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# Ultrafast Phenomena Related Products for Femtosecond Systems



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Developed by **Altechna**

# Optics Set for Ti:Sapphire and Ytterbium Based Lasers

(For fundamental wavelengths  $\lambda = 760-840$  or  $1020-1040$  nm and their harmonics)

Optics set for titanium sapphire and ytterbium based lasers is a perfect combination of optical components and accessories suitable for femtosecond applications. Set consists of dielectric coated, polarizing optics, laser and non-linear crystals and laser accessories. Usually, all the items are from stock.

## Dielectric coated optics

|                         |   |
|-------------------------|---|
| Substrate material      | UVFS  |
| Diameter                | $\varnothing 25.4 \times 5$ mm ( $\varnothing 12.7 \times 2$ mm also available) |
| Angle                   | 45° (0° by request)   |
| Adhesion and durability | Per MIL-C-675A  |
| Clear aperture          | >90% of diameter  |
| Surface quality         | 20-10 S-D   |
| Surface flatness        | $< \lambda/8 @ 632.8$ nm  |
| Diameter tolerance      | +0.0/-0.1 mm  |
| Thickness tolerance     | $\pm 0.1$ mm  |
| Chamfer                 | 0.3 mm @ 45° typical  |
| Parallelism             | <1 arcmin   |
| Laser damage threshold  | >500 mJ/cm <sup>2</sup> for 300 fs @ 1030 nm                                    |



| Low GDD Ultrafast Mirrors |                                     |        |          |
|---------------------------|-------------------------------------|--------|----------|
| Product ID                | Wavelength of coating, nm           | AOI, ° | Price, € |
| 1-OS-2-0254-5-[1P45-GDD]  | $R_{avg} > 99.5\% @ 1000 - 1060$ nm | 45     | 74       |
| 1-OS-2-0254-5-[1K45-GDD]  | $R_{avg} > 99.5\% @ 760 - 840$ nm   | 45     | 76       |
| 1-OS-2-0254-5-[1E45-GDD]  | $R_{avg} > 99.5\% @ 500 - 532$ nm   | 45     | 76       |
| 1-OS-2-0254-5-[1C45-GDD]  | $R_{avg} > 99.5\% @ 380 - 420$ nm   | 45     | 63       |
| 1-OS-2-0254-5-[1B45-GDD]  | $R_{avg} > 99.5\% @ 340 - 370$ nm   | 45     | 76       |
| 1-OS-2-0254-5-[1A45-GDD]  | $R_{avg} > 99.5\% @ 250 - 270$ nm   | 45     | 76       |

| Low loss HR mirrors       |   |        |          |
|---------------------------|---|--------|----------|
| Product ID                | Wavelength of coating, nm                           | AOI, ° | Price, € |
| 1-OS-2-0254-5-[1PR45-IBS] | $R_s > 99.995\%$ , $R_p > 99.95\% @ 1030 - 1060$ nm | 45     | 140      |
| 1-OS-2-0254-5-[1K45-IBS]  | $R_s > 99.995\%$ , $R_p > 99.95\% @ 800$ nm         | 45     | 135      |
| 1-OS-2-0254-5-[1F45-IBS]  | $R_s > 99.99\%$ , $R_p > 99.9\% @ 515 - 532$ nm     | 45     | 115      |
| 1-OS-2-0254-5-[1C45-IBS]  | $R_s > 99.95\%$ , $R_p > 99.8\% @ 400$ nm           | 45     | 125      |
| 1-OS-2-0254-5-[1B45-IBS]  | $R_s > 99.9\%$ , $R_p > 99.7\% @ 343 - 355$ nm      | 45     | 155      |

| Gires-Tournois Interferometer Mirrors (GTI) |                                    |                              |        |          |
|---|------------------------------------|------------------------------|--------|----------|
| Product ID                                  | Wavelength of coating, nm          | Average GDD, fs <sup>2</sup> | AOI, ° | Price, € |
| 1-OS-2-0254-5-1000-[10B00]                  | $R_{sp} > 99.8\% @ 1010 - 1080$ nm | -1000                        | 0-10   | 390      |
| 1-OS-2-0254-5-600-[10B00]                   | $R_{sp} > 99.8\% @ 1010 - 1080$ nm | -600                         | 0-10   | 390      |
| 1-OS-2-0254-5-400-[10B00]                   | $R_{sp} > 99.8\% @ 1010 - 1080$ nm | -400                         | 0-10   | 390      |
| 1-OS-2-0254-5-200-[10B00]                   | $R_{sp} > 99.8\% @ 1010 - 1080$ nm | -200                         | 0-10   | 390      |
| 1-OS-2-0254-5-400-[10A00]                   | $R_{sp} > 99.8\% @ 700 - 900$ nm   | -400                         | 0-10   | 390      |
| 1-OS-2-0254-5-250-[10A00]                   | $R_{sp} > 99.8\% @ 700 - 900$ nm   | -250                         | 0-10   | 390      |
| 1-OS-2-0254-5-150-[10A00]                   | $R_{sp} > 99.8\% @ 700 - 900$ nm   | -150                         | 0-10   | 390      |

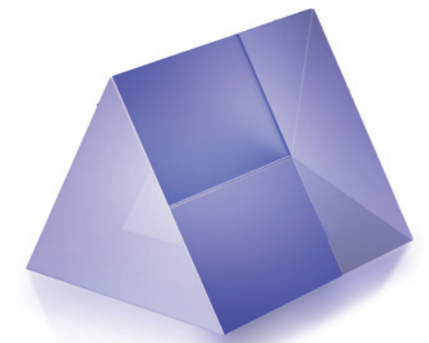
| Non-polarizing Plate Beamsplitters |   |                          |        |          |
|------------------------------------|---|--------------------------|--------|----------|
| Product ID                         | Wavelength of coating, nm                   | Reflectivity (Rs, Rp), % | AOI, ° | Price, € |
| 1-OS-2-0254-5-[4G45-50]            | 1025 - 1095 nm (GDD < 100 fs <sup>2</sup> ) | 50                       | 45     | 220      |
| 1-OS-2-0254-5-[4F45-50]            | 770 - 830 nm (GDD < 75 fs <sup>2</sup> )    | 50                       | 45     | 220      |
| 1-OS-2-0254-5-[4D45-50]            | 515 - 532 nm                                | 50                       | 45     | 175      |
| 1-OS-2-0254-5-[4C45-50]            | 390 - 410 (GDD < 20 fs <sup>2</sup> )       | 50                       | 45     | 155      |

| Laser Output Coupler     |   |        |          |
|--------------------------|---|--------|----------|
| Product ID               | Wavelength of coating, nm                 | AOI, ° | Price, € |
| 1-OS-2-0254-5-[3F100-70] | $R_{avg} > 70 \pm 3\% @ 760 - 840$ nm     | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3H100-70] | $R_{avg} > 70 \pm 3\% @ 1020 - 1070$ nm   | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3F100-80] | $R_{avg} > 80 \pm 3\% @ 760 - 840$ nm     | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3H100-80] | $R_{avg} > 80 \pm 3\% @ 1020 - 1070$ nm   | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3F100-90] | $R_{avg} > 90 \pm 2\% @ 760 - 840$ nm     | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3H100-90] | $R_{avg} > 90 \pm 2\% @ 1020 - 1070$ nm   | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3F100-95] | $R_{avg} > 95 \pm 1\% @ 760 - 840$ nm     | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3H100-95] | $R_{avg} > 95 \pm 1\% @ 1020 - 1070$ nm   | 0 - 5  | 87       |
| 1-OS-2-0254-5-[3F100-97] | $R_{avg} > 97 \pm 1\% @ 760 - 840$ nm     | 0 - 5  | 90       |
| 1-OS-2-0254-5-[3H100-97] | $R_{avg} > 97 \pm 1\% @ 1020 - 1070$ nm   | 0 - 5  | 90       |
| 1-OS-2-0254-5-[3F100-98] | $R_{avg} > 98 \pm 1\% @ 760 - 840$ nm     | 0 - 5  | 90       |
| 1-OS-2-0254-5-[3H100-98] | $R_{avg} > 98 \pm 1\% @ 1020 - 1070$ nm   | 0 - 5  | 90       |
| 1-OS-2-0254-5-[3F100-99] | $R_{avg} > 99 \pm 0.5\% @ 760 - 840$ nm   | 0 - 5  | 95       |
| 1-OS-2-0254-5-[3H100-99] | $R_{avg} > 99 \pm 0.5\% @ 1020 - 1070$ nm | 0 - 5  | 95       |

## Brewster Angle Dispersing Prisms for Ultrashort Pulses

|                      |                |
|----------------------|----------------|
| Angle Tolerance      | $\pm 3$ arcmin |
| Clear Aperture       | >80%           |
| Dimension Tolerances | +0.0/-0.2 mm   |
| Protective chamfers  | <0.25 mm x 45° |
| Dimensions           | 25.4 x 25.4 mm |

| Product ID   | Material | Apex Angle, ° | Price, € |
|--------------|----------|---------------|----------|
| 1-BDP-2-0254 | UVFS     | 69.06         | 87       |
| 1-BDP-3-0254 | SF10     | 60.60         | 87       |
| 1-BDP-4-0254 | LaKL21   | 63.00         | 87       |



## Crystalline Quartz Waveplates

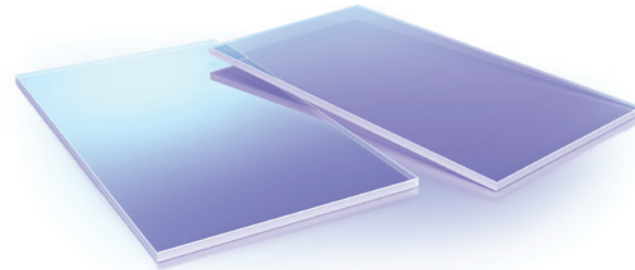
|                        |  |
|------------------------|--|
| Material               | Crystalline quartz   |
| Diameter               | $\varnothing 25.4$ mm (up to $\varnothing 80$ mm also available) |
| Dimension tolerance    | +0.0/-0.12 mm  |
| AR coatings            | $R < 0.2\%$ @ each surface                                       |
| Retardation tolerance  | $\lambda/300 @ 20^\circ\text{C}$                                 |
| Wavefront distortion   | $\lambda/10 @ 632.8$ nm  |
| Clear aperture         | >18 mm   |
| Surface quality        | 20-10 S-D  |
| Parallelism            | <3 arcsec  |
| Laser damage threshold | >1 J/cm <sup>2</sup> for 300 fs @ 1030 nm                        |
| Mounting               | Mounted in 25.4 mm anodized metal mount                          |

| Product ID | Wavelength, nm | Retardation | Price, € |
|------------|----------------|-------------|----------|
| ZO-1030-2  | 1030           | $\lambda/2$ | 210      |
| ZO-0800-2  | 800            | $\lambda/2$ | 210      |
| ZO-0515-2  | 515            | $\lambda/2$ | 210      |
| ZO-0400-2  | 400            | $\lambda/2$ | 210      |
| ZO-0343-2  | 343            | $\lambda/2$ | 210      |
| ZO-0258-2  | 258            | $\lambda/2$ | 210      |
| ZO-1030-4  | 1030           | $\lambda/4$ | 210      |
| ZO-0800-4  | 800            | $\lambda/4$ | 210      |
| ZO-0515-4  | 515            | $\lambda/4$ | 210      |
| ZO-0343-4  | 343            | $\lambda/4$ | 210      |
| ZO-0400-4  | 400            | $\lambda/4$ | 210      |
| ZO-0258-4  | 258            | $\lambda/4$ | 210      |



## Brewster Type Thin Film Polarizers

|                             |  |
|-----------------------------|--|
| Substrate material          | UVFS   |
| Dimensions                  | 20 x 40 mm (ø25,4 x 5 mm also available)     |
| Dimensions tolerance        | +0.0/-0.12 mm                                |
| Thickness                   | 5 mm   |
| Thickness tolerance         | ±0.2 mm                                      |
| Clear aperture              | >90% of diameter                             |
| Surface quality             | 20-10 S-D                                    |
| Wavefront distortion        | $\lambda/8$ @ 632.8 nm                       |
| Parallelism error           | <30 arcsec                                   |
| Extinction ratio, $T_p/T_s$ | >200:1                                       |
| Typical transmission        | $T_p > 95\%$                                 |
| Typical reflection          | $R_s > 99.5\%$                               |
| Laser damage threshold      | >500 mJ/cm <sup>2</sup> for 300 fs @ 1030 nm |



| Product ID        | Wavelength, nm                | Price, € |
|-------------------|-------------------------------|----------|
| 2-BFP-1030-2040   | 1020 - 1040 (centered @ 1030) | 150      |
| 2-BFP-0800-A-2040 | 780 - 820 (centered @ 800 nm) | 160      |
| 2-BFP-0515-2040   | 515                           | 130      |
| 2-BFP-0400-2040   | 400                           | 130      |
| 2-BFP-0343-2040   | 343                           | 170      |

## Achromatic (Broadband) Waveplates

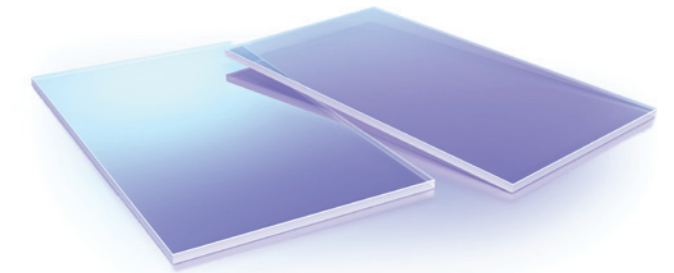
|                        |   |
|------------------------|---|
| Material               | Quartz + MgF <sub>2</sub>                           |
| Dimension tolerance    | +0.0/-0.2 mm  |
| Retardation tolerance  | $\lambda/100$                                       |
| Clear aperture         | >18 mm  |
| Wavefront distortion   | $\lambda/4$ @ 632.8 nm                              |
| Surface Quality        | 40-20 S-D   |
| Parallelism error      | <30 arcsec  |
| Laser damage threshold | 5 J/cm <sup>2</sup> 10 ns pulsed at 1064 nm typical |
| AR coatings            | BBAR coated by default                              |
| Mounting               | Mounted in ø25.4x6 mm black anodized metal mount    |



| Product ID     | Wavelength, nm | Retardation | Price, € |
|----------------|----------------|-------------|----------|
| 2-APW-L/2-018D | 900 - 2100     | $\lambda/2$ | 640      |
| 2-APW-L/2-018C | 650 - 1100     | $\lambda/2$ | 640      |
| 2-APW-L/2-018B | 550 - 750      | $\lambda/2$ | 640      |
| 2-APW-L/2-018A | 450 - 650      | $\lambda/2$ | 640      |
| 2-APW-L/4-018D | 900 - 2100     | $\lambda/4$ | 640      |
| 2-APW-L/4-018C | 650 - 1100     | $\lambda/4$ | 640      |
| 2-APW-L/4-018B | 550 - 750      | $\lambda/4$ | 640      |
| 2-APW-L/4-018A | 450 - 650      | $\lambda/4$ | 640      |

## High Contrast Thin Film Polarizers

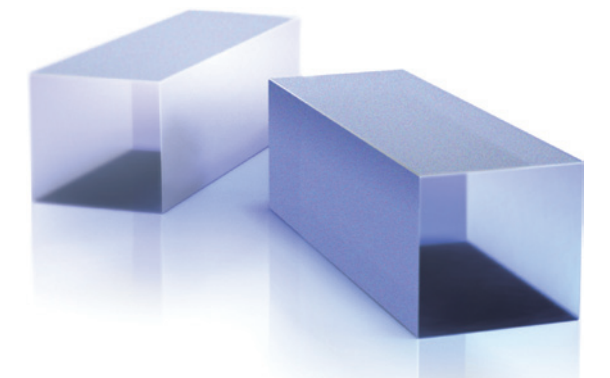
|                        |   |
|------------------------|---|
| Dimensions             | ø25.4 x 5   |
| Clear Aperture         | >90%  |
| Diameter Tolerance     | +0.0/-0.12 mm   |
| Laser Damage Threshold | >10 J/cm <sup>2</sup><br>for 10 ns pulses @ 1064 nm typical |
| Parallelism            | <30 arcsec  |
| Substrate Material     | UVFS  |
| Surface Quality        | 20-10 S-D   |
| Thickness Tolerance    | ±0.2 mm   |



| Product ID        | Wavelength, nm | Coating GDD   | Transmission                   | Price, € |
|-------------------|----------------|---|--------------------------------|----------|
| 2-HCTFP-1030-0254 | 1030           | GDD(s-pol)<200 fs <sup>2</sup> GDD(p-pol)<500 fs <sup>2</sup> | $T_p > 99\%$ , $T_s < 0.1\%$   | 200      |
| 2-HCTFP-0800-0254 | 800            | GDD(s-pol)<200 fs <sup>2</sup> GDD(p-pol)<400 fs <sup>2</sup> | $T_p > 99\%$ , $T_s < 0.1\%$   | 180      |
| 2-HCTFP-0515-0254 | 515            | GDD(s-pol)<100 fs <sup>2</sup> GDD(p-pol)<300 fs <sup>2</sup> | $T_p > 99\%$ , $T_s < 0.1\%$   | 165      |
| 2-HCTFP-0400-0254 | 400            | GDD(s-pol)<100 fs <sup>2</sup> GDD(p-pol)<300 fs <sup>2</sup> | $T_p > 98\%$ , $T_s < 0.1\%$   | 165      |
| 2-HCTFP-0343-0254 | 343            | GDD(s-pol)<50 fs <sup>2</sup> GDD(p-pol)<80 fs <sup>2</sup>   | $T_p > 97.5\%$ , $T_s < 0.1\%$ | 180      |

## BBO Crystals

|                                   |  |
|-----------------------------------|--|
| Aperture Tolerance                | +0.0/-0.1 mm                                       |
| Laser Damage Threshold            | >0.5 GW/cm <sup>2</sup> for 10 ns pulses @ 1064 nm |
| Length Tolerance                  | +0.0/-0.1 mm                                       |
| Orientation Accuracy of Cut Angle | <30 arcmin   |
| Parallelism                       | <20 arcsec   |
| Perpendicularity                  | <5 arcmin  |
| Surface Flatness                  | $\lambda/8$ @ 632.8 nm                             |
| Surface Quality                   | 10-5 S-D   |
| Transparency Range                | 189 - 3500 nm                                      |



| Product ID   | Aperture, mm | Application   | Orientation $\Theta / \phi, ^\circ$ | Length, mm | Protective coatings S1/S2, nm/nm | Price, € |
|--------------|--------------|---------------|-------------------------------------|------------|----------------------------------|----------|
| 4-BBO-0605-2 | 6 x 6        | SHG @ 1030 nm | 23.4/90                             | 0.5        | 515 + 1030 / 515 + 1030          | 490      |
| 4-BBO-0610-2 | 6 x 6        | SHG @ 1030 nm | 23.4/90                             | 1          | 515 + 1030 / 515 + 1030          | 420      |
| 4-BBO-0615-2 | 6 x 6        | SHG @ 1030 nm | 23.4/90                             | 1.5        | 515 + 1030 / 515 + 1030          | 465      |
| 4-BBO-1005-2 | 10 x 10      | SHG @ 1030 nm | 23.4/90                             | 0.5        | 515 + 1030 / 515 + 1030          | 650      |
| 4-BBO-1010-2 | 10 x 10      | SHG @ 1030 nm | 23.4/90                             | 1          | 515 + 1030 / 515 + 1030          | 610      |
| 4-BBO-1015-2 | 10 x 10      | SHG @ 1030 nm | 23.4/90                             | 1.5        | 515 + 1030 / 515 + 1030          | 695      |
| 4-BBO-0601-0 | 6 x 6        | SHG @ 800 nm  | 29.2/90                             | 0.1        | 400 - 800 / 400 - 800            | 455      |
| 4-BBO-0601-1 | 6 x 6        | THG @ 800 nm  | 44.3/90                             | 0.1        | 400 - 800 / 266                  | 455      |
| 4-BBO-0602-0 | 6 x 6        | SHG @ 800 nm  | 29.2/90                             | 0.2        | 400 - 800 / 400 - 800            | 455      |
| 4-BBO-0602-1 | 6 x 6        | THG @ 800 nm  | 44.3/90                             | 0.2        | 400 - 800 / 266                  | 455      |
| 4-BBO-0605-0 | 6 x 6        | SHG @ 800 nm  | 29.2/90                             | 0.5        | 400 - 800 / 400 - 800            | 360      |
| 4-BBO-0605-1 | 6 x 6        | THG @ 800 nm  | 44.3/90                             | 0.5        | 400 - 800 / 266                  | 360      |
| 4-BBO-0610-0 | 6 x 6        | SHG @ 800 nm  | 29.2/90                             | 1          | 400 - 800 / 400 - 800            | 260      |
| 4-BBO-0610-1 | 6 x 6        | THG @ 800 nm  | 44.3/90                             | 1          | 400 - 800 / 266                  | 260      |
| 4-BBO-1001-0 | 10 x 10      | SHG @ 800 nm  | 29.2/90                             | 0.1        | 400 - 800 / 400 - 800            | 675      |
| 4-BBO-1002-0 | 10 x 10      | SHG @ 800 nm  | 29.2/90                             | 0.2        | 400 - 800 / 400 - 800            | 675      |
| 4-BBO-1005-0 | 10 x 10      | SHG @ 800 nm  | 29.2/90                             | 0.5        | 400 - 800 / 400 - 800            | 610      |
| 4-BBO-1010-0 | 10 x 10      | SHG @ 800 nm  | 29.2/90                             | 1          | 400 - 800 / 400 - 800            | 575      |



## LBO Crystals

|                                   |  |
|-----------------------------------|--|
| Length                            | 0.9 mm (other lengths also available)                |
| Aperture Tolerance                | +0.0/-0.1 mm   |
| Laser Damage Threshold            | >10 GW/cm <sup>2</sup><br>for 10 ns pulses @ 1064 nm |
| Length Tolerance                  | +0.0/-0.1 mm   |
| Orientation Accuracy of Cut Angle | <30 arcmin   |
| Parallelism                       | <20 arcsec   |
| Perpendicularity                  | <5 arcmin  |
| Surface Flatness                  | $\lambda/8$ @ 632.8 nm                               |
| Surface Quality                   | 10-5 S-D   |
| Transparency Range                | 160 - 2800 nm  |



| Product ID   | Aperture, mm | Application   | Orientation $\Theta/\phi, ^\circ$ | Protective coatings S1/S2, nm/nm | Price,€ |
|--------------|--------------|---------------|-----------------------------------|----------------------------------|---------|
| 4-LBO-0609-2 | 6 x 6        | SHG @ 1030 nm | 90/13.8                           | 515 + 1030 / 515 + 1030          | 490     |
| 4-LBO-0809-2 | 8 x 8        | SHG @ 1030 nm | 90/13.8                           | 515 + 1030 / 515 + 1030          | 625     |
| 4-LBO-1009-2 | 10 x 10      | SHG @ 1030 nm | 90/13.8                           | 515 + 1030 / 515 + 1030          | 650     |
| 4-LBO-1209-2 | 12 x 12      | SHG @ 1030 nm | 90/13.8                           | 515 + 1030 / 515 + 1030          | 940     |
| 4-LBO-2009-2 | 20 x 20      | SHG @ 1030 nm | 90/13.8                           | 515 + 1030 / 515 + 1030          | 2495    |

## Ti:Sapphire Crystals

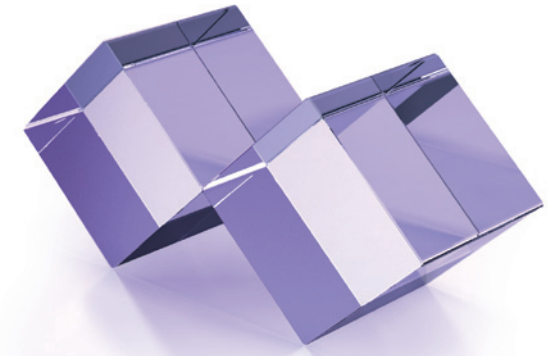
|                                       |                                   |
|---------------------------------------|-----------------------------------|
| Absorption @ 532 nm on crystal length | >90%                              |
| Dimension Tolerances                  | $\pm 0.1$ mm                      |
| Flatness                              | $<\lambda/10$ @ 632.8 nm over CA  |
| Length Tolerance                      | $\pm 0.1$ mm                      |
| Maximal size                          | 50 x 50 x 50 mm                   |
| Orientation                           | Optical axis C normal to rod axis |
| Parallelism                           | <30 arcsec                        |
| Protective chamfers                   | <0.1 mm x 45°                     |
| Surface Quality                       | 10-5 S-D                          |
| Ti2O3 Concentration                   | 0.03 - 0.25 wt. %                 |
| Transmitted Wavefront Distortion      | $<\lambda/4$ @ 632.8 nm over CA   |



| Product ID  | Aperture, mm    | AR coatings                               | End surfaces    | FOM  | Length, mm | Price,€ |
|-------------|-----------------|---|-----------------|------|------------|---------|
| 3-TS-0-0605 | $\varnothing 6$ | (R<1%) @ 532 nm + (R<0.3%) @ 780 - 820 nm | Right-angle cut | >120 | 5          | 970     |
| 3-TS-0-0610 | $\varnothing 6$ | (R<1%) @ 532 nm + (R<0.3%) @ 780 - 820 nm | Right-angle cut | >150 | 10         | 1020    |
| 3-TS-0-0615 | $\varnothing 6$ | (R<1%) @ 532 nm + (R<0.3%) @ 780 - 820 nm | Right-angle cut | >150 | 15         | 1100    |
| 3-TS-0-6605 | 6 x 6           | (R<1%) @ 532 nm + (R<0.3%) @ 780 - 820 nm | Right-angle cut | >120 | 5          | 970     |
| 3-TS-0-6610 | 6 x 6           | (R<1%) @ 532 nm + (R<0.3%) @ 780 - 820 nm | Right-angle cut | >150 | 10         | 1020    |
| 3-TS-0-6615 | 6 x 6           | (R<1%) @ 532 nm + (R<0.3%) @ 780 - 820 nm | Right-angle cut | >150 | 15         | 1100    |
| 3-TS-1-0605 | $\varnothing 6$ | none                                      | Brewster cut    | >120 | 5          | 970     |
| 3-TS-1-0610 | $\varnothing 6$ | none                                      | Brewster cut    | >150 | 10         | 1020    |
| 3-TS-1-0615 | $\varnothing 6$ | none                                      | Brewster cut    | >150 | 15         | 1100    |
| 3-TS-1-6605 | 6 x 6           | none                                      | Brewster cut    | >120 | 5          | 970     |
| 3-TS-1-6610 | 6 x 6           | none                                      | Brewster cut    | >150 | 10         | 1020    |
| 3-TS-1-6615 | 6 x 6           | none                                      | Brewster cut    | >150 | 15         | 1100    |

## Yb:KGW and Yb:KYW Crystals

|                      |  |
|----------------------|--|
| Aperture             | 5 x 5 mm   |
| Dopant Concentration | 0.5 - 5 atm. % for Yb:KGW 0.5 - 100 atm. % for Yb:KYW                                    |
| Flatness             | $\lambda/10$ @ 632.8 nm  |
| Orientation          | b-cut: Nm-axis is parallel to input/ output faces<br>(other orientations also available) |
| Parallelism Error    | $\leq 10$ arcsec   |
| Perpendicularity     | $\leq 10$ arcmin   |
| Protective chamfers  | <0.1 mm @ 45°  |
| Surface Quality      | 10-5 S-D   |



| Product ID         | Coatings            | Material    | End surfaces       | Length, mm | Price,€ |
|--------------------|---------------------|-------------|--------------------|------------|---------|
| 3-YB10KYW-01/02/03 | 2AR @ 980 - 1080 nm | Yb(10%):KYW | Right-angle cut    | 1 / 2 / 3  | 700     |
| 3-YB10KYW-04/05/06 | none                | Yb(10%):KYW | Brewster-angle cut | 1 / 2 / 3  | 740     |
| 3-YB1KGW-01/02/03  | 2AR @ 980 - 1080 nm | Yb(1%):KGW  | Right-angle cut    | 2 / 3 / 5  | 700     |
| 3-YB1KGW-04/05/06  | none                | Yb(1%):KGW  | Brewster-angle cut | 2 / 3 / 5  | 740     |
| 3-YB20KYW-01/02/03 | 2AR @ 980 - 1080 nm | Yb(20%):KYW | Right-angle cut    | 1 / 2 / 3  | 700     |
| 3-YB20KYW-04/05/06 | none                | Yb(20%):KYW | Brewster-angle cut | 1 / 2 / 3  | 740     |
| 3-YB3KGW-01/02/03  | 2AR @ 980 - 1080 nm | Yb(3%):KGW  | Right-angle cut    | 1 / 3 / 5  | 700     |
| 3-YB3KGW-04/05/06  | none                | Yb(3%):KGW  | Brewster-angle cut | 1 / 3 / 5  | 740     |
| 3-YB5KGW-01/02/03  | 2AR @ 980 - 1080 nm | Yb(5%):KGW  | Right-angle cut    | 1 / 2 / 3  | 700     |
| 3-YB5KGW-04/05/06  | none                | Yb(5%):KGW  | Brewster-angle cut | 1 / 2 / 3  | 740     |

## Tunable Laser Beam Expanders

|                                |   |
|--------------------------------|---|
| Housing material               | black anodized aluminium                |
| Mounting                       | M27 x 1                                 |
| Laser Damage Threshold         | >5 J/cm <sup>2</sup> , 10 ns, @ 1064 nm |
| Lens material                  | UVFS                                    |
| Each lens wavefront distortion | $<\lambda/4$ @ 632.8 nm                 |
| Transmission                   | 97%                                     |



| Product ID | Expansion | Exit aperture, mm | Input aperture, mm | Wavelength, nm     | Price,€ |
|------------|-----------|-------------------|--------------------|--------------------|---------|
| 6-BE-Tx    | 1.5X - 5X | 30                | 8                  | 343 or 515 or 1030 | 1250    |
| 6-BE-Tx    | 2X - 8X   | 36                | 11                 | 343 or 515 or 1030 | 1290    |
| 6-BE-Tx    | 1.5X - 5X | 30                | 8                  | 800 + 400          | 1450    |
| 6-BE-Tx    | 2X - 8X   | 36                | 11                 | 800 + 400          | 1450    |

## MOTEX - Motorized Tunable Beam Expanders

|                                     |                                   |                      |
|-------------------------------------|-----------------------------------|----------------------|
| Continuously variable magnification | 2.5x...12x                        | Wavelength range, nm |
| Material                            | BK7 or UVFS                       |                      |
| Control interfaces                  | USB                               | 1020 - 1070          |
| Supported OS                        | Win XP/2003/Vista/7/8, Linux, MAC | 510 - 540            |
| Input aperture                      | 10 mm                             | 340 - 360            |
| Output aperture                     | 50 mm                             |                      |
| Overall transmission                | 98.5%                             |                      |
| Price                               | on request info@femtolutions.eu   |                      |



## Enhanced Watt Pilot – Attenuator

Attenuation range @ CWL 0.5 – 98% for reflected s-pol beam

Clear aperture 15 mm (up to 50 mm by request)  
 Time dispersion  $t < 4$  fs for 100 fs laser pulse  
 Laser damage threshold  $> 5$  J/cm<sup>2</sup>;  $> 100$  mJ/cm<sup>2</sup> @ 100 fs, 10 Hz, 800 nm



## Motorized Watt Pilot – Attenuator

Motorized Enhanced Watt pilot includes also controller and all the necessary cables.

Specifications of computer controlled device:

Number of steps (360°) 31200  
 Rotation speed 11.54°/s (at 1000 steps/s)  
 Resolution 0.4 mrad/s

| Product ID       | Wavelength, nm                | Price, € | Enhanced version, price, € |
|------------------|-------------------------------|----------|----------------------------|
| 2-EWP-BBR-1030-M | 1020 - 1040 (centered @ 1030) | 1570     | 820                        |
| 2-EWP-R-0800-M   | 800                           | 1470     | 720                        |
| 2-EWP-R-0515-M   | 515                           | 1470     | 720                        |
| 2-EWP-R-0400-M   | 400                           | 1470     | 720                        |

## ultraFAST Watt Pilot – Attenuator

Attenuation range: reflection mode  $R_s \sim 4 - 96\%$ ;  
 reflection contrast mode  $R_s \sim 0.1 - 70\%$ .

Central wavelength 800 or 1030 nm (other available upon request)  
 Clear aperture Standard 15 mm (up to 50 mm are available)  
 Laser damage threshold  $> 5$  J/cm<sup>2</sup> 10 ns, 10 Hz pulses @ 1064 nm;  
 $> 100$  J/cm<sup>2</sup> @ 100 fs, 10 Hz, 800 nm



| Product ID       | Wavelength range, nm | Optimization             | Configuration                                       | Price, € | Manual version, price, € |
|------------------|----------------------|--------------------------|---|----------|--------------------------|
| 2-UWP-R1-1030-M  | 1005 - 1055          | Reflection mode          | $\lambda/2$ ZO waveplate + 2x BB polarizers         | 1970     | 1220                     |
| 2-UWP-R2-1030-M  | 1005 - 1055          | Reflection contrast mode | $\lambda/2$ ZO waveplate + 2x BB polarizers         | 1970     | 1220                     |
| 2-UWPA-R1-1030-M | 980 - 1090           | Reflection mode          | $\lambda/2$ achromatic waveplate + 2x BB polarizers | 2130     | 1380                     |
| 2-UWPA-R2-1030-M | 980 - 1090           | Reflection contrast mode | $\lambda/2$ achromatic waveplate + 2x BB polarizers | 2130     | 1380                     |
| 2-UWP-R1-0800-M  | 775 - 825            | Reflection mode          | $\lambda/2$ ZO waveplate + 2x BB polarizers         | 1970     | 1220                     |
| 2-UWP-R2-0800-M  | 775 - 825            | Reflection contrast mode | $\lambda/2$ ZO waveplate + 2x BB polarizers         | 1970     | 1220                     |
| 2-UWPA-R1-0800-M | 750 - 850            | Reflection mode          | $\lambda/2$ achromatic waveplate + 2x BB polarizers | 2130     | 1380                     |
| 2-UWPA-R2-0800-M | 750 - 850            | Reflection contrast mode | $\lambda/2$ achromatic waveplate + 2x BB polarizers | 2130     | 1380                     |

## Spectacles

Protects from fundamental wavelength ( $\lambda = 1020-1040$  nm) and its harmonics

Product ID: SG-DBY  
 Transmittance in VIS 35%  
 Price 150€

| Spectral range, nm | Optical density |
|--------------------|-----------------|
| 190 - 534          | 7+              |
| 960 - 1064         | 7+              |
| 925 - 1070         | 6+              |
| 850 - 925          | 5+              |

