

# 2004 Laser Surveys

## Electronic Levels (beam coverage greater than 1,000 feet)

Manufacturer	AGL LASERSOURCE	AGL LASERSOURCE	LaserMark by CST/berger	David White by CST/berger	Laser Reference Inc.	Leica Geosystems	MIKROFYN Positioning Products	MIKROFYN Positioning Products
<b>Model</b>	EAGL 1000	EAGL 20	LMH	3150	L4+	RUGBY 100LR	ML 10x	ML 15i
<b>Date of introduction</b>	1996	2001	Aug-01	Aug-03	Mar-99	Nov-02	2003	2003
<b>Beam type</b>	Infrared	Visible laser diode	650 nm visible laser diode	635 nm visible dual-beam laser diode	633 nm highly visible	780 nm invisible laser diode	650 nm visible	635 nm high powered visible [3]
<b>Beam coverage</b>	2000 ft	2000 ft	up to 2000 ft	up to 2000 ft	2000 ft	2500 ft (770 m) min.	> 1050 ft dia	> 2600 ft dia.
<b>Rotation speed</b>	600 rpm	600 rpm	600 rpm	Variable: 150, 300, 600 rpm	0-450 rpm	300/600 rpm	600 rpm	30/60/180/360/600 rpm + Scan
<b>Compensation or self-leveling type</b>	Pendulum compensator	Electromechanical	Electronic self-leveling	Electronic self-leveling	Compensated self-leveling	Electronic self-leveling	Self-leveling	Self-leveling - (Horizontal & vertical)
<b>Compensation or self-leveling range</b>	± 10 arc minutes (± 1/6°)	± 4% (± 2.2°)	± 5°	± 5°	± 10 arc minutes	± 5°	± 9%	± 9%
<b>Self-leveling speed</b>	N/A		30 seconds	30 seconds		Typical: less than 10 seconds, Max: 30	Typical < 8 seconds	Typical < 8 seconds
<b>Accuracy</b>								
- Degrees	± 7 arc seconds	± 10 arc seconds			± 10 arc seconds	± 10 arc seconds or better	± 10 arc seconds	± 10 arc seconds
- Variance per 100 feet	± 1/20 in	± 1/16 in	± 1/16 in	± 1/8 in	± 1/16 in	± 1/16 (1.5 mm)	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)
<b>Power source</b>	4 D alkaline/NiCAD	6 volt lead acid	4 D alkaline	4 D alkaline	4 C alkaline or rechargeable	4 D alkaline or NiMH rechargeable	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]
<b>Battery life</b>								
- Alkaline	90 hours	N/A	± 70 hours	± 70 hours	60 hours	60 hours		
- Rechargeable	40 hours	35 hours	± 30 hours	± 30 hours	20 hours	35 hours	30 hours	30 hours
<b>Operating temperature</b>	14 to 122° F	14 to 122° F	22 to 120° F	22 to 120° F	0 to 122° F	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)
<b>Water and dust sealed?</b>	Yes	Yes	IPX4	IPX4	Resistant	IPX6	IP67	IP67
<b>Warranty</b>	1 year, 2nd yr opt. \$99 net	2 years, 3rd year opt. \$99 net	2 years	2 years	3 years	2 years (knockdown warranty)	2 years	2 years
<b>Laser Sensor included</b>	Yes	Yes	Yes	Yes	No	Yes	Yes, HS 10	Yes, HS 14 w/ RC radio full 2-way
- Price if purchased separately					\$225	\$150 to \$325	\$315	\$495
<b>Package price</b>	\$1395 alk/\$1530 NiCAD	\$2295	\$995	\$1345	\$995	\$1495 to \$1640	\$1095	\$1995
<b>Reader Service Number</b>	1	2	3	4	5	6	7	8

Manufacturer	MIKROFYN Positioning Products	MIKROFYN Positioning Products	MIKROFYN Positioning Products	SOKKIA	Topcon Positioning Systems Inc.	Trimble	Trimble	Trimble
<b>Model</b>	ML 2H	ML 2	ML 2VD	LP30A	RL-H3A	LL500	LL600	HV601 [1]/HV602 [2]
<b>Date of introduction</b>	1998	1998	1998	Feb-03	Mar-02	Mar-02	May-02	May-02 and Dec-02
<b>Beam type</b>	670 nm visible	670 nm visible	635 nm visible	Infrared laser diode	Visible red laser diode	1mW, 670 nm visible	1mW, 670 nm visible	5mW, 635 nm visible
<b>Beam coverage</b>	> 2600 ft dia	> 2600 ft dia	> 5200 ft dia.	2000 ft dia.	2300 ft (700m)	1600 ft	2600 ft	2600 ft
<b>Rotation speed</b>	300 rpm	300 rpm	300 rpm	600 rpm	600 rpm	600 rpm	600 rpm	0.50-600 rpm
<b>Compensation or self-leveling type</b>			Self-leveling - (Horizontal & vertical)	Compensation	Electronic w/Liquid compensator	Compensation	Electronic self-leveling	Electronic self-leveling
<b>Compensation or self-leveling range</b>	± 18%	± 18%	± 18%	± 10 arc minutes	± 3 degrees	±11 arc minutes	5°	5°
<b>Self-leveling speed</b>	Typical < 8 seconds	Typical < 8 seconds	Typical < 8 Seconds	N/A	.5 degree per second	Instant when roughly leveled	10°/minute	10°/minute
<b>Accuracy</b>								
- Degrees	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds	± 7 arc seconds	± 8 arc seconds	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds
- Variance per 100 feet	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)	1/24 in	3/64 in (1.3mm)	±1/16 in	± 1/16 per 100 ft	± 1/16 per 100 ft
<b>Power source</b>	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]	4 D alkaline or NiCd	4 D cells	Alkaline or NiCad	Alkaline, NiCd or NiMH	Alkaline, NiCd or NiMH
<b>Battery life</b>								
- Alkaline				90 hours	120 hours	55 hours	50 hours	50/30 hours
- Rechargeable	30 hours	30 hours	30 hours	40 hours	60 hours	40 hours	50 hours	50/30 hours
<b>Operating temperature</b>	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	14 to 122° F	-4 to 122° F (-20° to 50° C)	-20 to 50° C	-20 to 50° C	-20 to 50° C
<b>Water and dust sealed?</b>	IP67	IP67	IP67	IPX4	Yes	Yes	Yes	Yes
<b>Warranty</b>	2 years	2 years	2 years	1 year	2 years	2 years	2 years use and abuse	1 year
<b>Laser Sensor included</b>	Yes, HS 10	Yes, HS 10	Yes, HS 10	Yes	LS-70B [1]	Yes	Yes	No/yes
- Price if purchased separately	\$315	\$315	\$315	\$285	\$365 [2]	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative
<b>Package price</b>	\$2395	\$2695	\$2995	\$1495	\$1695	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative
<b>Reader Service Number</b>	9	10	11	12	13	14	15	16

Numbers in brackets refer to notes (see page 42).

## Electronic Levels (beam coverage up to 1,000 feet)

Manufacturer	AGL LASERSOURCE	LaserMark by CST/berger	David White by CST/berger	Laser Reference, Inc.	Laser Reference Inc.	Leica Geosystems
<b>Model</b>	EAGL 400	LM1000	AEL 900	L4	L5	RUGBY 100
<b>Date of introduction</b>	1996	Mar-03	Jun-98	Aug-97	May-00	Feb-02
<b>Beam type</b>	Infrared	Visible dual-beam 635 nm laser diode	Visible dual-beam 635 nm laser diode	670 nm visible, use with receiver only	635 nm highly visible	635 nm visible laser diode
<b>Beam coverage</b>	1000 ft	1000 ft	1000 ft	1500 ft	1000 ft	1000 ft (305 m) min.
<b>Rotation speed</b>	600 rpm	Variable: 150, 300, 600, 1000 rpm	0-600 rpm	600 rpm	0-450 rpm	300/600 rpm
<b>Compensation or self-leveling type</b>	Pendulum compensator	Compensated	Compensated	Compensated self-leveling	Compensated self-leveling	Electronic self-leveling
<b>Compensation or self-leveling range</b>	± 10 arc minutes (± 1/6°)	± 5°	60 arc minutes	10 arc minutes	10 arc minutes	± 5°
<b>Self-leveling speed</b>	N/A	3 seconds	10 seconds			Typical: <10 seconds, Max: 30
<b>Accuracy</b>						
- Degrees	± 10 arc seconds		± 11 arc seconds	10 arc seconds	30 arc seconds	± 18 arc seconds or better
- Variance per 100 feet	± 1/16 in	± 1/8 in	± 1/16 in	± 1/16 in	± 3/16 in	± 3/32 in (2.6 mm)
<b>Power source</b>	4 D alkaline/NiCAD pack	Ni-CAD pack	4 C alkaline	4C alkaline or rechargeable	2 D alkaline or rechargeable	4 D alkaline or NiMH rechargeable
<b>Battery life</b>						
- Alkaline	90 hours	N/A	40 hours	70 hours continuous	70 hours continuous	60 hours
- Rechargeable	40 hours	12+ hours		24 hours continuous	24 hours continuous	35 hours
<b>Operating temperature</b>	14 to 122° F	22 to 120° F	22 to 120° F	0 to 122° F	0 to 122° F	-4 to 122° F (-20 to 50° C)
<b>Water and dust sealed?</b>	Yes	IPX4	IPX4	Resistant	Resistant	IPX6
<b>Warranty</b>	1 year, 2nd yr. opt. \$99 net	1 year	2 years	3 years	1 year	2 years (knockdown warranty)
<b>Laser Sensor included</b>	Yes	Yes	Yes	Yes, R7	Depends on package	Yes
- Price if purchased separately				\$225	\$150	\$150 to \$325
<b>Package price</b>	\$1145 alk/\$1280 NiCAD	\$695	\$1299	\$995	\$649	\$1125 to \$1445
<b>Reader Service Number</b>	17	18	19	20	21	22

Manufacturer	Leica Geosystems	SOKKIA	SOKKIA	SOKKIA	Topcon Positioning Systems Inc.	Topcon Positioning Systems Inc.
<b>Model</b>	RUGBY 200	LP31A	EL40HV	MP40	RL-H3C	RL-H3B
<b>Date of introduction</b>	Feb-03	Feb-03	June-02	June-02	Jan-02	Mar-02
<b>Beam type</b>	635 nm visible laser diode	Infrared laser diode	Visible laser diode	Visible laser diode	Visible red laser diode	Visible red laser diode
<b>Beam coverage</b>	1000 ft (305 m) min.	800 ft dia.	1000 ft dia.	1000 ft dia.	980 ft (300 m)	1300 ft (400 m)
<b>Rotation speed</b>	60/120/300/600 rpm	600 rpm	130/530 rpm	60 to 530 rpm	600 rpm	600 rpm
<b>Compensation or self-leveling type</b>	Electronic self-leveling	Compensation	Self-leveling	Self-leveling, horiz. and vert. [3]	Electronic	Electronic w/liquid compensator
<b>Compensation or self-leveling range</b>	± 5°	± 10 arc minutes	± 9 degrees	± 9 degrees	± 3 degrees	± 3 degrees
<b>Self-leveling speed</b>	Typical, less than 10 seconds, Maximum 30	N/A	< 30 seconds	< 30 seconds	N/A	N/A
<b>Accuracy</b>						
- Degrees	± 10 arc seconds or better	± 10 arc seconds	± 15 arc seconds horiz.; ± 20 arc seconds vert.	± 15 arc seconds horiz. and vert.	± 15 arc seconds	± 10 arc seconds
- Variance per 100 feet	± 1/16 in (1.5 mm)	17/64 in	3/16 in horiz; 1/2 in vert.	1/8 in horiz. and vert.	< 3/32 in (2.3 mm)	< 1/16 in (1.7mm)
<b>Power source</b>	4 D alkaline or NiMH rechargeable	4 D alkaline or NiCd	2 C alkaline or NiCd	2 C alkaline or NiCd	4 C cells	4 D cells
<b>Battery life</b>						
- Alkaline	50 hours	90 hours	160 hours	160 hours	60 hours	120 hours
- Rechargeable	30 hours	40 hours	40 hours	40 hours	N/A	60 hours
<b>Operating temperature</b>	-4 to 122° F (-20 to 50° C)	14 to 122° F	14 to 122° F	14 to 122° F	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)
<b>Water and dust sealed?</b>	IPX6	IPX4	IPX4	IPX4	Yes	Yes
<b>Warranty</b>	2 years (knockdown warranty)	1 year	1 year	1 year	1 year	1 year
<b>Laser Sensor included</b>	Yes	Yes	Yes	Yes	LS-70C	LS-70B [1]
- Price if purchased separately	\$150 to \$325	\$285	\$225	\$225	\$195	\$365 [2]
<b>Package price</b>	\$1520 to \$2100	\$1195	\$925 [2]	\$1295 [4]	\$895	\$1295
<b>Reader Service Number</b>	23	24	25	26	27	28

Numbers in brackets refer to notes (see page 42).

# 2004 Laser Surveys

## Electronic Levels (beam coverage up to 1,000 feet) continued

Manufacturer	Topcon Positioning Systems Inc.	Trimble	Trimble	Trimble	Trimble	Trimble
<b>Model</b>	RL-H3CS [3]	LL200	1452GC	1422-2	1452XL-1	HV301
<b>Date of introduction</b>	Jan-03	Apr-02	Jan-01	Feb-01	Mar-99	Nov-03
<b>Beam type</b>	Visible red laser diode	Infrared	1mW, 635 nm visible	635 nm visible	3mW, 635 nm isible	3mW, 635 nm visible. Simultaneous 90° split
<b>Beam coverage</b>	980 ft (300 m)	1000 ft	1000 ft	400 ft	1000 ft	1000 ft
<b>Rotation speed</b>	600 rpm	N/A	550 rpm	0/50/250/600 rpm	0/10/80/280/800 rpm	0/10/80/200/600 rpm
<b>Compensation or self-leveling type</b>	Electronic	Compensation	Electronic self-leveling	Manual, horizontal/vertical	Electronic self-leveling, horizontal/vertical	Electronic self-leveling, horizontal/vertical
<b>Compensation or self-leveling range</b>	± 3°	± 1°	± 5°	N/A	± 5°	± 5°
<b>Self-leveling speed</b>	N/A	Instant when roughly leveled	5° /min	N/A	5° /min	5° /min
<b>Accuracy</b>						
- Degrees	± 15 arc seconds	± 18 arc seconds	± 30 arc seconds	± 60 arc seconds	± 40 arc seconds	± 20 arc seconds
- Variance per 100 feet	< 3/32 in (2.3 mm)	± 3/32 in	± 3/16 in	± 5/16 in	± 1/4 in	± 1/8 in
<b>Power source</b>	4 C cells	1 D alkaline	4 C NiCad	2 D alkaline	4 C NiCad	4 D NiCad
<b>Battery life</b>						
- Alkaline	60 hours	100 hours	15 hours	40 hours	15 hours	40 hours
- Rechargeable	N/A	N/A	10 hours	N/A	10 hours	30 hours
<b>Operating temperature</b>	-4 to 122° F (-20 to 50° C)	-20 to 50° C	-20 to 50° C	-5 to 45° C	-5 to 45° C	-5 to 45° C
<b>Water and dust sealed?</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Warranty</b>	1 year	1 year	1 year	1 year	1 year	1 year
<b>Laser Sensor included</b>	LS-70C	Yes	Yes	Yes	Yes	Yes
- Price if purchased separately	\$195	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative
<b>Package price</b>	\$1195 [3]	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative
<b>Reader Service Number</b>	29	30	31	32	33	34

## Laser Sensors (hand-held or rod mounted)

Manufacturer	Laser Reference Inc.	Laser Reference Inc.	LaserMark by CST/berger	LaserMark by CST/berger	Leica Geosystems	Leica Geosystems	Leica Geosystems
<b>Model</b>	R6	R7	LD400	LD120	Rod-Eye Pro	Rod-Eye Mini	Rod-Eye Basic
<b>Date of introduction</b>	May-00	Jun-00	Aug-99	Jun-02	Feb-02	Feb-02	Feb-02
<b>Beam detection range</b>	1.5 in	2 in	2 in	2 in	2 in (50 mm)	1.5 in (38 mm)	1.5 in (38 mm)
<b>Beam detection precision</b>	± 1/16 in	± 1/16, 1/8, 1/64 in	± 1/16 / ± 1/8 / ± 1/4 in	± 1/16 / ± 1/8 / ± 1/4 in	[1]	0.080 in	0.030 in
<b>Beam detection channels</b>	3	5	7	3	7 plus initial audio locator	3	3
<b>Beam detection display</b>	LCD	LCD front, LED back	LCD (front/back)	LCD (front/back)	LCD	LCD	LED
<b>Beam detection angle</b>	90°	120°	160°	160°	± 45° (90°)	± 45° (90°)	± 45° (90°)
<b>Audio beam detection signal</b>	Yes	Yes	Yes	Yes	Yes, high and low selectable	Yes, high and low selectable	Yes, high and low selectable
<b>Laser status monitor and indication</b>	No	No	Manual only	Manual only	Yes, with laser low battery monitoring	No	No
<b>Power source</b>	2 AA	9V	9V battery	9V battery	2 1.5-volt AA	2 x 1.5v AA	2 x 1.5v AA
<b>Battery life</b>	100 hours	60 hours	up to 3 months	up to 3 months	70+ hours	200 hours	100 hours
<b>Power shut-off</b>	Yes, 30 minutes	Yes, 12 minutes	Yes, 6 minutes	Yes, 6 minutes	Yes, selectable 30 minutes, 24 hours, continuous on	Yes, 30 min.	Yes, 30 min.
<b>Remote display</b>	No	No	No	No	No	No	No
<b>Rod clamp</b>	Screw down	Screw down	Screw down	Screw down	[2]	Yes	Lanyard strap
<b>Operating temperature</b>			22 to 125° F	22 to 125° F	-4 to 140° F (-20 to 60° C)	-4 to 140° F (-20 to 60° C)	-4 to 140° F (-20 to 60° C)
<b>Water and dust sealed?</b>	Yes	Yes	IPX4	IPX4	Yes, 100%	Yes, 100%	Yes, 100%
<b>Warranty</b>	1 year	3 years	1 year	1 year	3 years	2 years	2 years
<b>Price</b>	\$150	\$225	\$295	\$195	\$325 w/ rod clamp	\$150 w/ rod clamp	\$150 w/ lanyard strap
<b>Reader Service Number</b>	35	36	37	38	39	40	41

Numbers in brackets refer to notes (see page 42).

Laser Sensors (hand-held or rod mounted) continued

Manufacturer	MIKROFYN Positioning Products	MIKROFYN Positioning Products	SOKKIA	SOKKIA	Topcon Positioning Systems Inc.	Topcon Positioning Systems Inc.
<b>Model</b>	HS 10	HS 14 w/remote control	LR100	R80 [16]	LS-70A	LS-70B
<b>Date of introduction</b>	2003	2003	Apr-00	June-03	Jan-98	Jan-98
<b>Beam detection range</b>	2 in	2 in	2 1/4 in	3 in	2 in (50mm)	2 in (50mm)
<b>Beam detection precision</b>	± 1/16, ± 1/8 in	± 1/16, ± 1/8 in	± 1/32 fine; ± 1/8 coarse	± 1/16 Fine; ± 1/8 Coarse	± .04, ± .08 in [4]	± .04, ± .08 in [4]
<b>Beam detection channels</b>	5	5	5	5	11 [5]	11 [5]
<b>Beam detection display</b>	LCD front and back + LED	LCD front and back + LED	LCD (front and back)	LCD (front and back)	Proportional LCD, front & rear	Proportional LCD, front & rear
<b>Beam detection angle</b>	135°	135°			145°	145°
<b>Audio beam detection signal</b>	3 On/Low/High	3 On/Low/High	Yes, variable pitch	Yes, variable pitch	Yes	Yes
<b>Laser status monitor and indication</b>	No	Yes, 2-way radio controller [4]	No	No	Yes, HI alert & power [1]	Yes, HI alert & power [1]
<b>Power source</b>	9V alkaline	9V alkaline	9 VDC (1 each)	9 VDC (1 each)	9 volt alkaline	9 volt alkaline
<b>Battery life</b>	3 months/ 200 hours continuous	3 months/ 200 hours continuous	100 hours	100 hours	Approx. 3 months	Approx. 3 months
<b>Power shut-off</b>	Yes, 15 minutes	Yes, 15 minutes	5 min. after no signal	5 min. after no signal	Auto, 30 minutes	Auto, 30 minutes
<b>Remote display</b>	No	Yes	No	No	Optional, LCD	No
<b>Rod clamp</b>	Universal w/ level vial	Universal w/ level vial	Screw type	Screw type	Quick release	Universal
<b>Operating temperature</b>	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	14 to 122° F	14 to 122° F	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)
<b>Water and dust sealed?</b>	Water proof	Water proof	IPX7	IPX6	Yes	Yes
<b>Warranty</b>	2 years	2 years	1 year	1 year	2 years	1 year
<b>Price</b>	\$315	\$495	\$285	\$225	\$495 [2]	\$365 [2]
<b>Reader Service Number</b>	42	43	44	45	46	47

Manufacturer	Topcon Positioning Systems Inc.	Trimble	Trimble	Trimble	Trimble	Trimble
<b>Model</b>	LS-70C	HR100	HR300	HR400	HR500	CR600
<b>Date of introduction</b>	Jan-02	Nov-03	Nov-03	Mar-02	Mar-02	May-02
<b>Beam detection range</b>	2 in (50mm)	2 in	2 in	2 in	2 x 2 in	4.5 in
<b>Beam detection precision</b>	± .04, ± .08 in [4]	1/8 in	1/16 and 1/8 in	1/16 in	0.004 in - 1/4 in	0.004 in - 3/4 in
<b>Beam detection channels</b>	11 [5]	3	5	9	15	15
<b>Beam detection display</b>	LCD front	2 x LED	LCD and LED	LCD and LED	LCD and LED	LCD and ultra-bright LED
<b>Beam detection angle</b>	145°	90°	90°	130°	180°	270°
<b>Audio beam detection signal</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Laser status monitor and indication</b>	Yes, HI alert & power [1]	Yes	Yes	Yes	Yes	Yes
<b>Power source</b>	9 volt alkaline	2 AA alkaline	2 AA alkaline	2 AA alkaline	2 AA alkaline	2 AA alkaline
<b>Battery life</b>	Approx. 3 months	100 hours	100 hours	100 hours	100 hours	100 hours
<b>Power shut-off</b>	Auto, 30 minutes	Yes	Yes	Yes	Yes	Yes
<b>Remote display</b>	No	No	No	No	No	No
<b>Rod clamp</b>	Standard	Yes	Yes	Yes	Screw, magnetic	Rod and machine magnetic
<b>Operating temperature</b>	-4 to 122° F (-20 to 50° C)	-20 to 50° C	-20 to 50° C	-20 to 50° C	-20 to 50° C	-20 to 50° C
<b>Water and dust sealed?</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Warranty</b>	1 year	1 year	1 year	1 year	2 years	2 years
<b>Price</b>	\$195	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative
<b>Reader Service Number</b>	48	49	50	51	52	53

Numbers in brackets refer to notes (see page 42).

# 2004 Laser Surveys

## Grade Lasers

Manufacturer	AGL LASERSOURCE	AGL LASERSOURCE	AGL LASERSOURCE	David White by CST/berger	LaserMark by CST/berger	LaserMark by CST/berger	Laser Reference Inc.
<b>Model</b>	EAGL 1S	EAGL 310S & 350S	EAGL 310 & 350 Dual Slope	3175	LMH-GR	LM400-4	L1-AS
<b>Date of introduction</b>	2002	1993	1993	Aug-03	Aug-01	Jun-99	Jan-94
<b>Beam type</b>	Visible laser diode	Visible laser diode	Visible laser diode	Visible split-beam 635 nm laser diode	Visible 635 nm laser diode	Visible split-beam 635 nm laser diode	670 nm visible use w/ receiver
<b>Beam coverage</b>	1000 ft	3000 ft	3000 ft	up to 2000 ft	up to 2000 ft	up to 2000 ft	2000 ft
<b>Grade capability and type</b>	Single/electronic	Single/electronic	Dual axis/electronic	Dual	Single	Dual	Single grade, compound with optional adapter
<b>Grade range</b>	0 to 10%	10% (310S) 50% (350S)	10% (310) 50% (350)	± 10%	± 10%	± 10%	0-9.00%
<b>Grade entry method</b>	Direct-dial	Electronic	Electronic	Digitally	Mechanically	Digitally	Mechanical counter
<b>Remote operation</b>	No	No	No	Remote capable	N/A	Remote capable	No
<b>Grade alignment method</b>		Scope	Scope	Peep sights	Peep sights	Peep sights	Sights on top of laser
<b>Self-leveling type</b>	Electronic	Electronic	Electronic	Electronic	Electronic	Electronic	Electronic servo motor
<b>Self-leveling range</b>	± 4% (± 2.2°)	± 10% (± 5.7°)	± 10% (± 5.7°)	± 5°	± 5°	± 5°	± 4°
<b>Rotation speeds</b>	600 rpm	0 to 1000 rpm	0 to 1000 rpm	100-1000 rpm	600 rpm	100-1000 rpm	600 rpm
<b>Accuracy at 0.00% grade</b>							
- Degrees							15 arc seconds
- Variance per 100 feet	± 1/8 in	± 1/16 in	± 1/16 in	± 1/16 in	± 1/16 in	± 1/8 in	± 3/32 in
<b>Temperature compensated</b>				No	No	No	Temperature stability tested
<b>Primary power source</b>	4 D alk or NiCAD pack	12 V rechargeable	12 V rechargeable	4 D alkaline	4 D alkaline	4 D alkaline	4 C alkaline or rechargeable
<b>Current draw (Amps per hour at 600 rpm)</b>				165-170 ma	165-170 ma	165-170 ma	60 hours continuous run
<b>Operating temperature</b>	14 to 122° F	14 to 122° F	14 to 122° F	22 to 120°F	22 to 120° F	22 to 120°F	0 to 122° F
<b>Water and dust sealed?</b>	Yes	Yes	Yes	IPX4	IPX4	IPX4	Resistant
<b>Warranty</b>	1 year	1 year	1 year	2 years	2 years	2 years	3 years
<b>Laser Sensor included</b>	Yes	No	No	No	Yes	Yes	Yes, R7
<b>Package price</b>	\$2795 alk/\$2930 NiCAD	\$5245 310S basic/\$5745 350S basic	\$6245 310 Basic/\$6745 350 Basic	\$1995	\$1095	\$1995	\$2495
<b>Reader Service Number</b>	54	55	56	57	58	59	60

Manufacturer	Laser Reference Inc.	Leica Geosystems	Leica Geosystems	MIKROFYN Positioning Products	MIKROFYN Positioning Products	MIKROFYN Positioning Products	MIKROFYN Positioning Products
<b>Model</b>	L1-ASm Magnum	Javelin-S	Javelin	ML 11x	ML 13x	ML 14i	ML 3
<b>Date of introduction</b>	Jun-03	Feb-02	Feb-02	2002	2004	2002	1998
<b>Beam type</b>	670 nm visible use w/ receiver	Visible laser diode 635 nm	Visible laser diode 635 nm	650 nm visible	650 nm visible	635 nm visible	670 nm visible
<b>Beam coverage</b>	3000 ft	3000 ft (900 m)	3000 ft (900 m)	> 1050 ft dia	> 1050 ft dia	> 1050 ft dia	> 2600 ft dia
<b>Grade capability and type</b>	Single grade, compound with optional adapter	Compound/dual grade, optical encoder	Compound/dual grade, optical encoder	Single grade	Dual grade	Dual grade	Single grade
<b>Grade range</b>	0-25.00%	-50.000% to +50.000% in both axes	-20.000% to +20.000% in both axes	0-10%	0-10%	0-10%	0-10%
<b>Grade entry method</b>	Mechanical counter	Digitally to 0.000%	Digitally to 0.000%	Digitally	Digitally		
<b>Remote operation</b>	No	Yes	No	No	No	Yes, radio full 2-way	No
<b>Grade alignment method</b>	Sights on top of laser	Automatic alignment with prism	Peep sights	Built-in sights	Built-in sights	Built-in sights	Built-in sights & telescope
<b>Self-leveling type</b>	Electronic servo motor	Electronic servo mechanism	Electronic servo mechanism	Electronic self-leveling	Electronic self-leveling - (H. & Vertical)	Electronic self-leveling - (H. & Vertical)	Electronic self-leveling - (H. & Vertical)
<b>Self-leveling range</b>	± 4°	± 5°	± 5°	± 9%	± 9%	± 9%	± 18%
<b>Rotation speeds</b>	600 rpm	300-1200 adjustable by 100 rpm	300-1200 adjustable by 100 rpm	600 rpm	600 rpm	30/60/180/360/600 rpm + scan	600 rpm
<b>Accuracy at 0.00% grade</b>							
- Degrees	10 arc seconds	6 arc seconds	6 arc seconds	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds
- Variance per 100 feet	± 1/16	1/32 in	1/32 in	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)
<b>Temperature compensated</b>	Temperature stability tested	No	No	Yes	Yes	Yes	Yes
<b>Primary power source</b>	4 C alkaline or rechargeable	NiMH rechargeable battery pack	NiMH rechargeable battery pack	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]
<b>Current draw (Amps per hour at 600 rpm)</b>	60 hours continuous run	300 ma	300 ma	60 ma	60 ma	60 ma	60 ma
<b>Operating temperature</b>	0 to 122° F	14 to 122° F (-10 to 50° C)	14 to 122° F (-10 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)
<b>Water and dust sealed?</b>	Resistant	IPX7	IPX7	IP67	IP67	IP67	IP67
<b>Warranty</b>	3 years	1 year	1 year	2 years	2 years	2 years	2 years
<b>Laser Sensor included</b>	Yes, R8	Yes	Yes	Yes, HS 10	Yes, HS 10	Yes, HS 14 w/ RC radio full 2 way	Yes, HS 10
<b>Package price</b>	\$2995	Contact Leica Geosystems	Contact Leica Geosystems	\$1395	\$1695	\$1995	\$4400
<b>Reader Service Number</b>	61	62	63	64	65	66	67

Numbers in brackets refer to notes (see page 42).

## Grade Lasers

Manufacturer	MIKROFYN Positioning Products	MIKROFYN Positioning Products	MIKROFYN Positioning Products	MIKROFYN Positioning Products	Topcon Positioning Systems Inc.	Topcon Positioning Systems Inc.	Topcon Positioning Systems Inc.
<b>Model</b>	ML 3VD	ML 4	ML 4B	ML 4VD & ML 4BVD	RL-H2Sa	RL-H1Sa	RT-5Sa
<b>Date of introduction</b>	1998	1998	1998	1998	Jan-02	Jan-02	Jul-98
<b>Beam type</b>	635 nm visible	670 nm visible	670 nm visible	635 nm high powered visible	Visible laser diode	Infrared diode	Visible laser diode
<b>Beam coverage</b>	> 5200 ft dia	> 2600 ft dia	> 2600 ft dia	> 5200 ft dia	2300 ft (700 m)	2300 ft (700 m)	4000 ft (1600 m)
<b>Grade capability and type</b>	Single grade	Dual grade	Dual grade	Dual grade	Single and Dual slope, encoder	Single slope, encoder	Dual slope, encoder
<b>Grade range</b>	0-10%	-10% to 12%	-10% to 110%	-10% to +12% or -10% to 110%	-8% to 8%	-5% to 10%	± 50%, no tilt required [6]
<b>Grade entry method</b>	Digitally	Digitally	Digitally	Digitally	Digital	Digital	Digital (unit & remote)
<b>Remote operation</b>	No	Yes	Yes	Yes	No	No	Yes, 2-way communication [7]
<b>Grade alignment method</b>	Built-in sights & telescope	Built-in sights & telescope	Built-in sights & telescope	Built-in sights & telescope	Manual, sighting scope	Manual, sighting scope	Automatic, SmartLine [8]
<b>Self-leveling type</b>	Electronic self-leveling - (H. & Vertical)	Electronic self-leveling - (H. & Vertical)	Electronic self-leveling - (H. & Vertical)	Electronic self-leveling - (H. & Vertical)	Electronic	Electronic	DLX digital-liquid [9]
<b>Self-leveling range</b>	± 18%	± 18%	± 18%	± 18%	± 5°	± 5°	± 5°
<b>Rotation speeds</b>	600 rpm	100 to 900 in steps of 100	100 to 900 in steps of 100	100 to 900 in steps of 100	300/600/900 rpm	300/600 rpm	300/600/900/1200 rpm
<b>Accuracy at 0.00% grade</b>							
- Degrees	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds	± 10 arc seconds	± 5 arc seconds
- Variance per 100 feet	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)	< 1/16 in (1.7 mm)	less than 1/16 in (1.7 mm)	less than 1/16 in (1.7 mm)	less than 1/32 in (1 mm)
<b>Temperature compensated</b>	Yes	Yes	Yes	Yes	No	No	Yes [10]
<b>Primary power source</b>	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]	NiCad or NiMH 1 hour charge [1],[2]	Rechargeable NiMH	4 D cells	Rechargeable NiCad
<b>Current draw (Amps per hour at 600 rpm)</b>	60 ma	60 ma	60 ma	60 ma	175 ma	175 ma	175 ma
<b>Operating temperature</b>	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)	-4 to 122° F (-20 to 50° C)
<b>Water and dust sealed?</b>	IP67	IP67	IP67	IP67	Yes	Yes	Yes
<b>Warranty</b>	2 years	2 years	2 years	2 years	2 years	1 year	2 years
<b>Laser Sensor included</b>	Yes, HS 10	Yes, HS 10	Yes, HS 10	Yes, HS 10	LS-70B	LS-70B	LS-70A
<b>Package price</b>	\$4700	\$5000	\$6000	\$5300/\$6300	\$4995	\$3295	\$7695
<b>Reader Service Number</b>	68	69	70	71	72	73	74

Manufacturer	Topcon Positioning Systems Inc.	Trimble	Trimble	Trimble	Trimble	Trimble
<b>Model</b>	RT-5Sb	GPlus	1242	GL710	GL720	GL722
<b>Date of introduction</b>	Oct-98	1999	2000	Jan-02	Jan-02	Jan-02
<b>Beam type</b>	Visible laser diode	635nm visible	635 nm visible	670 nm visible	670 nm visible	670 nm visible
<b>Beam coverage</b>	4000 ft (1600 m)	2600 ft	2600 ft	3000 ft	3000 ft	3000 ft
<b>Grade capability and type</b>	Dual slope, encoder	Single	Single	Single	Dual	Dual
<b>Grade range</b>	± 10%	0.1% to 25.0%	0.1% to 25.0%	-0.5% to 25.0%	±10% x-axis, -0.5% to 25.0% y-axis	±10% x-axis, -0.5% to 25.0% y-axis
<b>Grade entry method</b>	Digital (unit & remote)	Digitally	Digitally	Digitally	Digitally	Digitally with remote
<b>Remote operation</b>	Yes, 2-way communication [7]	N/A	N/A	N/A	N/A	Yes, radio full 2-way
<b>Grade alignment method</b>	Manual, sighting scope	Visual sight	Visual sight	Telescope	Telescope	Automatic
<b>Self-leveling type</b>	DLX digital-liquid [9]	Compensation	Electronic self-leveling	Electronic self-leveling	Electronic self-leveling	Electronic self-leveling
<b>Self-leveling range</b>	± 5°	±11 arc minutes	up to 10% grade	Grade range	Grade range	Grade range
<b>Rotation speeds</b>	300/600/900/1200 rpm	0/50-300/600 rpm	0/50-300/600 rpm	300/600/900 rpm	300/600/900 rpm	300/600/900 rpm
<b>Accuracy at 0.00% grade</b>						
- Degrees	± 5 arc seconds	± 8 arc seconds	± 8 arc seconds	± 4.6 arc seconds	± 4.6 arc seconds	± 4.6 arc seconds
- Variance per 100 feet	less than 1/32 in (1 mm)	<±1/16 in	<±1/16 in	± 1/32 in	± 1/32 in	± 1/32 in
<b>Temperature compensated</b>	Yes [10]	Yes	Yes	Yes	Yes	Yes
<b>Primary power source</b>	Rechargeable NiCad	Alkaline or NiCad	Alkaline or NiCad	NiMH or NiCad	NiMH or NiCad	NiMH or NiCad
<b>Current draw (Amps per hour at 600 rpm)</b>	175 ma	120 Alkaline/45 NiCad	80 alkaline/24 NiCad	30 NiMH/20 NiCad	30 NiMH/20 NiCad	30 NiMH/20 NiCad
<b>Operating temperature</b>	-4 to 122° F (-20 to 50° C)	-20 to 50° C	-20 to 50° C	-20 to 50° C	-20 to 50° C	-20 to 50° C
<b>Water and dust sealed?</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Warranty</b>	2 years	2 years	2 years	2 years	2 years	2 years
<b>Laser Sensor included</b>	LS-70A	Yes	Yes	Yes	Yes	Yes
<b>Package price</b>	\$6995	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative	Contact Trimble Representative
<b>Reader Service Number</b>	75	76	77	78	79	80

Numbers in brackets refer to notes (see page 42).

## 2004 Laser Surveys Notes

### Leica Geosystems

- 1 Super fine, fine, medium, coarse ( $\pm 0.020, 0.040, 0.080, 0.120$  in)
- 2 Yes - Screw type with reversible jaw for all rod shape configurations

### Mikrofyn Positioning Products

- 1 All Mikrofyn lasers use the Makita tool type 7.2 v battery stick. NiCad \$30/NiMH \$45. Features 1 hr fast recharger. Standard chargers: 130 v AC charger or 12 v DC charger.
- 2 External power - 12 v DC optional on all Mikrofyn units.
- 3 ML 15i includes a high powered diode & beam quality that is suitable for the most demanding interior application.
- 4 The Mikrofyn HS 14 sensor is a combination sensor and 2-way radio remote controller that provides full control of the transmitter from the handheld sensor. All information transmitter controls are shown on the HS 14 display. The HS 14 notifies the user if the transmitter (ML 14 & ML 15) has been distributed. The HS 10 is a standard type sensor for use with any rotating laser. The HS 10 and MS 14 offer the same sensor feature/benefits.

### Topcon Positioning Systems

- 1 When used with the Topcon RL-H3A, RL-H3B, RT-5Sa and RT-5Sb models, the sensor notifies the user if the laser transmitter has been

- disturbed (HI alert) and when the laser power source begins to run low.
- 2 Price includes Quick Release rod clamp, deduct \$20 for screw type rod clamp.
  - 3 Includes ability to slope beam plane to match grade.
  - 4 Two position.
  - 5 11 channels include on-grade, five each above and below grade, and off sensor high and low.
  - 6 RT-5Sa does not require any accessories or tilting of unity for any grade setting.
  - 7 All functions can be controlled with wireless remote control with 2-way communication up to 25 feet away from unit, 1-way communication up to 300 feet.
  - 8 Smartline automatically aligns the grade access using Topcon's patented scanning technology to locate a target placed on the ground up to 300 feet away from the unit.
  - 9 DLX is a patented hybrid self-leveling system that combines high-speed electronics with liquid compensation stability. No leveling screws are required.
  - 10 Temperature sensors and monitoring software continually check instrument and perform compensation adjustments based on specific performance criteria.

### Trimble

- 1 HV601 = IR 150 ft radius Remote Control.
- 2 HV602 = Radio 500 ft radius Remote Control w/PlaneLok

### Participating Manufacturers

#### AGL Lasersource

[www.agl-lasers.com](http://www.agl-lasers.com)

#### CST/berger

[www.cstsurvey.com](http://www.cstsurvey.com)

#### Laser Reference Inc.

[www.proshotlaser.com](http://www.proshotlaser.com)

#### Leica Geosystems

[www.leica-geosystems.com](http://www.leica-geosystems.com)

#### MIKROFYN Positioning Products

[www.positioningproducts.com](http://www.positioningproducts.com)

#### SOKKIA

[www.SOKKIA.com](http://www.SOKKIA.com)

#### Topcon Positioning Systems

[www.topcon.com](http://www.topcon.com)

#### Trimble

[www.trimble.com](http://www.trimble.com)

Denver, Colorado  
asprs 2004

mountains of data  
peak decisions...

ASPRS 2004  
Annual Conference  
May 23-27, 2004  
Denver, Colorado  
Adams Mark Hotel

asprs 70th

- Workshops including the new Technologist Certification Preparation and other topics of current interest
- Keynote Address delivered by Dr. Ahmed Noor, Professor of Aerospace Engineering, Old Dominion University, Norfolk, Virginia
- Plenary Session led by Lynne Sherrod, Executive Director of the Colorado Cattlemen's Agricultural Land Trust
- Technical Program with over 450 presentations
- Poster Presentations numbering 70+
- Technical Tours to BP Center for Visualization, DigitalGlobe, Jeppesen, and Spectrum Mapping
- Classified Session
- Social Events including the ASPRS 70th Anniversary Party, a reception at the Denver Museum of Nature and Science, and a reception at the Jeffco Airport Hangar sponsored by Spectrum Mapping, LLC
- User Groups offered by the top names in the industry
- Exhibition Hall of super size with the latest developments in the field presented by more than 120 suppliers

DigitalGlobe image of Overland fire in Jamestown, Colorado processed with IS1's ENVI remote sensing software.

For complete details and to register on line, visit  
[www.asprs.org/denver2004](http://www.asprs.org/denver2004)