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### Precision analysis and the determination of outliers

Precision was determined by analyzing replicate samples drawn from one Niskin.

Outliers are discarded on the basis of Chauvenet's criteria. The statistic is calculated by finding the Chauvenet critical value (Z-critical) for the total degrees of freedom ( $v$ ) of the dataset:

$$Z\text{-critical} = \text{ABS}(\text{NORM.S.INV}(1/(4*v)))$$

The maximum deviation,  $D_{max}$ , is compared with the individual residuals from the original concentrations.

If a replicate's residual is greater than  $D_{max}$  this value can be rejected.  $D_{max}$  is determined by the following formula:

$$D_{max} = Z\text{-critical} * \sigma$$

where  $\sigma$  is the standard deviation of residuals

Precision is assessed by calculating the pooled standard deviation ( $S_p$ ).

Pooled standard deviation is calculated for a combination of duplicates and triplicates using the following formula:

$$s_p = \sqrt{\frac{SS_1 + SS_2 + \dots + SS_k}{v_1 + v_2 + \dots + v_k}}$$

where:  $v$  = total degrees of freedom (1 for duplicates, 2 for triplicates).

$SS$  = sum of squares of the residuals.

**Dissolved oxygen datasets with pooled standard deviations < 0.010 ml/l are considered of good quality.**

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### Precision statement for replicate samples drawn from a single Niskin bottle:

Oxygen:Dissolved:Bottle:Volume ranged from 0.266 to 6.608 ml/l with a pooled standard deviation of 0.011 ml/l from 23 replicates and a pooled standard deviation of 0.009 ml/l after the removal of 1 outlier sample using Chauvenet's criteria.

### Duplicate samples from a single Niskin bottle

Event Number	Sample Number	Station	Pressure dbar	Oxy:Dis 1 ml/l	Oxy:Dis 2 ml/l	Rejected yes / no	Comment
1	14	HARO59	5.4	5.996	5.995		
5	42	JF2	79.9	2.202	2.222		
9	61	P1	102.7	2.097	2.089		
12	90	P2	108.5	1.659	1.647		
18	154	P4	1249.9	0.416	0.402		
18	166	P4	74.8	5.917	5.917		
26	253	P8	2000.0	1.408	1.424		
26	261	P8	250.3	2.385	2.400		
26	269	P8	25.0	6.403	6.400		
31	290	P12	3000.3	2.268	2.257		
31	295	P12	1000.9	0.266	0.276		
31	303	P12	150.8	3.300	3.281		
31	307	P12	50.4	6.549	6.551		
45	433	P16	2000.8	1.328	1.320		
45	440	P16	300.2	2.302	2.302		
45	447	P16	74.6	6.608	6.563	yes	Replicate outliers. Titration not ideal.
53	482	P20	3499.4	2.863	2.866		
53	487	P20	1249.9	0.367	0.371		
53	492	P20	300.0	2.365	2.363		
72	601	P26	4000.8	3.150	3.146		
72	607	P26	1249.0	0.536	0.504		
72	613	P26	250.3	2.462	2.459		
72	617	P26	124.5	5.403	5.421		

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### Duplicate Niskins at the same pressure

Oxygen:Dissolved:Bottle:Volume ranged from 0.409 to 2.865 ml/l with a standard deviation of 0.005 ml/l from 4 replicates after the removal of 0 outlier sample using Chauvenet's criteria.

**Note:** Although the precision statement for samples drawn from duplicate Niskin bottles is calculated using the same formula as the precision statement for duplicates samples drawn from one single Niskin, this process is mainly used to identify problem samples and is not being used as a measure of analytical precision.

Event Number	Sample Number	Station	Nominal Pressure dbar	Oxy:Dis 1 ml/l	Oxy:Dis 2 ml/l	Rejected yes / no	Comment
18	153 / 154	P4	1250	0.414	0.409		
31	289 / 290	P12	3000	2.272	2.263		
45	429 / 430	P16	3500	2.713	2.719		
53	481 / 482	P20	3500	2.863	2.865		