

2.2 USB Description of Operation

This product is recognized by the USB host as a virtual COM port.
This product can be controlled by sending and receiving commands via serial communication from the COM port.

2.2.1 USB Command List

These communication commands are used to control LSM-CU-A.

● Command format

The command format is as follows.

<command>,<ID>,<data>,<delimiter>

The contents of each element are as follows.

Command

The length of a command is variable.

The initial letters of the send commands have the following meanings.

P: Execution

S: Setting

G: Acquisition

The response consists of the first letter of the outgoing command converted to a number.

The first character response has the following meanings.

0: No error

1: Post-execution error

2: Command data is abnormal (data content is incorrect)

3: Unable to execute

4: Undefined command received

5: Functional limitation error

Tips

- When using two items measurement, two parameter sets are paired. The paired parameter set combinations are as follows.
 - 0 and 5
 - 1 and 6
 - 2 and 7
 - 3 and 8
 - 4 and 9
 - 10 and 15
 - 11 and 16
 - 12 and 17
 - 13 and 18
 - 14 and 19

ID

Fixed to 1000.

Data

Data length is variable.

If the data contains multiple items, they are separated by commas (,) as follows.

< Ident 1>,< Ident 2>.....< data>

Tips

- Applicable items must be separated with commas (,) even if they are not present.
- Responses in binary format are not delimited with commas (,).

Delimiter

CR and LF are fixed at "0x0D" and "0x0A", respectively.

● List of commands

Item	Send commands	Response	Remarks
Single run measurement execution	PMEAS,1000,R	P<parameter set number>,<GO/NG judgment result>,<measured value>	<ul style="list-style-type: none"> The output timing of measurement results can be set with SCOND,1000,PRC and SCOND,1000,PRT. If GO/NG judgment is enabled, the GO/NG results are output.
Execute continuous measurement	PMEAS,1000,CR		
Measurement end	PMEAS,1000,STOP	0MEAS,1000,STOP	Ends measurement processing. Upon command input, measurement is ended following output of measurement results.
Execute LSM cancellation	PMEAS,1000,CL	0MEAS,1000,CL	Assorted cancellations. Cancels measurement. Measurement in progress at the time the command is entered is discarded.
Acquire FW version of LSM-CU-A.	GCF,1000	0CF,1000,*	* <model name>,<version>,<release date>,<release time>
Set and apply high calibration value	PCAL,1000,H,*	0CAL,1000,H,*	* High calibration value (mm or in)
Acquire high calibration value setting	GCAL,1000,H	0CAL,1000,H,*	
Set and apply low calibration value	PCAL,1000,L,*	0CAL,1000,L,*	* High calibration value (mm or in)
Acquire high calibration value setting	GCAL,1000,L	0CAL,1000,L,*	
Clear calibration	PCAL,1000,C	0CAL,1000,C	
Set calibration application range	SCAL,1000,R,*	0CAL,1000,R,*	* 1: Apply individually to each pair in the current parameter set 2: Apply to pairs in all parameter sets
Acquire calibration application range	GCAL,1000,R	0CAL,1000,R,*	

Item	Send commands	Response	Remarks
Configure parameter set	SCOND,1000,P,*	0COND,1000,P,*	* 0–19
Acquire parameter set	GCOND,1000,P	0COND,1000,P,*	
Set parameter set name	SCOND,1000,P_NAME,*	0COND,1000,P_NAME,*	* Parameter set name
Acquire parameter set name	GCOND,1000,P_NAME	0COND,1000,P_NAME,*	
Set controller name	SCOND,1000,S_NAME,*	0COND,1000,S_NAME,*	* Controller name
Acquire controller name	GCOND,1000,S_NAME	0COND,1000,S_NAME,*	
Set number of sample measurement	SCOND,1000,SMPN,*	0COND,1000,SMPN,*	* 0: Set zero-run measurement 1–999 (number of sample measurement)
Acquire number of sample measurement	GCOND,1000,SMPN	0COND,1000,SMPN,*	
Set calculation items for measurement.	SCOND,1000,SMPA,*	0COND,1000,SMPA,*	* 1: Maximum value 2: Minimum value 3: Range 4: Average
Acquire calculation item for measurement.	GCOND,1000,SMPA	0COND,1000,SMPA,*	
Set averaging method	SCOND,1000,AVEA,*	0COND,1000,AVEA,*	* 0: Arithmetical average 1: Moving average
Acquire averaging method	GCOND,1000,AVEA	0COND,1000,AVEA,*	
Set number of averaging	SCOND,1000,AVEN,*	0COND,1000,AVEN,*	* 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048
Acquire number of averaging	GCOND,1000,AVEN	0COND,1000,AVEN,*	
Batch save common setting items	PCOND,1000,STR	0COND,1000,STR	Batch save common setting items to EEPROM. If the power is turned off without saving the settings, settings revert to their former values the next time the power is turned on.
Set two items measurement	SCOND,1000,SUBMEAS,*	0COND,1000,SUBMEAS,*	* 0: Disabled 1: Enabled
Acquire setting of two items measurement	GCOND,1000,SUBMEAS	0COND,1000,SUBMEAS	

Item	Send commands	Response	Remarks
Set data output timer	SCOND,1000,PRT,*	0COND,1000,PRT,*	When data output conditions are met, measured values and GO/NG judgment results are output to USB after the set time. * 0: Disabled 1–999: Valid (specified in seconds)
Acquire setting of data output timer	GCOND,1000,PRT	0COND,1000,PRT,*	
Setting data output conditions	SCOND,1000,PRC,*	0COND,1000,PRC,*	Measurement values and GO/NG judgment results are output to USB according to the set conditions. Output timing can be delayed according to the data output timer setting. * 0: Disabled 1: Output each time measurement ends 2: Output only when judgment is NG 3: Output only when judgment is OK
Acquire data output conditions	GCOND,1000,PRC	0COND,1000,PRC,*	
Acquire workpiece position	GCOND,1000,WORK_POS	0COND,1000,WORK_POS,*	Displayed in hexadecimal
Acquire focus detection position	GCOND,1000,OPT_POS	0COND,1000,OPT_POS,*	
Set automatic workpiece detection	SAUT,1000,T,*	0AUT,1000,T,*	* 0: Disabled D: Diameter method P: Position method
Acquire setting of auto-work detection	GAUT,1000,T	0AUT,1000,T,*	
Set number of measurements for automatic workpiece detection	SAUT,1000,N,*	0AUT,1000,N,*	* 1–999
Acquire number of measurements for automatic workpiece detection	GAUT,1000,N	0AUT,1000,N,*	


Item	Send commands	Response	Remarks
Set invalid time for automatic workpiece detection	SAUT,1000,D,*	0AUT,1000,D,*	Specify the interval from when a workpiece is automatically detected to the start of measurement (the measurement invalid time). * 0–9999 (in milliseconds)
Acquire automatic workpiece detection invalid time	GAUT,1000,D	0AUT,1000,D,*	
Set lower detection limit for automatic workpiece detection	SAUT,1000,L,*	0AUT,1000,L,*	* Lower limit (mm or in)
Acquire lower detection limit for automatic workpiece detection setting	GAUT,1000,L	0AUT,1000,L,*	
Set upper detection limit for automatic workpiece detection	SAUT,1000,H,*	0AUT,1000,H,*	* Upper limit (mm or in)
Acquire upper detection limit for automatic workpiece detection setting	GAUT,1000,H	0AUT,1000,H,*	
Set "S send" for automatic workpiece detection	SAUT,1000,S,*	0AUT,1000,S,*	During auto-work detection, "S" is sent at the start of measurement. Always set to disabled at start-up. * 0: Disabled 1: Enabled
Acquire "S send" for automatic workpiece detection	GAUT,1000,S	0AUT,1000,S,*	
Set "E send" for automatic workpiece detection	SAUT,1000,E,*	0AUT,1000,E,*	During auto-work detection, "E" is sent at the end of measurement. Always set to disabled at start-up. * 0: Disabled 1: Enabled
Acquire "E send" for automatic workpiece detection	GAUT,1000,E	0AUT,1000,E,*	

Item	Send commands	Response	Remarks
Set scanning rate for auto-workpiece detection	SAUT,1000,C,*	0AUT,1000,C,*	Set when using the "diameter detection" in "auto-work detection" (number of averaging during auto-work detection). * 1, 16 (times)
Acquire scanning rate for automatic workpiece detection	GAUT,1000,C	0AUT,1000,C,*	
Set outlier elimination	SABO,1000,T,*	0ABO,1000,T,*	* 0: Disabled 1: USE1 2: USE2
Acquire setting of outlier elimination	GABO,1000,T	0ABO,1000,T,*	
Set lower value of outlier elimination	SABO,1000,L,*	0ABO,1000,L,*	* Lower limit (mm or in)
Acquire lower value of outlier elimination	GABO,1000,L	0ABO,1000,L,*	
Set upper value of outlier elimination	SABO,1000,H,*	0ABO,1000,H,*	* Upper limit (mm or in)
Acquire upper value of outlier elimination	GABO,1000,H	0ABO,1000,H,*	
Set count for outlier elimination	SABO,1000,N,*	0ABO,1000,N,*	A warning is displayed if the number of samples excluded as outliers exceeds [Count val.]. * Count value
Acquire count for outlier elimination	GABO,1000,N	0ABO,1000,N,*	
Set detection method	SEDG,1000,T,*	0EDG,1000,T,*	* 0: Normal measurement as segment mode method 1: Transparent object measurement as segment mode method 2: Ultra-fine wire measurement as segment mode method 3: Transparent object & ultra-fine wire as segment mode method N: Edge mode method
Acquire detection method	GEDG,1000,T	0EDG,1000,T,*	

Item	Send commands	Response	Remarks
Set arbitrary THL value	SEDG,1000,THL_E,*	0EDG,1000,THL_E,*	* 0: Disabled 1: Enabled
Acquire arbitrary of THL value setting	GEDG,1000,THL_E	0EDG,1000,THL_E,*	
Set THL value	SEDG,1000,THL,*	0EDG,1000,THL,*	* Set as a hexadecimal number
Acquire THL value	GEDG,1000,THL	0EDG,1000,THL,*	
Set segment mode location	SEDG,1000,S,*	0EDG,1000,S,*	* Segment number
Set edge mode location	SEDG,1000,E,**	0EDG,1000,E,**	** <starting edge number> <ending edge number>
Function setting: Acquire Segment/Edge (measurement location) setting	GEDG,1000,P	0EDG,1000,P,* 0EDG,1000,P,**	* Segment number ** <starting edge number> <ending edge number>
Obtains judgment result indicating whether the connected sensor supports ultra-fine wire measurement.	GEDG,1000,CAPFIN	0EDG,1000,CAPFIN,*	* 0: Ultra-fine wire measurement not supported (LSM-30-A is connected) 1: Ultra-fine wire measurement supported (LSM-02-A is connected)
Set I/O RUN input	SEXIO,1000,RUN_T,*	0EXIO,1000,RUN_T,*	* 0: Single run measurement 1: Continuous run measurement with a specified period 2: Continuous run measurement
Acquire I/O RUN input setting	GEXIO,1000,RUN_T	0EXIO,1000,RUN_T,*	
Set STB/ACK output selection	SEXIO,1000,ACK_T,*	0EXIO,1000,ACK_T,*	* 0: STB 1: ACK
Acquire STB/ACK output selection setting	GEXIO,1000,ACK_T	0EXIO,1000,ACK_T,*	

Item	Send commands	Response	Remarks
Set the STB length	SEXIO,1000,STB_T,*	0EXIO,1000,STB_T,*	* 0: Auto 1: 0.1 ms
Acquire STB length setting	GEXIO,1000,STB_T,*	0EXIO,1000,STB_T,*	2: 0.3 ms 3: 2.0 ms 4: 5.0 ms 5: 10.0 ms 6: 20.0 ms 7: 50.0 ms 8: 100.0 ms
Set the input software filter	SEXIO,1000,IN_FILTER,*	0EXIO,1000,IN_FILTER,*	Input signal filter setting for I/O. Signals less than the setting are discarded (filtered). * 2: 2.0 ms 5: 5.0 ms 20: 20.0 ms
Acquire setting of input software filter	GEXIO,1000,IN_FILTER	0EXIO,1000,IN_FILTER,*	
Set the output voltage at the time of no work-piece error	SEXIO,1000,AN_OUTE,*	0EXIO,1000,AN_OUTE,*	* 0: 0 V 1: 5 V 2: -5 V
Acquire the output voltage setting at the time of no work-piece error	GEXIO,1000,AN_OUTE	0EXIO,1000,AN_OUTE,*	
Set analog output scale	SEXIO,1000,AN_OUTS,*	0EXIO,1000,AN_OUTS,*	* 1: 1X 2: 10X
Acquire analog output scale	GEXIO,1000,AN_OUTS	0EXIO,1000,AN_OUTS,*	3: 100X 4: 1000X 5: 10000X
Set analog output reference value	SEXIO,1000,AN_OUTR,*	0EXIO,1000,AN_OUTR,*	* Reference value (mm or in)
Acquire analog output reference value	GEXIO,1000,AN_OUTR	0EXIO,1000,AN_OUTR,*	
GO/NG judgment	SJDG,1000,E,*	0JDG,1000,E,*	* 0: Disabled 1: Enabled
Acquire setting of GO/NG judgment	GJDG,1000,E	0JDG,1000,E,*	
Set type of GO/NG judgment	SJDG,1000,T,*	0JDG,1000,T,*	* 0: LL, LH (upper/lower limit value)
Acquire GO/NG judgment type	GJDG,1000,T	0JDG,1000,T,*	1: L1–L6 (multi-limits) 2: Target value and upper/lower tolerance

Item	Send commands	Response	Remarks
Set lower limit value for GO/NG judgment	SJDG,1000,L,*	0JDG,1000,L,*	* Lower limit (mm or in)
Acquire lower limit value for GO/NG judgment	GJDG,1000,L	0JDG,1000,L,*	
Set upper limit for GO/NG judgment.	SJDG,1000,H,*	0JDG,1000,H,*	* Upper limit (mm or in)
Acquire upper limit value for GO/NG judgment	GJDG,1000,H	0JDG,1000,H,*	
Set target value for GO/NG judgment.	SJDG,1000,t,*	0JDG,1000,t,*	* Target value (mm or in)
Acquire target value for GO/NG judgment	GJDG,1000,t	0JDG,1000,t,*	
Set lower limit value for GO/NG judgment	SJDG,1000,l,* (lower case L)	0JDG,1000,l,*	* Lower tolerance (mm or in)
Acquire lower tolerance for GO/NG judgment	GJDG,1000,l (lower case L)	0JDG,1000,l,*	
Set upper tolerance for GO/NG judgment	SJDG,1000,h,*	0JDG,1000,h,*	* Upper tolerance (mm or in)
Acquire upper tolerance for GO/NG judgment	GJDG,1000,h	0JDG,1000,h,*	
Batch set multi-limit GO/NG judgment	SJDG,1000,nn,*,*,*.....	0JDG,1000,nn,*,*,*.....	* <number of multi-limit judgment rows>,L1 (mm or in),<L2 (mm or in)>..... Number of multi-limit judgment rows: 3–7
Acquire multi-limit GO/NG judgment	GJDG,1000,nn	0JDG,1000,nn,*,*,*.....	
Execute [Memorize light amount]	PLIGHT,1000,P	0LIGHT,1000,P	

Item	Send commands	Response	Remarks
Set [Memorize light amount]	SLIGHT,1000,E,*	0LIGHT,1000,E,*	* 0: Disabled 1: Enabled
Acquire setting [Memorize light amount]	GLIGHT,1000,E	0LIGHT,1000,E,*	
Apply/cancel preset	PPST,1000,T,*	0PST,1000,T,*	* 0: Cancel 1: Start application
Setting preset	SPST,1000,**	0PST,1000,**	** <preset direction>,<preset value (mm or in)> • Preset direction P: Positive direction M: Negative direction
Acquire preset	GPST,1000	0PST,1000,**,*	*** <preset direction>,<status>,<preset value> • Status 0: Canceling 1: Applying
Set preset application range	SPST,1000,R,*	0PST,1000,R,*	* 1: Apply to current parameter set
Acquire preset application range	GPST,1000,R	0PST,1000,R,*	2: Apply to all parameter sets
Apply/cancel offset	POST,1000,T,*	0OST,1000,T,*	* 0: Cancel 1: Start application
Setting the offset	SOST,1000,V,*	0OST,1000,V,*	* Offset value (mm or in)
Acquire offset	GOST,1000,V	0OST,1000,V,**	** <status>,<offset value> • Status 0: Canceling 1: Applying
Acquire current position and status (in ASCII format)	GSTS,1000,A	0STS,1000,A,****,*	****,* <parameter set number>,<measured value>,<status>,<error status>,<number of averaging> Tips For details about the status and error status, see  "• About Status and Error Status" on page D-17.


Item	Send commands	Response	Remarks
Acquire current position and status (in binary format)	GSTS,1000,B	0STS,1000,B,*****	***** <parameter set number (4 bytes)><measured value (4 bytes)><status (4 bytes)><error status (4 bytes)><number of averaging (4 bytes)>
Clear error status	PSTS,1000,C	0STS,1000,C	
Acquire statistical processing results	GSTAT,1000,A	0STAT,1000,A	P,①,N,②,A,③,X,④,N,⑤,R,⑥,S,⑦ ①: Parameter set number (integer) ②: Number of data (integer) ③: Average (real number) ④: Maximum value (real number) ⑤: Minimum value (real number) ⑥: Width (real number) ⑦: Standard deviation (real number) IMPORTANT During [Two items measurement], only the statistical processing result of the currently selected parameter set number can be obtained.
Run/stop statistical processing	PSTAT,1000,E,*	0STAT,1000,E,*	* 0: Stop 1: Run
Acquire setting of statistical processing	GSTAT,1000,E	0STAT,1000,E,*	

Item	Send commands	Response	Remarks
Clear statistical processing results	PSTAT,1000,C,*	0STAT,1000,C,*	Clears measurement results accumulated for statistical processing (clears statistical processing memory). * 0: Clear accumulated measurement results only for the parameter set being displayed. 1: Clear accumulated measurement results for both the parameter set being displayed and the paired parameter set.
Unit settings	SSYS,1000,UNIT,*	0SYS,1000,UNIT,*	* M: mm I (upper case "i"): in Valid only with mm/in-type LSM controllers Tips If the unit is changed, turn the power off and then on again.
Acquire set unit	GSYS,1000,UNIT	0SYS,1000,UNIT,*	
Initialize arithmetic unit EEPROM	PSYS,1000,INIEEP	0SYS,1000,INIEEP	Initialize settings.

● About Status and Error Status

The status and error statuses that can be acquired by the GSTS,1000,A USB command are as follows: Convert the decimal number output in ASCII data format to 8 hex digits and then refer to the table below.

(Example: 256 → 0x00000100)

For details about error number displayed by LSMPAK, see  "1 Error Messages and Solutions" on page F-1 in "PART F Troubleshooting".

Status

Value	Status
0x00000000	Ready
0x00000001	Measuring
0x00000002	Simultaneous measurement
0x00000020	Workpiece detected (automatic workpiece detection)
0x00000100	Preset state
0x00000200	Offset state
0x00000400	Calibrating

Error status

Value	Status	Error number displayed by LSMPAK
0x00000001	Outlier elimination	—
0x00000002	Outlier elimination (all)	—
0x00000010	Hardware error	H0007
0x00000020	Statistics buffer overflow error	—
0x00000040	Calibration error	E0001
0x00000080	Outlier detection warning	W0001
0x00000100	No workpiece error	E0008
0x00000200	Output buffer overflow error	E0002
0x00000800	Hardware error	H0005
0x00001000	Edge not found error	E0005
0x00002000	Edge error	E0004
0x00010000	Hardware error	H0003
0x00020000	Hardware error	H0004
0x00040000	Hardware error	H0002
0x00080000	Insufficient light error	E0006
0x00100000	Hardware error	H0006
0x00200000	Hardware error	H0001
0x00800000	Dirt detection error	E0007
0x01000000	Power supply error	P0001

2.2.2 Example of USB Command Usage

Some examples of command usage with USB connection are explained below.

For more information on how to use the commands in addition to the examples in this section, contact your local Mitutoyo sales and service representative.

■ Measurement operation

● Pre-measurement settings

Set the number of sample measurement, calculation items, averaging method, and number of averaging before starting measurement.

For settings, see the following.

- "3 Settings" on page C-9 in "PART C Operation"
- "2.2.1 USB Command List" on page D-4

Setting item	USB command	Settings
Set number of averaging	SCOND,1000,AVEN,*	* 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048 (number of averaging)
Check the number of averaging	GCOND,1000,AVEN	
Set number of sample measurement	SCOND,1000,SMPN,*	* 0–999 (number of sample measurement)
Check the number of sample measurement	GCOND,1000,SMPN	
Set the calculation items	SCOND,1000,SMPA,*	* 1: Maximum value 2: Minimum value 3: Range 4: Average
Check the calculation items	GCOND,1000,SMPA	

● USB data output


Output data (measurement values and GO/NG results) in accordance with the output conditions. This command is only supported with USB output.

This function outputs data from USB after measurement when measured values meets the output conditions and the set time for timer output setting has elapsed.

Setting item	USB command	Settings
Set output conditions for USB data output	SCOND,1000,PRC,*	* 0: Disabled 1: Output each time measurement ends 2: Output only when judgment is NG 3: Output only when judgment is OK
Check output conditions for USB data output	GCOND,1000,PRC	
Set timer output for USB data output	SCOND,1000,PRT,*	* 0: Disabled 1–999: Valid (specified in seconds)
Check timer output for USB data output	GCOND,1000,PRT	

● Measurement operation using USB

Measuring method	Settings	Operation (command)		
	Number of samples*	Measurement start	End measurement (measurement in progress at the time of input is valid)	Cancel measurement (measurement in progress at the time the command is entered is discarded)
Single run measurement	0	PMEAS,1000,R	PMEAS,1000,STOP Or when 65535 samples acquired	PMEAS,1000,CL
	1-999		Measure once then end automatically (acquire set number of sample measurement)	
Continuous run measurement	1-999	PMEAS,1000,CR	PMEAS,1000,STOP	

* Measurement values are calculated from acquired samples based on calculation item settings. When the number of sample measurement is 1, no calculation is possible, so the acquired sample value is output as the measured value. For details, see  "■ Sample measurement" on page C-57 in "PART C Operation".

Tips

- The number of measurement results output depends on the measuring method. The number of sample measurement does not affect the number of measurement results.
- With single measurement, one measurement result is output.
- With continuous measurement, the number of measurement results output is the same as the number of measurements performed consecutively from start of measurement to end of measurement.