

# SONY

## LASERSCALE™

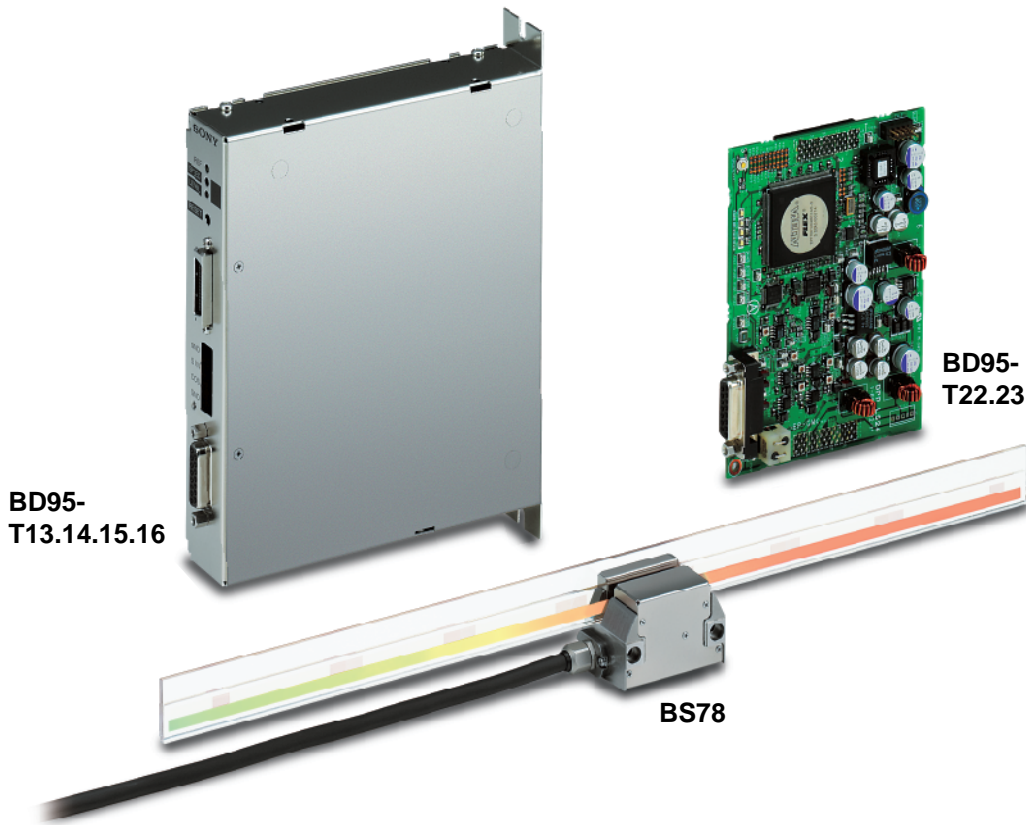
Scale Unit

# BS78

Interpolator

# BD95-T13.14.15.16.22.23

**Compact LASERSCALE with a zero point boosting a resolution of 0.07nm**  
**Capable of high accuracy and high speed measuring**  
**supporting the next generation semiconductor design rule.**



### Scale unit BS78

High-resolution scale with signal wavelength of  $0.1379\ \mu\text{m}$  that out-performs light wave interferometer systems

High stability that is not affected by humidity, air pressure, and air disturbances

Newly designed optics used in zero point  
Half in volume with zero point comparing to previous model

Zero point accuracy  $\pm 0.1\ \mu\text{m}$

Accuracy:  $\pm 0.04\ \mu\text{m}$  or better (for a measuring of 40 mm.)

Complete non-contact design  
Return error is theoretically eliminated

Measuring length: 40 to 420mm covered by 9 models (-R/-RS)  
10 to 420mm covered by 10 models (-N/-NS)

Please consult our sales for vacuum environment application and / or magnetism free application.

### Interpolator BD95-T13.14.15.16.22.23

A single-chip IC and newly designed circuitry

High resolution: 0.07nm

High response speed: 400mm/s

DC offset, gain, phase automatic conditioning

AB quadrature output (T13, T14, T15, T16)

32 bit binary output with clock synchronized (T22)  
32 bit binary output by data request input (T14, T16, T23)

\*Description of this brochure is based on the specifications as of October 2003.



These products are manufactured at our Isehara Plant that is certified to ISO9001 Quality Management System and ISO14001 Environmental Management System.

Sony Precision Technology Inc.

**BS78**

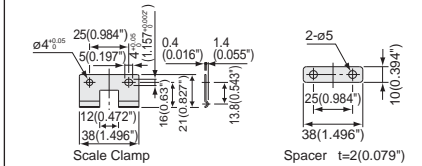
Measuring length	10(N/NS),40,70,120,170,220,270,320,370,420mm / 0.39"(N/NS),1.57",2.75",4.72",6.69",8.66",10.62",12.59",14.56",16.53"	
Overall length	58mm / 2.28"(Measuring length 10mm/0.39"), Measuring length + 26mm / 1.02"(Measuring length 40mm / 1.57 to 420mm / 16.53")	
Max. travel length	Measuring length + 2mm / 0.07"(Measuring length 10mm / 0.39") Measuring length + 10mm / 0.39"(Measuring length 40mm / 1.57 to 420mm / 16.53")	
Accuracy	NS type, RS type	N type, R type
	Measuring length: 10mm / 0.39": ± 0.03µm or less (NS type) 40mm / 1.57": ± 0.04µm or less 70,120mm / 2.75", 4.72": ± 0.1µm or less 170,220mm / 6.69", 8.66": ± 0.18µm or less 270mm/10.62": ± 0.25µm or less 320mm/12.59": ± 0.34µm or less 370mm/14.56": ± 0.39µm or less 420mm/16.53": ± 0.44µm or less	Measuring length: 10mm/0.39": ± 0.06µm or less (N type) 40mm/1.57": ± 0.08µm or less 70,120mm/2.75", 4.72": ± 0.2µm or less 170,220mm/6.69", 8.66": ± 0.35µm or less 270mm to 370mm/10.62" to 14.56": ± 0.5µm or less 420mm/16.53": ± 0.65µm or less
Reference point accuracy	± 0.1µm (Only R / RS type)	
Return error	In principle, No Return error. Regard it as 2 counts or less, of resolution of connecting detector	

Repeatability	In principle, No error. Regard it as 1 count or less, of resolution of connecting detector
Temperature coefficient	-0.7 x 10 <sup>-6</sup> / °C
Light source	Semiconductor laser
Radiation power	DHHS class1
Detection type	Diffraction grating scan type
Operating temperature	+10 to +30 °C (No condensation)
Storage temperature	-10 to +50 °C (humidity less than 60%)
Weight (kg / lbs)	0.4 / 0.4 / 0.41 / 0.42 / 0.43 / 0.44 / 0.45 / 0.46 / 0.47 / 0.48 (0.88 / 0.88 / 0.9 / 0.92 / 0.94 / 0.97 / 0.99 / 1.01 / 1.03 / 1.05)

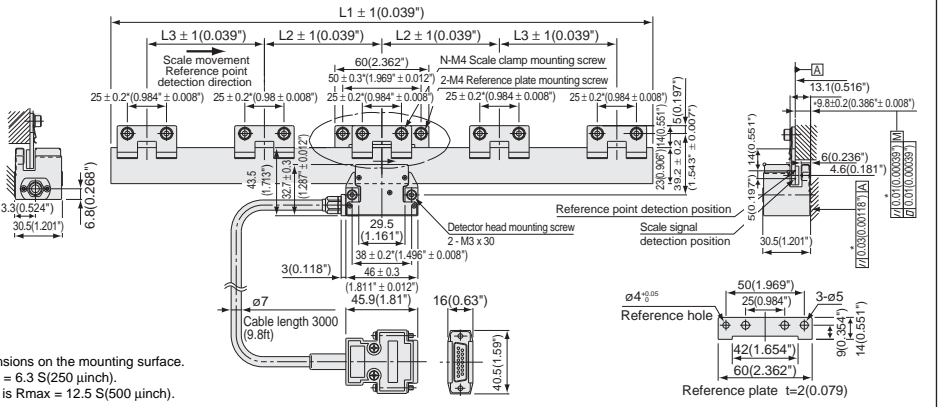
Model Names : The model name indicates the measuring length and scale type.  
Example : BS78-220N

Measuring length ↑  
N : Normal type without reference point  
NS : High-precision type without reference point  
R : Normal type with reference point  
RS : High-precision type with reference point

Model	L1	L2	L3	N
BS78-40R (RS)	66(2.59")	-	-	2
BS78-120R (RS)	146(5.748")	50(1.969")	-	6
BS78-170R (RS)	196(7.717")	75(2.953")	-	6
BS78-320R (RS)	246(9.685")	100(3.94")	-	8
BS78-370R (RS)	346(15.60")	75(2.953")	75(2.953")	10
BS78-420R (RS)	446(17.56")	100(3.94")	100(3.94")	10



Note 1: The items marked by an asterisk indicate the machining dimensions on the mounting surface.  
Note 2: The surface roughness of the scale mounting surface is Rmax = 6.3 S(250 µinch).  
Note 3: The surface roughness of the detector head mounting surface is Rmax = 12.5 S(500 µinch).  
Note 4: "M" refers to the machine guide.  
Note 5: Reference point detection direction :Standard (Scale movement direction→ with the head stationary)



Unit: mm (inch)

**BD95**

Item	Model	BD95-T22	BD95-T23
Resolution		Approx. 0.07 nm	
Max. response speed		400 mm/s	
Output signal		32-bit binary data (LSD0 to LSD31) Reference point signal (REF) LASERSCALE signal (SIN/COS) Scale data update timing signal (CLKOUT) Error and alarm signals (/ERROR, /SPALM, /LVALM)	32-bit binary data (LSD0 to LSD31) Reference point signal (REF) LASERSCALE signal (SIN/COS) Error and alarm signals (/ERROR, /SPALM, /LVALM) Data ready signal (/READY)
Input signal		Scale data zero clear signal (/LSDCLR) Scale data reference point zero clear (/REFCLR) Clear error/alarm signal (/ALMCLR) Reset signal (/RESET)	Scale data zero clear signal (/LSDCLR) Scale reference point data zero clear (/REFCLR) Clear error/alarm signal (/ALMCLR) Reset signal (/RESET) Data request signal (/DRQ)
Alarm		Max. response speed exceeded Low laser signal level (cable broken or disconnected) When one of the above states occurs, the signal turns to "Low" and LED turns on. (After removing the cause of alarm, the clear input turn alarm signal "High" and turns off LED.)	
Reset		Turning power off and on again, external reset input, or reset switch	
LED indicators		On when power is supplied (green) On when passing reference point (yellow) On when speed alarm occurs (red) On when level alarm occurs (red)	
Input signal compensation (On/Off switching is possible)		DC offset, amplitude, phase Frequencies allowing compensation update: Input signals of 50 kHz or less	
Power supply		DC + 5V ± 5% DC + 9V ± 5% DC - 9V ± 5%	
Consumption current		+5V:0.3A +9V:0.5A -9V:0.2A (when scale is connected)	
Operating temperature		0 °C to 40 °C / 32 ° F to 104 ° F	
Storage temperature		-10 °C to 50 °C / 14 ° F to 122 ° F	
Dimensions		135.0 (W)x98.0(D)x23.5(H) mm/5.31"(W)x3.85"(D)x0.92"(H)	
Weight		Approx. 0.2 kg	

Item	Model	BD95-T13	BD95-T14	BD95-T15	BD95-T16
Resolution (selectable)		Approx. 34.5 nm (4 divisions) or approx. 17.2 nm (8 divisions)	100 nm or 50 nm during pitch compensation	Approx. 17.2 nm (8 divisions) or approx. 8.6 nm (16 divisions)	100 nm, 50 nm, or 10 nm during pitch compensation
Max. response speed		400 mm/s (with 4 divisions) 275 mm/s (with 8 divisions)		275 mm/s (with 8 divisions) 120 mm/s (with 16 divisions)	
Output signal		AB quadrature 1 with / without pitch compensation (compliant with EIA-422) AB quadrature 2 without pitch compensation (compliant with EIA-422) Alarm (compliant with EIA-422) (Switching between automatic reset and holding is possible) LASERSCALE signal (SIN/COS) 32-bit binary data (-T14, -T16 only)			
Alarm		Max. response speed exceeded Low laser signal level (cable broken or disconnected) LEDs (Turn on independently for speed alarm and level alarm) Output signal: Output when either a speed or level alarm occurs. Switching between automatic reset and holding is possible			
Pitch compensation function		AB quadrature 1 only A round-off error of 1 resolution occurs.			
Input signal compensation (On/Off switching is possible)		DC offset, Amplitude level, Phase Frequencies allowing compensation update: Input signals of 180 kHz or less			
Power supply		DC + 24V ± 1V			
Consumption current		400 mA (maximum) (when scale is connected)			
Operating temperature		0 °C to 50 °C / 32 ° F to 122 ° F			
Storage temperature		-10 °C to 60 °C / 14 ° F to 140 ° F			
Dimensions		172(W)x144(D)x32(H)mm/6.77"(W)x5.66"(D)x1.25"(H)			
Weight		Approx. 0.8 kg / Approx. 1.76 lbs			

\*This product uses semiconductor laser (wave length 790nm).It is harmful to the human body though laser beam is invisible. Do not look into detecting head.  
\*When using BD95 -T22/23 detector with equipment governed by CE Marking or FCC Rules, measures should be taken to ensure conformance with these regulations.



\*These standards, specifications and exteriors are subject to change without prior notice for the purpose of incorporating technical improvements.

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Printed on 100 % recyclable paper using VOC-free vegetable oil based ink.

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