RIQAS Evaluation of Performance

This document is a guide to the evaluation of participant performance on RIQAS quantitative programmes. Separate guides are available for RIQAS qualitative and semi-quantitative programmes.

1.   Acceptable criteria for performance

Performance on RIQAS may be evaluated using a combination of calculated scores:

- RIQAS Target Score,
- Standard Deviation Index, and
- Percentage Deviation.

Each of these evaluates performance differently as stated in the sections below.

Criteria for acceptable performance is considered to be:

- **Target Score greater than 50**
- **SDI less than ±2**
- **% Deviation within the "acceptable limits" set.**

When your result falls outside all three criteria, a red triangle is shown beside the parameter on the summary page of your routine report, as an overall indication of poor performance.

The report examples used throughout this document are taken from the RIQAS Human Urine Programme. For further information on RIQAS reports, please request a RIQAS Explained brochure, or contact RIQAS at mail@riqas.com.

2. Criteria for selection of Mean for comparison (assigned value)

Your results are evaluated by comparing them to a mean for comparison, which is based on consensus. All participants are registered on each programme according to their chosen parameter, method, instrument, unit, measuring temperature (where appropriate), and Ortho slide generation number (where appropriate). For a given sample and parameter, your results returned are compared to a mean for comparison to generate performance statistics.

The mean for comparison may be the Instrument, the Method, or the All Methods group of results, depending on the number of results. The minimum number of results required to generate a mean for comparison is 5, as agreed by the RIQAS Advisory Panel. If there are 5 or more results in your registered instrument group, your results will be compared to your instrument group statistics. If there are less than 5, your result will be compared to your registered method group mean. If there are less than 5 results in your method group, your results will be compared to the "All methods" mean. Exceptions to this rule are:

a) enzymes on the Clinical Chemistry, Cardiac and Human Urine Programmes (only instrument or method means used as mean for comparison).
b) Ortho Vitros participants are compared to their Slide Generation, where possible, then by method, then by All Method mean
c) Assays where it is not appropriate to be compared to an All Methods mean for comparison, such as, for example, Immunoassay-based or Haematology assays.

3. Calculation of Mean for comparison, Standard Deviation and Exclusion of Outliers

Results are entered into the RIQAS database, and then processed to generate statistics, following manual de-activation of gross outliers. For each instrument, method and all methods group, the mean and standard deviation (SD) are calculated and at this point Chauvenet's Criterion is applied to identify and exclude statistical outlying results from the calculations. The mean and SD are recalculated after the outliers have been excluded. Then, the Chauvenet's process is repeated. Finally the 95th percentile of the new mean and SD is calculated. This is used to create a final upper and lower range. If any results fall outside this range they are also excluded. The final mean, SD and coefficient of variation (CV) are then calculated. The calculated SD is used to generate uncertainty associated with the mean for comparison (see section 8.1. c)).

4. Report text section

On the top left of each parameter report page, the text section summarises:

- The parameter and your chosen unit of result submission,
- Calculated statistics for the current sample, presented in your chosen unit
- Your result,
- Your selected mean for comparison,
- Your performance scores: SDI, Target Score and %Deviation, along with Running Means,
- Acceptable limits of performance (defaulted to the RIQAS TDPA, and indicated on the "%Deviation by sample" chart, see section 9.2),

Although not shown below, there is also space to indicate if your performance scores exceed the acceptable criteria (see section 1). There is also space to indicate reference method values, weighed-in values or other important information, as appropriate.

Calcium, mmol/l

	N	Mean	CV%	U_m	SDPA	Exc.
All Methods	270	3.696	7.4	0.02	0.17	23
Cresolphthalein complexone (CPC)	144	3.879	4.3	0.02	0.18	21
Siemens/Dade Dimension RxL/Max/Xpand	11	3.885	4.0	0.06	0.19a	0

|			
▲ Your Result	3.790	SDI	-0.51
		RMSDI	-0.15
■ Mean for Comparison	3.885	TS	99
		RMTS	105
		%DEV	-2.4
		RM%DEV	-0.6

Acceptable limits of performance for RIQAS	7.50%

5. Histogram of results

A histogram of results is presented on each parameter report page to allow you to view your result relative to all other results submitted. The histogram is presented in your chosen unit and shows the number of laboratories returning results in your registered instrument, method and "all methods" groups. A black triangle indicates where your result is placed.
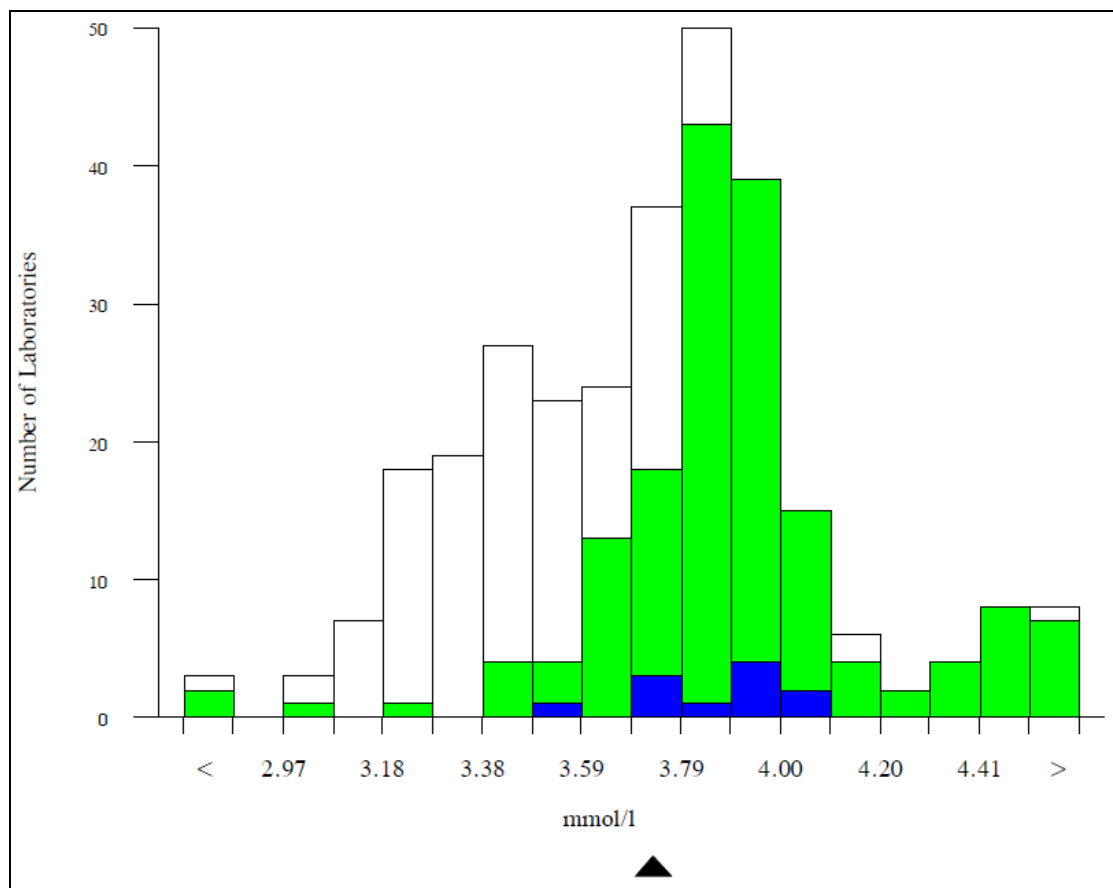
6.Multi Method Statistics Summary

Beneath the histogram, the multi method statistics summary allows you to review performance of the methods registered for each parameter. Statistics are presented in your registered unit.

Method	N	Mean	CV%	U_m
ISE, indirect	247	87.917	2.9	0.21
ISE, direct	23	88.017	2.5	0.58
Vitros	12	94.375	3.3	1.11

7. Target Scoring System

The Target Scoring system was developed to provide a simple interpretation of your laboratory's performance. The system will present the performance of your results for each *RIQAS* sample and also show how your laboratory's performance varies with time. In order to calculate the Target Score, your result is calculated as a percentage deviation (V) from the Mean for Comparison. This deviation is then compared to a Target Deviation for Performance Assessment to calculate the Target Score.

7.1. Definition and description
The difference between 'your result' and the 'mean for comparison' is expressed as a Target Score (TS) using the following mathematical formulae:

$$TS = \log_{10} \left(3.16 \times \frac{TDPA}{|V|} \right) \times 100$$

Where:

TDPA = Target Deviation for Performance Assessment (%)

V = Your deviation from the mean for comparison (%)

$$V = \frac{(\text{Your result} - \text{Mean for Comparison})}{\text{Mean for Comparison}} \times 100$$

The better your percentage deviation compared to the Target Deviation for Performance Assessment, the higher your Target Score will be.

Target Scores are in the range from 10 to 120 and are interpreted as follows:

less than 40			Unacceptable
41	-	50	Need for improvement
51	-	70	Acceptable
71	-	100	Good
101	-	120	Excellent

7.2. Target Deviation for Performance Assessment (TDPA)
Target Deviations for Performance Assessment are set to encourage participants to achieve and maintain acceptable performance. Target Deviations are assigned to be fit-for-purpose and take all possible sources of variation into account, including sample homogeneity and stability (taking guidance from ISO/IEC17043, ISO13528 and IUPAC).

In general, the TDPA is set so that ~10% laboratories achieve Target Scores less than 50. However, depending on homogeneity and stability, the TDPAs may be adjusted, so that participants' performance is not adversely affected by sample variability. Further details are available from RIQAS, on request. If your % deviation (V) is equal to the Target Deviation for Performance Assessment (TDPA) then a target score of 50 is achieved.

RIQAS reviews the Target Deviations for Performance Assessment annually and the methods used to assign them have been agreed by the RIQAS Advisory Panel.

Target Deviations for Performance Assessment are also used to calculate the Standard Deviation for Performance Assessment (SDPA), taking into account the estimated uncertainty associated with the mean for comparison.

7.3. Running Mean Target Score (RMTS)

This is the mean of the 10 most recent TSs for an individual analyte. RMTS is presented in the text section of your report, under your current Target Score.

7.4. Overall Running Mean Target Score (ORMTS)

This is the mean of all RMTSs listed for an individual RIQAS sample. ORMTS is stated on the summary page of your report.

7.5. The Target Scoring Chart

An example of a typical Target Scoring chart is presented below. The chart appears in the top right quadrant of the *RIQAS* report. The TDPA is printed at the top of the chart for reference. Sample numbers are printed on the x-axis and the Target Score on the y-axis. If a result is not submitted, the sample number is replaced by "N", the "No Result" flag. The flag "C" denotes a corrected result and "L" denotes a late result. The vertical line at sample 8 indicates a registration update (a change in method or unit).

For parameters that are new or have small participant numbers, it may not be possible to assign a Target Deviation. Target Scores will not be calculated for such parameters, and you can evaluate performance based on SDIs and % deviations alone. When no Target Score is available, the Target Score chart will be absent from the report parameter page and N/A will be stated in the TS and RMTS column on the report summary page.

The five performance categories, ranging from "Unacceptable" to "Excellent" performance are indicated on the chart. The participant's results are plotted for each sample returned. It is clear that the performance below has improved dramatically after the registration update.

Criteria for Acceptable Performance: Target Score greater than 50.

Target Scoring chart

TDPA = 4.9%
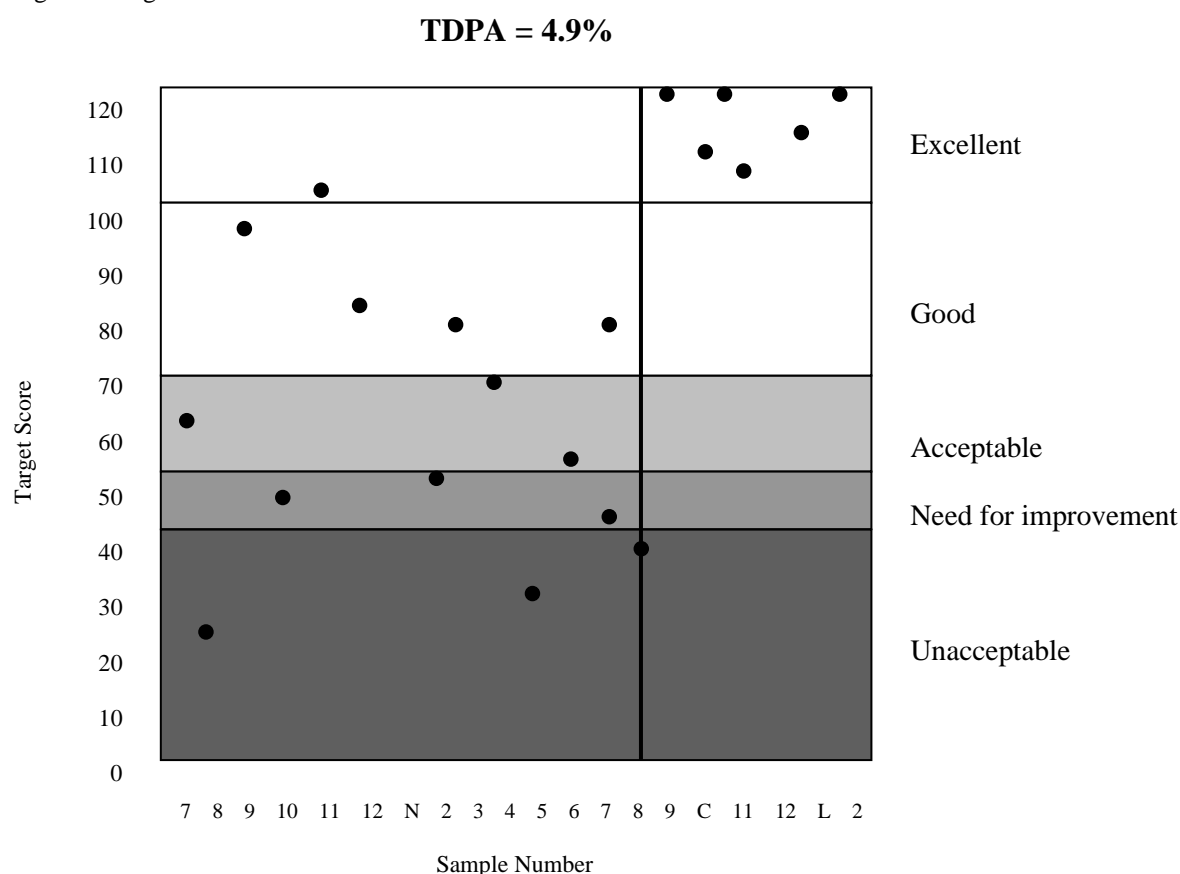
8. Standard Deviation Index Score

The Standard Deviation Index is a score which compares the participant's difference from the assigned value (mean for comparison) with an evaluation interval called the Standard Deviation for Performance Assessment (SDPA).

8.1. Assignment of Standard Deviation for Performance Assessment (SDPA)

Standard Deviations for Performance Assessment are calculated from Target Deviations for Performance Assessment (TDPA):

a) **For each parameter, a CV for Performance Assessment (CVPA) is calculated as follows:**

$$CVPA = \frac{TDPA}{\text{t-value}}$$

where t-value = factor which represents the % of poor performers reflected in the TDPA.

In general, the TDPA is set so that ~10% laboratories achieve Target Scores less than 50 (poor performance). In such cases, the t-value used to convert TDPA to CVPA is ~1.645. However, depending on homogeneity and stability, the TDPA may need be increased, so that participants' performance is not adversely affected by sample variability. In such cases less than 10% of laboratories will have poor performance, and a larger t-value will be chosen to convert TDPA to CVPA. More details are available from RIQAS, on request.

b) **Then the CVPA is converted to an SDPA, as follows:**

$$SDPA = \frac{CVPA \times \text{Mean for comparison}}{100}$$

Using these equations, an initial SDPA is calculated for **every** mean for comparison (i.e. for all methods, method and instrument statistics). Uncertainty associated with the mean for comparison is then combined with the SDPA, where it is considered to be significant.

Exception: For parameters that are new or have small participant numbers, it may not be possible to assign a Target Deviation. Therefore, SDPA cannot be calculated from the TDPA. The SDPA will simply be the SD calculated when the mean for comparisons are generated (see section 3).

c) **Calculating uncertainty of assigned value**

According to ISO/IEC17043, when the assigned value is based on consensus (mean for comparison), the uncertainty of the assigned value must be calculated and combined with the SDPA when it is considered to be significant. This forms an adjusted SDPA, which is used to calculate the participant's performance in terms of SDI (Standard Deviation Index).

The Uncertainty (U_m) associated with each mean for comparison is calculated as follows:

$$U_m = \frac{1.25 \times SD}{\sqrt{n}}$$

where:

SD   = SD calculated when the mean for comparisons are generated (see section 3)
N   = Number of results used to calculate the SD

d) Combining U_m with SDPA, where it is significant

Each U_m calculated for the mean for comparison is compared to the SDPA:

i) If **U_m is greater than 0.3 x SDPA**, it needs to be combined with SDPA, as follows

$$SDPA_{adjusted} = \sqrt{(U_m{}^2 + SDPA^2)}$$

ii) If **Um is less than 0.3 x SDPA**:

$$SDPA_{adjusted} = SDPA \text{ calculated in part b) above.}$$

Both $SDPA_{adjusted}$ and Uncertainty are printed in the text section of participants' reports alongside each mean for comparison, in the participant's registered units. Where uncertainty has been combined with SDPA, a small "a" is printed beside the SDPA, to indicate that it has been adjusted. This example is taken from the Human Urine Programme.

		N	Mean	CV%	U_m	SDPA	Exc.
☐	All Methods	281	88.024	3.1	0.20	3.53	32
🟩	ISE, indirect	247	87.917	2.9	0.21	3.53	23
🟦	Siemens/Dade Dimension RxL/Max/Xpand	11	83.026	4.0	1.24	3.55a	0

Uncertainty is also shown alongside the method statistics printed at the bottom left of each report page.

Method	N	Mean	CV%	U_m
ISE, indirect	247	87.917	2.9	0.21
ISE, direct	23	88.017	2.5	0.58
Vitros	12	94.375	3.3	1.11

8.2 Calculation of Standard Deviation Index (SDI)

The Standard Deviation Index (SDI) is an indication of how far your reported result is from the consensus mean relative to the Standard Deviation for Performance Assessment, and is calculated as follows: -

$$SDI = \frac{\text{participant's result} - \text{mean for comparison}}{SDPA_{adjusted}}$$

Your current sample SDI is presented in the text section of each report page and your most recent 20 SDIs are plotted on a Levey-Jennings chart, along with an indication of the mean for comparison for each sample (I = Instrument group, M = Method group, or A = All Methods group). Sample numbers are printed on the x-axis and the number of SDPAs is printed on the y-axis. If a result is not submitted, the sample number is replaced by "N" ("No Result"). The flag "C" denotes a corrected result and "L" denotes a late result. A vertical line on the chart indicates a change in method or unit (not shown below).
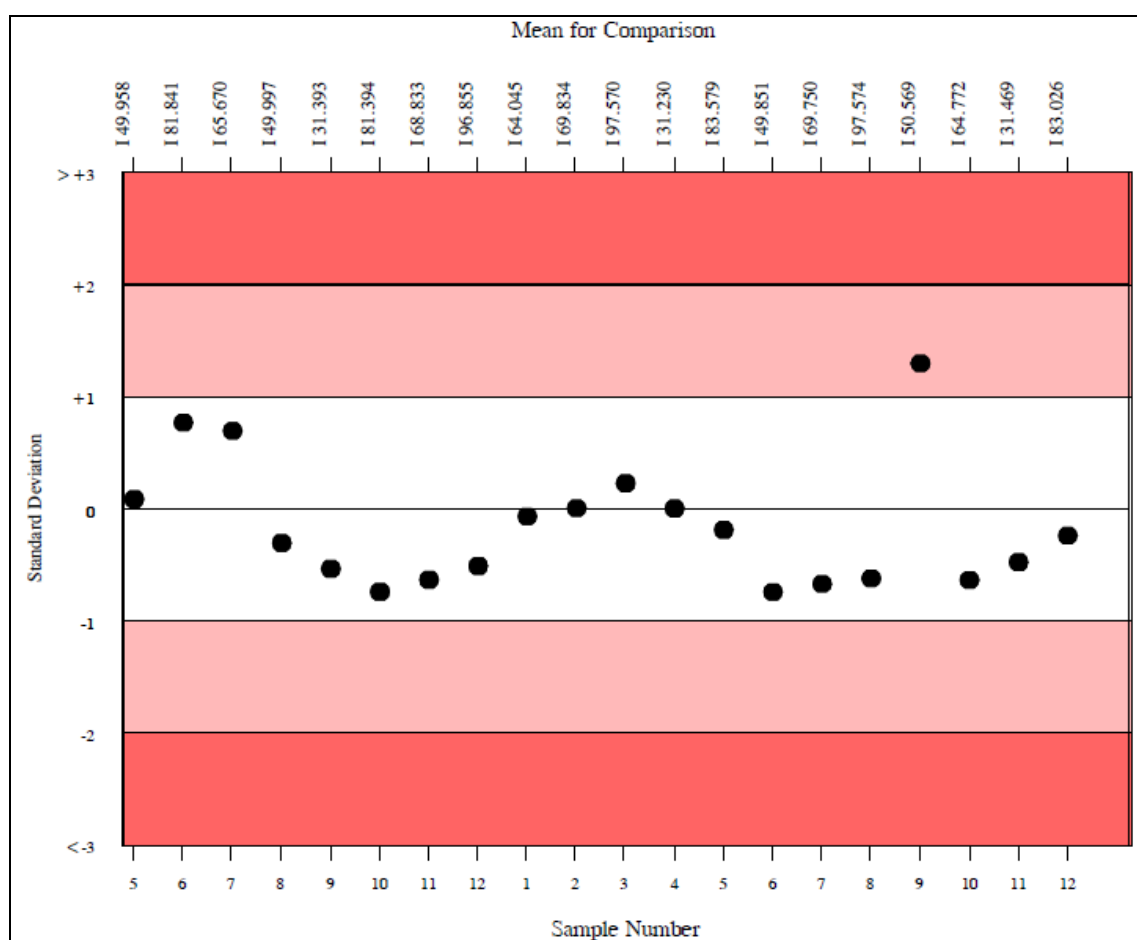
8.3. Criteria for acceptable performance
Acceptable performance is an SDI less than ± 2.

8.4. Calculation of Running Mean Standard Deviation Index (RMSDI)
The RMSDI is the average of the last 10 SDIs for a given parameter, as a measure of performance over the full range of concentrations. RMSDI is printed in the text section of each report, under your current SDI.

8.5. Calculation of Overall Running Mean Standard Deviation Index (ORMSDI)
The ORMSDI is the average of all the parameter RMSDIs for a given sample, as measure of overall performance for all parameters over the full range of concentrations. This is presented on the summary page of the routine report.

9. Percentage Deviation Score (%Dev)

9.1. Calculation of percentage deviation

Sometimes known as percentage error or bias, the % Deviation is calculated as follows:

$$\%Deviation = \frac{\text{participant's result - mean for comparison}}{\text{mean for comparison}} \times 100$$

The closer your % deviation is to zero, the better your performance.

9.2. Criteria for Acceptable Performance

Your percentage deviation is compared to pre-set acceptable limits of performance. These pre-set acceptable criteria are defaulted to be the RIQAS Target Deviations for Performance Assessment. However, the acceptable criteria can be changed to official criteria defined by governing bodies, or country-specific requirements (e.g. CLIA'88 or Biological Variation) on request. Please contact RIQAS for further details. The acceptable criteria are shown in the text section of the routine report (below your performance scores) and on the "% deviation by sample" chart (red shaded areas).
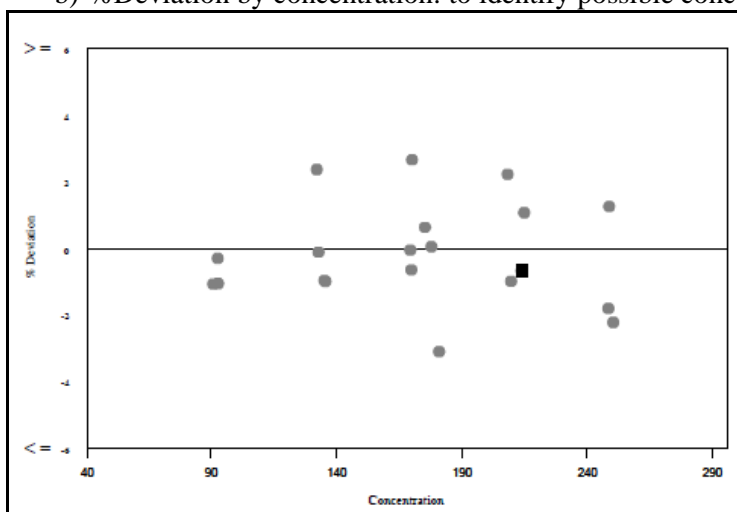
9.3. Percentage deviation charts

Percentage deviation is presented on RIQAS reports in two charts:

a) %Deviation by sample number: to monitor performance over time
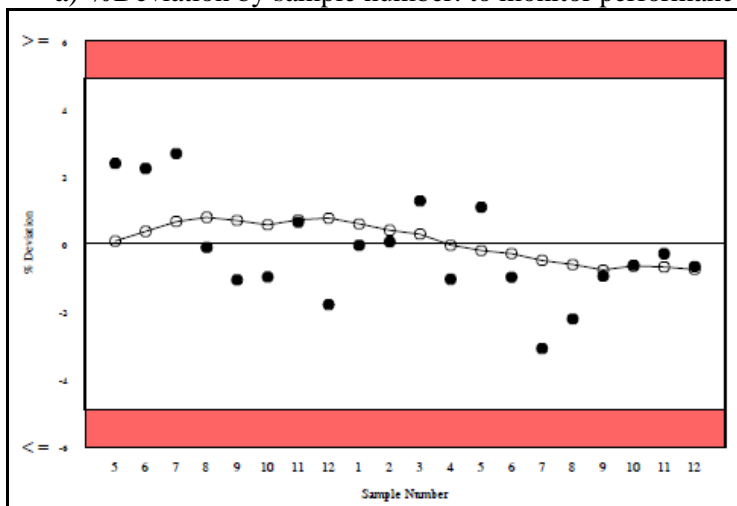
b) %Deviation by concentration: to identify possible concentration-rated biases (current sample marked as ■).

9.4. Calculation of Running Mean Percentage Deviation (RM%Dev)

The RM%Dev is the average of the last 10 %Deviations, as a measure of performance over the full range of concentrations. RM%Dev is presented in the text section of each routine report. The RM%Dev is identified on the upper %Deviation chart by open circles connected with a straight line.

9.5. Calculation of Overall Running Mean Percentage Deviation (ORM%Dev)

The ORM%Dev is the average of all the parameter RM%Devs for a given sample, as a measure of overall performance for all parameters over the full range of concentrations. ORM%Dev is presented on the summary page of the routine report.

10. "Less than" and "Greater than" results

It is possible to submit "less than" and "greater than" results via RIQASNet. If your analyser reports such a result, it is important that you include the sign in your submitted result. "Less than" and "greater than" results will be entered into the RIQAS database. Such results will be printed in the text section of your routine reports (see below), but they will not be used to calculate the mean for comparison. You will not be assigned an SDI, a Target Score or a % Deviation.

▲	Your Result	<0.100	SDI	
			RMSDI	-0.13
■	Mean for Comparison	0.214	TS	
			RMTS	75
			%DEV	
			RM%DEV	-1.1

Result not included in Instrument Group calculation

An indication of a "less than" or "greater than" result will also be presented on the Levey-Jennings, Target Score and % Deviation charts, with "<" or ">" beside the appropriate sample number.

11. Report Summary Page

Your performance can be reviewed at a glance on the summary page presented at the back of each report. This report shows your performance scores and means for comparison for each registered parameter. Performance scores, which fall outside the acceptable criteria, are presented in underlined, bold text.

When a result falls outside all 3 acceptable criteria, a red triangle is shown in the "Performance" column. Your Running Mean and Overall Running Mean statistics are also presented on this report.

Analyte	Mean for Comparison	Your Result	SDI	RMSDI	%DEV	RM%DEV	TS	RMTS	Performance
Amylase	482.147	467.600	-0.26	-0.26	-3.0	-1.2	119	89	
Calcium	3.885	3.790	-0.51	-0.15	-2.4	-0.6	99	105	
Chloride	213.757	212.320	-0.23	-0.29	-0.7	-0.8	120	109	
Creatinine	13.534	13.748	0.27	-0.32	1.6	-1.5	120	112	
Glucose	10.084	10.100	0.04	-0.36	0.2	-1.0	120	104	
Magnesium	10.422	10.360	-0.09	0.18	-0.6	1.2	120	110	
Phosphate, Inorganic	20.868	21.090	0.19	-0.27	1.1	-1.2	120	109	
Potassium	83.026	82.170	-0.24	-0.21	-1.0	-0.7	120	103	
Protein, Total	0.214	<0.100		-0.13		-1.1		104	
Sodium	143.821	141.200	-0.47	-0.50	-1.8	-1.3	113	109	
Urea	226.339	229.800	0.25	0.08	1.5	0.6	120	99	
Uric Acid (Urate)	1.183	1.220	0.49	-0.39	3.1	-2.2	97	87	

ORMSDI -0.22   **ORM%DEV -0.8**   **ORMTS 103**

12. Worked calculation of performance statistics

The following worked example uses data from the Human Urine Programme, for Calcium. In this example, the participant is registered as using a Siemens Dimension RxL, which employs a CPC method. For the current sample the participant submitted a result of **3.79 mmol/l**.

A) Setting the TDPA

According to ISO/IEC17043, ISO13528 and IUPAC, the performance evaluation interval (TDPA) should be greater than 3.33 x the variability of the samples (homogeneity, stability and transport stability)

The highest of the following is therefore chosen as the new TDPA:

Historical Target Deviation	7.5 %
Homogeneity x 3.33	1.1 x 3.33 = 3.66 %
Stability x 3.33	0.6 x 3.33 = 2.00%
Transport Stability x 3.33	0.66 x 3.33 = 2.20%

The material variability is much less than the historical Target Deviation. Therefore, the Target Deviation for Performance Assessment is set to 7.5%. This is printed above the Target Scoring chart and used to calculate the participant's Target Score.

B) Choosing the Mean for Comparison

A participant is using a Siemens Dimension RxL, which employs a CPC method. For the current sample the participant submitted a result of **3.79 mmol/l**. The participant will be compared to the instrument statistics below because there are more than 5 returns in the instrument group, within the CPC method group.

The calculated statistics, after removal of gross and statistical outliers are:

		N	Mean	CV%
☐	All Methods	270	3.696	7.4
🟩	Cresolphthalein complexone (CPC)	144	3.879	4.3
🟦	Siemens/Dade Dimension RxL/Max/Xpand	11	3.885	4.0

C) Calculating the Target Score

The participant's Target Score is calculated as follows:

$$V = \frac{(\text{Your result} - \text{Mean for Comparison})}{\text{Mean for Comparison}} \times 100$$

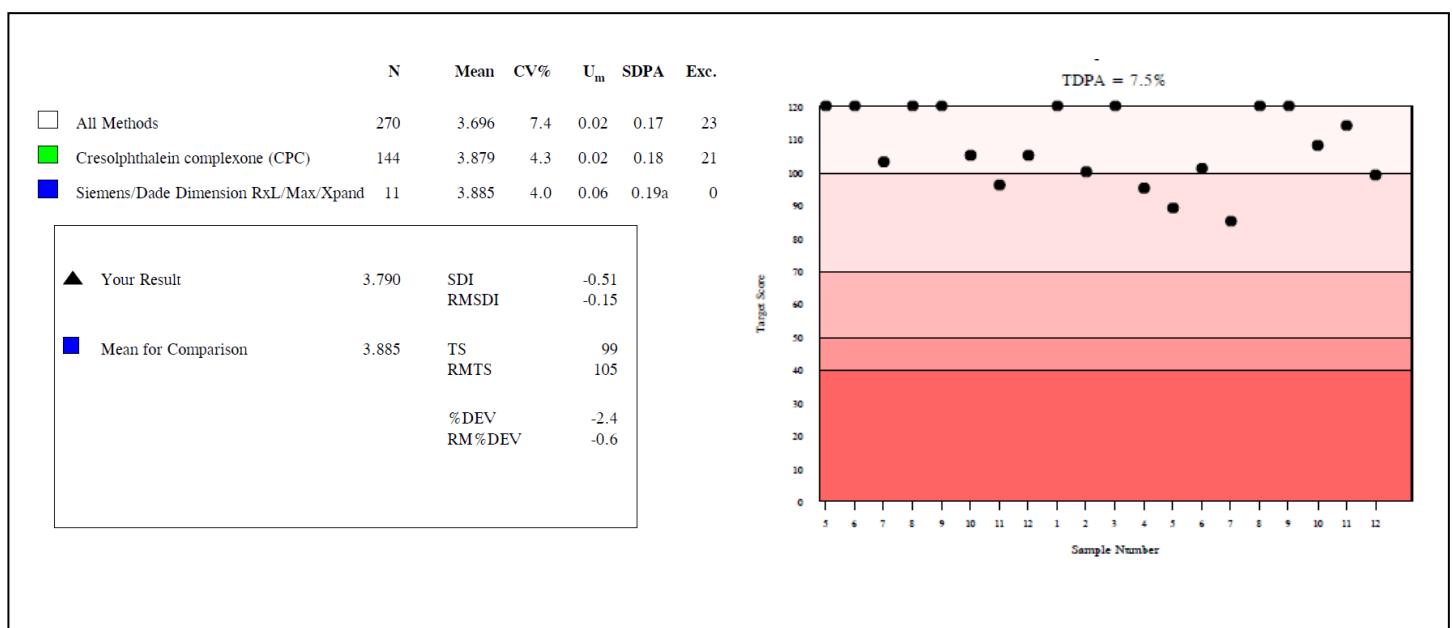$$TS = \log_{10}\left(3.16 \times \frac{TDPA}{|V|}\right) \times 100$$

Entering the known values, we calculate:

$$V = \frac{(3.79 - 3.885)}{3.885} \times 100 = -2.4453\%$$

$$TS = \log_{10}\left(3.16 \times \frac{7.5}{|-2.4453|}\right) \times 100$$

$$TS = 99$$

The Target Score is presented in the text section and on the Target Scoring chart, as shown. This result is considered to be "Good".

	N	Mean	CV%	U$_m$	SDPA	Exc.
☐ All Methods	270	3.696	7.4	0.02	0.17	23
🟩 Cresolphthalein complexone (CPC)	144	3.879	4.3	0.02	0.18	21
🟦 Siemens/Dade Dimension RxL/Max/Xpand	11	3.885	4.0	0.06	0.19a	0

▲ Your Result	3.790	SDI	-0.51
		RMSDI	-0.15
🟦 Mean for Comparison	3.885	TS	99
		RMTS	105
		%DEV	-2.4
		RM%DEV	-0.6

TDPA = 7.5%

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D) Calculation of Standard Deviation for Performance Assessment (SDPA)

A CV for Performance Assessment (CVPA) is calculated as follows:

$$\text{CVPA} = \frac{\text{TDPA}}{\text{t-value}}$$

where t-value = factor which represents the % of poor performers reflected in the TDPA. When TDPA is set so that ~10% labs having poor performance, the t-value is ~ 1.645 (or more exactly, 1.64485).

For Urinary Calcium, $\text{CVPA} = \dfrac{7.5}{1.64485} = 4.5607\%$

Then the CVPA is converted to an SDPA, for each mean for comparison, as follows:

$$\text{SDPA} = \frac{\text{CVPA x Mean for comparison}}{100}$$

i) For the All methods statistics:

$$\text{SDPA} = \frac{4.5607 \text{ x } 3.695607}{100} = 0.16854 \text{ mmol/l}$$

ii) For the CPC method statistics:

$$\text{SDPA} = \frac{4.5607 \text{ x } 3.879246}{100} = 0.17692 \text{ mmol/l}$$

iii) For the Siemens Dimension instrument group statistics, within the CPC method:

$$\text{SDPA} = \frac{4.5607 \text{ x } 3.884818}{100} = 0.17718 \text{ mmol/l}$$

E) Calculating uncertainty of assigned value

According to ISO/IEC17043, when the assigned value is based on consensus (mean for comparison), the uncertainty of the assigned value is calculated and combined with the SDPA when it is considered to be significant. This forms an adjusted SDPA, which is used to calculate the participant's performance in terms of SDI (Standard Deviation Index).

The Uncertainty (U_m) associated with each mean for comparison is calculated as follows:

$$U_m = \frac{1.25 \times SD}{\sqrt{n}}$$

where:

SD   = SD calculated when the mean for comparisons are generated (not shown on reports)
N   = Number of results used to calculate the SD
SDPA = Standard Deviation for Performance Assessment.

i) For the All methods statistics:

$$U_m = \frac{1.25 \times SD}{\sqrt{n}} = \frac{1.25 \times 0.2730}{\sqrt{270}} = 0.0207, \text{ rounded to } 0.02 \text{ mmol/l on report}$$

ii) For the CPC method statistics:

$$U_m = \frac{1.25 \times SD}{\sqrt{n}} = \frac{1.25 \times 0.1651}{\sqrt{144}} = 0.0172, \text{ rounded to } 0.02 \text{ mmol/l on report}$$

iii) For the Siemens Dimension instrument group statistics, within the CPC method:

$$U_m = \frac{1.25 \times SD}{\sqrt{n}} = \frac{1.25 \times 0.1540}{\sqrt{11}} = 0.05804, \text{ rounded to } 0.06 \text{ mmol/l on report}$$

F) Combining U_m with SDPA, where it is significant

Each U_m calculated for the mean for comparison is compared to the SDPA

i) For the All methods statistics: SDPA = 0.16854, 0.3 x SDPA = 0.0506 mmol/l

U_m = 0.0207 is less than 0.3 x SDPA, so U_m is insignificant.
Therefore SDPA remains 0.16854, rounded to 0.17 mmol/l on report

ii) For the CPC method statistics: SDPA = 0.17692, 0.3 x 0.17692 = 0.0531 mmol/l

U_m = 0.0172 is less than 0.3 x SDPA, so U_m is insignificant
Therefore SDPA remains 0.17692, rounded to 0.18 mmol/l on report

iii) For the Siemens Dimension instrument statistics: SDPA = 0.17718, 0.3 x 0.17718 = 0.05154 mmol/l

U_m = 0.05804 is greater than 0.3 x SDPA, so U_m is significant and must be combined with SDPA

$$SDPA_{adjusted} = \sqrt{(U_m^2 + SDPA^2)} = \sqrt{(0.05804^2 + 0.17718^2)}$$

$$SDPA_{adjusted} = 0.1864, \text{ rounded to } 0.19 \text{ mmol/l on report}$$

Both SDPA$_{adjusted}$ and Uncertainty are printed on participants' report alongside each mean for comparison. Where uncertainty has been combined with SDPA, as small "a" is printed beside the SDPA, to indicate that it has been adjusted.

Calcium, mmol/l

|		N	Mean	CV%	U_m	SDPA	Exc.
☐	All Methods	270	3.696	7.4	0.02	0.17	23
🟩	Cresolphthalein complexone (CPC)	144	3.879	4.3	0.02	0.18	21
🟦	Siemens/Dade Dimension RxL/Max/Xpand	11	3.885	4.0	0.06	0.19a	0

G) Calculation of SDI

The Standard Deviation Index (SDI) is a measurement of how far your reported result is from the consensus mean relative to the Standard Deviation for Performance Assessment, and is calculated as follows: -

$$SDI = \frac{\text{participant's result} - \text{mean for comparison}}{SDPA_{adjusted}}$$

The participant in this example has a result of 3.79 mmol/l and is being compared to the instrument mean for comparison (3.885)

$$SDI = \frac{3.79 - 3.885}{0.1864} = -0.5097, \text{ rounded to } -0.51 \text{ mmol/l on the report}$$

SDI is presented in the text section of the report, and is plotted on the Levey-Jennings chart. This participant's SDI is acceptable as it is less than 2.

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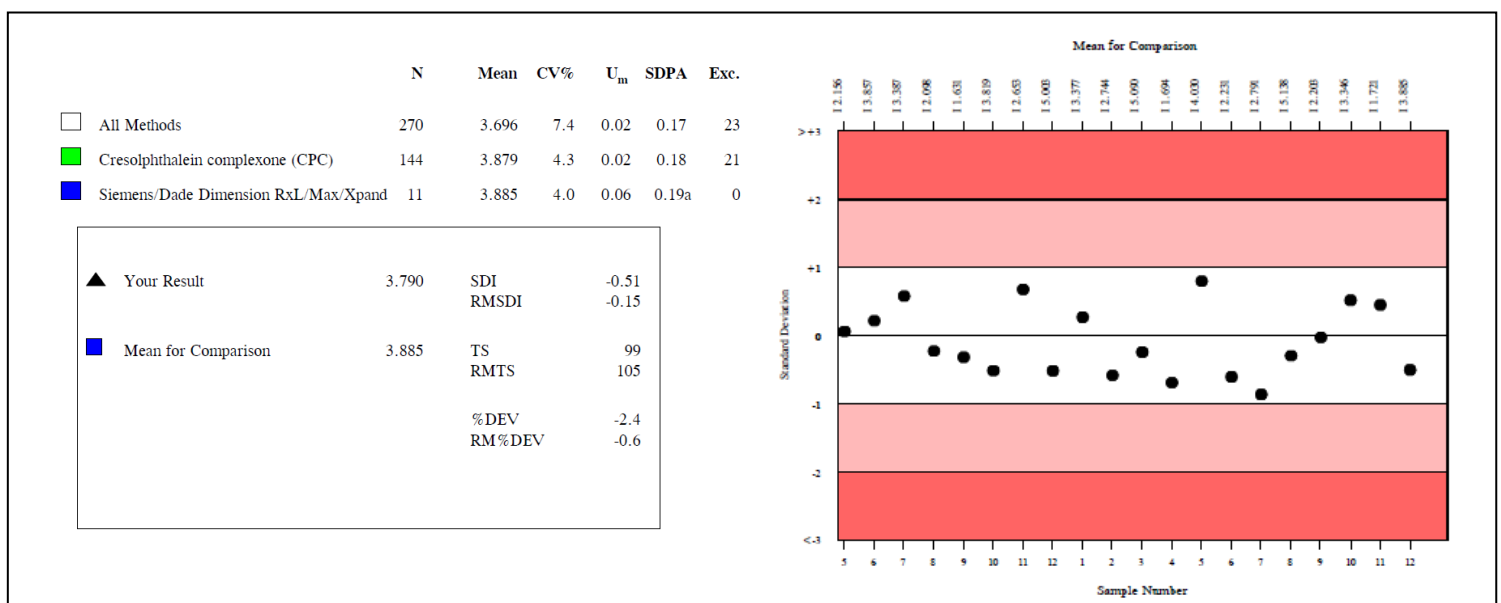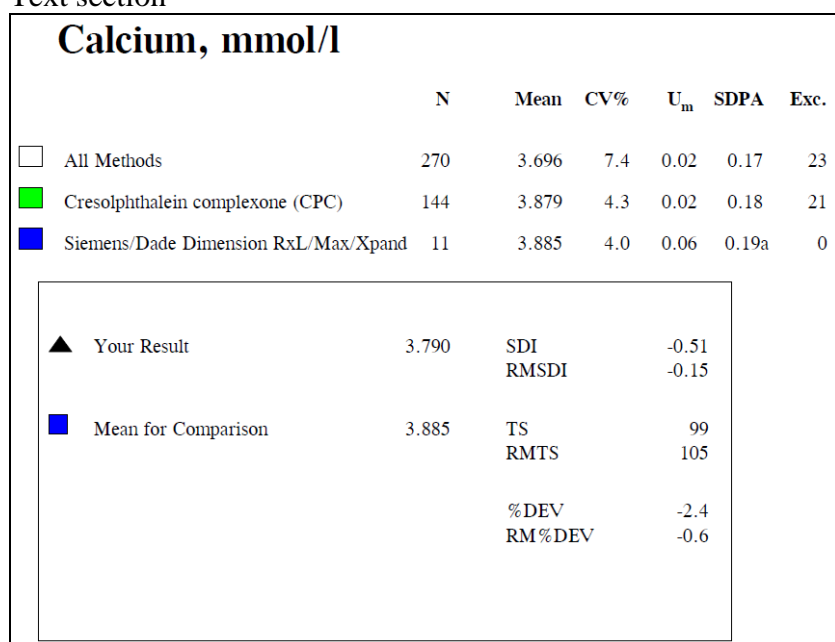
H) Calculation of Percentage Deviation Score (%Dev)

$$\%\text{Deviation} = \frac{\text{participant's result} - \text{mean for comparison}}{\text{mean for comparison}} \times 100$$

$$\%\text{Deviation} = \frac{3.79 - 3.885}{3.885} \times 100$$

$$\%\text{Deviation} = -2.445\%, \text{ rounded to } -2.4\% \text{ on the reports}$$

This participant's %Deviation is acceptable since it is less then the acceptable criteria set (RIQAS TDPA of 7.5%). %Deviation is presented in the text section of the report, and is plotted on two charts:

Text section

Calcium, mmol/l

	N	Mean	CV%	U_m	SDPA	Exc.
☐ All Methods	270	3.696	7.4	0.02	0.17	23
🟩 Cresolphthalein complexone (CPC)	144	3.879	4.3	0.02	0.18	21
🟦 Siemens/Dade Dimension RxL/Max/Xpand	11	3.885	4.0	0.06	0.19a	0

▲ Your Result	3.790	SDI	-0.51
		RMSDI	-0.15
🟦 Mean for Comparison	3.885	TS	99
		RMTS	105
		%DEV	-2.4
		RM%DEV	-0.6

% Deviation by sample chart. Black spots indicate the % deviations. Open spots represent the Running Mean % Deviation (average of last 10 % deviations). Results falling in the unshaded area (%Dev < 7.5%) have good performance.
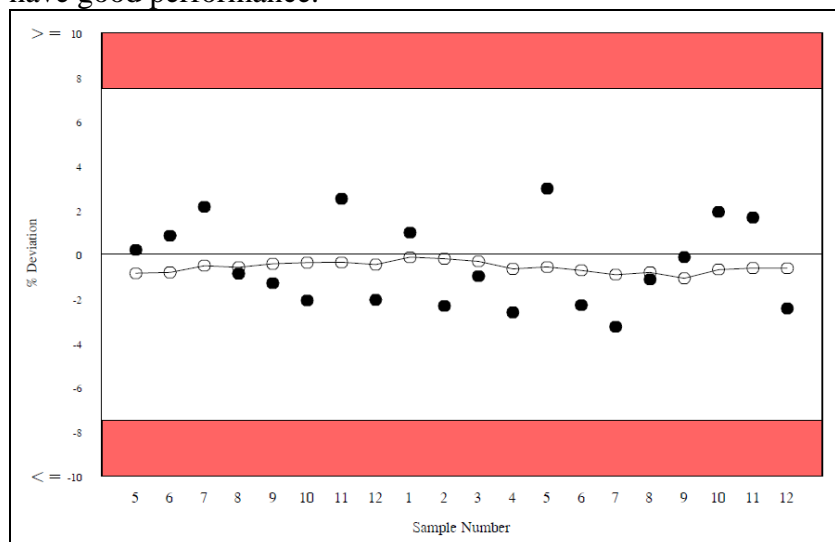
% Deviation by concentration chart. Grey spots indicate the % deviations. The black square represents the current sample (%Dev = -2.4%).
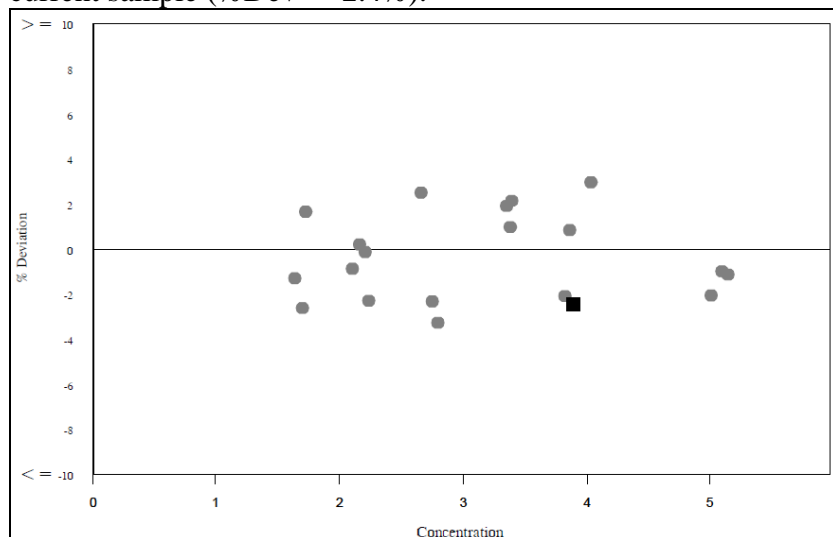
I) Acceptable performance

Criteria for acceptable performance is considered to be:

- **Target Score greater than 50**
- **SDI less than 2**
- **% Deviation within the "acceptable limits" set (Urine Calcium limit = 7.5%).**

The participant's Target Score is 99, SDI is –0.51 and %Deviation is –2.4%. Therefore the participant has acceptable performance for this sample.