X	X	Clean and calibrate, ISO 17025 accredited
		Repair, Clean, & Calibrate	RP-379X	X		Repair, clean and calibrate
			RA-379X	X	X	Repair, clean and calibrate, ISO 17025 accredited
3790A-10, 3792E	10 nm	Clean & Calibrate	CL-379X-10	X		Standard clean and calibrate
			CA-379X-10	X	X	Clean and calibrate, ISO 17025 accredited
		Repair, Clean, & Calibrate	RP-379X-10	X		Repair, clean and calibrate
			RA-379X-10	X	X	Repair, clean and calibrate, ISO 17025 accredited

\*Models 3791 and 3792 can also be serviced with these services in the 'Order' column. When selecting the correct service for a 3791 or 3792, be mindful of the D50 cutpoint of the instrument (i.e. 23 nm or 10 nm).

\*\*D50: The D50 cutpoint is a traditional specification of CPCs, and is defined as the particle size at which the CPC can count particles with 50% efficiency. In the case of the 3790A-10, counting efficiency at 10 nm is required by upcoming PMP regulations to be between 50-80%.

TABLE 2:

Calibration offerings for Reference Number Concentration Instruments (Models 3750, 3772, and 3068B) typically used for verifying or calibrating EECPCs. Note that while ISO 17025-accredited calibrations are available for the EECPCs, such calibrations are not available for the Reference units.

Instrument Models	D50*	Service Type	Order	PMP - ISO 27891	Description of Service
3750	7 nm	Clean & Calibrate	CL-3750		Clean and calibrate
			CL-3750-PMP	X	Clean and calibrate, PMP compliant; for use as a reference counter (counting efficiency and linearity)
		Repair, Clean, & Calibrate	RP-3750		Repair, clean and calibrate
			RP-3750-PMP	X	Repair, clean and calibrate, PMP compliant; for use as a reference counter (counting efficiency and linearity)
3772	10 nm	Clean & Calibrate	CL-3772		Clean and calibrate
			CL-3772-PMP	X	Clean and calibrate, PMP compliant; for use as a reference CPC (counting efficiency and linearity)
		Repair, Clean, & Calibrate	RP-3772		Repair, clean and calibrate
			RP-3772-PMP	X	Repair, clean and calibrate, PMP compliant; for use as a reference CPC (counting efficiency and linearity)
3068B	N/A	Clean & Calibrate	CL-3068B		Clean and calibrate
			CL-3068B PMP	X	Clean and calibrate, PMP compliant; for use as a reference counter (counting efficiency and linearity)
		Repair, Clean, & Calibrate	RP-3068B		Repair, clean and calibrate
			RP-3068B PMP	X	Repair, clean and calibrate, PMP compliant; for use as a reference counter (counting efficiency and linearity)

\* D50: The D50 cutpoint is a traditional specification for CPCs, and is defined as the particle size at which the CPC can detect the particles with 50% efficiency.

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