# Raman spectroscopy food & beverage application guide

Trusted technology for composition analysis in a laboratory or process environment

**Endress+Hauser** EH

People for Process Automation

# Applications in process and product quality

## Benefit from our lab-to-process Raman spectroscopy offerings to ensure consistent product quality

### Deliver consistent product quality from the beginning

Endress+Hauser helps you efficiently and consistently deliver a quality product. Raman spectroscopy is a non-destructive and highly specific chemical analysis for the laboratory or process, providing the capability for *in situ*, real-time analysis of multiple components with a single probe. Through this information, you can gain new understanding, monitor product quality, and adopt advanced process control strategies.



The Raman Rxn2 for laboratory or process development applications
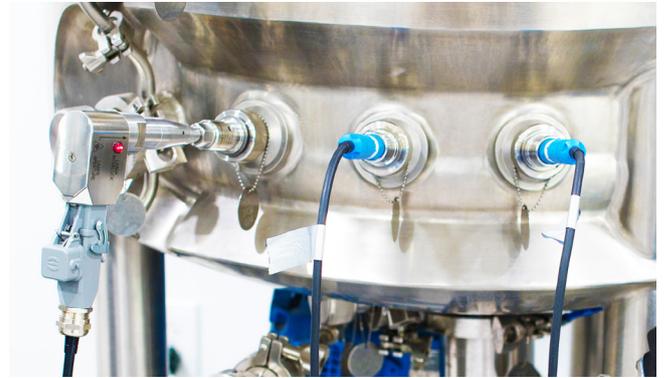
### Raman applications

| Application family | Application | Parameter | Application note title(s) |
|---|---|---|---|
| Fats and oils | Fat or oil quality in foods | Fatty acid saturation<br>Iodine value<br>PUFA | Fast Raman screening of unsaturation of fats in pork<br>Raman spectroscopy at 1000 nm for chocolate measurements<br>Screening of margarine adulteration in butter<br>Determination of unsaturation in food oils and fats |
| Dairy solids | Solid dairy powder product quality | Fat<br>Protein<br>Carbohydrates | Raman spectroscopy for measurement of solid dairy powders |
|  | Final semi-solid product quality | Fat<br>Protein<br>Pigments | Screening of margarine adulteration in butter |
| Meat and fish processing | Raw meat or fish grading | Fats<br>Protein<br>Pigments | Fast Raman screening of unsaturation of fats in pork<br>Multi-attribute salmon quality monitoring using Raman spectroscopy |
|  | Meat byproduct hydrolysis | Protein<br>Fat<br>Ash weight<br>Bone calcium | The role of Raman spectroscopy in meat processing |

Contact Endress+Hauser for additional product and process related parameters.

# Applications in biotechnology

Scalable Raman technology so you can consistently deliver excellent product from lab to production

**Biotechnology is the oldest and newest food production technique** Biotechnology, the use of biological organisms to transform a material, has been used for thousands of years to preserve foods and beverages. Today, biotechnology encompasses fermentations and mammalian cell growth to preserve, functionalize, and create food and beverages. Modern biotechnology processes require new manufacturing approaches that include detailed scientific understanding, 24/7 process knowledge, and data-based control. Endress+Hauser uses its decades of experience in biotechnology to offer food and beverage companies in-depth product composition knowledge and statistical process control strategies based on Raman spectroscopy.



The Rxn-45 probe for clean-in-place installations

**Raman applications**

| Application family | Application | Parameter | Application note title(s) |
|---|---|---|---|
| Plant-based, cell-based, algae, fungi, or air-based meat analogues | Mammalian cell growth | Glucose Lactate Titer VCD ...and more | Raman-based nutrient control in bioprocessing <br> Analysis of a mammalian cell culture |
| | Fermentation | Sugars Alcohol Biomass ...and more | Analysis of a batch fermentation process <br> Advanced bioprocess control |
| | Formulation optimization Protein ingredient | Protein crystallinity Molecular structure | In-line Raman monitoring of protein crystallization <br> Optimizing plant-based proteins using Raman spectroscopy |
| Alcoholic spirits | Juice or mash production | Fructose Glucose Inulin | Contact Endress+Hauser for more information |
| | Fermentation | Sugars Alcohol Biomass ...and more | Analysis of a batch fermentation process <br> Advanced bioprocess control |

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