PSI, spol. s r.o. – Photon Systems Instruments
Professional Instruments for Plant Science, Biotechnology, and Agriculture
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PolyPen RP 400

PolyPen RP 400 features a complete system for measurement of spectral reflectance of an internal light source (Xenon incandescent lamp 380 - 1050 nm) from leaves, as well as measurements of transmittance and absorbance of any external light source.

In addition, the PolyPen incorporates formulas of commonly used reflectance indices (e.g. NDVI, NDGI, PRI, Greenness Index, etc.) into its software. Measured data are instantly displayed in graphs or data sheets on the device screen display. They are also stored in the device memory for later re-collection or transfer onto a PC.

PolyPen RP 400 is a self-contained system that runs on Li-Ion rechargeable battery and does not require any external PC. It features an innovative user interface with integral computer, full color touch screen display, built-in light source, and a sample holder - leaf clip. The leaf clip also provides reference standard for calibration of the light source and detector.

HIGHLIGHTS

- Complete system for measurement of spectral reflectance on leaves
- Automatic calculation of all commonly used reflectance indices
- Custom indices calculation possible
- Programmable via intuitive touch-screen use
- Integrated light source
- Leaf clip for non-destructive, in-situ measurements
- USB connectivity
- No PC needed
- Handheld, lightweight and battery-powered with affordable price

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PolyPen RP 400

SOFTWARE

- Automatic calculation of all commonly used reflectance indices
- Calculation of custom indices (possible on request)
- Instant data graphs and data sheets
- Export to a PC via USB communication
- Future firmware updates

LIST OF CALCULATED VEGETATION INDICES

- **Light Source:**
  Normalized Difference Vegetation Index (NDVI)
  Reference: Rouse et al. (1974)
  Equation: $NDVI = (R_{NIR} - R_{RED}) / (R_{NIR} + R_{RED})$

- **Simple Ratio Index (SR)**
  Reference: Jordan (1969); Rouse et al. (1974)
  Equation: $SR = R_{NIR} / R_{RED}$

- **Modified Chlorophyll Absorption in Reflectance Index (MCARI1)**
  Reference: Haboudane et al. (2004)
  Equation: $MCARI1 = 1.2 * [2.5 * (R_{790} - R_{670}) - 1.3 * (R_{790} - R_{550})]$

- **Optimized Soil-Adjusted Vegetation Index (OSAVI)**
  Reference: Rondeaux et al. (1996))
  Equation: $OSAVI = (1 + 0.16) * (R_{790} - R_{670}) / (R_{790} - R_{670} + 0.16)$

- **Greenness Index (G)**
  Equation: $G = R_{554} / R_{677}$

- **Modified Chlorophyll Absorption in Reflectance Index (MCARI)**
  Reference: Daughtry et al. (2000)
  Equation: $MCARI = [(R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550})] * (R_{700} / R_{670})$

- **Transformed CAR Index (TCARI)**
  Reference: Haboudane et al. (2002)
  Equation: $TSARI = 3 * [(R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550}) * (R_{700} / R_{670})]$

- **Triangular Vegetation Index (TVI)**
  Reference: Broge and Leblanc (2000)
  Equation: $TVI = 0.5 * [120 * (R_{750} - R_{550}) - 200 * (R_{670} - R_{550})]$

- **Zarco-Tejada & Miller Index (ZMI)**
  Reference: Zarco-Tejada et al. (2001)
  Equation: $ZMI = R_{750} / R_{710}$

- **Simple Ratio Pigment Index (SRPI)**
  Reference: Peñuelas et al. (1995)
  Equation: $SRPI = R_{430} / R_{680}$

TECHNICAL SPECIFICATION

- **Light Source:** Xenon incandescent lamp 380-1050 nm
- **Spectral Response Range:** 380 nm - 790 nm
- **Spectral Response Half Width:** 8 nm
- **Spectral Straylight:** -30 dB
- **Size of Aperture:** 7 mm
- **Scanning Speed:** About 100 ms
- **Touch Screen:** 240 x 320 pixel; 65535 colors
- **Memory Capacity:** 32 Mbit (up to 8000 measurements)
- **System Data:** 16 bit AD conversion
- **Dynamic Range:** High gain: 1:4300; Low gain: 1:13000
- **Communication:** USB
- **Dimension / Weight:** 15 x 7.5 x 4 cm / 300 g
- **Case:** Splash-proof
- **Battery:** Li-Ion; rechargeable via USB port of a PC

LIST OF CALCULATED VEGETATION INDICES

- **Normalized Phaeophytinization Index (NPQI)**
  Reference: Barnes et al. (1992)
  Equation: $NPQI = (R_{415} - R_{435}) / (R_{415} + R_{435})$

- **Photochemical Reflectance Index (PRI)**
  Reference: Gamon et al. (1992)
  Equation: $PRI = (R_{531} - R_{570}) / (R_{531} + R_{570})$

- **Normalized Pigment Chlorophyll Index (NPCI)**
  Reference: Peñuelas et al. (1994)
  Equation: $NPCI = (R_{680} - R_{430}) / (R_{680} + R_{430})$

- **Carter Indices**
  Reference: Carter (1994), Carter et al. (1996)
  Equation: $Ctr1 = R_{695} / R_{420}$; $Ctr2 = R_{695} / R_{760}$

- **Lichtenthaler Indices**
  Reference: Lichtenthaler et al. (1996)
  Equation: $Lic1 = (R_{790} - R_{680}) / (R_{790} + R_{680})$; $Lic2 = R_{440} / R_{690}$

- **Structure Intensive Pigment Index (SIPI)**
  Reference: Peñuelas et al. (1995)
  Equation: $SIPI = (R_{790} - R_{450}) / (R_{790} + R_{650})$

- **Gitelson and Merzlyak Indices**
  Reference: Gitelson & Merzlyak (1997)
  Equation: $GM1 = R_{750} / R_{550}$; $GM2 = R_{750} / R_{700}$