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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,  $D_{\text{max}}$ , is compared with the individual residuals from the original concentrations.

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

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

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 0.308 to 7.042 ml/l with a pooled standard deviation of 0.003 ml/l from 32 replicates after the removal of 0 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
10	6	P1	30.3	6.121	6.127		
11	16	P2	50.8	3.688	3.689		
20	61	P4	600.2	0.429	0.433		
20	66	P4	175.4	2.425	2.425		
20	71	P4	50.5	6.737	6.740		
30	91	P8	1501.6	0.679	0.677		
30	98	P8	250.2	2.284	2.284		
30	102	P8	124.8	3.989	3.986		
30	108	P8	30.3	6.985	6.987		
39	131	P12	3276.7	2.273	2.282		
39	136	P12	1498.5	0.644	0.644		
39	143	P12	250.2	3.157	3.153		
39	153	P12	5.4	6.711	6.709		
52	220	P16	2501.9	1.859	1.856		
52	223	P16	1250.1	0.337	0.335		
52	231	P16	175.2	3.161	3.163		
52	235	P16	74.7	6.953	6.949		
64	324	P20	3500.3	2.844	2.848		
64	331	P20	1000.8	0.308	0.308		
64	336	P20	250.6	2.110	2.104		
64	345	P20	10.6	6.935	6.932		
77	422	P26	2500.2	1.786	1.785		
77	427	P26	800.8	0.467	0.471		
77	433	P26	175.9	3.681	3.682		
77	441	P26	5.3	7.022	7.015		
84	465	PA015	10.6	7.042	7.033		
84	466	PA015	5.1	7.039	7.039		
84	467	PA015	3.0	7.040	7.034		
121	794	CHAT2	40.1	6.015	6.014		
131	865	CHAT1	74.8	5.114	5.115		
135	912	CH26	50.3	6.047	6.050		
136	921	CH27	20.2	6.742	6.746		

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### Duplicate Niskins at the same pressure

**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.

Oxygen:Dissolved:Bottle:Volume ranged from 0.410 to 3.220 ml/l with a pooled standard deviation of 0.008 ml/l from 4 replicates after the removal of 1 outlier sample using Chauvenet's criteria.

The pooled standard deviation was 0.093 when using the complete set of 5 replicates.

Event Number	Sample Number	Station	Nominal Pressure dbar	Oxy:Dis 1 ml/l	Oxy:Dis 2 ml/l	Rejected yes / no	Comment
11	14 / 15	P2	75	3.220	3.218		
20	57 / 58	P4	1250	0.425	0.410		
39	132 / 133	P12	3000	2.260	2.245		
52	217 / 218	P16	3000	2.708	2.415	yes	
64	325 / 326	P20	3000	2.512	2.503		