



Scientific Cameras

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Introduction:

IL Photonics offers 6 series of scientific cameras

Hi Res V, Electra, Electra Plus, CHROMA, DISCOVERY and iCAM.

These differ in type of chip that can be integrated, cooling performance, read-out speed, read-out noise, A/D etc. However all are considered high quality scientific grade Camera.

Some of the modules are available in Engineering grade that can save over 50% of the price and even more.

The basic preliminary specifications of each of the series are displayed below and firm specs will be given with the quotation.

In addition to that we list the basic specs of the CCD Chips available and with what camera they fit.

Please feel free to contact us by e-mail or phone to be sure you will get the system that most suits your application, and a quote that includes all the parts you need.

We also offer 6 and 8 positions Filter Wheels, one can easily control with proprietary software, that are designed to be used with high sensitivity cameras like the ones we offer.



HiRes V

DISCOVERY

iCAM

CHROMA

Electra

Specs of Camera systems:

Hi Res V



Picture of the Hi Res V Camera

| | |
|---------------------|--|
| Readout speed * | Slow scan: up to 100 kpix/s (Dynamic Range > 1:55000) Fast scan: up to 2Mpixel/s (Dynamic Range 1:20000) |
| Filter wheel (opt.) | External |
| A/D Converter | Slow scan: 16 bit Fast scan: selectable 12, 14, 16 bit |
| Max total noise ** | 5e-/15e- |
| Partial CCD Reading | Programmable |
| Binning | From 1x1 to 8x8 (or arbitrary) |
| Mount ** | 42x0.75 or 50x0.75 input (to be specified on the order) |
| Backfocus ** | 17.5/22.5 mm |
| Interface *** | USB 2 |
| Spectral response | 350-1000 nm |
| Cooling | Double stage Peltier+air stage > 50°C ΔT below ambient Double stage Peltier+liquid stage up to 55°C ΔT below liquid temperature |
| Shutter | Electromechanical |



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| | |
|-------------------------|--|
| Exposure time | From 0.01 to 9999 s |
| CCD temperature control | ± 0.1 °C |
| Settable gains | Slow scan: 1 (as requested by customer) Fast scan: 64 |
| BIAS Control | 9 bit |
| Optical window **** | Fused Silica, 1mm |
| Head weight | Starting from 2000 g |
| Dimensions | 130x130x162 mm |
| Auxiliary port | yes |

* Selectable by software

** According to sensors

*** On request we can provide the DTA FDL-PCI interface card at a little added cost

**** With double coating. On request, it can mount coating and/or double coating windows with non parallel faces and windows in berillium with X-ray scintillator screen.

The standard system includes:

- Assembled unit in light alloy with threaded 42x0.75 or 50x0.75 input (to be specified on the order);
- USB 2.0 with 3m link cable (optionally, 32-bit FDL-PCI interface with 2.5m PC parallel link cable);
- software for image grab and processing under Windows 2000/XP;
- 230/115V power supply;
- manual, test report and case.

Options

| | |
|-------|---|
| FOL | Serial fiber optic link (fiber: 30 m, ST 62/125 mount). Different lengths on demand |
| NIK-H | Adapter for Nikon lens |
| MIN-H | Adapter for 42x1 mm lens |
| M10 | 10 m parallel link cable for FDL-PCI |
| TTC | Adapter from 42x0.75 to C mount |
| ATE | 1/4" mounting post |

All the data reported are subject to change without prior warning.

Pictures of the Electra Camera



| | |
|-----------------------------------|---------------------------------|
| Readout speed | 420 kpixel/s |
| A/D Converter | Selectable: 12, 14, 16 bit |
| Max total noise * | 5e-/30e- |
| Partial CCD Reading | Programmable |
| Binning | From 1x1 to 8x8 (or arbitrary) |
| Interface | USB 1.1/2.0 |
| Mount (in case of Shutter option) | 42x0.75 (C on request) |
| Spectral response | 350-1000 nm |
| Cooling | Double stage Peltier > 50 °C ΔT |
| Shutter (optional) | Electromechanical |
| Exposure time ** | From 0.01 to 9999 s |
| CCD temperature control | ±0.1 °C |
| Settable gains | 64 |
| BIAS Control | 9 bit |
| Optical window *** | Fused Silica |
| Weight | 1400 g |
| Dimensions | 160x130x100 mm |
| Auxiliary port | yes |

* According to sensors.

** The minimum exposure time depends on the sensor's type, on the shutter's type and if the user utilize our Power Supply.



Scientific Cameras

***With double coating. On request, it can mount coating and/or double coating windows with non parallel faces and windows in Beryllium with an X-ray scintillator screen.

The standard system includes:

- assembled unit in light alloy with threaded 42x0.75 input;
- 1.8 m USB link cable;
- software for image grab and processing under Windows Me/2000/XP;
- case, manual with test report and 24 months of warranty.

Options

| | | | |
|-----------|---|-----|---------------------------------|
| EV- 25 | Electromechanical shutter, dia 25 mm | TTC | Adapter from 42x0.75 to C mount |
| EV- 35 | Electromechanical shutter, dia 35 mm | XTE | ¼" mounting post |
| EV- 45 | Electromechanical shutter, dia 45 mm | PWS | 230/115V Power Supply |
| NIK- C | Adapter for Nikon lens | BPA | Battery Power Adapter |
| MIN- C | Adapter for 42x1 mm lens | | |

All the data reported are subject to change without prior warning.



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Electra Plus

| | |
|-----------------------------------|---|
| Readout speed | slow scan: up to 100 kpixel/s fast scan: up to 1 Mpix/s @ 16 bit up to 2 Mpix/s @ 14 bit up to 4 Mpix/s @ 12 bit |
| A/D Converter | slow scan: 1 (optional) fast scan: Selectable: 12, 14, 16 bit |
| Max total noise * | 5e-/30e- |
| Partial CCD Reading | Programmable |
| Binning | From 1x1 to 8x8 (or arbitrary) |
| Interface | USB 2.0 High Speed |
| Mount (in case of Shutter option) | 42x0.75 (C on request) |
| Spectral response | 350-1000 nm |
| Cooling | Double stage Peltier > 55°C ΔT (EX series) 2 Double stage Peltier > 55°C ΔT (EXH series) |
| Shutter (optional) | Electromechanical |
| Exposure time ** | From 0.01 to 9999 s |
| Shutter time base | 1 microseconds |
| CCD temperature control | ±0.05 °C |
| Settable gains | 64 |
| BIAS Control | 9 bit |
| Optical window *** | Fused Silica |
| Weight | 1400 g |
| Dimensions | 160x130x100 mm (EX series) 164x141x81 mm (EXH series) |
| On board memory | 256 kbyte |
| Auxiliary port | yes |

* According to sensors.

** The minimum exposure time depends on the sensor's type, on the shutter's type and if the user utilize our Power Supply.

***With double coating. On request, it can mount coating and/or double coating windows with non parallel faces and windows in Beryllium with an X-ray scintillator screen.

The standard system includes:

- assembled unit in light alloy with threaded 42x0.75 input;
- 1.8 m USB link cable;

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- software for image grab and processing under Windows Me/2000/XP;
- case, manual with test report and 24 months of warranty.

Options

| | | | |
|-----------|---|-------|--------------------------------------|
| EV- 25 | Electromechanical shutter, dia 25 mm | MIN-C | Adapter for 42x1 mm lens |
| EV- 35 | Electromechanical shutter, dia 35 mm | TTC | Adapter from 42x0.75 to C mount |
| EV- 45 | Electromechanical shutter, dia 45 mm | XTE | ¼" mounting post |
| EV- 65 | Electromechanical shutter, dia 65 mm | PWS | 230/115V Power Supply |
| EV- 90 | Electromechanical shutter, dia 90 mm | PWSH | 230/115V Power Supply for EXH series |
| NIK- C | Adapter for Nikon lens | BPA | Battery Power Adapter |

* During the time, the USB connexion evolved following some standards until the present USB 2.0.

It exists in three versions, characterized by three different values of data-transfer rate:

Low speed: 1,5 Mbit/s

Full speed: 12 Mbit/s

High speed: 480 Mbit/s

All the data reported are subject to change without prior warning.



| | |
|-------------------------|--|
| Readout speed | Up to 2.2 Mpixel/s |
| Filter wheel (optional) | 8 or 6 positions according to different models |
| A/D Converter | 14 bit |
| Max total noise (Typ.) | 10e- |
| Partial CCD Reading | Programmable |
| Binning | From 1x1 to 8x8 or arbitrary |
| Interface | FDL-PCI |
| Mount * | 42x0.75 or C |
| Spectral response | 350-1000 |
| Backfocus | 26.8/17.5 mm |
| Cooling | Single stage Peltier -40°C ΔT |
| Shutter | Electromechanical |
| Exposure time | From 0.01 to 9999 s |
| CCD temperature control | ±0.1 °C |
| Settable gains | 64 |
| BIAS Control | 9 bit |



Scientific Cameras

| | |
|-------------------|-------------------|
| Optical window ** | Fused silica, 1mm |
| Weight | 1600 g |
| Dimensions | 155x134x62 mm |
| Auxiliary port | yes |

* The C mount panel is a customization of the camera, so involve a little additional cost

** With double coating. On request, it can mount coating and/or double coating windows with non parallel faces and windows in Berillium with X-ray scintillator screen.

The standard system includes:

- assembled unit in light alloy with threaded 42x0.75 input;
- 32 bit FDL-PCI interface;
- 2.5 m PC parallel link cable;
- software for image grab and processing under Windows 95/98/Me/2000/XP with PCI interface (included);
- 230/115V power supply;
- case, manual with test report and 24 months of warranty.

Options

| | |
|-------|---|
| FOL | Serial fiber optic link (fiber: 30 m, ST 62/125 mount). Different lengths on demand |
| RGB | RGB interference + Blank, dia. 25 mm |
| WEL | 8-position integrated filter wheel (6-position for CX6000), filter: 25mm dia., 4 mm max thickness |
| NIK-C | Adapter for Nikon lens |
| MIN-C | Adapter for 42x1 mm lens |
| PAR | 2.5 m standard parallel port link cable |
| M10 | 10 m parallel link cable for FDL-PCI |
| XTE | 1/4" mounting post |
| TTC | Adapter from 42x0.75 to C mount |
| CPA | Front panel with C mount and backfocus (you can not fit the filter wheel) |

All the data reported are subject to change without prior warning.

DISCOVERY



| | |
|-------------------------|--|
| Readout speed | Up to 250 Kpixel/s |
| Filter wheel | External |
| A/D Converter | Selectable 12, 14, 16 bit |
| Max total noise (Typ.)* | 10e- |
| Partial CCD Reading | Programmable |
| Binning | From 1x1 to 8x8 or arbitrary |
| Interface | USB 1.1/2.0 |
| Mount | C |
| Spectral response | 350-1000 nm |
| Backfocus | 17.5 mm |
| Cooling | Single stage Peltier 35 °C ΔT (standard version) Double stage Peltier 45 °C ΔT (on request)** |
| Shutter | Electromechanical |
| Exposure time | From 0.1 to 9999 s |
| CCD temperature control | ±0.1 °C |
| Settable gains | 64 |
| BIAS Control | 9 bit |
| Optical window | Fused Silica, 1mm |



Scientific Cameras

| | |
|----------------|-----------------|
| Weight | 800 g |
| Dimensions | dia 118 x 53 mm |
| Auxiliary port | yes |

* According to sensors.

The standard system includes:

- assembled unit in light alloy with threaded C input;
- USB link cable of 1.8 m;
- software for image grab and processing under Windows 95/98/Me/2000/XP;
- 230/115V power supply (optional, not included);
- case, manual with test report and 24 months of warranty.

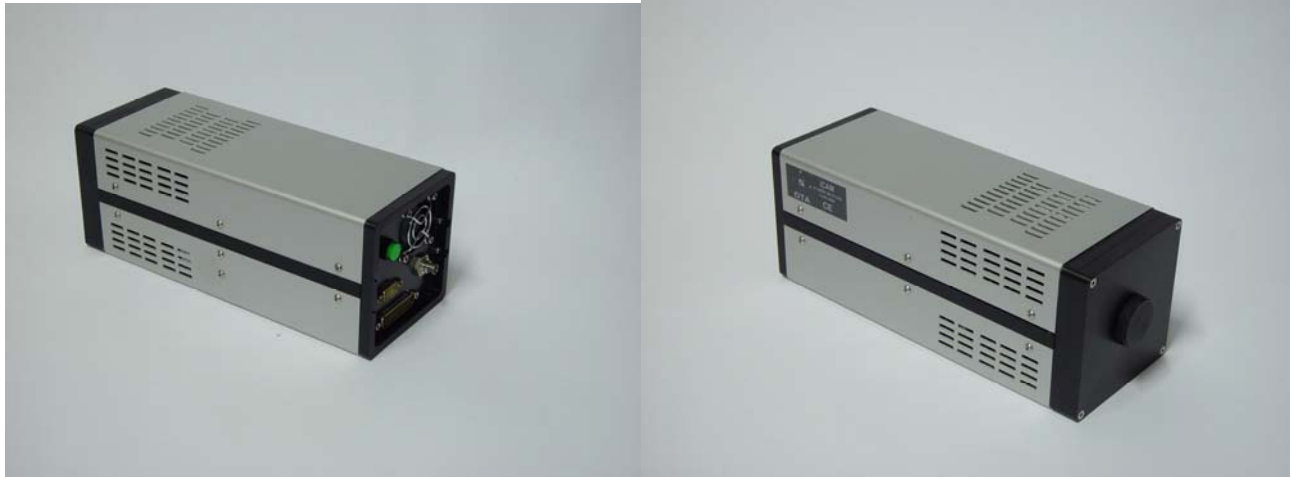
Options

- NIK-A Adapter for Nikon lens
- MIN-A Adapter for 42x1 mm lens
- TBR Adapter for T mount 42 x 0.75 mm
- DSC-1 Double stage Peltier -50°C DT
- PWR-X Stabilized power supply 230V; 13.8V; 5A
- APW Battery adapter for cars

All the data reported are subject to change without prior warning.

iCAM

Pictures of the iCAM Camera



| | |
|-------------------------|-------------------------------|
| Readout speed | Up to 12.5 Mpixel/s |
| Filter wheel | External |
| A/D Converter | 12 bit |
| Max total noise (Typ.) | 15-25 e- |
| Partial CCD Reading | Programmable |
| Binning | From 1x1 to 8x8 or arbitrary |
| Interface | FDL-PCI |
| Mount | * |
| Spectral response | 350-1000 nm |
| Backfocus | 17.5 mm |
| Cooling | Single stage Peltier -40°C ΔT |
| Shutter | Electromechanical |
| Exposure time | From 0.01 to 9999 s |
| CCD temperature control | ±0.1 °C |
| Settable gains | 64 |
| BIAS Control | 8 bit |
| Optical window** | Fused silica, 1mm |



Scientific Cameras

| | |
|----------------|--------------|
| Weight | 1500 g |
| Dimensions | 95x95x250 mm |
| Auxiliary port | yes |

* According to different sensors.

**With double coating. On request, it can mount coating and/or double coating windows with non parallel faces and windows in Beryllium with X-ray scintillator screen.

The standard system includes:

- assembled unit in light alloy with threaded C input;
- 32 bit FDL-PCI interface;
- 2.5 m PC parallel link cable;
- software for image grab and processing under Windows 95/98/Me/XP/2000 with PCI interface (included);
- 230/115V power supply;
- case, manual with test report and 24 months of warranty.

Options

- NIK-A Adapter for Nikon lens
- MIN-A Adapter for 42x1 mm lens
- TTC Adapter from 42x0.75 to C mount

All the data reported are subject to change without prior warning.

IL Photonics declines any responsibility for errors that may occur in the specifications listed above.

CCD Sensor scheme

| CCD manufacturer | Kodak | Kodak | Kodak | Kodak | Kodak | Kodak |
|--|----------------------------------|--------------------------------------|--------------------------------------|-------------------------|----------------------------|--------------------------------------|
| CCD sensor | KAF-0261E FI | KAF-401LE FI | KAF-402E (ME) FI | KAF-1001E FI | KAF-1301E (LE) FI | KAF-1602E (LE) FI |
| Camera model | CX3, C3P, C4, DS, EL, HR V | CX3, C3P, C4, DS, EL, HR V, IC | CX3, C3P, C4, DS, EL, HR V, IC | EL, HR V | HR V | CX3, C3P, C4, DS, EL, HR V, IC |
| CCD format Aspect Ratio | 512x512 1:1 | 768x512 3:2 | 768x512 3:2 | 1024x1024 1:1 | 1280x1024 | 1536x1024 3:2 |
| Pixel Size (μm^2) | 20x20 | 9x9 | 9x9 | 24x24 | 16x16 | 9x9 |
| Active area HxV (mm ²) | 10.2x10.2 | 6.9x4.6 | 6.9x4.6 | 24.5x24.5 | 20.48x16.38 | 13.8x9.2 |
| FWC (ke ⁻) | 500 | 100 | 100 | 500 | 120 | 100 (50) |
| QE% @ 450, 550, 650 nm | 35, 55, 58 | 20, 35, 42 | 35, 55, 68 (55, 67, 82) | 40, 55, 65 | 40, 55, 63 (20, 32, 28) | 40, 50, 60 (20, 35, 42) |
| QE (%) NIR 1000 nm | 7-8 | 3-4 | 5-6 | 4 | 7-8 | 5-6 |
| Dark Current max @ -30°C (e ⁻ / pixel · s) | 0.8 | 0.03 | 0.04 | 1.1 | 0.18 (0.3) | 0.04 (0.03) |
| Total Sensor Noise (e ⁻ rms) | 22 @ -30 °C | 15 @ 25 °C | 15 @ 25 °C | 22 @ -30 °C | 15 @ 25 °C | 15 @ 25 °C |
| Dynamic Range ¹ (dB) | 83 (87) ² | 70 | 76 | 83 (87) ² | 77 (74) ² | 74 (70) ² |
| Fill Factor (%) | 100 | 70 | 100 | 100 | 100 (70) | 100 (70) |

E=Enhanced (ITO) version; FI= front-illuminated; LE= with Antiblooming Protection; ME= with microlens; CE= color version. All parameters are typical.

¹ 20 LOG(FWC/Total Sensor Noise)

² Two output amplifiers: High Gain Output and Low gain Output (value in brackets)

CCD Sensor scheme

| CCD manufacturer | Kodak | Kodak | Kodak | Kodak | Kodak | Kodak |
|---|--------------------------------------|------------------------------|-------------------------|-------------------------------------|-------------------------------------|----------------------------|
| CCD sensor | KAF-1603ME FI | KAF-3200E (ME) FI | KAF-4301E FI | KAF-6302LE FI | KAF-6303E FI | KAF-16801E (LE) FI |
| Camera model | CX3, C3P, C4, DS, EL, HR V, IC | CX3, C3P, C4, EL, HR V | HR V | CX3, C3P, C4, EL, HR V, IC | CX3, C3P, C4, EL, HR V, IC | HR V |
| CCD format Aspect Ratio | 1536x1024 3:2 | 2184x1472 3:2 | 2084x2084 1:1 | 3072x2034 3:2 | 3072x2048 3:2 | 4096x4096 1:1 |
| Pixel Size (μm^2) | 9x9 | 6.8x6.8 | 24x24 | 9x9 | 9x9 | 9x9 |
| Active area HxV (mm ²) | 13.8x9.2 | 14.85x10.26 | 50.02x50.02 | 27.65x18.48 | 27.65x18.48 | 36.88x36.88 |
| FWC (ke^-) | 100 | 55 | 570 | 50 | 100 | 100 (55) |
| QE% @ 450, 550, 650 nm | 50, 67, 75 | 40, 52, 65 60, 75, 82 | 40, 55, 65 | 9, 15, 13 | 40, 55, 64 | 40, 52, 65 (20, 28, 33) |
| QE(%) NIR 1000 nm | 5-6 | 5-6 (7-8) | 8-9 | 5-6 | 5-6 | 33 (8) |
| Dark Current max @ -30 °C ($\text{e}^-/\text{pixel}\cdot\text{s}$) | 0.04 | 0.03 | 0.3 | 0.03 | 0.03 | 0.04 (0.03) |
| Total Sensor Noise ($\text{e}^- \text{rms}$) | 15 @ 25 °C | 7 @ -10 °C | 22 @ -30 °C | 15 @ 25 °C | 15 @ 25 °C | 15 @ 25 °C |
| Dynamic Range ¹ (dB) | 74 (70) ² | 77 | 83 (87) ² | 76 | 76 | 76 (71) ² |
| Fill Factor (%) | 100 (70) | 100 | 100 | 70 | 100 | 100 (70) |

E=Enhanced (ITO) version; FI= front-illuminated; LE= with Antiblooming Protection; ME= with microlens; CE= color version. All parameters are typical.

¹ $20 \text{ LOG}(\text{FWC}/\text{Total Sensor Noise})$

² Two output amplifiers: High Gain Output and Low gain Output (value in brackets)

CCD Sensor scheme

| CCD manufacturer | E2V | E2V | E2V | E2V | E2V | E2V |
|--|----------------------------|----------------------------|-------------------|---------------------------|----------------------------|---------------------------|
| CCD ¹ sensor | 30-11 B (F) | 42-10 B (F) | 42-40 B | 47-10 B (F) | 47-20 B (F) FT | 77-00 B (F) |
| Camera model | EL, HR V | EL, HR V | HR V | EL, HR V | HR V | EL, HR V |
| CCD format Aspect Ratio | 1024x256 4:1 | 2048x512 4:1 | 2048x2048 4:1 | 1024x1024 1:1 | 1024x1024 1:1 | 512x512 1:1 |
| Pixel Size (μm ²) | 26x26 | 13.5x13.5 | 13.5x13.5 | 13x13 | 13x13 | 24x24 |
| Active area HxV (mm ²) | 26.6x6.7 | 27.6x6.9 | 27.6x27.6 | 13.3x13.3 | 13.3x13.3 | 12.3x12.3 |
| FWC (ke ⁻) | 500 | 100 | 100 | 100 | 100 | 300 |
| QE% @ 450, 550, 650 nm | 82, 81, 76 (21, 43, 45) | 84, 82, 76 | 83, 81, 77 | 82, 81, 76 (8, 25, 40) | 82, 81, 76 (8, 25, 38) | 82, 81, 76 (8, 31, 45) |
| QE(%) NIR 1000 nm | 14-15 (10-11) | 7-8 | 14-15 | 14-15 (9-10) | 14-15 (9-10) | 14-15 (7-8) |
| Dark Current max @ -30 °C (e ⁻ / pixel -s) | 0.5 (2) | 0.5 (0.2) | 0.5 | 0.5 (0.2) | 0.5 (0.2) | 1.5 (0.4) |
| Total Sensor Noise (e ⁻ rms) | 4 @ -40 °C (4 @ -20 °C) | 3 @ -40 °C (2 @ -40 °C) | 2 (2) @ -20 °C | 2 @ -20 °C | 2 @ -20 °C (2 @ -30 °C) | 3 @ -20 °C |
| Dynamic Range ² | 83,000:1 | 33,333:1 | 33,333:1 | 50,000:1 | 50,000:1 | 100,000:1 |
| Fill Factor (%) | 100 | 100 | 100 | 100 | 100 | 100 |

F= front-illuminated; B= back-illuminated; FT= frame transfer. All parameters are typical; for the Back illuminated sensors, they are referred to the broadband coating model (even uncoated, midcoated and UV coated versions are available).

¹ All the sensors operate in Advanced Inverted Mode Operation (AIMO), except CCD 77-00 B(F), that operates in Inverted Mode Operation (IMO)

² Dynamic range is the ratio of readout noise to full well capacity measured at 253 K and 20 kHz readout speed

Filter Wheel

Pictures of the Filter Wheel



RPF6 is a motorized filter wheel, which has six different holders for filters of 1¼". It has been designed to be driven directly from VISTA, the software that controls the cameras, but it is also supplied with a separated control program for all Windows systems. There are two different connection systems: by means of RS232 or by means of the parallel port.

It is possible to set the rotation speed and a different stop position for each filter. The motor hold current is user adjustable.

This product can be customized, specifying different size, number of filters, input or output adapters.

The typical applications are Photometry, Microscopy and colour sequences.

Specifications

| | | | |
|--------------------------|-----------------|---------------------|---|
| Positioning speed | 0.2 s | Number of positions | 6 (an 8 position version is also available) |
| Standard mount | 1+1/4" | Speed control | Yes |
| Serial interface | RS232 4800 Baud | Parallel interface | 4 bit input, 1 bit output |
| Maximum filter thickness | 8 mm | Backfocus | 30 mm |
| Power supply | 12V 500mA (max) | Dimension | dia 140 mm |

The standard system includes:

- assembled unit in light alloy with threaded 31.75 input;
- RS232/Parallel interface;
- 2.5 m PC parallel link cable;



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- managing software for Windows 95/98/ME/XP/2000;
- 230/115V power supply;
- case, manual with test report and 24 months of warranty.

Options

RGB-6 31.7 mm RGB interference filter kit

NIK-6 Adapter for Nikon lens

MIN-6 Adapter for 42x1 mm lens

ARH-6 Adapter for HiRes

ARI-6 Adapter for DISCOVERY, iCAM

PAR-6 Standard parallel port link cable