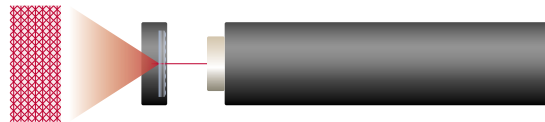


DIFFRACTIVE OPTICAL ELEMENTS (DOE)

Accessories for Laser Modules



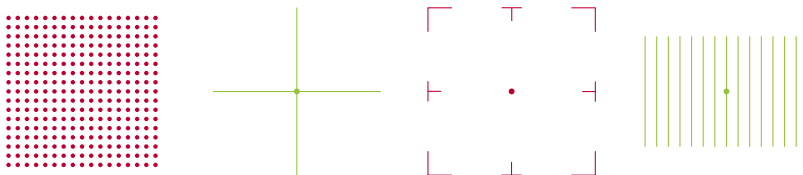
By using a diffractive optical element (DOE) a simple dot laser beam can be transformed into a large variety of patterns and beam shapes. Various pattern are available leading to cross-hair beams, dotted lines and parallel lines or special patterns.

The DOE can be integrated to our standard FLEXPOINT® modules (11.5 mm and 19 mm diameter housing), HD series, ILM12F/ILM12IP and also to the MVmicro.

Besides the integrated DOE a DOE Add-on is available for all FLEXPOINT® modules with 11.5 mm diameter with an elliptical dot beam. A black plastic cap equipped with the DOE can be mounted onto the laser module and is removable for multi-use with different modules.

If you would like to apply a DOE Add-on please make sure you are familiar with the laser class. As a DOE usually distributes the power of a laser beam compared to a dot shaped beam, the output power may be dangerous after removing the Add-on from the laser module.

On the next pages you can find the selection of the available standard DOEs. For customized solutions please contact us. Please pay attention to the design wavelength and optimal wavelength. The values for pattern size and pattern angle may be crucial to distinguish individual points. The pattern size may scale according to the factor calculated from comparing the required working distance and 100 m indicated in the table.



APPLICATIONS

- / Integration into a laser module (not exchangeable) e.g. for cross or multi-dot pattern
- / Add-on for laser module (exchangeable - careful with laser class)
- / Cross-beam: positioning e.g. conveyor belt or medical instruments
- / Multi-dot: Orientation for quality inspection

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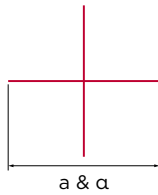
ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



SPECIFICATIONS

Crosshair



Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ a [mm]	Pattern Angle ² α [°]	Image
DOE-205	Cross - 5@650	650	580 - 660	8.7	5	
DOE-212	Cross - 25@532	532	500 - 640	45.1	25.4	
DOE-214	Cross - 2@645	645	600 - 645	3.4	2	
DOE-218	Cross - 15@640	640	500 - 640	26.3	15	
DOE-239	Cross - 5@520	520	488 - 600	8.7	5	
DOE-245	Cross - 10@633	633	570 - 690	17.6	10	
DOE-246	Cross with surrounding high contrast area	633	530 - 670	17.5	10	
DOE-247	Cross - 25@645	645	600 - 800	44.3	25	
DOE-248	Cross - 37@645	645	630 - 700	66.8	37	
DOE-249	Cross - 45@633	633	620 - 700	83	45	
DOE-270	Cross - 30@640	640	590 - 660	53.6	30	
DOE-280	Cross - 60@635	635	580 - 690	115.5	60	

1 @ 100mm Distance (@ Design Wavelength)

2 @ Design Wavelength

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ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)

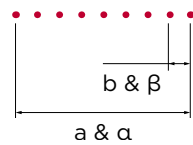


Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ a [mm]	Pattern Angle ² α [°]	Image
DOE-289	Cross - 15@520	520	480 - 550	26.4	15	
DOE-340	Cross - 60@450	450	420 - 520	116.1	60.3	
DOE-342	Cross - 52@515	515	440 - 540	97.6	52	
DOE-299	Cross - 75@650	650	600 - 700	153.5	75	
DOE-382	Cross - 30@450	450	440 - 480	53.6	30	

1 @ 100mm Distance (@ Design Wavelength)

2 @ Design Wavelength

Lines and Dot Lines



Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]		Pattern Angle ² [°]		Image
				a	b	α	β	
DOE-263	1:5 Dot	635	450 - 700	10.5	2.6	6	1.54	
DOE-264	1:9 Dot	670	630 - 780	1.6	0.2	0.9	0.1	
DOE-265	1:19 Dot	650	500 - 540 630 - 690	24	1.3	13.7	0.8	
DOE-266	QC-Line - 5	633	630 - 690	8.7	-	5	-	
DOE-267	QC-Line - 30	532	470 - 560	53.8	-	30.1	-	
DOE-281	1:11 Dot	650	600 - 730	28.9	2.9	16.5	1.6	

1 @ 100mm Distance (@ Design Wavelength)

2 @ Design Wavelength

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ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]		Pattern Angle ² [°]		Image
				a	b	α	β	
DOE-282	1:99 Dot	660	600 - 700	33.7	0.3	19.1	0.2	
DOE-283	QC-Line - 20	633	630 - 670	35	-	20	-	
DOE-286	QC-Line - 30	660	600 - 700	54.6	-	30.5	-	
DOE-287	QC-Line - 45	660	600 - 700	83.9	-	45.5	-	
DOE-337	1:99 Dot	635	600 - 700	49.3	0.5	27.7	0.3	
DOE-364	QC-Line - 45	940	890 - 980	83	-	45	-	
DOE-369	QC-Line - 36	639	600 - 700	65	-	36	-	
DOE-383	QC-Line - 51	840	790 - 880	95	-	50.6	-	

1 @ 100mm Distance (@ Design Wavelength)

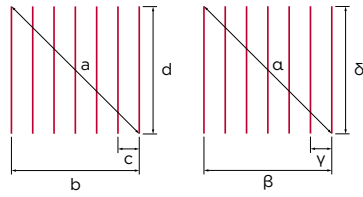
2 @ Design Wavelength

ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



Multi Lines



Item #	Number of lines	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]				Pattern Angle ² [°]				Image
				a	b	c	d	α	β	γ	δ	
DOE-213	11 ^s	635	530 - 670	76.3	54.1	5.4	54.1	41.8	30.3	3	30.3	
DOE-233	7 ^s	635	530 - 670	54	38.2	6.4	38	30	22	3.6	22	
DOE-250	5 ^r	660	590 - 670	55	10.9	2.7	53.9	30	6	1.5	30	
DOE-251	7 ^r	650	590 - 730	15.2	8.8	1.47	12.3	8.7	5.1	0.84	7	
DOE-252	5 ^s	635	530 - 670	43	30	7.5	30	24	17.2	4.3	17.2	
DOE-253	11 ^s (Thin Lines)	635	530 - 670	76	54	5.4	54	42	30	3	30	
DOE-254	25 ^s	660	530 - 670	68.4	48.3	2	48.3	37.7	27.2	1.1	27.2	
DOE-255	65 ^s (Central Line Thicker)	660	530 - 670	45.6	32.2	0.5	32.2	25.7	18.3	0.3	18.3	
DOE-284	41 ^r	660	600 - 700	133.4	104	2.6	78	67.4	54.9	1.4	42.6	
DOE-348	10 ^r	650	600 - 700	125.1	90	10	87.5	64.2	48.5	5.4	47.3	
DOE-350	15 ^r	520	480 - 550	65.5	42.1	3	50.2	36.3	23.8	1.7	28.2	
DOE-381	11 ^r	850	830 - 880	155.6	41.5	4.15	150	75.8	23.5	2.3	74	
DOE-386	3 ^r	520	490 - 550	50.7	8	4	50	28.4	4.6	2.3	28.1	

1 @ 100 mm Distance (@ Design Wavelength)

2 @ Design Wavelength

s Square

r Rectangular

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ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



Item #	Number of lines	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]				Pattern Angle ² [°]				Image
				a	b	c	d	α	β	γ	δ	
DOE-387	5 ^r	520	480 – 560	50.7	8	2	50	28.4	4.6	1.15	28.1	
DOE-391	81 ^r	650	600 – 700	156	124.8	1.6	93.6	75.9	63.9	0.8	50.2	
DOE-392	3 ^r	660	600 – 700	54.7	10.8	5.4	53.6	30.6	6.2	3.1	30	

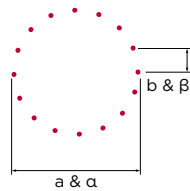
1 @ 100 mm Distance (@ Design Wavelength)

2 @ Design Wavelength

s Square

r Rectangular

Circles and Dot Circles



Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]		Pattern Angle ² [°]		Image
				a	b	α	β	
DOE-219	Solid Line	592	480 – 600	55.8	–	31.2	–	
DOE-220	1:16 Dot	515	480 – 532	81.9	16.1	44.5	9.2	
DOE-221	1:72 Dot	532	400 – 570	36.9	1.6	20.9	0.9	
DOE-229	1:36 Dot	532	480 – 560	6.1	0.5	3.5	0.3	
DOE-238	Solid Line	520	520 – 532	6	–	3.4	–	
DOE-240	1:16 Dot	635	530 – 700	18.9	3.7	10.8	2.1	
DOE-268	Solid Line	488	488 – 532	77	–	42.1	–	

1 @ 100 mm Distance (@ Design Wavelength)

2 @ Design Wavelength

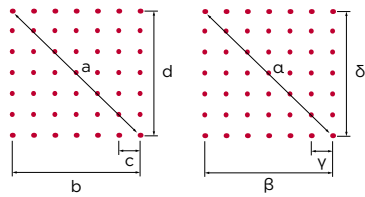
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ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



Dot Matrix



Item #	Dots	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]				Pattern Angle ² [°]				Image
				a	b	c	d	α	β	γ	δ	
DOE-206	17x17	660	590 – 730	38	26.6	1.7	26.6	21.5	15.2	0.9	15.2	
DOE-223	2x2 +1	635	635, 405	28	19.9	19.9	19.9	16.1	11.4	11.4	11.4	
DOE-231	101x101	660	635 – 680	12.8	9.1	0.1	9.1	7	5	0.5	5	
DOE-241	21x21	635	560 – 730	11.9	8.4	0.4	8.4	6.8	4.8	0.2	4.8	
DOE-242	16x16	635	530 – 730	12.4	8.8	0.6	8.8	7.1	5	0.3	5	
DOE-243	17x17	635	550 – 720	12.4	8.8	0.5	8.8	7.1	5	0.3	5	
DOE-244	13x13	635	590 – 670	7.4	5.3	0.4	5.3	4.3	3	0.3	3	
DOE-257	51x51	660	560 – 720	56.9	40.3	0.8	40.3	31.8	22.8	0.5	22.8	
DOE-258	11x11	635	590 – 690	71	50	5	50	39	28	2.8	28	
DOE-339	6x6	635	590 – 690	11.7	8.3	1.7	8.3	6.7	4.7	0.9	4.7	
DOE-351	10x10	532	510 – 600	21.1	14.9	3.3	14.9	23.8	17	1.9	17	
DOE-352	4x6	532	500 – 580	26.6	13.7	4.6	22.8	15.1	7.8	2.6	13.6	
DOE-353	5x5	690	630 – 750	1.1	0.75	0.19	0.75	0.61	0.43	0.11	0.43	

1 @ 100 mm Distance (@ Design Wavelength)

2 @ Design Wavelength

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ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



Item #	Dots	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]				Pattern Angle ² [°]				Image
				a	b	c	d	α	β	γ	δ	
DOE-388	51x51	532	480 – 600	46.8	33.1	0.66	33.1	26.4	18.8	0.38	18.8	
DOE-389	21x21	520	480 – 600	46.8	33.1	1.66	33.1	26.4	18.8	0.95	18.8	

1 @ 100mm Distance (@ Design Wavelength)

2 @ Design Wavelength

Special Pattern

Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]		Pattern Angle ² [°]		Image
DOE-236	Solid Line Square	633	530 – 650	Width: 63.1 Height: 63.1 Diagonal: 89.5		Width: 35 Height: 35 Diagonal: 48.2		
DOE-256	Square Grid 51x51 Lines	660	530 – 660	Width: 40.3 Height: 40.3 Diagonal: 56.9 Line Spacing: 0.8		Width: 22.8 Height: 22.8 Diagonal: 31.8 Angle betw. Lines: 0.45		
DOE-259	5 Rings	545	530 – 700	Width: 51 Line Spacing: 5.1		Width: 29 Line Spacing: 2.8		
DOE-269	10 Rings	515	488 – 532	Width: 96.2 Line Spacing: 4.8		Width: 51.4 Line Spacing: 2.6		
DOE-285	Hexagon	780	520 – 800	Width: 13.1		Width: 7.5		
DOE-354	SquareGrid 10x10 Lines	658	620 – 680	Width: 72.8 Height: 72.8 Diagonal: 102.9 Line Spacing: 8.1		Width: 40 Height: 40 Diagonal: 51.4 Angle betw. Lines: 4		
DOE-396	21x11 Hexagonal Array	660	580 – 730	Width: 61.1 Height: 35.3 Diagonal: 70.5 Line Spacing: 3.5		Width: 34 Height: 20 Diagonal: 38.8 Angle betw. Dots: 2.0		
DOE-397	11x10 Hexagonal Array	660	580 – 730	Width: 44.4 Height: 46.2 Diagonal: 64.1 Line Spacing: 5.1		Width: 25.1 Height: 26 Diagonal: 35.5 Angle betw. Dots: 2.9		

1 @ 100mm Distance (@ Design Wavelength)

2 @ Design Wavelength

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ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



Random Dot Patterns

Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]	Pattern Angle ² [°]	Image
DOE-332	33000-Dot Pseudo-Random Pattern	830	820 – 850	Width: 114.6 Height: 76.3 Diagonal: 136.9	Width: 59.6 Height: 41.7 Diagonal: 68.8	
DOE-335	33000-Dot Pseudo-Random Pattern (46° x 32° @650 nm)	645	630 – 660	Width: 84.8 Height: 56.4 Diagonal: 101.3	Width: 45.9 Height: 31.5 Diagonal: 53.7	
DOE-372	40100-Dot Pseudo-Random Pattern	850	825 – 870	Width: 114.9 Height: 72 Diagonal: 135.6	Width: 59.7 Height: 39.6 Diagonal: 68.3	
DOE-373	31806-Dot Truly-Random	830	800 – 890	Width: 146.9 Height: 118.5 Diagonal: 86.9	Width: 72.6 Height: 61.3 Diagonal: 47.0	
DOE-374	47708-Dot Truly-Random	830	800 – 890	Width: 146.9 Height: 118.5 Diagonal: 86.9	Width: 72.6 Height: 61.3 Diagonal: 47.0	
DOE-375	29594-Dot Pseudo-Random Pattern	830	810 – 850	Width: 118.5 Height: 86.5 Diagonal: 146.7	Width: 61.3 Height: 46.8 Diagonal: 72.5	
DOE-384	51978-Dot Truly-Random	640	610 – 660	Width: 97.5 Height: 130.4 Diagonal: 162.8	Width: 52.0 Height: 66.2 Diagonal: 78.3	
DOE-385	101050-Dot Truly-Random	640	610 – 660	Width: 100.4 Height: 133.9 Diagonal: 167.4	Width: 53.3 Height: 67.6 Diagonal: 79.9	

1 @ 100 mm Distance (@ Design Wavelength)

2 @ Design Wavelength

ACCESSORIES FOR LASER MODULES

Diffraction Optical Elements (DOE)



Viewfinder

Item #	Description	Design Wavelength [nm]	Optimum Wavelength Range [nm]	Pattern Size ¹ [mm]	Pattern Angle ² [°]	Image
DOE-215	Viewfinder	645	570 – 750	Width: 27.0 Height: 17.7 Diagonal: 32.0	Width: 15.5 Height: 10.1 Diagonal: 18.2	
DOE-234	Viewfinder (Lines Square)	633	590 – 730	Width: 61.0 Height: 61.0 Diagonal: 86.0	Width: 34 Height: 34 Diagonal: 47	
DOE-260	Viewfinder (Circle + Cross)	645	570 – 750	Width Cross: 37.0 Circle Ø: 18.3	Width Cross: 21 Circle Ø: 10.5	
DOE-261	Viewfinder (Dot Circle + Cross)	635	570 – 750	Width Cross: 11.0 Circle Ø: 8.8 Dot Spacing: 1.1	Width Cross: 6.3 Circle Ø: 5 Angle betw. Dots: 0.63	
DOE-262	Viewfinder (Dot Square)	532	480 – 670	Width: 12.3 Height: 12.3 Diagonal: 17.4 Dot Spacing: 0.5	Width: 7 Height: 7 Diagonal: 10 Angle betw. Dots: 0.3	
DOE-288	Viewfinder	650	590 – 730	Width: 83.0 Height: 53.7 Diagonal: 98.9	Width: 43.7 Height: 27.9 Diagonal: 52.6	
DOE-345	Viewfinder (Circle + Cross)	520	500 – 540	Width Cross: 49.9 Circle Ø: 24.6	Width Cross: 28.0 Circle Ø: 14.0	
DOE-394	Viewfinder	520	500 – 540	Width: 65.9 Height: 65.9 Diagonal: 93.2	Width: 36.5 Height: 36.5 Diagonal: 50	

1 @ 100 mm Distance (@ Design Wavelength)

2 @ Design Wavelength