MILKOSTREAM TECHNOLOGY FOR INLINE MILK STANDARDISATION

HILLERÖD 11.01.2019

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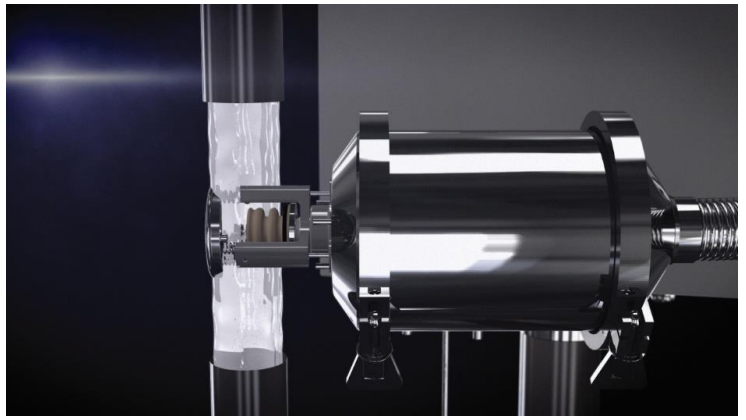
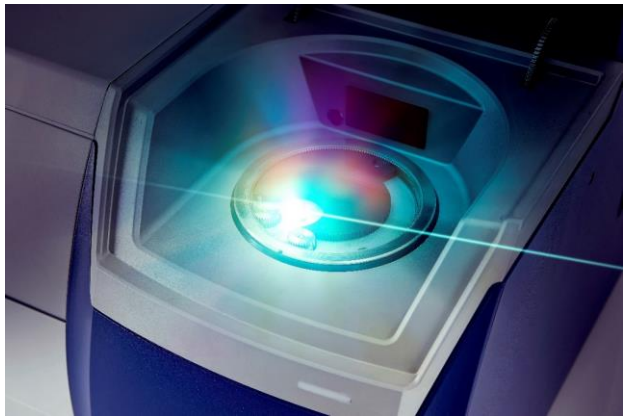
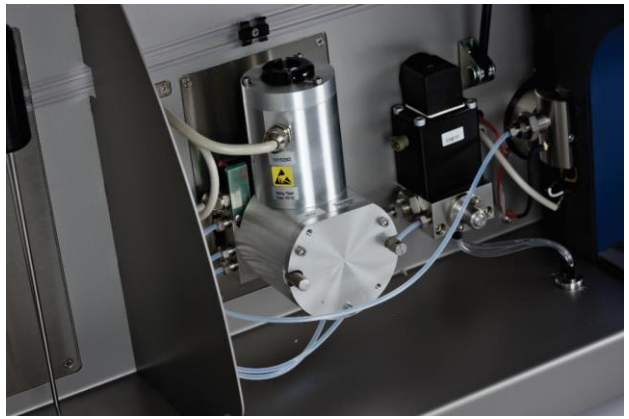
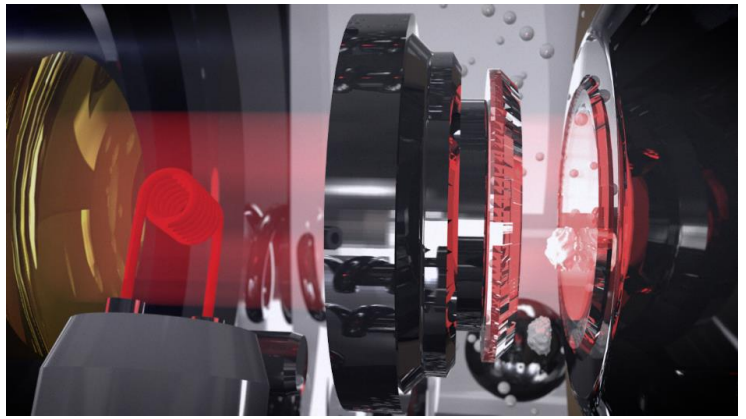








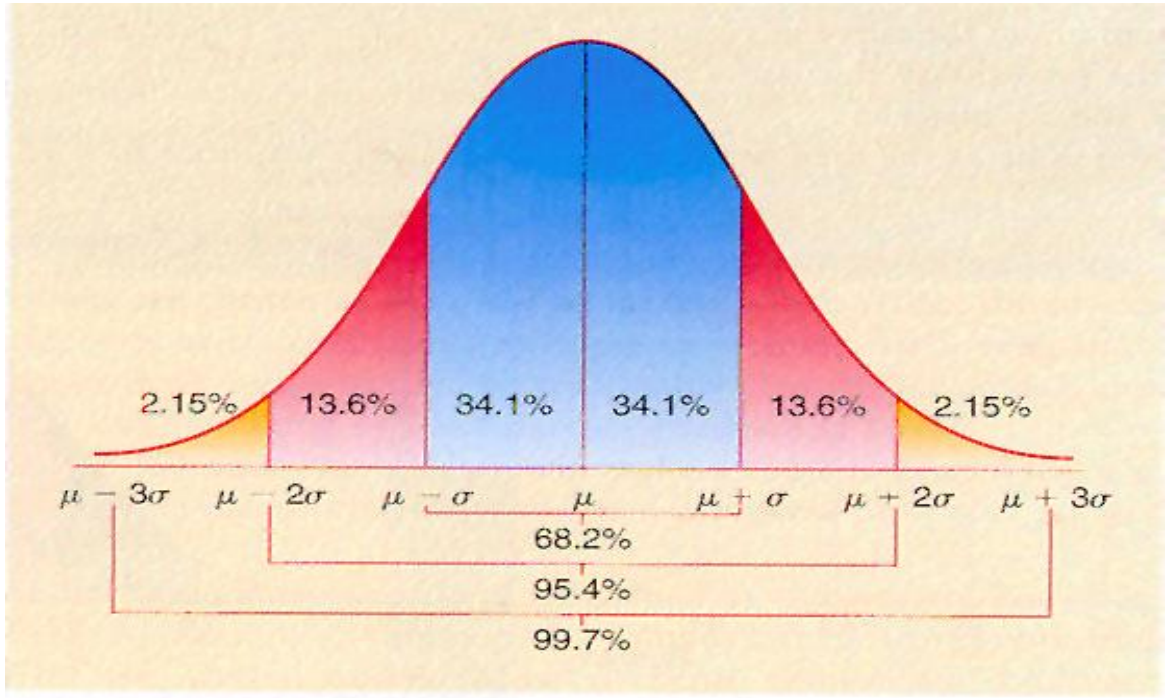
ANALYTICS BEYOND MEASURE

HOW CAN TRUE INLINE ANALYSIS OPTIMIZE YOUR PROCESS ?

FOSS

ANALYTICS BEYOND MEASURE

ALL ANALYTICAL RESULTS HAVE A MEASURING UNCERTAINTY



A SD of 0,02 means that out of 10 samples
7 will be within +/- 0,02
9 samples within +/- 0,04
10 sample within +/- 0,06
How can you adjust a Process control on 1 result ?

The Limit of Process Control with a Lab instrument is the accuracy !!!

STANDARDISATION DONE WITH MASS BALANCE CALCULATION

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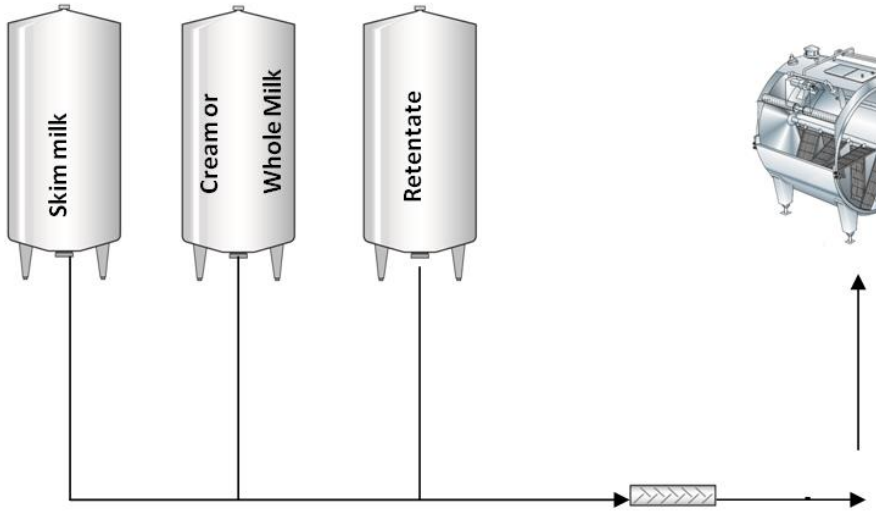

- ***3 samples taken from each Tank***
- ***Each result has an sampling error (esp. UF conc. / Cream)***
- ***Each results has an measuring uncertainty (Cream SD up to 0,30 %)***
- ***Based on this result you calculate the correct blending of the ingredients, limited ability to detect Process changes*** *(*instead of tank blending you can also use off the separator blending)*
- ***But what if the source tank is inhomogeneous during emptying / change to another source tank?***

RESULT:

- ***Increased Process Variation → higher security margin → reduced yield and Profit***

ANALYTICS BEYOND MEASURE

PROCESS CONTROL WITH LAB RESULTS
YOU RELY ON SINGLE RESULTS

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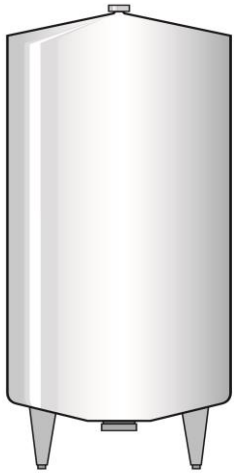

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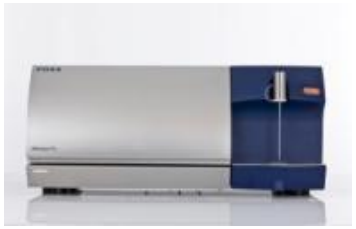

- **Tank is filled**
- **1 control sample is taken**
- **The Limit is the accuracy of the method**

ANALYTICS BEYOND MEASURE

POWER OF INLINE :
PROCESS CONTROL WITH 510 REAL TIME RESULTS PER HOUR INSTEAD OF 2

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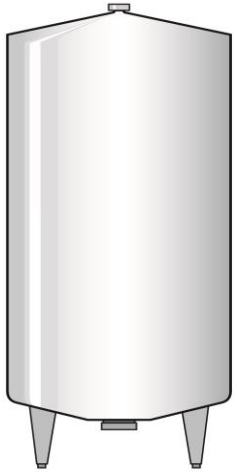

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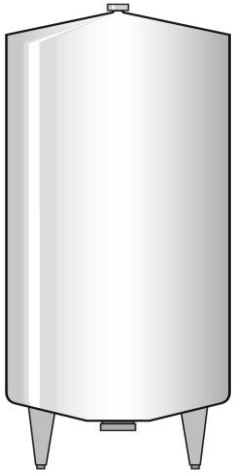
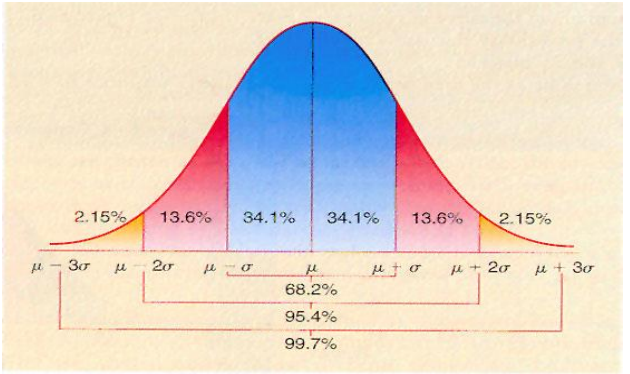


50 x

$$\text{Measurement uncertainty} = \frac{2 \times SE}{\sqrt{n}}$$



ANALYTICS BEYOND MEASURE

PROCESS CONTROL WITH INLINE RESULTS
YOU RELY ON 1500 RESULTS

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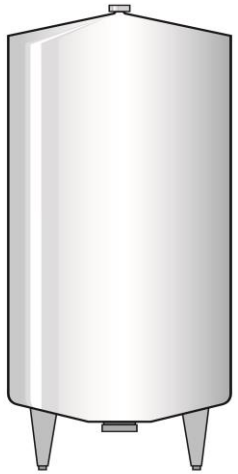

$$\downarrow \text{Measurement uncertainty} = \frac{2 \times SE}{\sqrt{n}} \uparrow$$

- Tank is filled in 3 hours
- During filling process is controlled inline with 1500 samples
- The Limit is the repeatability of the method

ANALYTICS BEYOND MEASURE

BETTER MILK STANDARDISATION WITH MILKOSTREAM™ FT

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ANALYTICS BEYOND MEASURE

THE ELECTROMAGNETIC SPECTRUM

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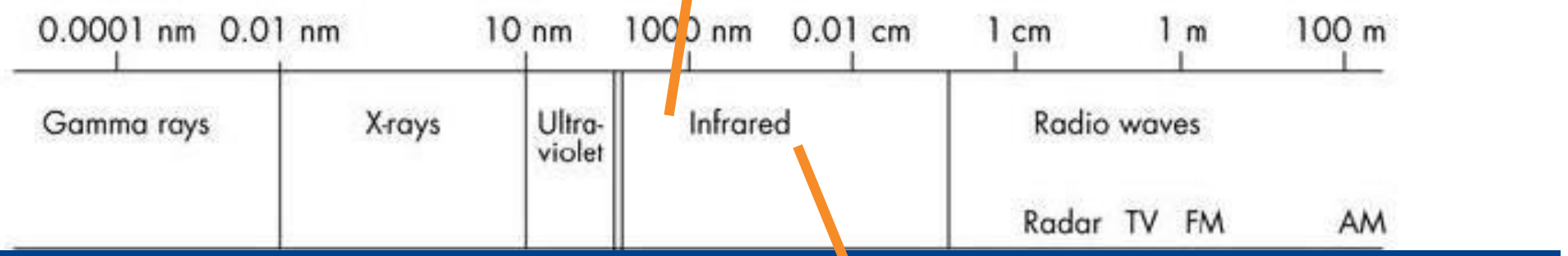
NIR spectroscopy (850 – 2500 nm)
Analysis of solids (butter, concentrates, powder.)



Mid-IR spectroscopy (2500 – 10000 nm)
Analysis of liquids (milk, wine etc.)
Very detailed information

ANALYTICS BEYOND MEASURE

NIR SPECTROSCOPY

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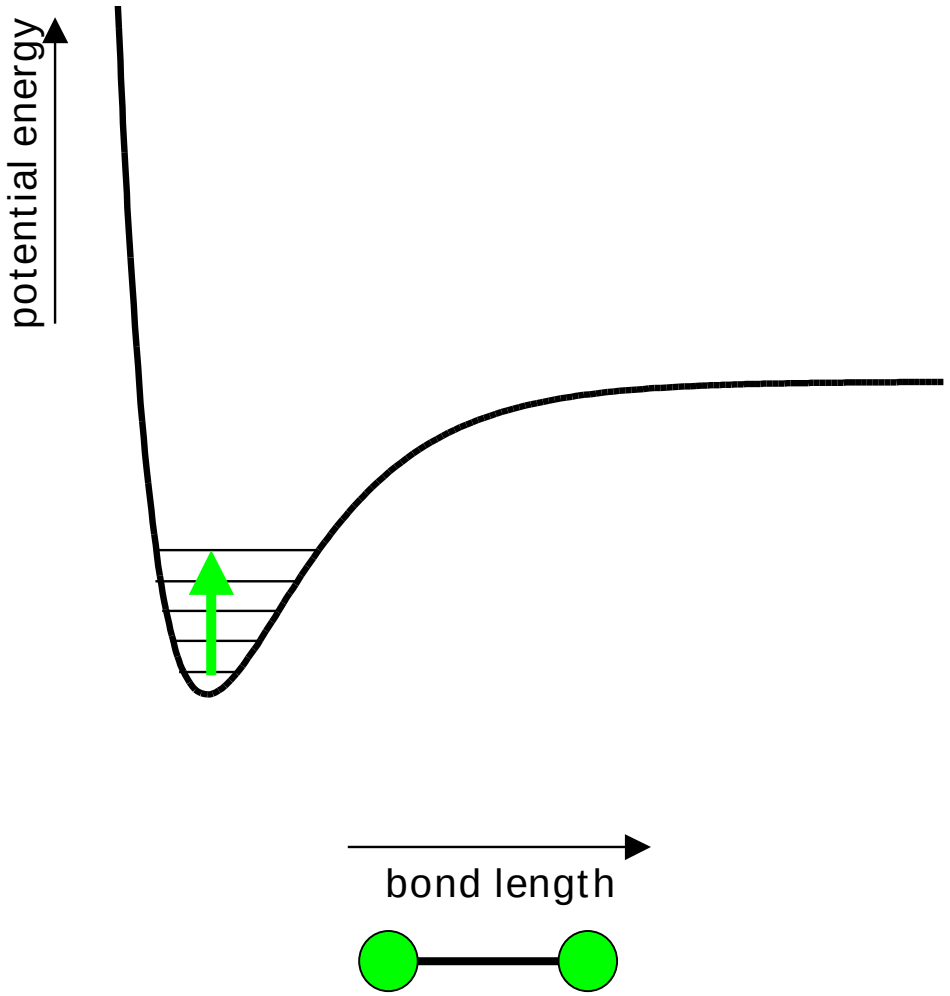

- Measures the higher harmonics – i.e. overtones and combination bands
- Vibrations are found in the range approx. 800-2500 nm (12500-4000 cm^{-1})
- Polar bonds are most active – just like in mid-IR
- Both reflection and transmission is used – with light paths up to 1 cm and higher

ANALYTICS BEYOND MEASURE

MID-IR SPECTROSCOPY

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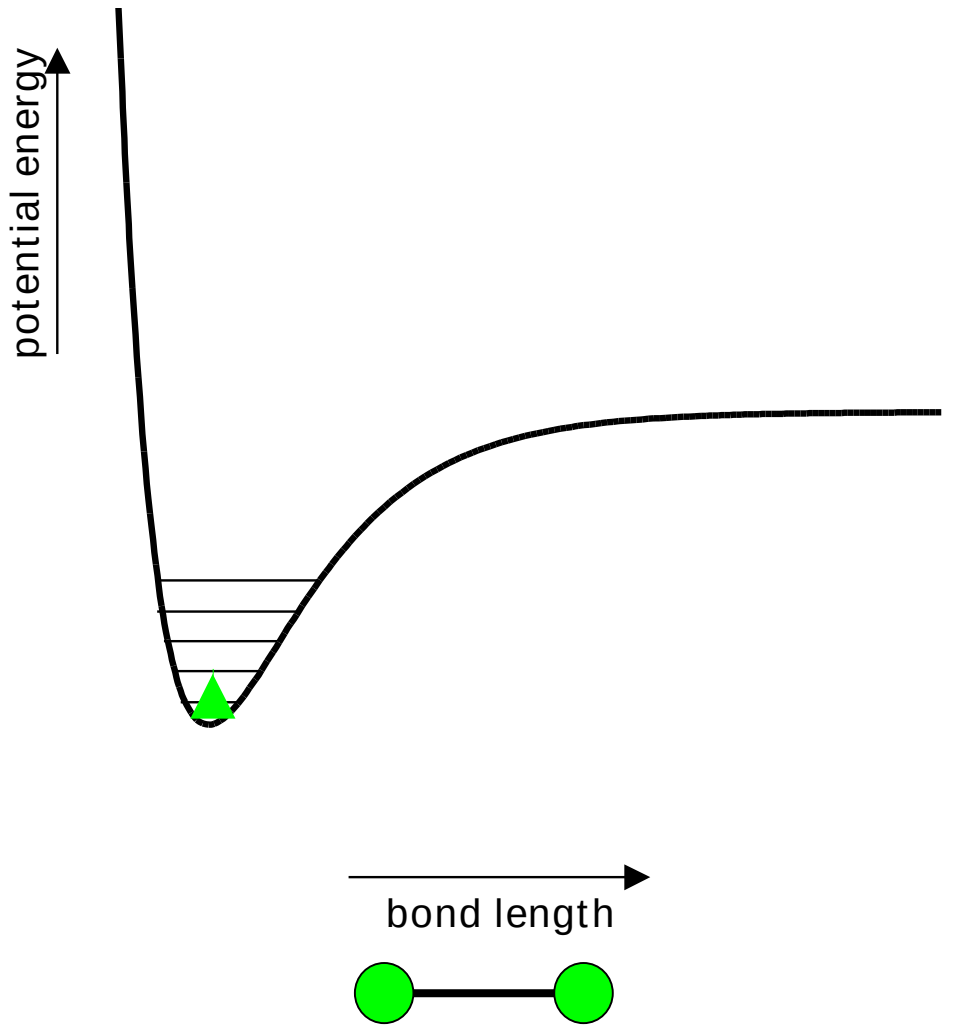

- Measures the fundamental vibrations (1st harmonic)
- Vibrations are found in the range 2500-10000 nm (4000-1000 cm^{-1})
- Spectra are usually plotted in wavenumbers (cm^{-1})
- Polar bonds are particularly active in mid-IR
  - C=O
  - C-N
  - O-H
  - N-H
  - C-O
- Often measured by transmission with light paths from few µm up to 1 mm

ANALYTICS BEYOND MEASURE

MID-IR PROTEIN SPECTRUM

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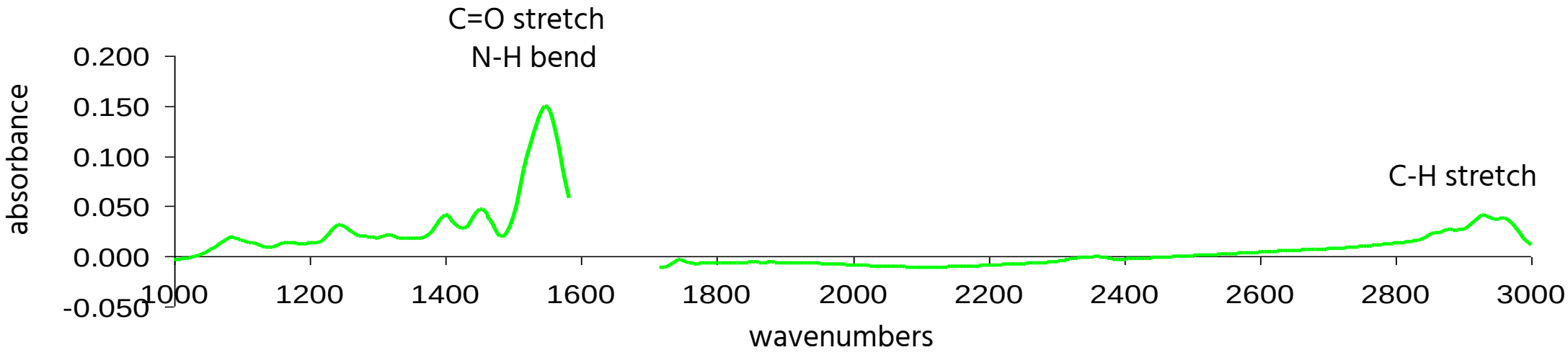

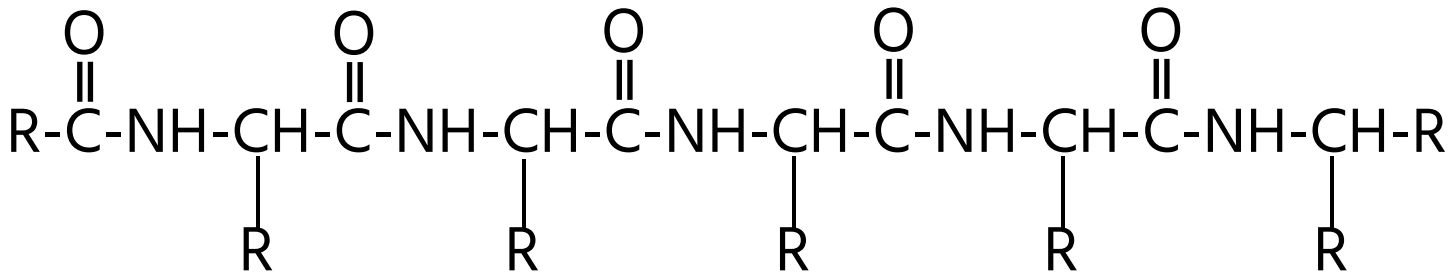

ANALYTICS BEYOND MEASURE

THE BEST TECHNOLOGY FOR INLINE MILK ANALYSIS ?

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- NIR is more complicated to calibrate compared to FTIR

- You need a significant higher amount of samples to establish a stable calibration, leading to an extremely long start up time (months instead of days)

- NIR requires more frequent monitoring of Performance

- FTIR is significantly more stable and robust on Matrix changes especially on Protein
  Accuracy < 0,05 % - Repeatability < 0,015 %

- Mid (FT)-IR is the only IDF approved secondary method for milk payment

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ANALYTICS BEYOND MEASURE

FTIR technology

MilkoScan FT 1

moves into the process line

MilkoStream

REQUESTS FROM THE MARKET :

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- A solution without a complex flow system (reduced downtime and Service low cost of ownership)
- No cleaning or reference liquids
- True Inline no Bypass

ANALYTICS BEYOND MEASURE

ANALYSING DIRECTLY IN PRODUCTION LINE : THE WORLD'S FIRST TRUE INLINE FTIR ANALYZER

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ANALYTICS BEYOND MEASURE

DDP PROBE

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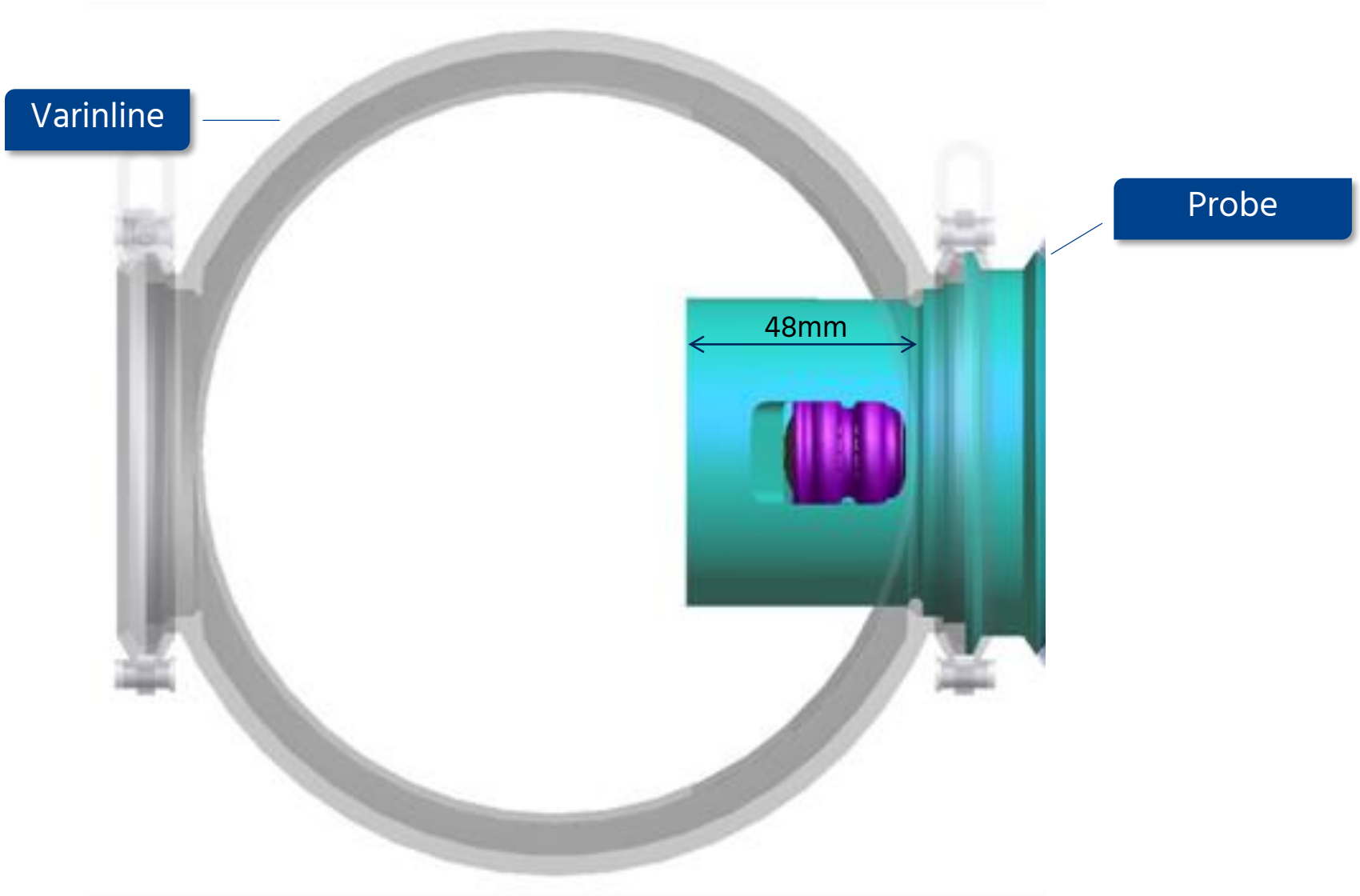

ANALYTICS BEYOND MEASURE

PRODUCT PERFORMANCE EXAMPLE PROTEIN

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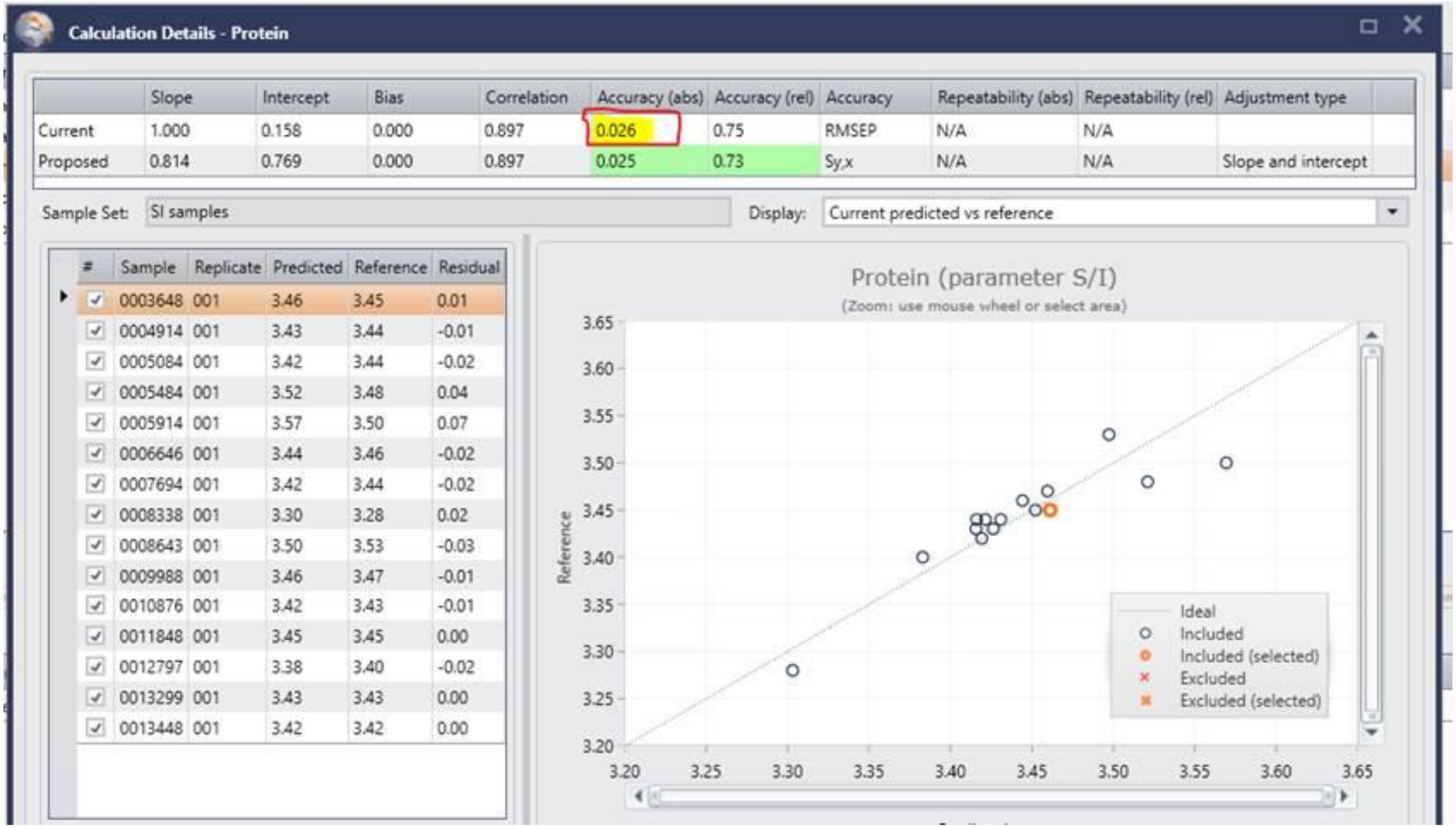

ANALYTICS BEYOND MEASURE

PRODUCT PERFORMANCE EXAMPLE FAT

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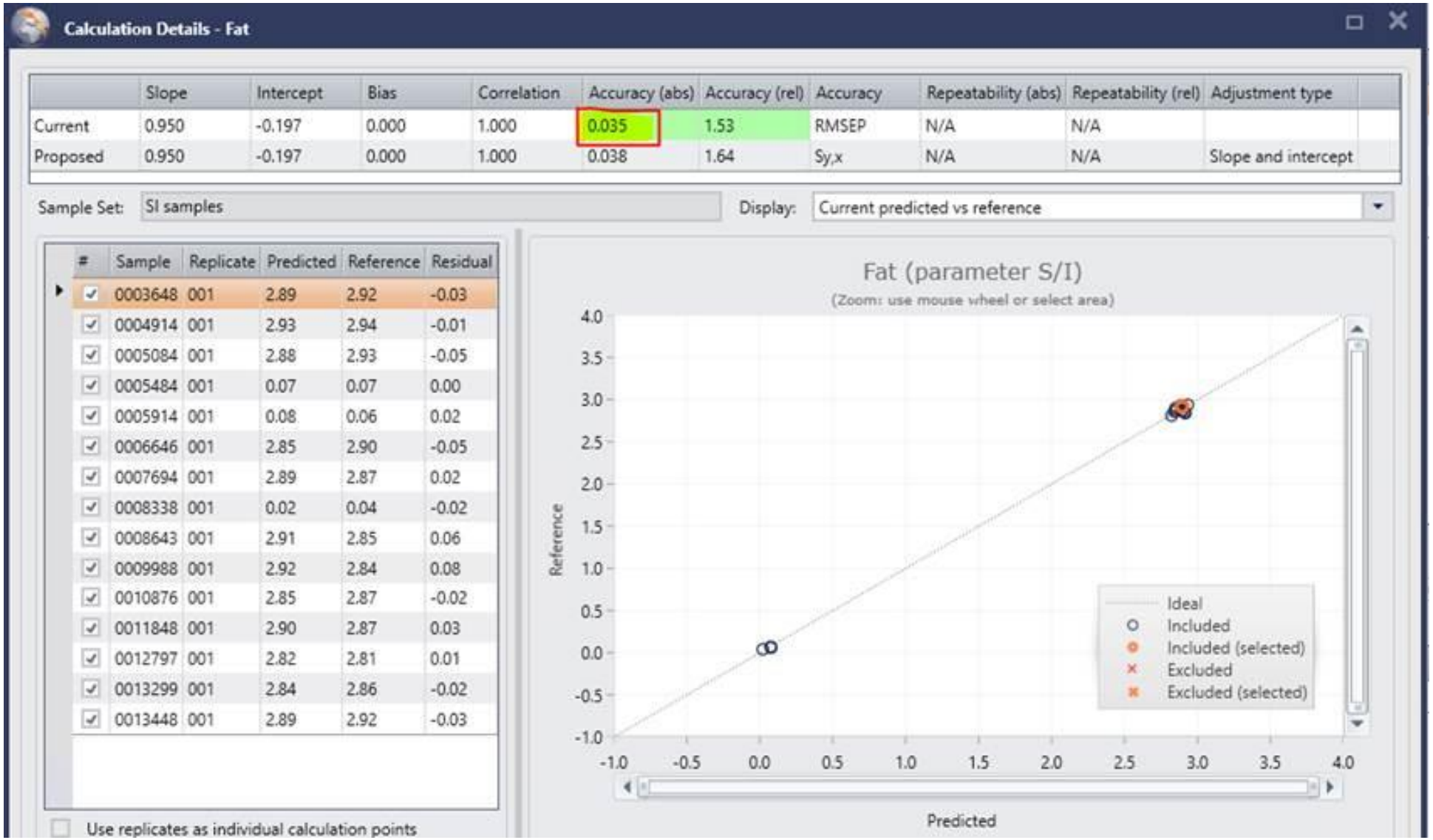

ANALYTICS BEYOND MEASURE

PRODUCT DESCRITPION

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Analysis time:	7 sec. Average result is flexible e.g. 30 seconds or number of samples
Protection class	IP66
Water supply (if ambient temp. ≥30 °C)	Temperature: 2 - 25 °C Flow rate: 12 - 60 liters per hour Connection: 3/8"
Pressurised air	According to ISO 8573. 1: 2001: Dirt 2, Water 2, Oil 1 Flow 300 liters/hour Connection: ID4/OD6 PU hose
Electrical supply	1 phase, 100-240 VAC ±10%, 50-60 Hz 2A, 150W
Humidity	< 93 % RH
Pipe dimension	Min 2.5 inches
Pipe pressure	Static air pressure
Ambient conditions	5 - 30 °C (without water cooling) 5 - 45 °C (with water cooling)
Flow rate	Min. flow rate 1.5 m/s
Vibrations	0.10 grms Max.
CIP temp	Up to 95 °C
Dimension	WxHxD: 485 x 353 x 255 mm
Weight	Cabinet: 24.3 kg Probe: 12.5 kg
Network connections	LAN - Ethernet Cat. 5e 4 x 2 x 26 AWG