Providing low and constant measuring force for high-accuracy inspection of delicate workpieces

LITEMATIC VL-50-B/50S-B

FEATURES VL-50-B/50S-B

• Patent registered (Japan), Patent pending (Japan)

Ideal for measuring the thickness or height of a workpiece that can be easily affected by the measuring force

- With a measuring force of only 0.01N, the Litematic is ideal for measuring easily deformed workpieces or high-accuracy components.
- For workpieces for which 0.01N is insufficient, either the 0.15N or 1N model is recommended.
- The spindle is motor-driven and stops when the contact point touches the workpiece. From then on, the maximum, minimum, or difference value can be measured using a constant measuring force.

High-accuracy measurement

- High resolution down to 0.01µm and a wide 50mm measurement range. The use of a low thermal-expansion material for the spindle and ceramic for the measuring table minimizes the effect of temperature variation during use. The unit is rust-free, simplifying maintenance and management.

Separate type VL-50S-B

Because the measuring unit and the display unit are separate, they can be integrated into the user's measurement system. An optional dedicated stand is also available.

*The stand (No.957460) is sold as an option.

Constant measuring force principle

An unbalanced, parallel-link structure enables the Litematic to offer a low and constant measuring force.

The Litematic's measuring force is not provided by a spring but comes from a structure resembling a balance scale. We call this a "parallel linkage." A motorized slider carrying the linked spindle moves down its guideway while the linkage is supported on a stop, as shown in Fig 1. When the spindle contacts the workpiece (Fig. 2) it moves the linkage up off the stop and the motor is halted. At this point the linkage is now supported by the workpiece, and thus a constant measuring force is applied.

Fig. 1. The spindle moves downwards towards the workpiece.

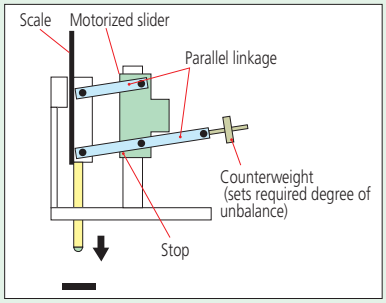
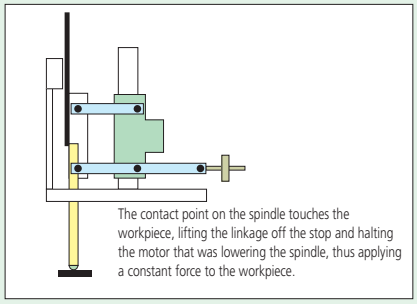


Fig. 2. The spindle lifts the linkage off the stop into the measuring position.



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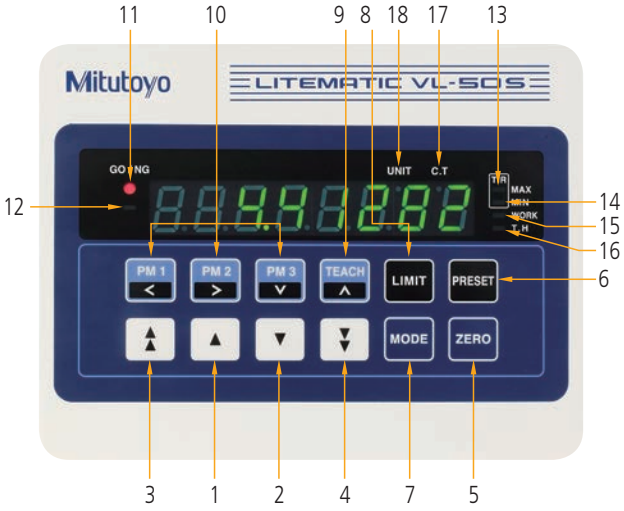
LITEMATIC VL-50-B/50S-B

FUNCTIONS VL-50-B/50S-B

• Control panel/Display Unit

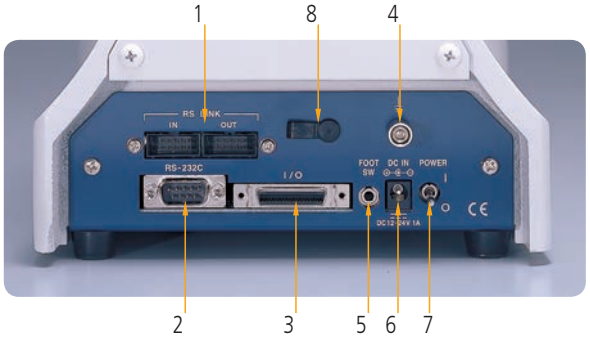


Key function	
Key	Function
1) Up	Moves the spindle up only while the key is pressed.
2) Down	Moves the spindle down only while the key is pressed. Used to touch the contact point on a workpiece to make a measurement.
3) Rapid Up	Moves the spindle up quickly only while the key is pressed.
4) Rapid Down	Moves the spindle down quickly only while the key is pressed.
5) ZERO	Sets the origin at any position of the spindle. Also, it zero-sets all display values for difference measurements. This key can be used to clear an error.
6) PRESET	Allows the currently displayed value to be set from the keyboard, irrespective of spindle position. Often used in conjunction with gauge blocks.
7) MODE	Selects and sets one of various measurement modes such as MAX/MIN measurement.
8) LIMIT	Enters tolerance limits for tolerance judgment.
9) TEACH	Sets up the position memory.
10) PM1 to Pm3	Moves the spindle to a previously stored position with a single keystroke.

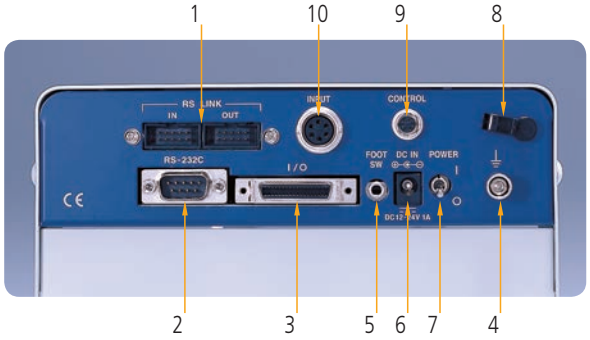
Indicator (LED)		
Indicator	Function	
11) GO/NG	Displays the result of a GO/NG judgment.	
12) Sign	Lights to display a minus value.	
13) MAX	Lights in the maximum value mode.	Both light when the measurement is the difference type (MAX - MIN).
14) MIN	Lights in the minimum value mode.	
15) WORK	Lights while a workpiece is being measured.	
16) T.H.	Lights when a measurement value is held after measurement has been completed.	
17) C.T.	Lights when the user compensation is set to ON. (Lights while the position memory is active.)	
18) UNIT	Lights while the unit of display values is inch. (Lights in the external HOLD mode.)	

• Rear panel (switches and connectors)

VL-50-B



VL-50S-B



1) Measurement data output connector (OUT)	Outputs measurement data to a Digimatic mini-processor, etc.
RS-LINK connector (IN/OUT)	Connects multiple devices and can output measurement data from one RS-232 port.
2) RS-232C connector	For communication with a PC, etc.
3) External control connector	Used to connect this instrument to an external device for remote control.
4) GND terminal	—
5) Foot switch	Foot switch (optional) for controlling measurement operation is connected here.
6) DC IN	Input connector to receive power from the AC mains adapter.
7) Power switch	—
8) AC adapter cord clamp	Prevents AC adapter cord from pulling out.
9) CONTROL connector: for VL-50S-B only	Gage head connector.
10) INPUT connector: for VL-50S-B only	Gage head connector.

SPECIFICATIONS VL-50-B/50S-B

Order No.		318-221A	318-222A	318-223A	318-226A	318-227A	318-228A
Model		VL-50-B	VL-50-15-B	VL-50-100-B	VL-50S-B	VL-50S-15-B	VL-50S-100-B
Measuring Range*1		0-50mm (0 - 2")					
Resolution (selectable)		0.01/0.1/1.0μm (.0000005"/.000005"/.00005")					
Display unit		Character height 14mm (.6")/8 digits (excluding "minus" sign)					
Scale type		4/4 Photoelectric reflection linear encoder					
Stroke		51.5mm (2") With standard contact point					
Accuracy at 20ºC*1		(0.5+L/100)μm L = Measured length (mm)					
Accuracy guarantee temperature*2		20 ± 1ºC					
Repeatability*1		σ = 0.05 μm					
Measuring force*1		0.01N (approx. 1gf)	0.15N (approx. 15.3gf)	1N (approx. 102gf)	0.01N (approx. 1gf)	0.15N (approx. 15.3gf)	1N (approx. 102gf)
Spindle feed speed	Measuring	Approx. 2mm/s (.08"/s) or 4mm/s (.16"/s) (selectable by parameter)					
	Quick feed	Approx. 8mm/s (.3"/s)					
Standard contact point		ø3mm carbide ball					
Worktable		ø100 (Ceramic, grooved, replaceable)					
Input		Data can be input with the foot switch					
Output		SPC output RS-232C output (switching by parameter)					
Power supply		85V to 264VAC (connected to AC adapter)					
Power consumption		Maximum 12W (12V, 1A)					
Main unit mass		19kg (35.2lbs)			6kg (11lbs)		
Standard accessories		• AC adapter: No.357651 • Power cord • Grounding wire: No.934626 • Allen wrench (for replacing the interchangeable contact point)					
Optional accessories		Foot switch: 937179T					
					Dedicated stand: 957460		
		Output connector (with cover): 02ADB440 (for external control)					
		RS-LINK/Digimatic connecting cable (1m): 936937 RS-LINK/Digimatic connecting cable (2m): 965014					
		Recommended interchangeable contact points: the following dial indicator interchangeable contact points are mountable.					
		Part No.: 101118			Measuring force*: Approx 0.02N		
		Part No.: 120059			Measuring force*: Approx 0.03N		
		Part No.: 120060			Measuring force*: Approx 0.06N		
		Part No.: 120066			Measuring force*: Approx 0.01N		
		Note: When another contact point that has a flat measuring face is mounted, the contact point requires parallelism adjustment with respect to the table surface. Mounting this contact point should be custom-ordered from Mitutoyo.					
		02AZE375			Measuring force*: Approx 0.01N to 0.96N		
		Note:The above VL weight parts are dedicated weight parts for VL-50-B and VL-50S-B. Be careful when setting a measuring force of 1N or greater as this may cause equipment failure.					

* Additional measuring force that is applied when non-standard contact points or VL weights are used.
*1 Using the standard contact point.
*2 Temperature variation must be gradual. The instrument must not be exposed directly to hot or cold drafts.

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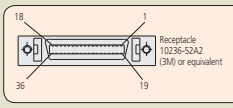
• Connector terminal Function

1) Applicable plugNo.02ADB440

No.02ADB440 (with cover) Optional accessory



Applicable plug specification

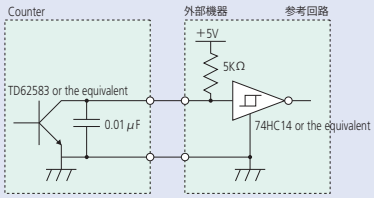
10136-3000VE	(3M: Plug)
10336-52AO-008	(3M: Cover)
DX40M-36P	(Hirose: Plug)
DX30M-36-CV	(Hirose: Cover)

2) Pin assignment

Pin No.	Signal name	Input/Output	Description (purpose)
1	COM	—	Common terminal to input and output circuits (internally connected to GND)
2	COM	—	
3	L1	OUT	Tolerance judgment output terminal A related judgment terminal only outputs "L" At error occurrence L1, L5 = Outputs "L" L2, L3, L4 = Outputs "H"
4	L2	OUT	
5	L3	OUT	
6	L4	OUT	
7	L5	OUT	
10	NOM	OUT	Outputs "L" in the count mode.
21	ULIMIT	OUT	Outputs "L" at the top dead point of the spindle.
22	WORK	OUT	Outputs "L" upon detection of a workpiece.
25	SET1	IN	Specifies peak selection/motor speed in combination with SET.
26	SET2	IN	
28	MODE	IN	Peak selection: In combination with SET Peak mode / SET2 / SET1 Current value: H / H MAX: H / L MIN: L / H TIR: L / L
30	UP	IN	Motor control: Specifies a spindle ascent speed along with SET. Speed (VL-50B/50-SB) / SET2 / SET1 8mm/s: H / H 4mm/s: H / L 2mm/s: L / H 1mm/s: L / L When changing the spindle speed, stops the spindle once and allows 50ms or more before change.
31	DN	IN	Motor control: Specifies a spindle ascent speed along with SET. Speed (VL-50B/50-SB) / SET2 / SET1 8mm/s: H / H 4mm/s: H / L 2mm/s: L / H 1mm/s: L / L When changing the spindle speed, stops the spindle once and allows 50ms or more before change.
32	FSW	IN	Motor control: Same function as that of foot switch.
34	HOLD	IN	The display value is held during input. At error occurrence the error is cleared at the leading edge of this signal.
35	P.SET	IN	Executes presetting. Peak clear: The peak value is cleared upon input of the signal during the HOLD signal input in the Peak mode.
	N.C.	—	Unconnected terminals (8, 9, 11-20, 23, 24, 27, 29, 33 and 36 pin terminals)

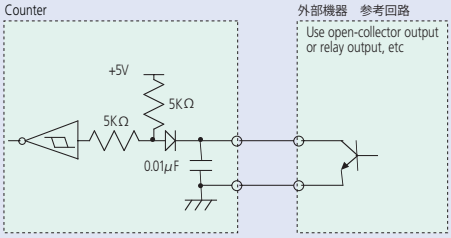
(3) Input/output circuit

1. Output circuit: When the signal goes to "Low," the transistor turns on.
(Open collector output)



Maximum output voltage : 24V
Maximum output current : 20mA
Maximum saturation voltage : 0.7V

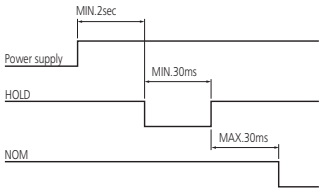
2. Input circuit: When the signal goes to "Low," the input is enabled.



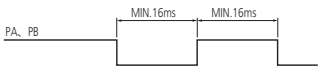
Maximum input current : 1mA
Inout volutage (H) : H=4～24V
Inout volutage (L) : =1V max.

(4) Timing Chart

1. Power On characteristics

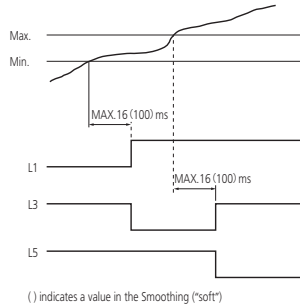


2. External presetting



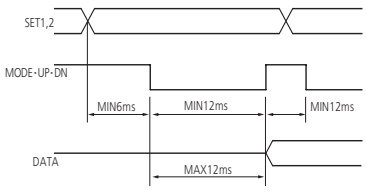
Not available during key input, RS-232C input, and Digimatic data processing.

3.Tolerance judgment result output timing

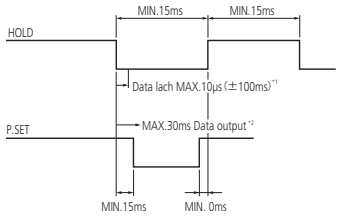


( ) indicates a value in the Smoothing ("soft")

4. Mode/Up/DN timing

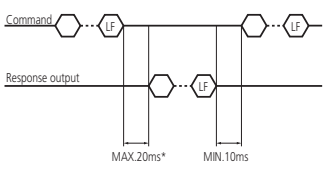


5. HOLD, Error clear



* Peak clear input (following HOLD input, preset input)
*1:The value in ( ) is that at the time of smoothing.
*2:In case of parametere 28 and HOLD selection 1.

6. RS-232C command input and response output



*The RS-232C output is put on hold during key operations.

RS-232C data output time

The maximum output time when the all-data-output command (GA00CRLF) is used can be calculated using the following formula:

Maximum output time [ms] = counter connection count X 20 + connected channel X 17 (8.5) + 6 (3)

*At a transfer speed of 9,600 bps; figures inside ( ) indicate values [in ms] when the speed is 19,200 bps.

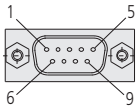
(Calculation example) 1 VL unit = MAX43 (31.5) ms (Note: The processing time by the personal computer is not included.)

• RS-232C Communication Function

(1) List of commands

Command format	Response output	Operation content
GA＊＊CRLF	G#＊＊, +01234.567CRLF	A display value is output via RS-232C. "＊＊" indicates gage channel numbers 01 to 99 (all channel number to 01 "#" indicates the type of data (N: current value, X: maximum value, M: minimum value, and W: TIR)CRLF stands for carriage return (CR) and line feed (LF).
CN＊＊CRLF	CH＊＊CRLF	The display is switched to the current value.
CX＊＊CRLF	CH＊＊CRLF	The display is switched to the maximum value.
CM＊＊CRLF	CH＊＊CRLF	The display is switched to the minimum value.
CW＊＊CRLF	CH＊＊CRLF	The display is switched to the TIR value.
CR＊＊CRLF	CH＊＊CRLF	The display is zero-set.
CL ＊＊CRLF	CH＊＊CRLF	The peak value is cleared.
CP ＊＊,+01234567CRLF	CH＊＊CRLF	The preset value is input. Input a preset value and a tolerance limit with a sign and a numeric value of 8 digits without appending a decimal point.
CD ＊＊,+01234567CRLF	CH＊＊CRLF	Input tolerance limit S1. Perform tolerance setup in the order of CD and CG for 3-step tolerance judgment, and in the order of CD, CE, CF, and CG for 5-step tolerance judgment. An error messege is output if there is a difference in tolerance limit order, or in the number of steps between the setting and data to be sent, or if incorrect data exists. If this is the case, repeat setup from the beginning of the CD command.
CE ＊＊,+01234567CRLF	CH＊＊CRLF	Input tolerance limit S2.
CF ＊＊,+01234567CRLF	CH＊＊CRLF	Input tolerance limit S3.
CG＊＊,+01234567CRLF	CH＊＊CRLF	Input tolerance limit S4.
CS ＊＊CRLF	CH＊＊CRLF	An error is canceled.
VS ＊＊,+＄CRLF	CH＊＊CRLF	Spindle control Sign +: Moves up the spindle., -:Moves down the spindle. $: Speed specification 0: Stop 1: 2mm/s 2: 4mm 3: 8mm/s approx.
VT ＊＊,+＄CRLF	CH＊＊,#CRLF	Staus of spindle condition In place of #, 0: Normal 1: Upper dead point limit 2: WORK ON Channel number 00 cannot be used.

(2) Pin assignment



•Receptacle specification: D-sub 9-pin (male), inch thread spec.
•Applicable plug specification: D-sub 9-pin (female), inch thread spec.
•Commercial cable examples:
For DOS/V: KRS-403XF1K (1.5m), Sanwa Supply Corp.
For PC-98 series: KRS-423XF1K (1.5m), Sanwa Supply Corp.

Pin No.	Signal name	Input/Output	Definition
2	RXD	IN	Receive data
3	TXD	OUT	Transmit data
4	DTR	OUT	Data terminal ready
5	GND	—	Ground
6	DSR	IN	Data set ready
7	RTS	OUT	Request to send
8	CTS	IN	Clear to send
1, 9	N.C.	—	Unconnected

(3) Communication protocol (EIA RS-232C compatible)

Home position	DTE (terminal) and cross cable are to be used.
Communication method	half-duplex, non-procedural
Baud rate	4800, 9600, 19200bps
Bit configuration	Start bit: 1 Data bits: (7 or 8) ASCII, uppercase Parity bit: None, even or odd Stop bits: 2
Communication condition setup	Set with parameters. See "3.3 List of Parameters".

Digimatic output function

* The number of significant digits in the Digimatic output is 6.

Data transmission to the PC

Input Tool IT-012U
No. 264-012-10

Converts the Digimatic output from Litematic into keyboard signals and transfers to the PC.

Connecting cable (**No.936937**)

Printer

Digimatic mini processor DP-1VR
No. 264-504-5A

Prints the Digimatic output from Litematic.

Connecting cable (**No.936937**)

Coordinate Measuring Machines
Vision Measuring Systems
Form Measurement
Optical Measuring
Sensor Systems
Testing Equipment and Seismometer
Digital Scale and DRO Systems
Small Tool Instruments and Data Management

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2.5M 0312-02 Printed in USA, June 2012

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