

## TO-11A Aldehydes and Ketones

Method TO-11A is used for the analysis of aldehydes and ketones that have been collected in DNPH sorbent cartridges. The DNPH solution forms a hydrazone derivative with the target compounds. The cartridges are extracted with acetonitrile and are analyzed by reverse phase high-pressure liquid chromatography (HPLC) using UV detection. The cartridges are available in a diffusion sampler package. There is also a TO-5 method which uses impingers with DNPH solution instead of the cartridges. The cartridges are much simpler and easier to use. Some scientists feel that high levels of ozone may negatively impact analytical results, so an ozone scrubber can be used if their project requires their use.

The EAS modification to this method includes the calibration procedure and QC criteria.

**Table 13.4a**  
**Summary of QC Criteria for TO-11A**

<b>Parameter</b>	<b>EAS TO-11A Modified</b>	<b>TO-11A Method</b>
Initial Calibration	5 points minimum See Table 13.4b RT determined and a bracket value is established	Method specifies standards run in triplicate. RT <2% RSD. Method criteria 0.999 correlation coefficient. Minimum every 6 months
Calibration Check Sample (CCS)	With Initial calibration curve See Table 13.4b	Second Source calibration check run after initial calibration curve 85-115% recovery
Continuing Calibration Verification (CCV)	Daily (24 hours) Mid range standard See Table 13.4b	10% precision on replicate <15% D for calibration verifications
Method Blank	Less than LOQ A cartridge blank is analyzed for the method blank.	Average Blank Subtraction
Laboratory Control Spike	1 per Daily Batch See Table 13.4b	Not Specified
Duplicate Lab Control Dup Sample Dup	Duplicate with each 20 samples See Table 13.4b	50% of sampling events should have a collocated sample. <20% D
Holding Times	Extract 14 days; analyze within 30 days.	Extract 14 days from sampling date

**Table 13.4b**  
**Summary of QC Procedures for TO-11A**

Analyte	MDL ug	LOQ ug	Criteria		
			ICAL CCV %D	LCS %R	Duplicate %RPD
Formaldehyde	0.08	0.12	<20	75-125	<25
Acetaldehyde	0.08	0.16	<20	75-125	<25
Acrolein (2)	0.08	0.16	<30	70-130	<30
Acetone	0.25	0.25	<30	70-130	<30
Propionaldehyde	0.08	0.16	<20	75-125	<25
Butyraldehyde (1)	0.08	0.16	<30		
Methyl ethyl ketone	0.08	0.16			
Benzaldehyde	0.08	0.16	<20	75-125	<25
Valeraldehyde	0.12	0.24	<30	70-130	<30
Cyclohexanone	0.16	0.32	<30	70-130	<30
Hexaldehyde	0.12	0.24	<30	70-130	<30

(1) Butyraldehyde and methyl ethyl ketone (MEK) coelute and are not included in the LCS

(2) Acrolein derivative is unstable in some samples.

**Table 13.4c**  
**MDL and RL at Common Sample Air Volumes**

Analyte	MDL ug	MDL ug/m3	MDL ug/m3	LOQ ug	LOQ ug/m3	LOQ ug/m3
<b>Air Volume</b>		<b>0.48 m3</b>	<b>1.44 m3</b>		<b>0.48 m3</b>	<b>1.44m3</b>
Formaldehyde	0.08	0.167	0.056	0.24	0.500	0.167
Acetaldehyde	0.08	0.167	0.056	0.24	0.500	0.167
Acrolein (2)	0.08	0.167	0.056	0.24	0.500	0.167
Acetone	0.25	0.521	0.174	0.75	1.562	0.521
Propionaldehyde	0.08	0.167	0.056	0.24	0.500	0.167
Butyraldehyde	0.08	0.167	0.056	0.24	0.501	0.167
Methyl ethyl ketone	0.08	0.167	0.057	0.24	0.501	0.170
Benzaldehyde	0.08	0.167	0.056	0.24	0.500	0.167
Valeraldehyde	0.12	0.250	0.083	0.36	0.750	0.250
Cyclohexanone	0.16	0.333	0.111	0.48	1.000	0.333
Hexaldehyde	0.12	0.250	0.083	0.36	0.750	0.250

**Table 13.4d**  
**TO-11 Common Sample Air Volumes**

Air Volume (m3)	Flow (L/min)	Time (hrs)	Volume (L)
0.48	1.0	8	480
1.44	1.0	24	1444

