

EPA TO-17 Volatile Organic Compounds

Method TO-17 is used to analyze samples for volatile organic compounds collected on multi-bed sorbent tubes, which are thermally desorbed and cryo-focused on the capillary column and then analyzed by GC/MS. The range of compounds analyzed by the method depends on the selection of the sorbent cartridge. EAS follows the method recommendation that the calibration and QC criteria for Method TO-17 follow the TO-15 method.

The modifications done by EAS include the target list. The method recommends using the Method TO-15 QC criteria. EAS uses the modified TO-15 QC criteria listed in Table 13.9a.

Table 13.9a
TO-17 Sorbent Cartridge Selection Guide

Tube Name	Compounds	Packing	Desorption Temperature
Tenax TA	BTEX Diesel Range Organic	Tenax TA	300C
Carbotrap 300	General VOC	Carbopak C Carbopak B Carboseive SIII	325C
VOC	General VOC	Tenax TA Carboxen 1000 Carboseive SIII	325C

TO-17 tubes can also be sampled passively using special adapters. The tubes are desorbed and analyzed in the same manner as the normal TO-17, and the TO-17 QC criteria is used.

Table 13.9b
TO-17 Recommended Sampling Times

Final Volume	Flow Rate	Time
500 ml	100 ml/min	5 min
480 ml	1 ml/min	8 hours
720 ml	0.5 ml/min	24 hours

Table 13.9c
TO-17 Summary of QC Criteria for Method TO-17

Parameter	EAS TO-15 Modified	TO-17 Method
BFB Tune	Daily (24 hour) 12 hours if Required	Daily (24 hour)
Tuning Criteria with BFB	TO-15 Tune Criteria	TO-15 Tune Criteria
Initial Calibration	Five points minimum See Table 13.9b 90% compounds meet criteria	Same as TO-15. Either liquid standards or gas phase standards can be used.
Calibration Check Sample (CCS)	After Initial Calibration Same Percent D as Initial Calibration	Same as TO-15
Continuing Calibration Verification (CCV)	Daily (24 hours) See Table 13.9b 90% compounds meet criteria	
Internal Standard (IS)	Pentafluorobenzene 1,4-Difluorobenzene RT < 0.5 min daily std. Response 60% to 140% 20 ppbv	Introduce gas phase internal standard onto sorbent tube (optional)
Surrogate	Toluene-d8 70-130% recovery	
Tube Blank	<RL for Tubes from the same media. From client media if supplied	Once tubes are analyzed they can be considered clean and can be reused. Artifact peaks should be identified in final report.
Laboratory Control Spike	1 per Daily Batch 70-130% for LCS list See Table 13.7b	Same as TO-15
Duplicate Lab Control Dup Duplicate Pairs	Duplicate Pair with each 20 samples <30% for LCS spike list See Table 13.7b	The precision is tested by using six standard tubes and repeated every 10 series of samples

The laboratory control spike (LCS) compounds are indicated in bold in Table 13.9d. The MDL for ppbV is based on a sample volume of 5L. This is the maximum volume that should be used.

Table 13.9d

TO-17 Method TO-17 Compound List and QC Criteria

Component	MDL ug	MDL ppbV	ICAL/CCV %D	LCS %R	Precision %D
Freon 12	0.5	0.02	<30%	70-130	<30%
Chloromethane	0.2	0.02	<30%	70-130	<30%
Freon 114	0.7	0.02	<30%	70-130	<30%
Vinyl chloride	0.3	0.02	<30%	70-130	<30%
Bromomethane	0.4	0.02	<30%	70-130	<30%
Chloroethane	0.3	0.02	<30%	70-130	<30%
Trichlorofluoromethane	0.6	0.02	<30%	70-130	<30%
1,1-Dichloroethene	0.4	0.02	<30%	70-130	<30%
Dichloromethane	0.3	0.02	<30%	70-130	<30%
Freon 113	0.8	0.02	<30%	70-130	<30%
1,1-Dichloroethane	0.4	0.02	<30%	70-130	<30%
c-1,2-Dichloroethene	0.4	0.02	<30%	70-130	<30%
Chloroform	0.5	0.02	<30%	70-130	<30%
1,2-Dichloroethane	0.4	0.02	<30%	70-130	<30%
1,1,1-Trichloroethane	0.5	0.02	<30%	70-130	<30%
Benzene	0.3	0.02	<30%	70-130	<30%
Carbon Tetrachloride	0.6	0.02	<30%	70-130	<30%
1,2-Dichloropropane	0.5	0.02	<30%	70-130	<30%
Trichloroethene	0.5	0.02	<30%	70-130	<30%
c-1,3-Dichloropropene	0.5	0.02	<30%	70-130	<30%
t-1,3-Dichloropropene	0.5	0.02	<30%	70-130	<30%
1,1,2-Trichloroethane	0.5	0.02	<30%	70-130	<30%
Toluene	0.4	0.02	<30%	70-130	<30%
1,2-Dibromoethane	0.8	0.02	<30%	70-130	<30%
Tetrachloroethene	0.3	0.01	<30%	70-130	<30%
Chlorobenzene	0.5	0.02	<30%	70-130	<30%
Ethylbenzene	0.4	0.02	<30%	70-130	<30%
M,p-Xylenes	0.4	0.02	<30%	70-130	<30%
Styrene	0.4	0.02	<30%	70-130	<30%
o-Xylene	0.4	0.02	<30%	70-130	<30%
1,1,2,2-Tetrachloroethane	0.3	0.01	<30%	70-130	<30%
1,3,5-Trimethylbenzene	0.5	0.02	<30%	70-130	<30%
1,2,4-Trimethylbenzene	0.5	0.02	<30%	70-130	<30%
1,3-Dichlorobenzene	0.3	0.01	<30%	70-130	<30%
1,4-Dichlorobenzene	0.3	0.01	<30%	70-130	<30%
1,2-Dichlorobenzene	0.3	0.01	<30%	70-130	<30%
1,2,4-Trichlorobenzene	0.2	0.01	<30%	70-130	<30%
Hexachlorobutadiene	0.3	0.01	<50%	50-150	<50%

Component	MDL ug	MDL ppbV	ICAL/CCV %D	LCS %R	Precision %D
TO-15 Compounds					
1,3-Butadiene	0.2	0.02	<40%	60-140	<40%
2-Butanone	0.3	0.02	<40%	60-140	<40%
Acetone	0.2	0.02	<40%	60-140	<40%
Carbon Disulfide	0.3	0.02	<40%	60-140	<40%
Bromoform	0.3	0.00	<40%	60-140	<40%
4-Methyl-2-pentanone	0.2	0.01	<40%	60-140	<40%
2-Hexanone	0.2	0.01	<40%	60-140	<40%
Bromodichloromethane	0.3	0.01	<40%	60-140	<40%
Dibromochloromethane	0.4	0.01	<40%	60-140	<40%
Vinyl acetate	0.4	0.02	<40%	60-140	<40%
t-1,2-Dichloroethene	0.2	0.01	<40%	60-140	<40%
Benzylchloride	0.3	0.01	<50%	50-150	<50%
4-Ethyltoluene	0.2	0.01	<40%	60-140	<40%
Methyl t-butyl ether	0.2	0.01	<40%	60-140	<40%
Cyclohexane	0.2	0.01	<40%	60-140	<40%
1,4-Dioxane	0.7	0.04	<40%	60-140	<40%
Tetrahydrofuran	0.3	0.02	<40%	60-140	<40%
Hexane	0.2	0.01	<40%	60-140	<40%
Heptane	0.2	0.01	<40%	60-140	<40%
2,2,4-Trimethylpentane	0.2	0.01	<40%	60-140	<40%
3-Chloroprene	0.3	0.02	<40%	60-140	<40%
Ethyl-Acetate	0.4	0.02	<40%	60-140	<40%
2-Propanol	0.2	0.02	<40%	60-140	<40%
TO-15 8260 Compounds					
n-Propylbenzene	0.2	0.01	<40%	60-140	<40%
Isopropylbenzene	0.2	0.01	<40%	60-140	<40%
2,2-Dichloropropane	0.5	0.02	<40%	60-140	<40%
1,1,1,2-Tetrachloroethane	0.3	0.01	<40%	60-140	<40%
Bromochloromethane	0.3	0.01	<40%	60-140	<40%
Octane	0.2	0.01	<40%	60-140	<40%
Nonane	0.3	0.01	<40%	60-140	<40%
Decane	0.3	0.01	<40%	60-140	<40%
1,1-Dichloropropene	0.2	0.01	<40%	60-140	<40%
1,2,3 Trichloropropane	0.3	0.01	<40%	60-140	<40%
1,3-Dichloropropane	0.2	0.01	<40%	60-140	<40%
Dibromomethane	0.4	0.01	<40%	60-140	<40%
Methyl methacrylate	0.2	0.01	<40%	60-140	<40%
Di-isopropyl ether	0.2	0.01	<40%	60-140	<40%
Isobutyl Alcohol	0.3	0.02	<40%	60-140	<40%
Ethanol	0.6	1.4	<40%	60-140	<40%

Component	MDL ug	MDL ppbV	ICAL/CCV %D	LCS %R	Precision %D
n-Butylbenzene	0.3	0.01	<40%	60-140	<40%
sec-Butylbenzene	0.3	0.01	<40%	60-140	<40%
tert-butylbenzene	0.3	0.01	<40%	60-140	<40%
i-Butylbenzene	0.3	0.01	<40%	60-140	<40%
p-Isopropyltoluene	0.3	0.01	<40%	60-140	<40%
t-Butanol	0.2	0.01	<40%	60-140	<40%
2-Chlorotoluene	0.3	0.01	<40%	60-140	<40%
4-Chlorotoluene	0.3	0.01	<40%	60-140	<40%
Methyl Acrylate	0.4	0.9	<40%	60-140	<40%
Ethyl tert butyl Ether	0.4	0.02	<40%	60-140	<40%
1,2,3-Trichlorobenzene	0.4	0.01	<40%	60-140	<40%

Table 13.9e
Method TO-17 Special Compound List and QC Criteria

The Special List has compounds that EAS has a 5 point initial calibration and QC, but are not regularly reported. We will include these compounds if requested, please call to get the QC criteria for these compounds.

Component	TO-17 MDL ug
Naphthalene	0.1
t-1,4-Dichloro-2-butene	0.3
1,2-Dibromo-3-chloropropane	0.5
Methanol	0.4
Acrylonitrile	0.2
Acetonitrile	0.3
Acrolein	0.2
Methacrylonitrile	0.3
Ethyl methacrylate	0.2
Methyl iodide	0.3
Propionitrile	0.2
Tetraethyl lead	0.3