

Converter Efficiency Reports

These reports come in two groupings:

- NO2 converter efficiency calculation vs NOy converter efficiency calculation
- SPAN vs. PREC (Precision)

Thus, there are four reports to handle the combinations, although the calculations are much the same.

The required configuration for the report to run is as follows:

1. Calibration sequence must have levels for ZERO, SPAN (or PREC), and PREC_GPT or SPAN_GPT (matching the SPAN or PREC level)
2. Parameters must have parameter templates NO and NO2 or NOY.
3. NOX is not required, but can be present. It is not used in the calculations.

An example input data set and report (for NOY – PREC) is as follows:

The screenshot shows the 'Calibration Data Editor' window in AirVision. The table below represents the data shown in the window:

Site	Parameter	Sequence	Phase	Start Date	End Date	Value	Expected Value	Exclude From Reporting	Tracer ID	Level	Method Code	AQS Null Code
NOY T	NO	NOVGPT	Zero	05/14/2020 00:00	05/14/2020 00:05	0.033	0	<input type="checkbox"/>		ZERO		
NOY T	NOY	NOVGPT	Zero	05/14/2020 00:00	05/14/2020 00:05	0.836	0	<input type="checkbox"/>		ZERO		
NOY T	NO	NOVGPT	Prec	05/14/2020 00:00	05/14/2020 00:20	18.93	21	<input type="checkbox"/>		PREC		
NOY T	NOY	NOVGPT	Prec	05/14/2020 00:00	05/14/2020 00:20	18.176	20	<input type="checkbox"/>		PREC		
NOY T	NO	NOVGPT	GPT	05/14/2020 00:00	05/14/2020 23:59	9.25	10	<input type="checkbox"/>		GPT_PREC		
NOY T	NOY	NOVGPT	GPT	05/14/2020 00:00	05/14/2020 23:59	17.3	20	<input type="checkbox"/>		GPT_PREC		

The screenshot shows the 'NOy Converter Efficiency Precision Report' window in AirVision. The report includes the following table:

Date Printed: 05/19/2020 07:17

Converter Efficiency Precision Report

NOY Test Site

Date	NO Input	Precision		Zero			Corrected Prec Response		GPT			Corrected GPT Response		Cal Diff Input	Diff Delta %	Converter Efficiency %		
		NO Resp.	% Diff	NO Resp.	% Diff	NO Resp.	NOy Resp.	Diff Resp.	NO	NOy	NO Resp.	Diff Resp.	NOy Resp.				NO	NOy
05/14/20 00:00	21	19	-9.524	18	-14.29	0	1	1	21	19.83	9	8	17	9.947	18.67	11.05	-27.6	89.44

The report can be run for a date range (month, quarter), and all the checks will be listed as rows.

Calculation Details (example for NOy Precision):

$$\text{Precision NO \% Difference} = 100 * (\text{NOprec} - \text{NOprec_expected}) / (\text{NOprec_expected})$$

$$\text{Precision NOy \% Difference} = 100 * (\text{NOyprec} - \text{NOyprec_expected}) / (\text{NOyprec_expected})$$

$$\text{Zero Diff Resp} = \text{NOyzero} - \text{Nozero}$$

$$\text{Corrected NO Prec Response} = (\text{NOspan} - \text{NOzero}) * (\text{NOprec_expected} / \text{NOprec})$$

$$\text{Corrected NOy Prec Response} = (\text{NOyspan} - \text{NOyzero}) * (\text{NOyprec_expected} / \text{NOyprec})$$

$$\text{GPT Diff Response} = \text{NOygpt} - \text{Nogpt}$$

$$\text{Corrected NO GPT Response} = (\text{NOgpt} - \text{NOzero}) * (\text{NOprec_expected} / \text{NOprec})$$

$$\text{Corrected NOy GPT Response} = (\text{NOygpt} - \text{NOyzero}) * (\text{NOyprec_expected} / \text{NOyprec})$$

$$\text{Calc Diff Input} = \text{Corrected NO Span Response} - \text{Corrected NO GPT Response}$$

$$\% \text{ Difference} = 100 * (\text{GPT Diff Response} - \text{Calc Diff Input}) / (\text{Calc Diff Input})$$

Converter Efficiency =

$$100 * (1 - (\text{Corrected NOy Response} - \text{Corrected NOy GPT Response}) / \text{Calc Diff Input})$$

Note that it is possible, through instrumentation errors, to get a corrected GPT response greater than the span / precision response, resulting in a calculated converter efficiency > 100%, as shown below:

NO Input	Span				Zero			Corrected Span Response		GPT			Corrected GPT Response		Calc Diff Input	Diff Δ%	Converter Efficiency %
	NO Response	Δ%	NOy Response	Δ%	NO Response	NOy Response	Diff Response	NO	NOy	NO Response	Diff Response	NOy Response	NO	NOy			
140	134.995	-3.6	137.081	-2.1	0.023	1.059	1.036	139.98	138.9	14.733	124.5	139.247	15.3	141.1	124.7	-0.2	101.8
140	136.349	-2.6	138.548	-1.0	-0.005	1.018	1.023	140.01	139.0	15.495	123.4	138.851	15.9	139.3	124.1	-0.6	100.2
140	137.784	-1.6	139.769	-0.2	0.014	0.372	0.358	139.99	139.6	20.086	119.4	139.521	20.4	139.4	119.6	-0.1	99.8