

Brolis BHL01 – Validation of Principle for an Inline Analyser for Milk Fat and Protein

Fact Sheet and Summary of ICAR Validation Test Findings Measuring, Recording & Sampling Devices Sub-Committee June 26, 2025

Overview of Test Purpose and Scope

Category of Measurement(s)	Milk Composition
Species	Dairy Cattle
Life Stage	Lactating Cows
Level of Reporting	Individual Cow Measurements at Each Milking
Parameters Included in the Validation Test	Milk Fat, Milk Protein
Use and Usability of Data	Data Use & Usability was not evaluated in this test.

Definition of the measurement principle

- The Brolis BHL01 in-line analyser is designed to measure in-line fat and protein content of individual cows milked by an automatic milking system.
- The device has a spectroscopic unit (NQN) generating a tuneable emission spectrum for milk spectroscopy.
- The device is mounted in the milk transfer line of an automatic milking system and has a control unit and interfaces with AMS and the Brolis cloud.



Evaluation of the accuracy/repeatability/reproducibility of measuring component(s) of the system

- Overview of results of two selected (at random) devices on standard deviation, bias, regression, R^2 , homoscedasticity and standard deviation for residual differences using ICAR statistical e-tool.
- Due to the setup with farm testing with cows, calculations for repeatability are not available.

Parameter	Fat [MLK0502]	Protein [MLK0502]	Fat [MLK0514]	Protein [MLK0514]
Claim Brolis	2.0% - 10.0%	2.0% - 7.0%	2.0% - 10.0%	2.0% - 7.0%
Bias g/100g	< 0.13	< 0.13	< 0.13	< 0.13
Accuracy g/100g	< 0.25	< 0.25	< 0.25	< 0.25
Farm System [AMS]	BouMatic Gemini	BouMatic Gemini	DeLaval V300	DeLaval V300
# measurements	105	105	105	105
Range min-max	2.68% - 6.22%	2.48% - 4.59%	2.56% - 6.10%	2.61% - 4.18%
Mean	4.08%	3.43%	4.20%	3.24%
Std Dev g/100g	0.67	0.45	0.74	0.27
Bias g/100g	-0.002	-0.006	-0.08	-0.02
Significance	No	Yes	Yes	Yes
Regression line	0.0118x – 0.0502	-0.0994x +0.3352	0.0522x -0.3012	-0.1073x +0.3318
R^2	0.0062	0.2073	0.2144	0.1496
Homoscedasticity	Yes	Yes	Yes	Yes
Std Dev of residual differences g/100g	0.099	0.098	0.084	0.075

Calculations were also made for Root Mean Square Prediction Error (RMSPE)

Milk fat	RMSPE for milk fat was 2.6% with a coefficient of determination (R^2) of 98.2%. Decomposition of the RMSPE showed that 15.1% of the error was due to mean bias, 9.5% to slope bias, and the remaining 75.3% to random error.
Protein	For milk protein, the R^2 was 95.0%, indicating a slightly weaker, but still strong, correlation between predicted and observed values. The RMSPE was also 2.6%, with the decomposition showing that 1.4% of the error originated from mean bias, 3.5% from slope bias, and 95.1% from random error.

Evaluation of the animal ID system and linkage to measurement

- Animal ID used by the Brolis BHL01 in-line analyser and application is delivered by the interface with the automatic milking system.
- The Test Centre did not face challenges with correct ID values during the ICAR validation test.

Evaluation of the data handling – estimates, rounding, missing data points, and outliers

- The Brolis BLH01 in-line analysers produces accurate data for fat and protein when compared with reference samples analysed in the laboratory.
- Missing values are reported as no value.
- The Brolis HerdLine application can present data in several reports and graphs for farmer support.

Evaluation of the data interface & transfer procedures to MRO and databases

- The data interface of the Brolis BLH01 in-line analyser is operated through the Brolis HerdLine cloud and offers several possibilities for data exchange using ISO formats or existing formats (ADE) within ICAR.

Evaluation of the system installation parameters and procedures

- The Brolis BLH01 in-line analyser must be installed by the manufacturer of the automatic milking system.
- The device is mounted in the milk transfer line of the automatic milking system directly after the milk pump.
- The software of the sensor is connected to the software of the AMS and the Brolis HerdLine cloud.

Evaluation of the routine or periodic checking procedures

- BHL sensors do not have calibration procedures as mentioned in the ICAR Guidelines.
- BHL sensors are not field-serviceable and do not have a field calibration option.
- Malfunctioning sensors must be changed to new ones and inspected/refurbished in factory.
- A procedure to compare results of the Brolis BHL01 in-line analyser with bulk tank data and/or MRO data is run in the Brolis Cloud service; however, no description of this process was available for review during the test.

Evaluation of the effect of the system on animal well-being

- There is no direct effect of the system on animal well-being is expected for this device.
- In general, the device and application are expected to positively support farm management.

Table 2.1 Technical characteristics of the BHL01 analyser

Spectroscopic measurement			
Technology		Short Wavelength Infrared Absorption	
Wavelength Range		2000 nm – 2400 nm	
Optical Safety		Class 1	
Single Measurement Time		1 s [Note: software adjustable]	
Sample Size (irradiated volume)		>10 µl	
Measurement parameters			
	Range	Bias [g /100 g]	Accuracy [g/100 g]
Fat	2.0 % - 10.0 %	< 0,13	< 0,25
Protein	2.0 % - 7.0 %	< 0.13	< 0,25
Lactose	3.0 % - 6.0 %	(pending)	(pending)
Conductivity	[..]		
Color	[..]		
Temperature	10 °C – 70 °C		
Environmental			
IP Rating		IP66	
Operational Temperature		5 °C – 35 °C	
Storage Temperature		-10 °C – 40 °C	
Ambient Humidity		Up to 100 %	
Mechanical			
Length x Width x Height		150 mm x 108 mm x 78 mm not including pipe/hose connectors	
Weight		1.5 kg	
Build Materials		Aluminium, PVC, parts in contact with milk are food-contact-safe	
Mechanical Connection		16 mm inner diameter milking hose or DIN 32676 couplings for installations on stainless steel pipe	
Electrical			
Power supply		IEEE 802.3at compliant power-over-ethernet (PoE+)	
Maximal Power Consumption		20 W	
Data interface		100BASE-TX Fast Ethernet	
Network		IPv4 with dynamic IP addressing (DHCP) support	
Cable type		Cat5e (or higher), gel filled, outdoor grade, foiled unshielded twisted pair (F/UTP)	
Data and Power Connector		RJ45	
Auto Crossover (Auto-MDIX) Support		Yes	