Model LSMT4
Multi Power Transducer
PC CONFIGURATOR SOFTWARE

Model: LSCFG Ver. 1.1

USERS MANUAL

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Contents

1. INTRODUCTION

1.1 GENERAL DESCRIPTION

M-System LSCFG is used to program parameters for the model LSMT4 Multi Power Transducer (referred hereunder as 'device'). The following major functions are available:

- Edit parameters
- Download parameters to the device, upload parameters from the device
- Save parameters as files, read parameters from files
- Compare parameters edited on the screen with the ones stored in the device

1.2 PC REQUIREMENTS

The following PC performance is required for adequate operation of the software program.

OS	Windows 10 (32-bit, 64-bit) Windows 11 (64-bit) The software may not function adequately in certain conditions.
Communication port	A COM port (RS-232-C) or USB port is required.

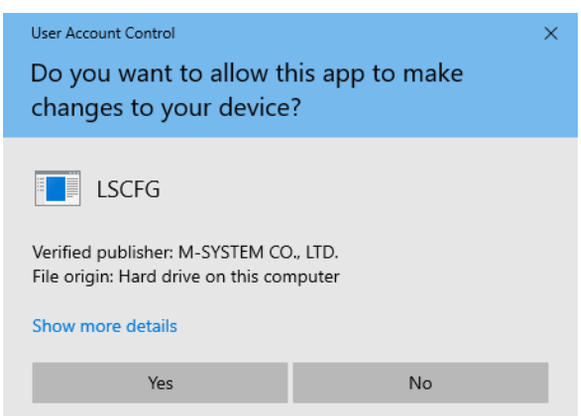
For connecting the device to a PC, the M-System's PC configurator cable detailed in the table below is required.

PORT	REQUIRED CABLE MODEL NO.
RS-232-C	MCN-CON
USB	COP-US

1.3 INSTALLING & DELETING THE PROGRAM

1.3.1 TO INSTALL THE PROGRAM

The program is provided as compressed archive.
Decompress the archive and execute 'setup.exe'.
Follow the instructions on the screen to install the program.
Note that it is required to log on as administrator to install the program.
'User Account Control' window appears to clarify your administrative right before proceeding.
Click 'Yes' to complete installation.



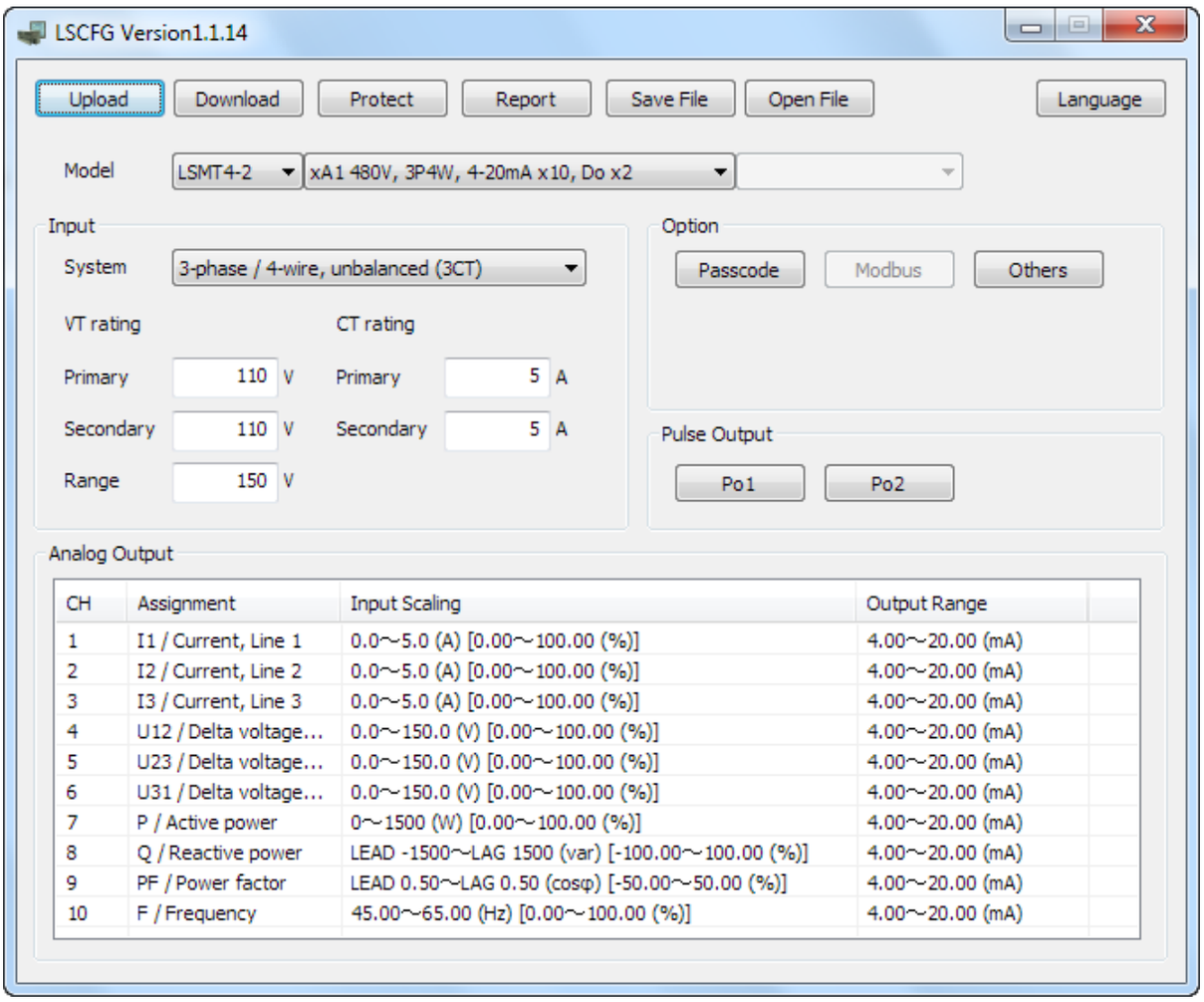
1.3.2 TO DELETE THE PROGRAM

For Windows 10, open Settings from Start menu > Apps > Apps & features.
Select the LSCFG from the program list and click [Uninstall] button.
Follow the instructions on the screen to uninstall the program.
For Windows 11, open Settings from Start menu > Apps > Installed apps.
Select the [...] of LSCFG from the program list and click [Uninstall] button.
Follow the instructions on the screen to uninstall the program.

2. BASIC OPERATIONS

2.1 STARTING THE LSCFG

Open Program > M-System > Configurator > LSCFG to start it up on a Windows PC. The following window appears on the screen. (The display may depend on the LSCFG version.)

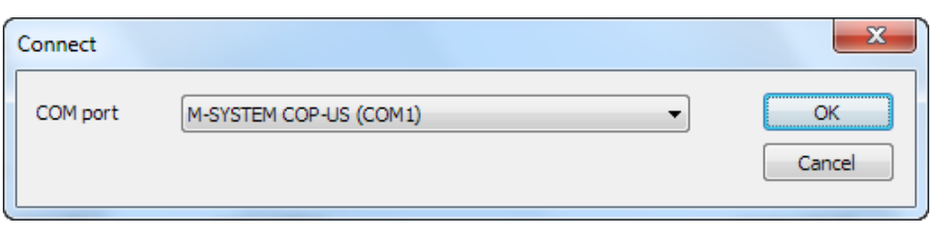


2.2 MODIFYING PARAMETERS

In order to modify parameters stored in the device, first (1) upload the device parameters, (2) modifying a part of or all of them on the screen, and then (3) download the new parameters to the device.

2.2.1 READING PARAMETERS FROM DEVICE (UPLOAD)

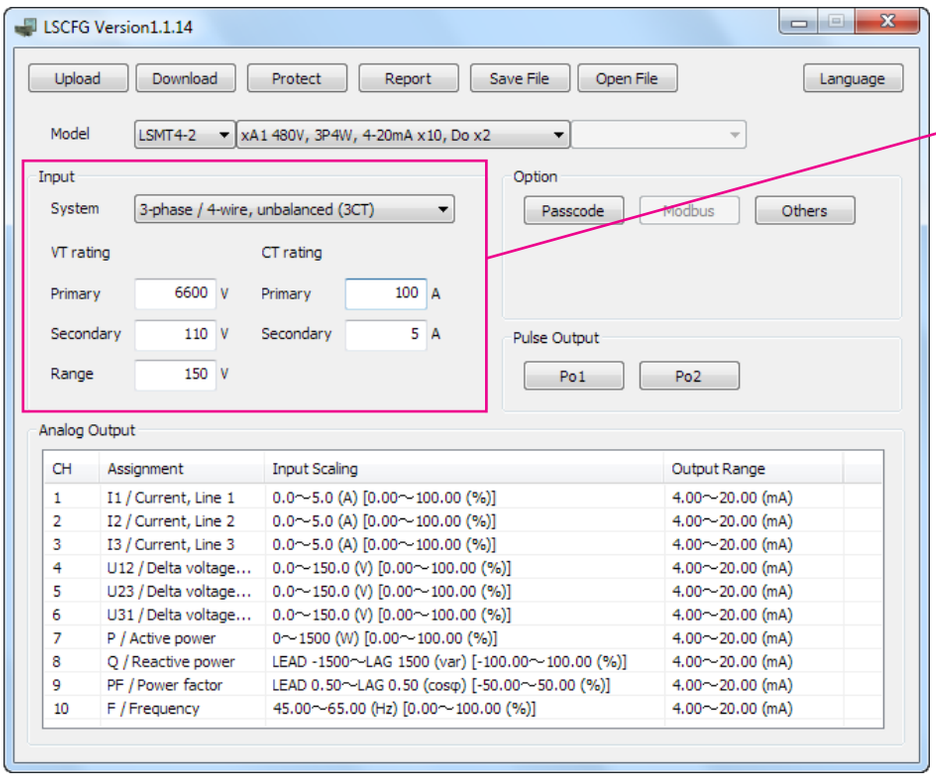
Clicking [Upload] opens the Connect dialog box.



Specify a COM port.
Click [OK] to start reading parameters stored in the connected device to show them on the screen.

2.2.2 MODIFYING PARAMETERS ON THE SCREEN

The initial window shows only basic parameters on the screen. The buttons are used to go into more detailed settings for respective categories.
In the example shown below, the device input has been changed to: 3-phase/4-wire, unbalanced load, VT ratio 6600/110 V, CT ratio 100/5 A.

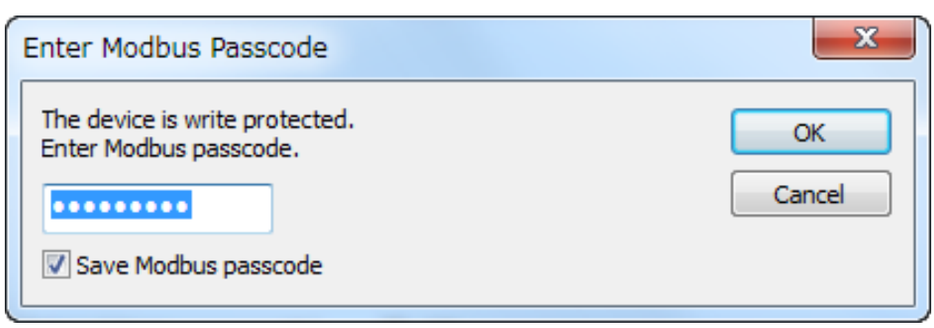


Choose from the menu options or enter appropriate values.

Detailed descriptions on each parameter and control button are given in the later pages of this manual.

2.2.3 WRITING PARAMETERS TO DEVICE (DOWNLOAD)

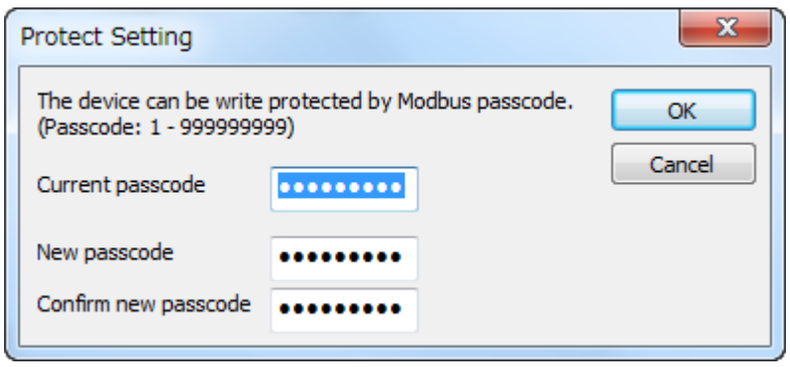
Clicking [Download] opens the Connect dialog box just as [Upload] button did. Specify the COM port.
Click [OK] to start downloading new parameters.
When the Modbus register writing protection is activated, a dialog box requesting Modbus passcode entry will appear on the screen.



Once downloading begins, a bargraph appears on the screen to indicate progress. When it disappears without any error messages, the new setting becomes valid.

2.3 PROTECTING PARAMETERS

In order to protect parameter changes by the front keys of the device, Passcode (4-digit number) is used.
In order to protect parameter changes via Modbus (CONFIG port), Modbus Register Writing Protection Passcode is used.
The code consists of 9-digit number.
Clicking [Protect] opens the Connect dialog box just as [Upload] button did. Specify the COM port.
Click [OK] to open Protect Setting dialog box.



Modbus passcode is selectable between 1 and 999 999 999. In order to change, enter the current passcode and new passcode (twice). If there is no passcode setting or if you do not want to activate the protection, leave relevant field blank.
Click [OK].

Caution!

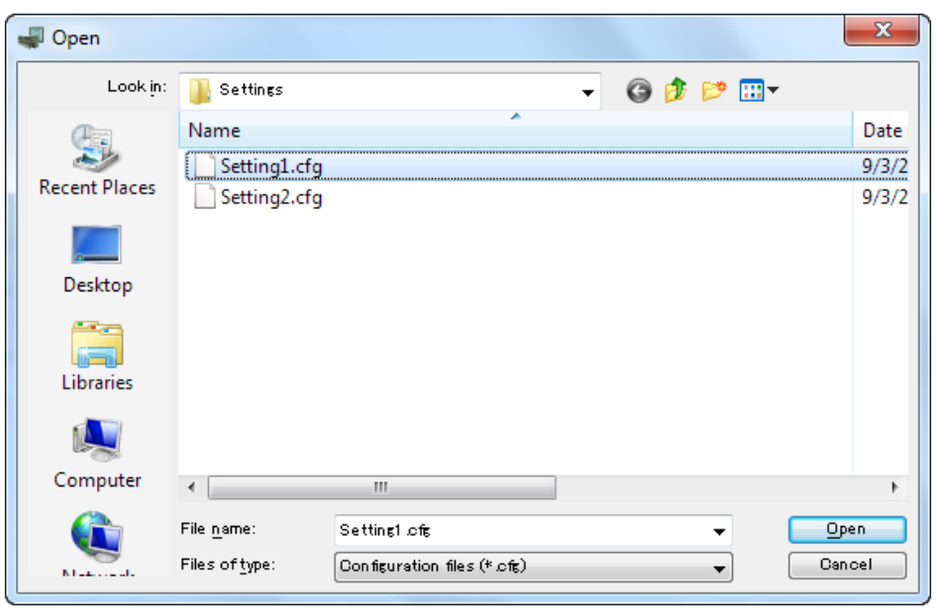
Once a passcode is set, no parameter changes via Modbus are available unless the correct passcode is entered.
BE SURE NOT TO FORGET the passcode.

2.4 SAVING FILES

Parameters set on the screen can be saved as a file on the hard disk. A file can be called up on the screen. You can store backup setting data by utilizing these functions in combination with [Upload] [Download] functions.

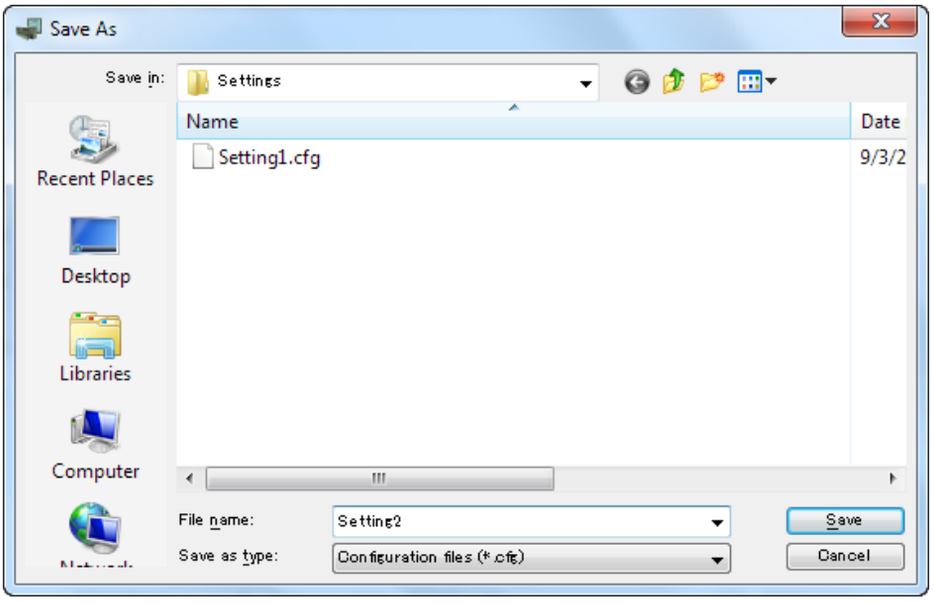
2.4.1 READING PARAMETERS SAVED AS FILE

Clicking [Open File] calls up the Windows-standard Open dialog box. Select a parameter file to show a stored parameter setting.



2.4.2 SAVING PARAMETERS IN A FILE

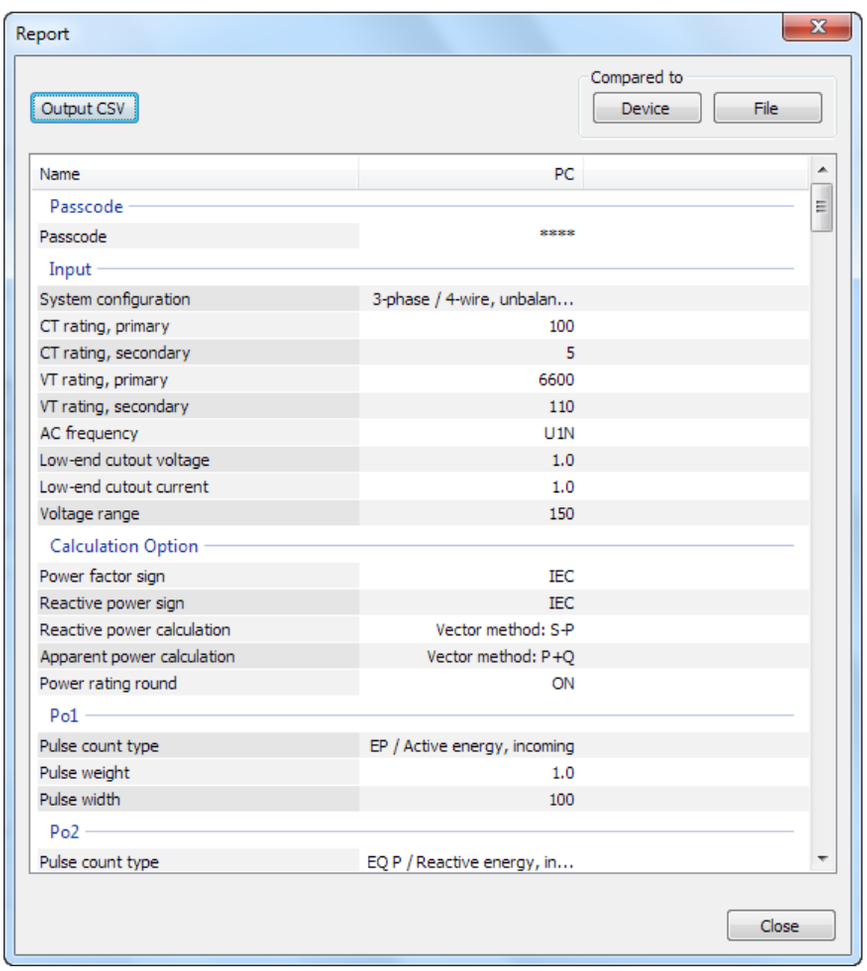
Clicking [Save File] calls up the Windows-standard Save As dialog box. Enter a desired file name to File Name field and click [Save] to store a parameter setting.



2.5 REPORT

2.5.1 DISPLAYING PARAMETERS

Clicking [Report] opens Report window showing all parameters presently edited on the screen.

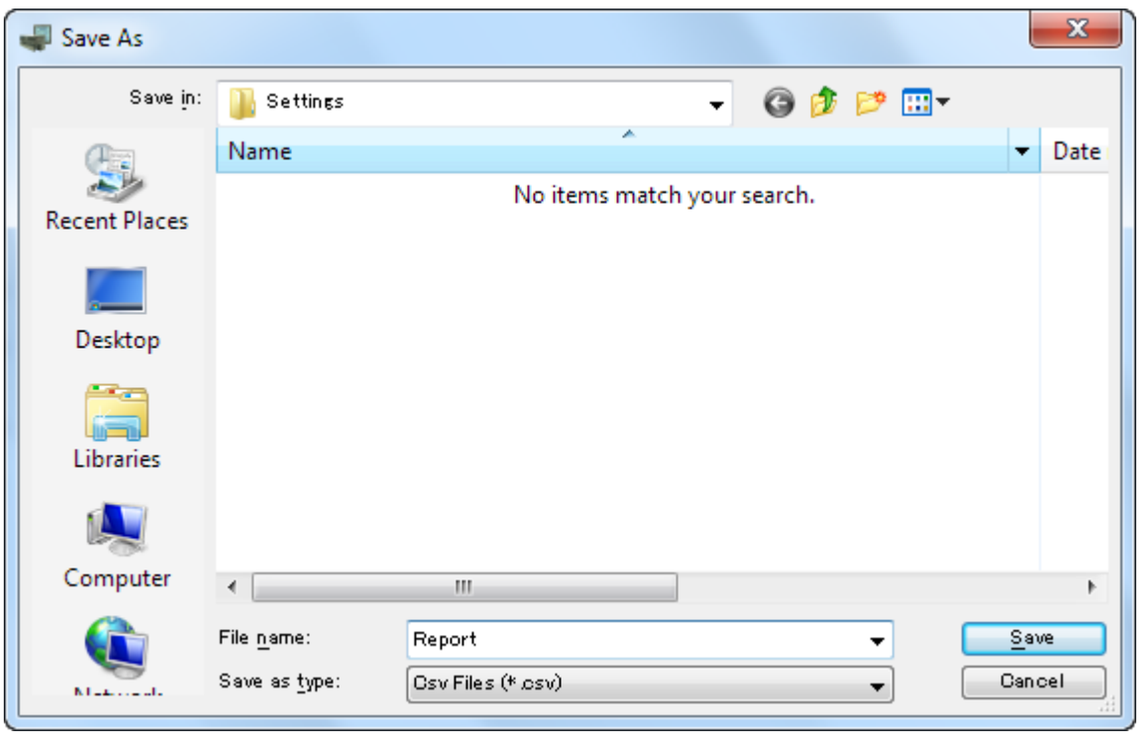


2.5.2 COMPARING PARAMETERS

Parameters presently edited on the screen and those stored in the connected device or in a file can be compared side by side.
Click [Device] in order to upload the parameters in the device, or [File] to upload those in a file. Parameters are compared and listed on the screen side by side.
The rows showing differences between two sets of parameters are highlighted in red background. Cells for matching parameters are filled in white, or light gray. Gray characters show parameters not supported by the other one.
The total number of non-matching cases is mentioned in the bottom of the window frame.

2.5.3 CSV FILE

The parameter list can be exported as a CSV text format file for use in another application software such as Microsoft Excel.
Click [Output CSV] button at the top left of the screen and go through standard Windows Save As procedure.



Input the file name and click [Save] button then the CSV file with the name is created. The CSV file format is in the following:
- Each row for one parameter
- Each row (parameter) consists of 3 or 4 separated data
- Data is arranged in order of 'Parameter group', 'Parameter identification', 'Parameter edited' and 'Parameter to compare'. If you have not uploaded a parameter set for comparing, 'Parameter to compare' is not exported.

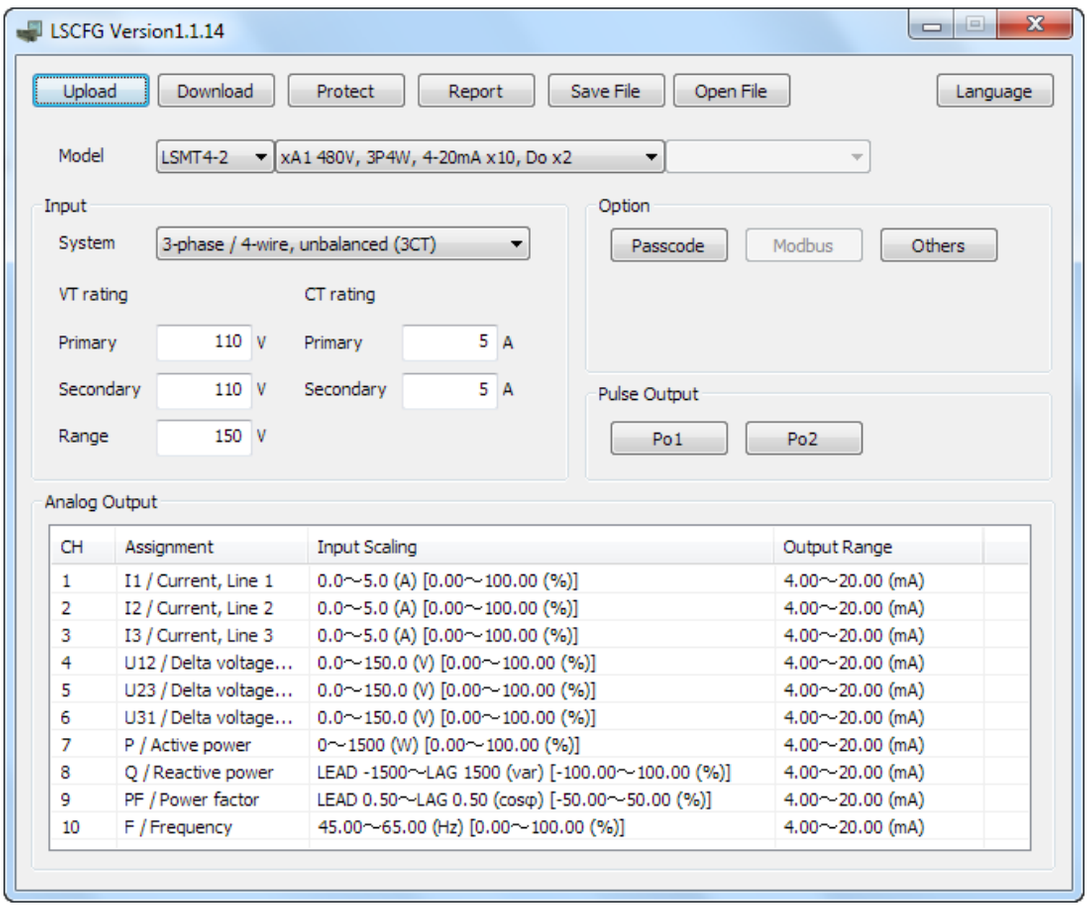
[Example]
; Group, Name, PC, Device
"Passcode", "Passcode", "****", "****"
"Input", "System configuration", "3-phase/3-wire, unbalanced (2CT)", "3-phase/3-wire, unbalanced (2CT)"

2.6 SWITCHING LANGUAGE

Click [Language] to switch the display language between English and Japanese.
The program starts up in English mode as initial state when the OS is other than Japanese version. You can switch to Japanese only when the OS supports Japanese language.

3. BASIC PARAMETERS

The initial window when you start up the LSCFG contains basic parameters as described below.



3.1 MODEL

Choose an appropriate device type to be configured on the LSCFG.

Selection

LSMT4-1	xA1 480V, 4-20mA x10, Do x2 x41 480V, 0-10V x10, Do x2 x51 480V, 0-5V x10, Do x2 x61 480V, 1-5V x10, Do x2
LSMT4-2	xA1 480V, 3P4W, 4-20mA x10, Do x2 x41 480V, 3P4W, 0-10V x10, Do x2 x51 480V, 3P4W, 0-5V x10, Do x2 x61 480V, 3P4W, 1-5V x10, Do x2

3.2 INPUT

3.2.1 SYSTEM

Choose an input wiring configuration from the following:

Selection

System	Single-phase / 2-wire (1CT) Single-phase / 3-wire (1CT) 3-phase / 3-wire, balanced load (1CT) 3-phase / 3-wire, unbalanced load (2CT) 3-phase / 4-wire, balanced load (1CT)*1 3-phase / 4-wire, unbalanced load (3CT)*1

*1) Available only with LSMT4-2.

3.2.2 VT RATING, PRIMARY / SECONDARY

Enter VT's primary and secondary ratings when an external voltage transformer (VT) is used. The maximum selectable ratio is 400 kV/50 V, but both CT and VT ratios must be considered to satisfy the maximum measurable power value of 2 GVA.

Selection / Range

VT rating, primary	50V to 400000V
VT rating, secondary	50V to 480V

3.2.3 VOLTAGE RANGE

Enter voltage range for the analog output assigned to voltage.

Selection / Range

Range	50 to 480V

When the secondary VT rating is changed, the voltage range is automatically set as shown in the table below. Enter a value if other one is needed.

Secondary VT rating	Automatic voltage range
110	150
220	300
Others	Same as the setting value

3.2.4 CT RATING, PRIMARY / SECONDARY

Enter CT's primary and secondary ratings when an external current transformer (CT) is used. The maximum selectable ratio is 20 kA/1 A, but both CT and VT ratios must be considered to satisfy the maximum measurable power value of 2 GVA.

Selection / Range

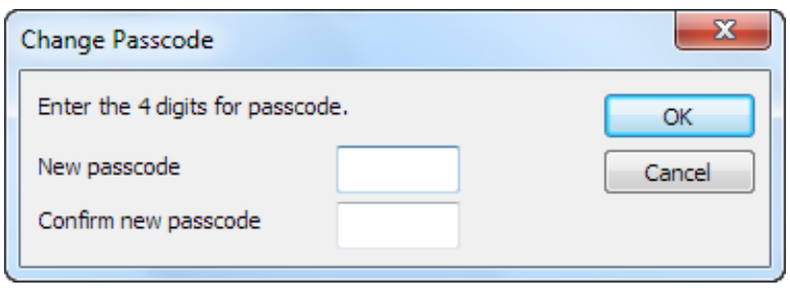
CT rating, primary	1A to 20000A
CT rating, secondary	1A to 5A

4. OPTION PARAMETERS

When you click control buttons under 'Option' on the initial window of the LSCFG, you can go to detailed setting.

4.1 PASSCODE

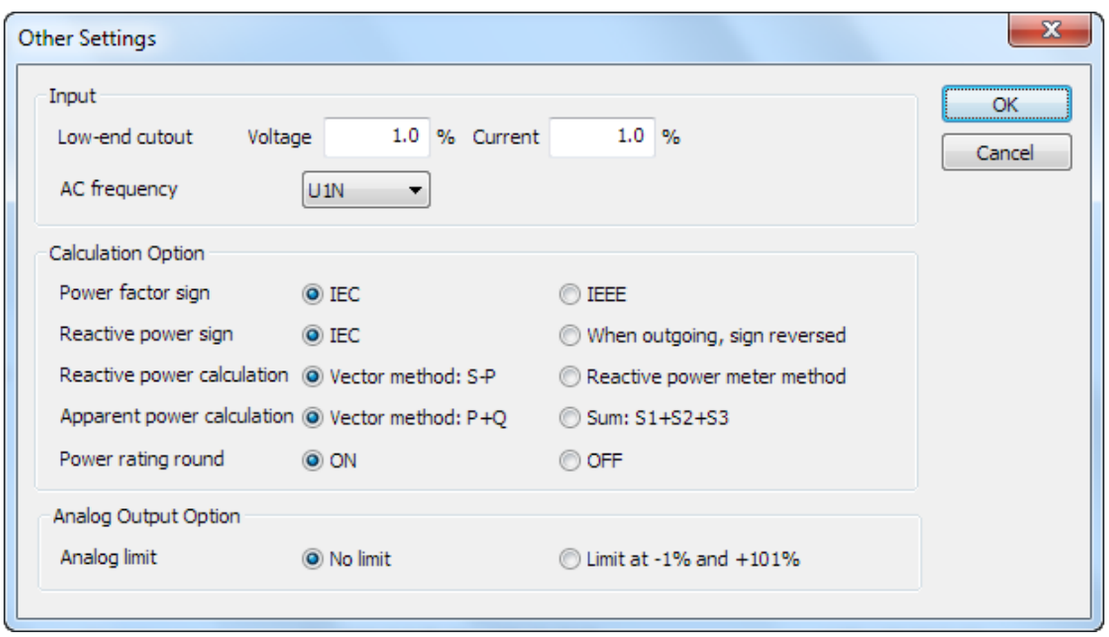
4-digit passcode is needed to enter the programming mode when you use the front keys. Type in 4-digit number once and twice for confirmation and click OK.



Selection / Range

Passcode	0000 to 9999

4.2 OTHER SETTINGS



4.2.1 LOW-END CUTOUT (VOLTAGE)

Specify voltage low-end cutout value in %. Actual cutout voltage is calculated from the VT's primary rating by the following equation:

Low-end cutout voltage = Setting in % x VT's primary rating

When the input signal goes below the calculated value, '0' is supplied as the input, discarding the actual input signal.

4.2.2 LOW-END CUTOUT (CURRENT)

Specify current low-end cutout value in %. Actual cutout current is calculated from the CT's primary rating by the following equation:

Low-end cutout current = Setting in % x CT's primary rating

When the input signal goes below the calculated value, '0' is supplied as the input, discarding the actual input signal.

4.2.3 AC FREQUENCY

Specify either voltage or current to monitor AC frequency.

Selection

I1	I1 current
U1N	U1 voltage

4.2.4 POWER FACTOR SIGN

Selection

Standard (IEC)	Positive in incoming active power; Negative in outgoing active power.
IEEE	Positive in LAG (inductive), Negative in LEAD (capacitive).

4.2.5 REACTIVE POWER SIGN

Selection

Standard (IEC)	Positive from [PF = 1.0] to 180˚ in LAG direction; Negative for the other direction.
When outgoing, sign reversed	Identical to IEC method in incoming power; Positive-negative inverted in outgoing power.

4.2.6 REACTIVE POWER CALCULATION

Selection

Standard (Vector method: S-P)	$Qn = \sqrt{Sn^2 - Pn^2}$
Reactive power meter method (Sigma UI)	$Qn = \frac{1}{Nsmp} \sum_{i=1}^{Nsmp} (Un_i - Nn_i) I_{i+(Nsmp/4)}$

4.2.7 APPARENT POWER CALCULATION

Selection

Standard (Vector method: P+Q)	$Qn = \sqrt{P^2 + Q^2}$
Sum: S1+S2+S3	S = S1 + S2 + S3

4.2.8 POWER RATING ROUND

Selection

Standard (ON)	After power rating is calculated by the formula below, it is rounded to the nearest integral multiple of (secondary rating x 100 (W)).
OFF	Power rating is calculated by the formula below (not rounded).

Power rating = VT secondary rating × CT secondary rating × a

System configuration	a	
	ON	OFF
Single phase/2-wire	1	1
Single phase/3-wire	2	2
3-phase/3-wire	2	√3
3-phase/4-wire	3	3

4.2.9 ANALOG LIMIT

Selection

Standard (no limit)	No limit (output -5 to +105%)
Limit at -1% and +101%	Limit at -1 and +101%

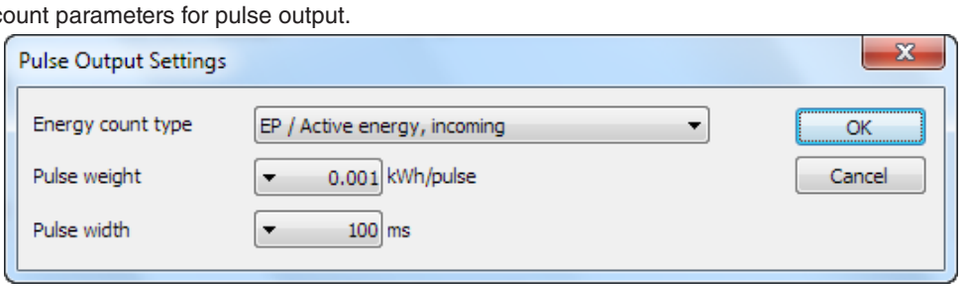
Note

When the linearization table is used, output is provided according to the table, disregarding the analog limit selection

5. PULSE OUTPUT PARAMETER

5.1 Po1, Po2

Define energy count parameters for pulse output.



5.1.1 ENERGY COUNT TYPE

Specify which energy parameter you want to supply to the pulse count output. Choose from the table below.

Selection

ID	PARAMETER
EP	Active energy, incoming
EQ	Reactive energy, LAG
ES	Apparent energy
EP-	Active energy, outgoing
EQ-	Reactive energy, LEAD
EQ G	Reactive energy, incoming, LAG
EQ D	Reactive energy, incoming, LEAD
EQ-G	Reactive energy, outgoing, LAG
EQ-D	Reactive energy, outgoing, LEAD
EQ P	Reactive energy, incoming
EQ-P	Reactive energy, outgoing

5.1.2 PULSE WEIGHT

Specify how much energy value corresponds to one pulse. Choose from the table below.

Selection

PARAMETER
P × 0.001 kWh / pulse
P × 0.01 kWh / pulse
P × 0.1 kWh / pulse
P × 1.0 kWh / pulse

P is determined by n calculated from the formula shown below and the table shown below.
n = a × primary rated voltage × primary rated current ÷ 1000
Where a is 1: Single phase/2-wire, 2: Single phase-3-wire, √3: 3-phase/3-wire, 3: 3-phase/4-wire.

n	P
< 10	1
10 ≤ n < 100	10
100 ≤ n < 1000	100
1000 ≤ n < 10 000	1000
10 000 ≤ n < 100 000	10 000
≥ 100 000	100 000

5.1.3 PULSE DURATION

Specify the output pulse width appropriate for a receiving instrument.

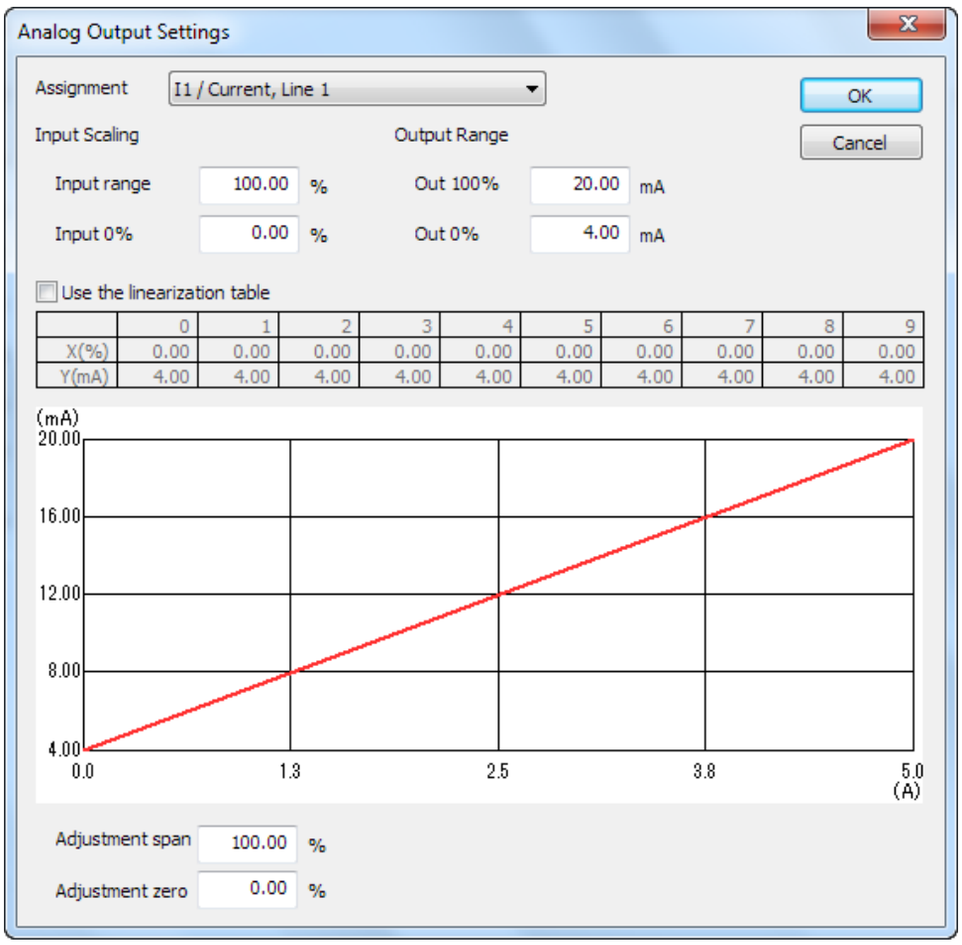
Selection / Range

Pulse duration	100 to 2000 milliseconds (in 100 msec. increments)

6. ANALOG OUTPUT PARAMETER

6.1 ANALOG OUTPUT ASSIGNMENT

Double-clicking an analog output row to edit opens Analog Output Settings window to configure the analog output of the device.



6.1.1 ASSIGNMENT

Choose measurand from the tables in the following page.

6.1.2 INPUT SCALING / OUTPUT RANGE

When 'Use the linearization table' is not selected, the output range is scaled using these parameters.

$$\text{Output} = \frac{\text{Input - Input 0\%}}{\text{Input range - Input 0\%}} \times (\text{Output 100\% - Output 0\%}) + \text{Output 0\%}$$

Note

Input value in engineering unit is first converted into percentage of the full-scale range before provided to the above equation.

After Input range is specified, Input 0% is automatically assigned. Refer to the tables in the following page for the available setting range for input range and auto setting value for input 0%.

Item	Description	-100% -75% -50% -25% 0% 25% 50% 75% 100%	Available setting range for input range	Auto setting value for input 0 %
NONE	Not assigned		—	
I1 I2 I3 IN	Current, Line 1 Current, Line 2 Current, Line 3 Neutral current	0 CT secondary rating	0.00 to 120.00% [0.00 to 100.00%]	0.00
U12 U23 U31 U1N U2N U3N	Phase to phase, Line 1 - 2 Phase to phase, Line 2 - 3 Phase to phase, Line 3 - 1 Phase voltage, Phase 1 Phase voltage, Phase 2 Phase voltage, Phase 3	0 Voltage range	0.00 to 120.00% [0.00 to 100.00%]	0.00
P P1 P2 P3	Active power Active power, Phase 1 Active power, Phase 2 Active power, Phase 3	-P (incoming) 0 (outgoing) P	-120.00 to 120.00% [0.00 to 100.00%]	0.00
Q Q1 Q2 Q3	Reactive power Reactive power, Phase 1 Reactive power, Phase 2 Reactive power, Phase 3	-P (LEAD) 0 (LAG) P	-120.00 to 120.00% [-100.00 to 100.00%]	Sign inversion value of the input range
S S1 S2 S3	Apparent power Apparent power, Phase 1 Apparent power, Phase 2 Apparent power, Phase 3	0 P	0.00 to 120.00% [0.00 to 100.00%]	0.00
PF PF1 PF2 PF3	Power factor Power factor, Phase 1 Power factor, Phase 2 Power factor, Phase 3	0 (LEAD) 1 (LAG) 0	-100.00 to 100.00% [-50.00 to 50.00%]	Sign inversion value of the input range
F	Frequency	45 55 65	0.00 to 100.00% [0.00 to 100.00%]	—

Item	Description	-100 -75 -50 -25 0 25 50 75 100	Available setting range for input range	Auto setting value for input 0 %
T-Q	Reactive power for bidirectional current	(outgoing) (incoming) -P (LEAD) 0 (LAG) P -P (LEAD) 0 (LAG) P When LEAD/LAG range of power rating is set, the unit outputs 0 to 50 % for outgoing and outputs; 50 to 100 % for incoming.	-100.00 to 100.00% [-100.00 to 100.00%]	Sign inversion value of the input range
T-PF	Power factor for bidirectional current	(outgoing) (incoming) 0 (LEAD) 1 (LAG) 0 (LEAD) 1 (LAG) 0 When LEAD/LAG range of power rating is set, the unit outputs 0 to 50 % for outgoing and outputs; 50 to 100 % for incoming.	-100.00 to 100.00% [-50.00 to 50.00%]	Sign inversion value of the input range

• Calculation of P (power rating)

P (power rating) is automatically determined by rounding to the unit (CT secondary rating x 100 (W)) after calculated with following formula by system configuration and secondary rating of CT/VT.
It is available not to round with option setting.
Power rating = (CT secondary rating) x (VT secondary rating) x a

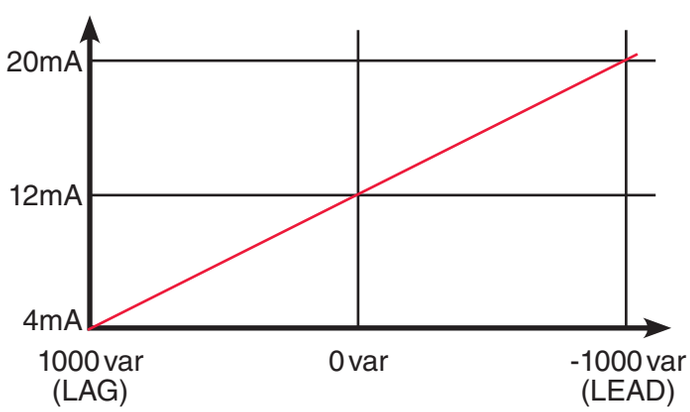
System configuration	a
Single phase/2-wire	1
Single phase/3-wire 3-phase/3-wire	2
3-phase/4-wire	3

Calculation example

System configuration	Rating	Power rating
Single phase/2-wire	110V / 5A 220V / 5A	500W 1000W
Single phase/3-wire	110V / 5A	1000W
3-phase/3-wire	110V / 5A 220V / 5A	1000W 2000W
3-phase/4-wire	220V / 5A	3500W

• Inversion of output 0 % to 100 %

When negative value is set to input range, output is inverted. For example, -50.00 % is set to input range of reactive power, 50.00 % is automatically set to input 0 % and then output characteristic is the figure shown below.



6.1.3 LINEARIZATION TABLE

When 'Use the linearization table' is selected, the segment data table must be set. When the output is assigned to reactive power for bidirectional current or power factor for bidirectional current, the linearization table is not available.
Table consists of ten (10) pairs of X (input) and Y (output) values. When the input is equal to X[n], Y[n] is provided as output.
When the input is between X[n-1] and X[n], the output is provided by the following equation.

$$\text{Output} = \frac{\text{Input} - \text{Table X[n-1]}}{\text{Table X[n]} - \text{Table X[n-1]}} \times (\text{Table Y[n]} - \text{Table Y[n-1]}) + \text{Table Y[n-1]}$$

Note

Input value in engineering unit is first converted into percentage of the full-scale range before provided to the above equation.

Segment data must be arranged in ascending order, i.e. X[n] must be greater than X[n-1]. For example, if you have set X[7] smaller than X[6], Table X[7] and later values are not used. Linearization is complete with data from X[0] to X[6].
When the input value is lower than X[0], the output equals Y[0]. When the input is higher than X[max], the output equals Y[max].

6.1.4 ADJUSTMENT ZERO / ADJUSTMENT SPAN

Analog output can be finely calibrated using Adjustment span and Adjustment zero by the following equation:

Analog Output = (Output Value – Analog 0%) × Adjustment span + Analog 0% +
{ Adjustment zero × (Analog 100% – Analog 0%) }
Where
Analog 0% = 4mA, 1V or 0V
Analog 100% = 20mA, 5V or 10V
Adjustment zero, Adjustment span 100.00% = 1.0000

Zero is adjustable within ±5.00%, while Span is adjustable from 95.00 to 105.00%.