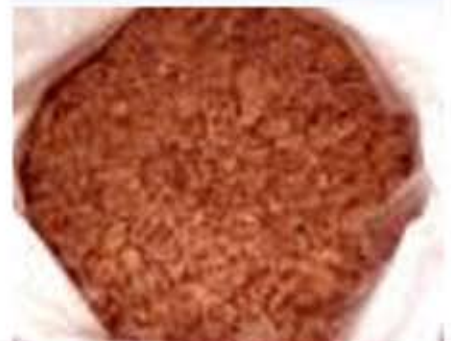# CORONA – The Compact Sensor Unit Specially Designed For Crude Palm, Crude Kernel Oil Extraction Processes and Palm Kernel Expeller

At line or Laboratory Measurements of :

- Moisture / Volatile Matter
- Fatty Acid (FA)
- Free Fatty Acid (FFA)
- Oil / Fat
- Hydroxyl Value
- Peroxide Value
- Iodine Value
- DOBI
- Pectins
- Triglyceride
- α, β, γ, δ Carotene
- Lycopene
- Xanthophyll

- Tocopherols
- Non Oily Solids (NOS)
- Non Fatty Pressing Quotient (NFPQ)
- Protein
- Fiber
- Carbohydrates
- Starch
- Cellulose
- Total Digestible Nutrient
- Sugars

Product information

ZEISS

We make it visible.

CORONA

A versatile compact sensor unit specially designed for accurate quantitative & qualitative measurement of the quality of incoming fresh fruit bunches, enables the mill to make informed decisions on purchase price and to set the accurate technological parameters proper to each stage of the extraction process to optimize the extraction yield.

The palm oil industry can now replace their time consuming conventional test methods and eliminate human error by using CORONA to guarantee excellent accuracy and repeatability for simultaneous determinations of Moisture, Fatty Acid, Free Fatty Acid, Oil, Hydroxyl Value, Peroxide Value, Iodine Value, DOBI, Pectins, Triglyceride, α, β, γ, δ Carotene, Lycopene, Xanthophyll, Tocopherols, Non Oilly Solids (NOS) and the Non Fatty Pressing Quotient (NFPQ) for the oil extraction processes.

The real time determination of the residual oil on meal for crude palm & crude kernel oil extraction process provides the mill very quick information on oil extraction efficiency. Hence, adjustments in process can be made right away, the more oil that is extracted from the palm fruits & palm kernel, the more money the mill makes. Volume of throughput, rate, yield and profits based on holding the lines on specifications at all points to the pre-determined value of the real time results are provided by the Carl Zeiss's Corona 45 NIR Instrument

Palm Kernel Expeller is a by-product of the crushing and expelling of oil from palm kernel, it has been used in compound feeds for animals due to its balance of high fiber, good level of residual oil and high content of palmitic acid. Carl Zeiss's Corona 45 NIR Instrument provides real time simultaneous determinations of the Nutrition and Energy Values, such as: Moisture, Oil / Fat, Protein, Fiber, Carbohydrates, Starch, Cellulose, Total Digestible Nutrient, Sugars, Metabolisable Energy (ME), Minerals and Ash in Palm Kernel Expeller.

The total elimination of moving mechanical components provides a very high degree of reliability and permanent accuracy of the spectral wavelength. Transferring, results and calibrations among the CORONA FAMILY is so simple on a "Plug and Play" basis.

CORONA can be used for a wide variety of measuring tasks and is poised to tackle new measuring concepts because it offers specific measuring geometry and the option of parallel detection in the UV, the visible and the Near Infrared Wavelength Range.
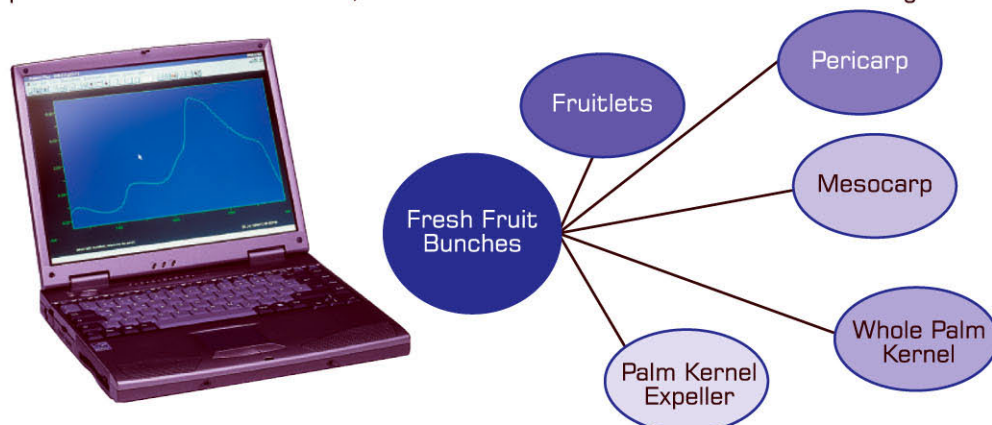
Software

CORONA uses microprocessors to enable simple and automated operation. It also offers full networking facilities for easy integration into modern Laboratory Information Management Systems (LIMS)

CORA

The Applications Software developed by Zeiss, for the intelligent multi-functionality check as well as the control of Corona, allows the simple and easy collection of the spectral data, on-line and off-line prediction of measurement results. The software is supported by Windows 98, 2000 and XP.

Aspect Plus

The spectrum software developed by Zeiss, provides the extensive mathematical functions for spectral analysis. The software is supported by Windows 3.11, 95, NT, 2000 and XP.

Functional libraries under LabView and C/C++

The driver library used for spectral range detection and parameter administration.

Grams 32 / Unscrambler

The flexible and powerful software used for chemometric routines for the creation of calibration models.
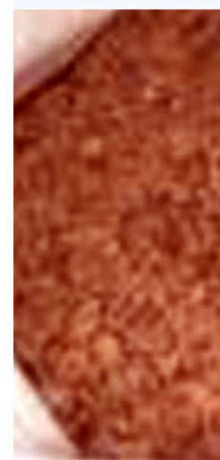
Benefits

■ Permits direct, safe, non-contact and non-destructive sample measurement. No complex sample preparation is required.

■ Allows simultaneous multi-component analysis in less than 1 minute.

■ Provides fast, precise and cost-saving analysis for quality control tasks.

■ Offers state-of-the-art diode array technology and the unique Zeiss Polychromator design. CORONA measurement is not sensitive to color, seasonal composition and particle size changes and is unaffected by external influences such as ambient lighting, temperature and humidity.

■ Provides a wide wavelength range, with detection possible in milliseconds. Greater speed of measurement means more representative measuring of the sample and improved accuracy.

■ Robust construction offers a very high degree of reliability and permanent accuracy of the spectral wavelength by eliminating moving mechanical components. Hence, CORONA is service-free and calibration transfer among the CORONA FAMILY is so simple on a "Plug and Play" basis

■ CORONA is configured for UV / VIS / NIR measurements as well as for reflection and transmission.

■ Comprehensive software package for simple automated operation with full networking facilities for easy integration into modern Laboratory Information Management Systems (LIMS)

Applications

The Corona 45 NIR Instrument real time measurements in the Palm Oil Industry include:

Crude Palm Oil & Crude Kernel Oil Extraction Processes
In the palm oil industry, free fatty acid in the fresh fruit determines the premium purchase price for the mill. The lower the free fatty acid causes refiners fewer effluent problems and gives resulting end products longer shelf life, high free fatty acid makes the palm oil expensive to refine and impaired bleachability. To control the volume of throughput, rate, yield and profits evolve the need to measure and control Parameters other than free fatty acid increases in the extraction processes.

The applications such as:
Fresh Fruit & Pericarp : Moisture, Fatty Acid, Free Fatty Acid, Oil, Hydroxyl Value, Peroxide Value, Iodine Value, DOBI, Pectins, Triglyeride, α, β, γ, δ Carotene, Lycopene, Xanthophyll, Tocopherols, Non Oily Solids (NOS) and Non Fatty Pressing Quotient (NFPQ)

Mesocarp:
Moisture, Fatty Acid, Free Fatty Acid, Oil, Non Oily Solids (NOS) and Fiber

Palm Kernel:
Moisture, Fatty Acid, Free Fatty Acid, Oil, Hydroxyl Value, Peroxide Value, Iodine Value, DOBI, Triglyeride and α, β, γ, δ Carotene

By- Products - Palm Kernel Expeller
At Line or Laboratory Measurements of the Nutrition and Energy Values: Moisture, Oil / Fat, Protein, Fiber, Carbohydrates, Starch, Cellulose, Total Digestible Nutrient, Sugars, Metabolisable Energy (ME), Minerals and Ash in Palm Kernel Expeller for animals feed.

| CONSTITUENT	PRODUCT				
	Whole Fresh Fruits	Pericarp	Mesocarp	Whole Palm Kernel	Whole Palm Kernel Expeller
Moisture / Volatile Matter	✓	✓	✓	✓	
Fatty Acid	✓	✓	✓	✓	
Free Fatty Acid	✓	✓	✓	✓	
Oil / Fat	✓	✓	✓	✓	✓
Hydroxyl Value	✓	✓			
Peroxide Value	✓	✓		✓	
Iodine Value	✓	✓		✓	
DOBI	✓	✓		✓	
Pectins		✓			
Triglyceride	✓	✓		✓	
Carotene *	✓	✓		✓	
Lycopene	✓	✓		✓	
Xanthophyll	✓	✓			
Tocopherols	✓	✓			
Non Oily Solids (NOS)	✓	✓	✓		
Non Fatty Pressing Quotient (NFPQ)	✓	✓			
Protein					✓
Fiber		✓	✓		✓
Carbohydrates					✓
Starch					✓
Cellulose					✓
Total Digestible Nutrient					✓
Sugars					✓
Metabolisable Energy (ME)					✓
Minerals *					✓
Ash					✓

Minerals * : Ca, Mg, Fe, Cu, Zn, P

Carotene * : α, β, γ, δ

CALIBRATION TRANSFER —— *"Plug and Play"*

The state-of-the-art diode array technology and the unique Zeiss Polychromator design offers a very high degree of reliability and permanent accuracy of the spectral wavelength by eliminating moving mechanical components and the powerful applications software enable the calibrations transfer among the CORONA FAMILY is so simple on a *"Plug and Play"* basis.

HOST CORONA 1

HOST CORONA 2

HOST CORONA 3

HOST CORONA 4

HOST CORONA 5

MASTER CORONA
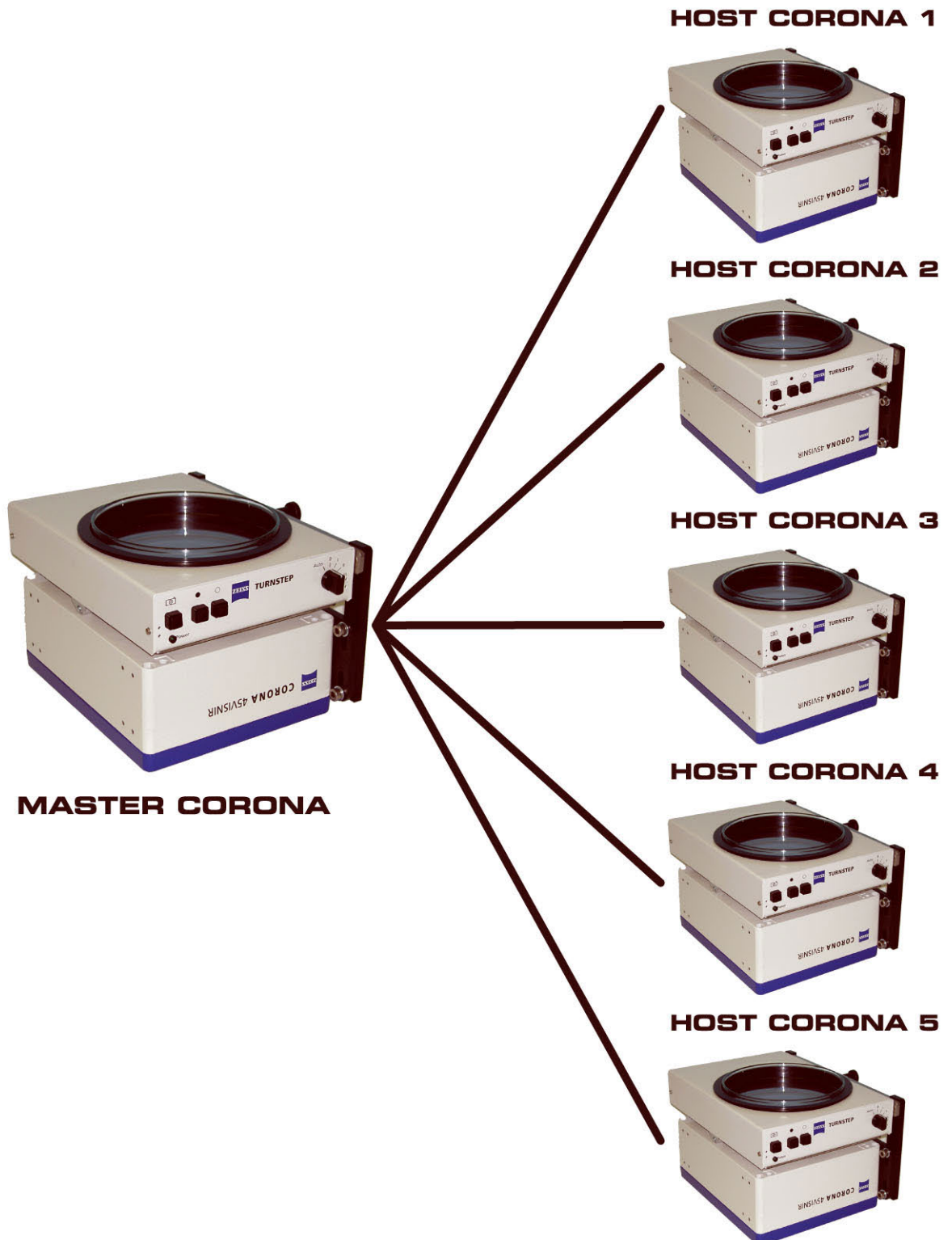
CORONA - Technical Data

Mechanical Specifications	* optional item, not included in standard delivery
Range of operating temperatures	0°C .... + 40°C
Storage temperatures	- 10°C ....+ 65°C
Power consumption	< 30 VA
Power supply	12V,2.2A
Spectrometer-PC communication interface	RS 422, RS 485*, RS 232*, RS 422 - fibre link*
Spectrometer-to-PC distance	< 10 m (RS 422), < 80 m (RS 232 / RS 485)
	< 2000 m (RS 422 fibre link)
Digital inputs/outputs	4 inputs (0 ... 24 V external voltage)
	4 outputs (0 ... 24 V external voltage)
Dimensions (W x H x D) in mm	About 324 x 168 x 246
Weight	About 7 kg
Protection grade	IP 65 (NEMA 4)
Optical Specifications	**** depending on the type of CORONA**
Spectrometer	Single beam diode array
Polychromator	MMS NIR 1.7
Sensor array	InGaAs array, 1-stage peltier cooling
Number of diodes	128 /256**
Wavelength range	950 ... 1700 nm
Spectral resolution	6/ 3** nm/diode (18/ 12**) nm/Rayleigh)
Wavelength accuracy	< 0.6 nm
Amplitude resolution	15 bits
Light source	Halogen lamp 5/10 V, 8/ 18 W, stabilized**
Lifetime of light source	About 3000 h
Measuring geometry	0° / 45° circular-shaped
Working distance (path height)	About 13 mm
Measuring spot	About 15 mm
Max. measuring rate	100 measurements/second (with RS 422 interface)
	80 measurements / second (with RS 485 interface)
	5 measurements/second (with RS 232 interface)
100% calibration	To external white standard
Sensor Specifications	
Reflectance range	0.2% ... 100% R
Reflection accuracy	< 0.2%
Reproducibility	30 measurements at two-second intervals. on white
at 0.1 s. measuring time	< 0.0003 AU ms
at 1 s. measuring time	< 0.0002 AU ms
Inter- instrument agreement	< 10 mAU differential between different sensors
Stray light	< 0.1% R (measurement with H_2O on 1.45 µm water band)
Drift	< 0.1 % R/h (after warm-up of > 30 minutes)

SCA