

『MMS101 Evakit5』 User's Guide:

Instruction Manual

OUTLINE

This document is the instruction manual of "MMS101 Evakit5".

This kit can acquire MMS101 logging data with PC and USB communication or Ethernet communication.

Refer to the datasheet for more information on MMS101.

CAUTION

This kit is an evaluation / sales promotion tool specifically for our products.

Therefore, we do not provide any guarantees for the performance, reliability, management of contained substances, export management, and others regarding this kit.

Please let us know that we will replace it if it is defective in its initial state.

This kit is sold only in countries and regions other than the 32 countries listed below.

- EU member states (27 countries)
- EFTA member states (4 countries)
- Turkey




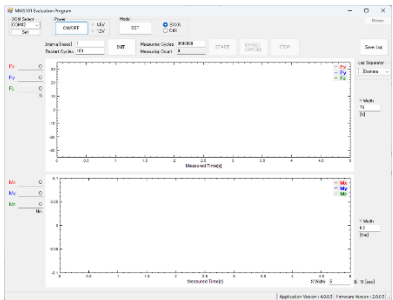

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1 Configuration

1-1 Kit configuration

This evaluation kit consists of below:

Conversion Board	Evaluation Board	Lead / Robot Cable	Evaluation App.
<div><p>MMS101B Conv.BD Ver.1.1</p></div>	<div><p>ForceSensorControllerBoard Ver.3.0 (MCU FW Ver.2.0.0.x)</p></div>	<div><p>Lead Cable 30cm</p></div>	<div><p>ForceSensorEvaluationProgram Ver.4.0.0.3</p></div>
<div><p>MMS101C Conv.BD Ver1.0 + FPC Cable (Molex 15032-0215(*1))</p></div>			


(*1) The equivalent product is the Molex FPC cable (Model No. 15032-0215).
If you need additional purchases or different lengths, please use commercially available FPC cable.

Force Sensor Sample
<div><p>MMS101BXA</p></div>
<div><p>MMS101C09</p></div>

You can choose whether or not to include the force sensor sample by configuring your purchase set.
For details, please refer to "[Ordering information](#)".

*Please use a conversion board that is compatible with each model.

This evaluation kit does not include the following items. Please prepare them yourself.

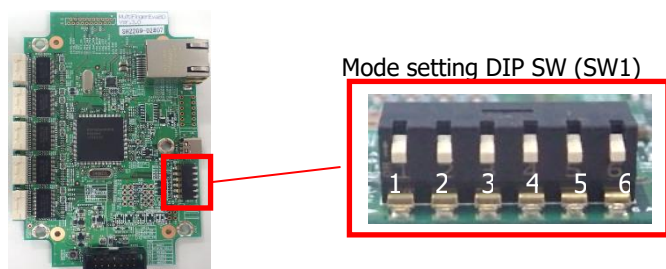
Cable	PC
<div>Required Spec. :<ul style="list-style-type: none">•USB cable USB ver.2.0 Type-C•Ethernet cable Cat5e or higher RJ-45 plug</div>	<div></div>

2 Usage form

This evaluation board supports USB and Ethernet communication. Evaluation board settings and cable connections vary depending on the communication method.

2-1 External communication selection

Before turning on the power to evaluation board, select the communication method using the mode setting DIP SW (SW1).



Interface Settings

Interface	DIP SW1	DIP SW2
USB	OFF(↓)	OFF(↓)
Ethernet	OFF(↓)	ON(↑)

IP Address Settings (only in Ethernet)

IP Address	DIP SW3	DIP SW4
192.168.0.200	OFF(↓)	OFF(↓)
192.168.0.201	OFF(↓)	ON(↑)

DIP SW5,6 are fixed to OFF(↓).

2-1-1 USB Communication

The mode setting DIP SW (SW1) for USB communication is as follows.



Interface	DIP SW1	DIP SW2	DIP SW3	DIP SW4	DIP SW5	DIP SW6
USB	OFF(↓)	OFF(↓)	OFF(↓)	OFF(↓)	OFF(↓)	OFF(↓)

2-1-2 Ethernet communication

The mode setting DIP SW (SW1) for Ethernet communication is as follows.



IP Address	DIP SW1	DIP SW2	DIP SW3	DIP SW4	DIP SW5	DIP SW6
192.168.0.200	OFF(↓)	ON(↑)	OFF(↓)	OFF(↓)	OFF(↓)	OFF(↓)
192.168.0.201	OFF(↓)	ON(↑)	OFF(↓)	ON(↑)	OFF(↓)	OFF(↓)

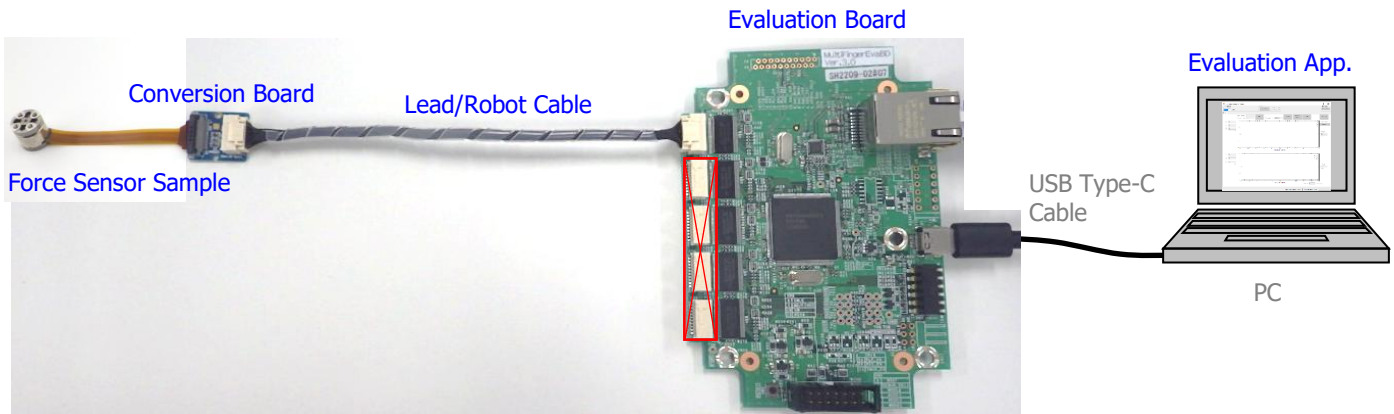
2-2 How to connect the evaluation board

2-2-1 USB communication

Only CN1 can be connected to the sensor.

The power is supplied via USB, please connect a USB Type-C cable to CN10 after connecting the sensor to be measured.

Do not attach or detach the sensor while power is being supplied.



This evaluation board uses FTDI's IC to perform UART-USB conversion, and you may be required to install a driver when connecting for the first time. If the driver does not install automatically, download the appropriate file for your environment from the FTDI website and install it.

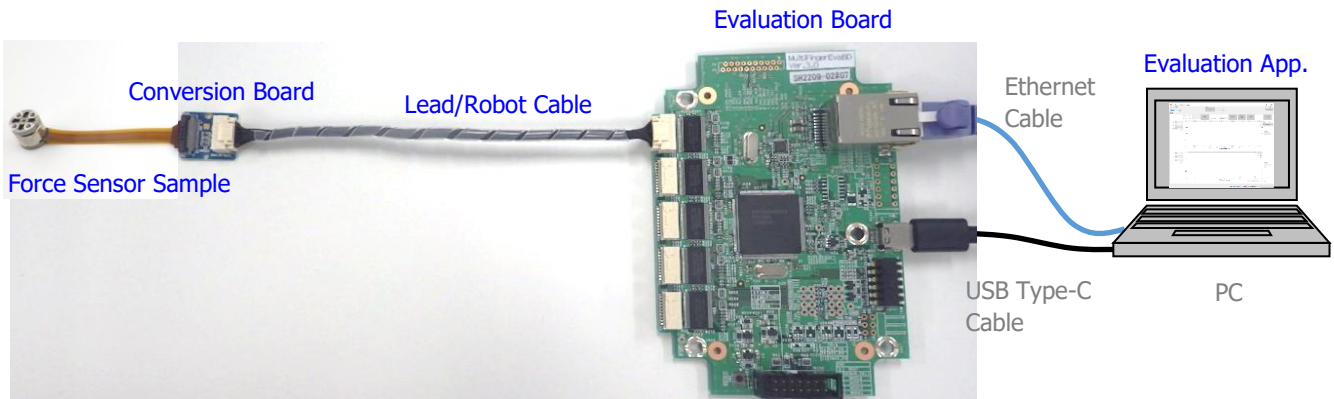
FTDI drivers download website: <https://www.ftdichip.com/Drivers/VCP.htm>

2-2-2 Ethernet communication

Up to five sensors can be connected.

The power is supplied via USB, please connect a USB Type-C cable to CN10 after connecting the sensor to be measured.

Do not attach or detach the sensor while power is being supplied.



2-3 Host (PC) Settings for Ethernet Communication

Please use "Internet Protocol Version 4 (TCP/IPv4)".

Match IP addressing up to the third octet (192.168.0). The 200 series of the 4th octet will be used on the evaluation board side. Please use other than 200 series.

3 Evaluation application

3-1 File configuration

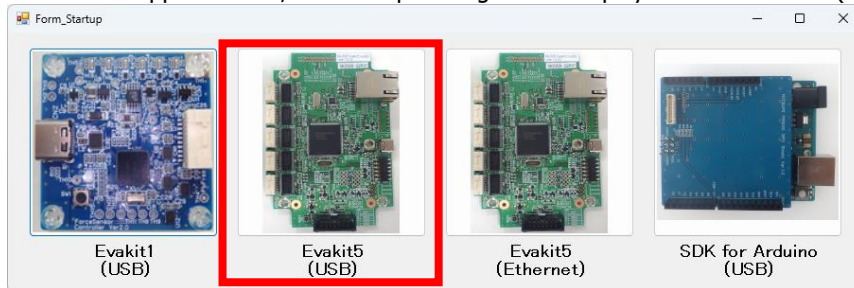
The file configuration of the evaluation application is as follows.

```
[ForceSensor_EvaluationProgram_ver.4.0.0.5
├ ForceSensor_EvaluationProgram.exe: Application
├ NPlot.dll: Library for drawing graphs
├ OpenTK.dll: Library for drawing graphs
├ OpenTK.GLControl.dll: Library for drawing graphs
├ [Settings]: Settings storage folder
├ [UserData]: Data storage folder
```

3-2 How to use the evaluation application (USB communication)

3-2-1 Launch the evaluation application

When the app is started, a "Start up" dialog will be displayed. Click "Evakit5 (USB)".



This app has been confirmed to work on Windows 11.

This app requires .NET Framework 4.8. An installation guide is available on the Microsoft website (URL below), so please install it according to your environment.

Microsoft .NET Framework 4.8 install guide homepage URL:

<https://learn.microsoft.com/ja-jp/dotnet/framework/install/>

3-2-2 Display screen

Data acquisition interval setting
*The setting is 1-10000msec (1msec step)

Model selection

Initiation button
*Read matrix correction coefficient from the AFE IC inside the sensor. Then the sensor operation is started. The button turns light green while sensor is operating.

COM selection

Logging start button

Logging stop button

Demo form switch button
*Not used in evaluation

Data save button
*Continuous measurement data is output as a CSV file,

Log Separator Selection
(select the delimiter format for log data)

Offset temperature correction update setting
*Offset temperature correction is performed for each set number of data acquisitions.

Fx,Fy,Fz measurement value

Fx,Fy,Fz measurement graph

Y Width
40 [N]

Fx,Fy,Fz measurement graph Y-axis scale setting
*Set around 0 N

Offset cancel button
(change to light green when ON state.)

Mx,My,Mz measurement value

Mx,My,Mz measurement graph

Y Width
0.2 [Nm]

Mx,My,Mz measurement graph Y-axis scale setting
*Set around 0 Nm

Measurement graph X-axis scale setting
*The maximum value that can be set changes depending value of interval

Number of measurement times

Interval[msec] 5
Restart Times 100
Measuring Cycles 3600000
Measuring Count 0
INIT. **START** **OFFSET CANCEL** **STOP**

COM Select COM7
Set

Model SET
BIOVA
C00

Save Log

Log Separator

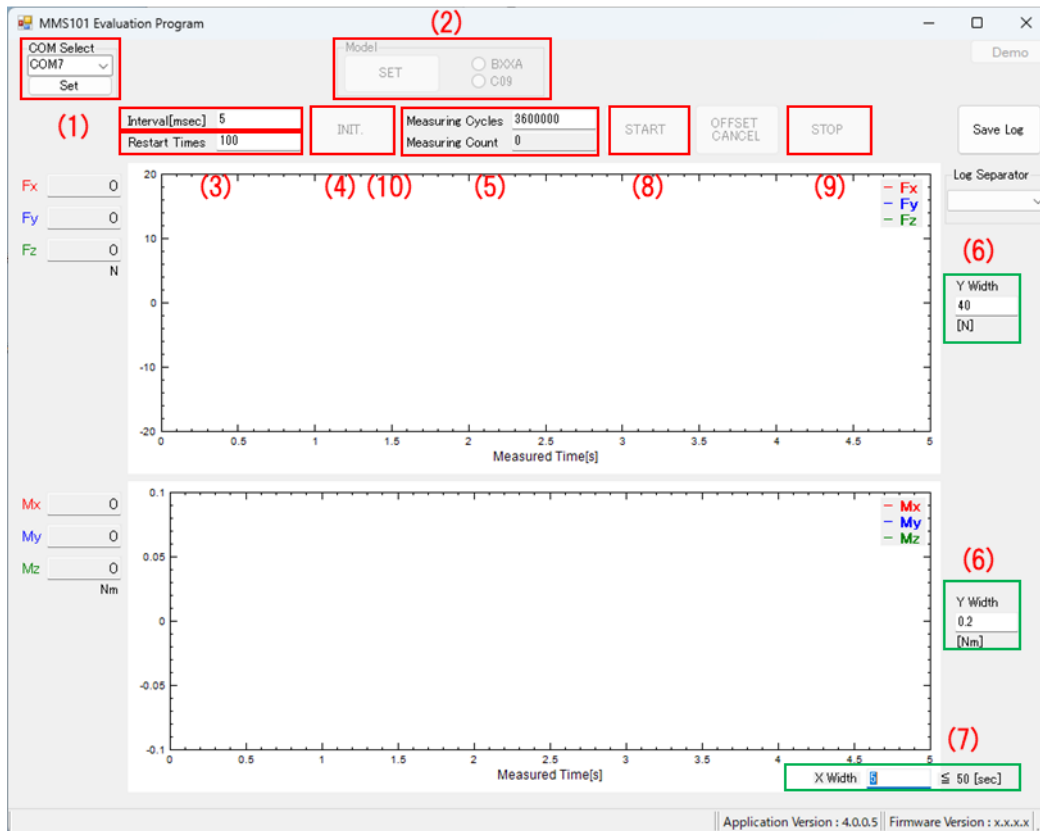
Y Width 40 [N]

Y Width 0.2 [Nm]

X Width 50 [sec]

Application Version : 4.0.0.5 | Firmware Version : x.x.x.x

3-2-3 Basic instruction for use



- (1) Select the COM port on the evaluation board. Click the “Set” button.
The COM port depends on the PC.
- (2) Select the mode and click the “SET” button.
- (3) Enter Interval[msec] and Restart times.
The temperature sensor value for offset/temperature control is updated every number of times the numerical value set in Restart Times is acquired.
e.g. Restart Times=0 : Temperature sensor value acquisition is the first time only. No temperature value updating is performed thereafter.
Restart Times=1 : Update temperature sensor value every time
Restart Times=10 : Temperature sensor value updated once every 10 data acquisitions
- (4) Click the “INIT.” button.
The sensor operation is started.
The “INIT.” button turns light green while the sensor is operating.
Click it again to stop the sensor operation.
- (5) Enter Measuring Times.
The settable number of measurements is 2,147,483,647 at the maximum.
Since the number of measurements depend on the PC specification, it should be set so that "the number of measurements x 64 bytes" is less than "available PC memory".
- (6) Enter Y Width. (Value can be changed even during measurement)
- (7) Enter X Width. (Value can be changed even during measurement)
- (8) Click the “START” button. => The data logging starts.
- (9) Click the “STOP” button. => The data logging stops.
If the data of Measuring Times set before measurement is acquired, measurement will stop without clicking the “STOP” button.
- (10) Click the “INIT.” button => The sensor operation stops.
The sensor operation is stopped.
The “INIT.” button turns gray after the sensor operation stops.

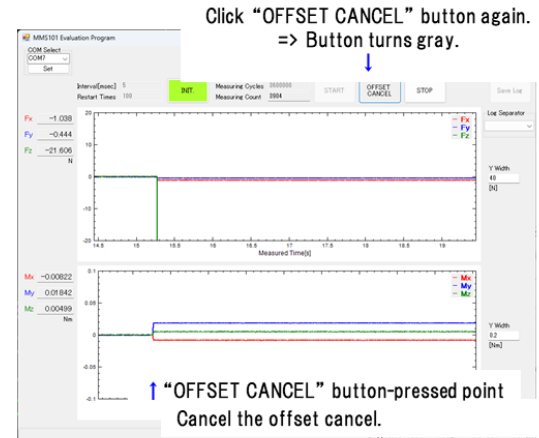
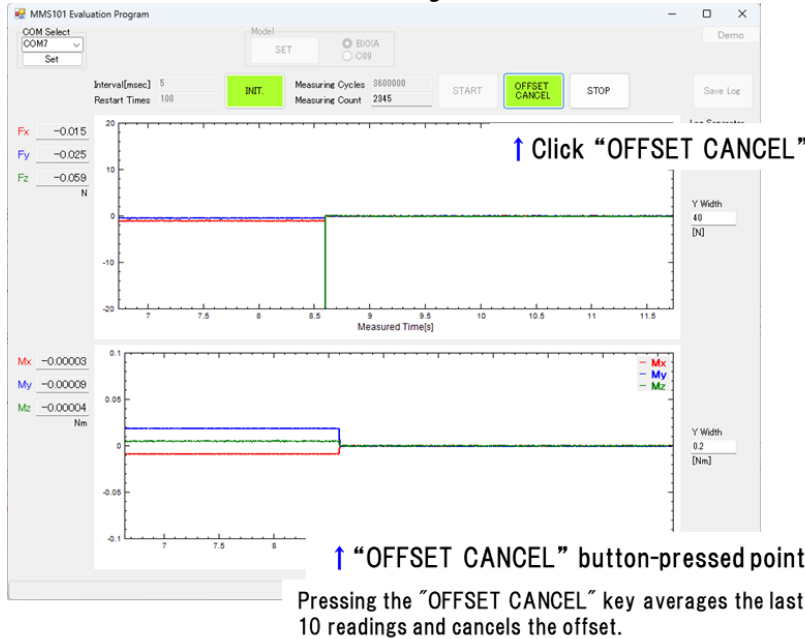
Before replacing the sample, first exit the application and then power off the Evakit5.

3-2-4 Offset cancel procedure

The sensor output has an initial offset. Offset also occurs in the mounted condition or in gravity.

It is possible to cancel the offset deviation with the "OFFSET CANCEL" button.

Click the "OFFSET CANCEL" button again to cancel the offset cancel.

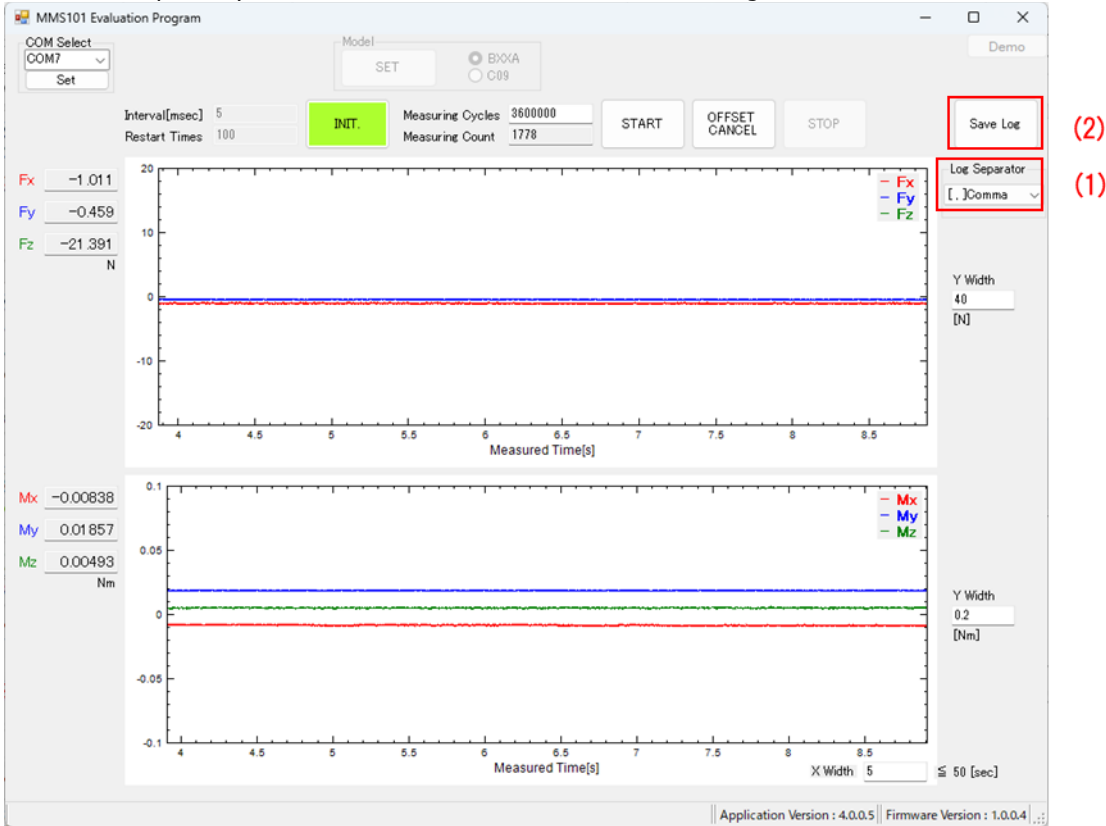


Please click the "OFFSET CANCEL" button after more than 5min has elapsed since sensor operation started to use.

*It is recommended that the output (initial-drift) stabilization wait time after sensor activation be equal to or greater than 5min.

3-2-5 Measurement data saving procedure

The data acquired by measurement can be saved with the “Save Log” button.



- (1) Select the log separator.
[,]Comma
[;]Semicolon
[]Tab
- (2) Click the “Save Log” button.
The logs are saved in the “UserData1” folder, located within the Evaluation Application’s folder, using the file name specified below.

log[yyyyMMddhhmmss].txt
(yyyy:Year / MM:Month / dd:Day / hh:Hour / mm:Minute / ss:Second)

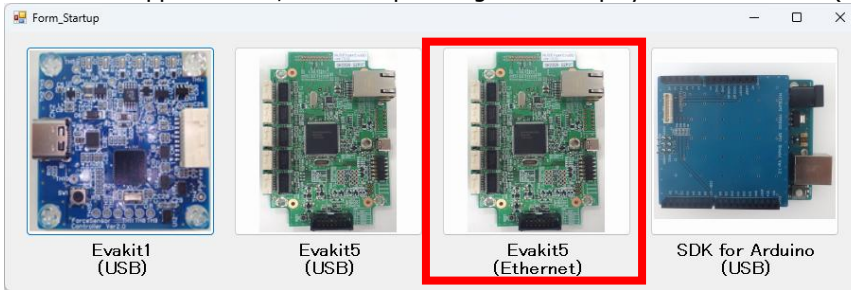
The data will be saved in the following format.

	A	B	C	D	E	F	G	H	I
1	2025/12/8 9:34								
2	count[times]	Measured Fx Value	[Fy Value]	[Fz Value]	[Mx Value]	[My Value]	[Mz Value]	[Nm]	
3	1	0.005009	-0.976	-0.471	-19.926	-0.0083	0.01897	0.00632	
4	2	0.010021	-0.967	-0.473	-19.89	-0.00819	0.01893	0.00563	
5	3	0.015033	-0.98	-0.467	-19.907	-0.00825	0.01901	0.00579	
6	4	0.020041	-0.972	-0.461	-19.922	-0.00825	0.01906	0.00531	
7	5	0.025049	-0.975	-0.465	-19.878	-0.00824	0.01892	0.00621	
8	6	0.030057	-0.976	-0.48	-19.913	-0.00829	0.01909	0.00586	
9	7	0.035066	-0.967	-0.469	-19.914	-0.00821	0.01905	0.00528	

3-3 How to use the evaluation application (Ethernet communication)

3-3-1 Launch the evaluation application

When the app is started, a "Start up" dialog will be displayed. Click "Evakit5 (Ethernet)".



This app has been confirmed to work on Windows 11.

This app requires .NET Framework 4.8. An installation guide is available on the Microsoft website (URL below), so please install it according to your environment.

Microsoft .NET Framework 4.8 install guide homepage URL:

<https://learn.microsoft.com/ja-jp/dotnet/framework/install/>

3-3-2 Display screen

Ethernet communication setting with board

- Src Port: PC port number
- Dst IP: Board IP address
- Dst Port: Board port number
- "BIND" button: Communication establishment
- "FREE" button: Communication release

Communication setting with sensor

- S1~S5: Select the sensor to be measured

"INIT." button:

Read the matrix operation correction coefficients from the sensor, and start sensor operation. Change to light green during operation

Interval: Data acquisition interval setting

- *The setting is 1-1000msec (1msec step)
- Meas.Times: Number of measurements setting
- Measuring: Number of measurements display

"START" button: Measurement start button

"STOP" button: Measurement stop button

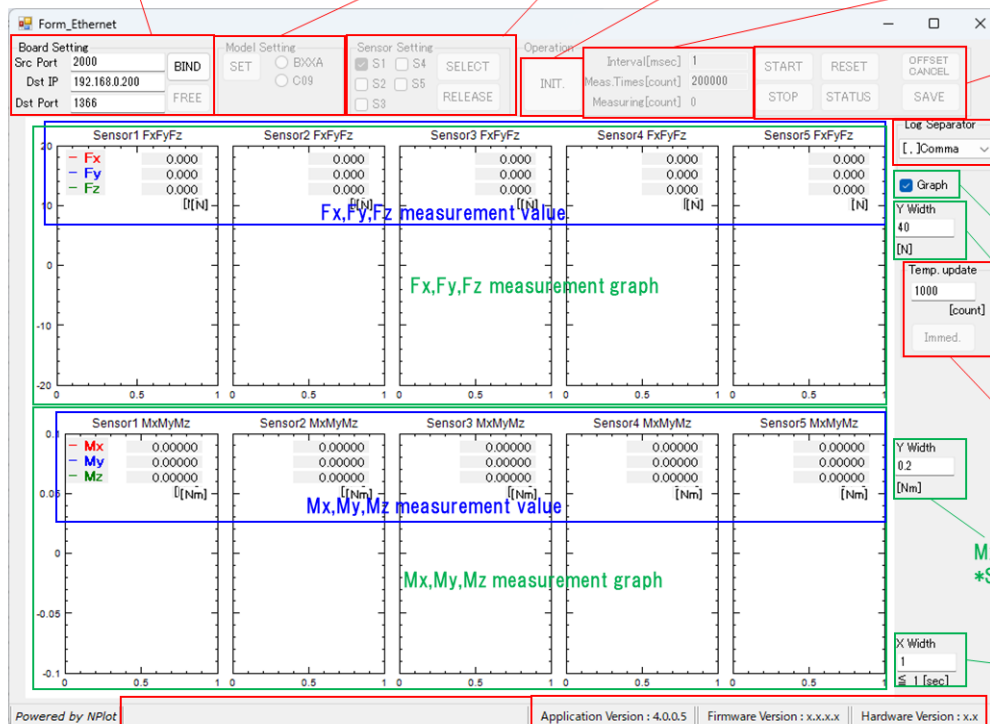
"RESET" button: Board initialize button

"STATUS" button: Board state check button

"OFFSET CANCEL" button: Offset cancel button

"SAVE" button: Data save button

*Measurement data is output as a text data.



Model selection

Fx,Fy,Fz measurement value

Fx,Fy,Fz measurement graph

Mx,My,Mz measurement value

Mx,My,Mz measurement graph

Log Separator

[.]Comma

Log Separator Selection (select the delimiter format for log data)

Graph drawing ON/OFF

Fx,Fy,Fz measurement graph Y-axis scale setting

*Set around 0 N

Temp. update

Temperature sensor value update setting for offset temperature correction

*"Immed." button: Temperature update button

Y Width

0.2

[Nm]

Mx,My,Mz measurement graph Y-axis scale setting

*Set around 0 Nm

X Width

1

[sec]

Measurement graph X-axis scale setting

*The maximum value that can be set

changes depending value of interval

Displaying the response value of "STATUS" button

Version display

3-3-3 Basic instruction of use

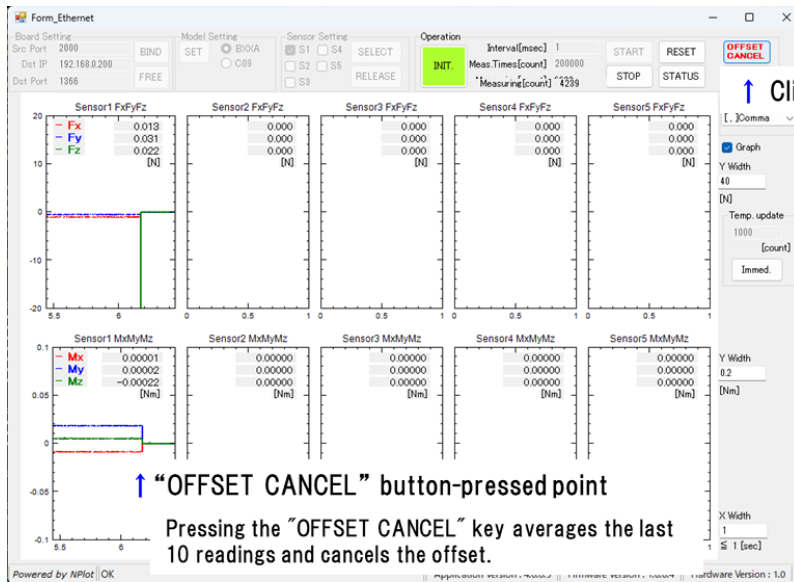
The screenshot shows the 'Form_Ethernet' application window. It is divided into several sections:

- Board Setting (1):** Includes fields for 'Src Port' (2000), 'Dest IP' (192.168.0.200), and 'Dst Port' (1366). Buttons for 'BIND', 'FREE', 'SET', and 'RELEASE' are present.
- Model Setting (2):** Radio buttons for 'BXXA' and 'C09'.
- Sensor Setting (3):** Checkboxes for selecting sensors S1, S2, S3, S4, and S5. A 'SELECT' button is also shown.
- Operation (4):** Includes 'Interval[msec]' (set to 1), 'Meas.Times[count]' (set to 200000), and 'Measure[count]' (set to 0). Buttons for 'INIT.', 'START', 'STOP', 'RESET', and 'STATUS' are located here.
- Graphs (5):** Ten subplots arranged in two rows of five. The top row shows 'Sensor1 Fx/Fy/Fz', 'Sensor2 Fx/Fy/Fz', 'Sensor3 Fx/Fy/Fz', 'Sensor4 Fx/Fy/Fz', and 'Sensor5 Fx/Fy/Fz'. The bottom row shows 'Sensor1 Mx/My/Mz', 'Sensor2 Mx/My/Mz', 'Sensor3 Mx/My/Mz', 'Sensor4 Mx/My/Mz', and 'Sensor5 Mx/My/Mz'. Each plot has axes and data points.
- Log Separator (6):** A dropdown menu currently set to '[,]Comma'.
- Graph Options (7):** A checkbox for 'Graph' (checked), a 'Y Width' field (set to 40), and a 'Temp. update' field (set to 1000) with a '[count]' label.
- Width Settings (8):** 'X Width' (set to 1) and 'Y Width' (set to 0.2) fields, both with '[Nm]' labels.
- Footer (9):** Displays 'Powered by NPlot', 'Application Version : 4.0.0.5', 'Firmware Version : x.x.x.x.x', and 'Hardware Version : x.x.x.x.x'.

- (1) Communication setting with the evaluation board
Set the port number, IP address, and the port number of the local PC, and then click "BIND". Button "FREE" to cancel.
When communication with the board is established, Firmware version and Hardware version of the board are displayed.
- (2) Selection of sensor model to be measured
Select the model and click the "SET" button.
- (3) Selection of sensor to be measured
Select sensor 1~5, and click "SELECT". Button "RELEASE" to cancel.
- (4) Enter "Interval[msec]"
Enter the data acquisition period (msec) in "Interval[msec]".
- (5) Start sensor operation
Click "INIT.". Start sensor operation. While the sensor is operating, the "INIT." button turns to the light green button. Click again to stop sensor operating, and then the "INIT." button turns to the gray button.
- (6) Enter "Meas. Times"
Enter the number of measurements in "Meas.Times[count]". The settable number of measurements is 2,147,483,647 at the maximum.
Since the number of measurements depend on the PC specification, it should be set so that "the number of measurements x 254 bytes" is less than "available PC memory".
- (7) Enter the graph display width
Enter X Width and Y Width. (Value can be changed even during measurement).
- (8) Enter Temp. update
The temperature sensor value for offset/temperature control is updated every number of times the numerical value set in "Temp.update" is acquired.
e.g. Temp. update = 0: Temperature sensor value acquisition is the first time only.
Temp. update = 1: Update temperature sensor value every time
Temp. update = 10: Temperature sensor value updated once every 10 data acquisitions
- (9) Click "START" => The data logging starts.
- (10) Click "STOP" => The data logging stops.
If the data of Measuring Times set before measurement is acquired, measurement will stop without clicking the "STOP" button.
- (11) You can disable chart drawing by unchecking "Graph"
Depending on the specification of PC, it may not be possible to acquire the data at the period set in "Interval" by dividing the processing capacity to draw the graph. You can override data acquisition by disabling graph drawing.
- (12) Click "INIT." again => The sensor operation is stops.
The "INIT." button turns gray after the sensor operation stops.

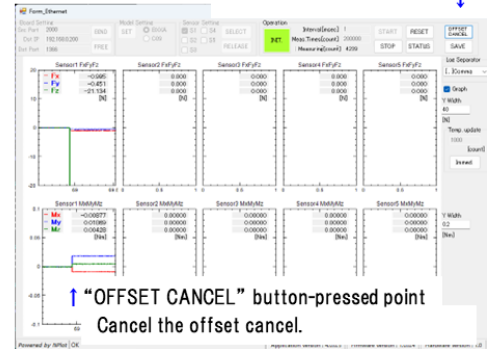
3-3-4 Offset cancel procedure

The sensor output has an initial offset. Offset also occurs in the mounted condition or in gravity.
It is possible to cancel the offset deviation with the "OFFSET CANCEL" button.
Click the "OFFSET CANCEL" button again to cancel the offset cancel.



↑ Click "OFFSET CANCEL" button => It changes to red.

Click "OFFSET CANCEL" button again.
=>Return to black.

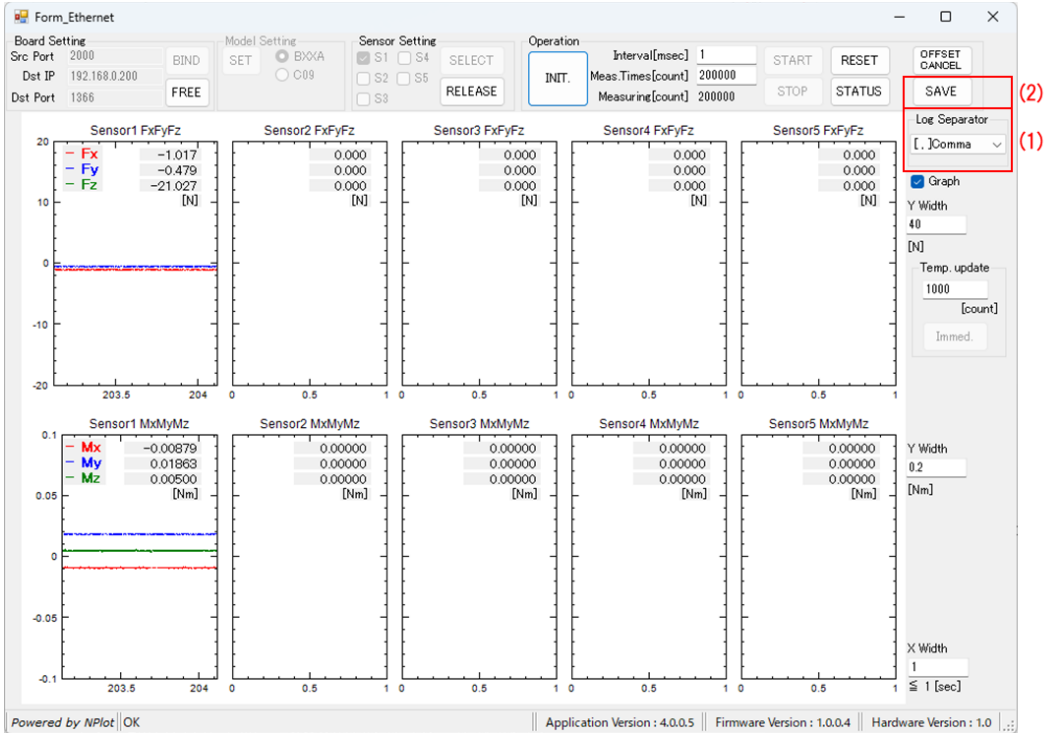


Please click the "OFFSET CANCEL" button after more than 5min has elapsed since sensor operation started to use.

*It is recommended that the output (initial-drift) stabilization wait time after sensor activation be equal to or greater than 5min.

3-3-5 Measure data saving procedure

The data acquired by measurement can be saved with the “SAVE” button.



- (1) Select the log separator
 - [,]Comma
 - [;]Semicolon
 - []Tab
- (2) Click “SAVE”

The logs are saved in the “UserData1” folder, located within the Evaluation Application’s folder, using the file name specified below.

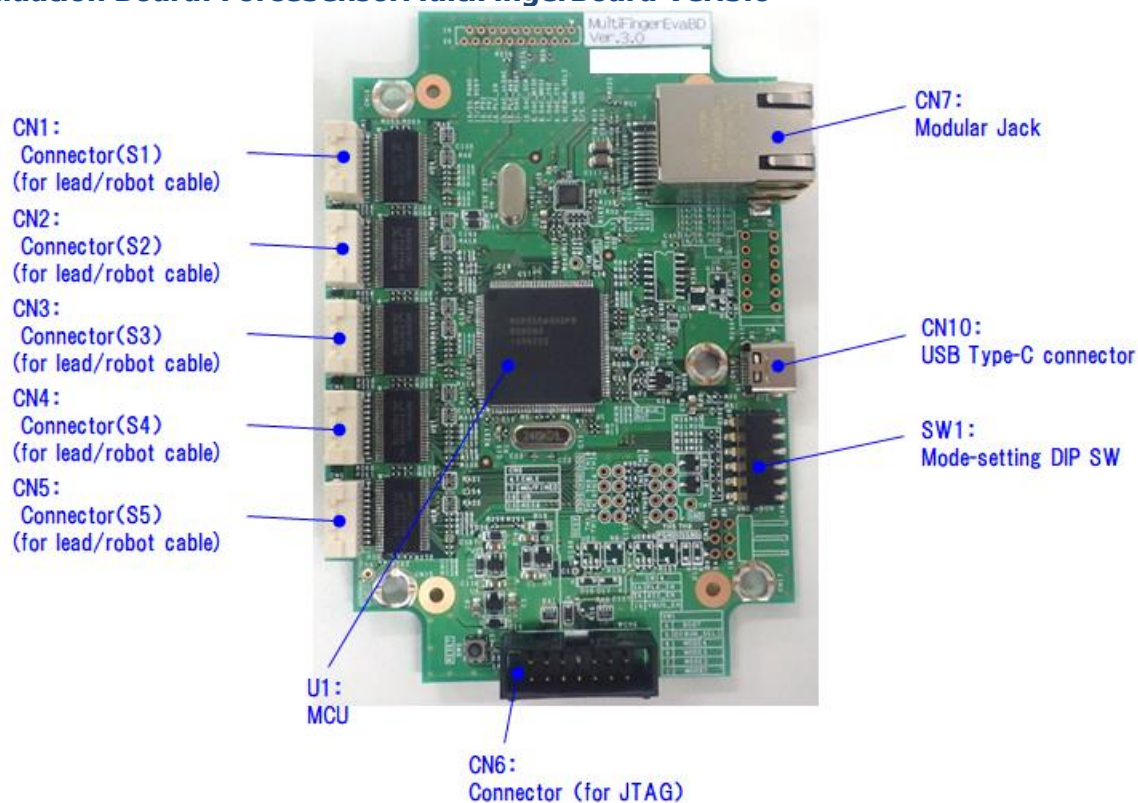
log[yyyyMMddhhmmss].txt
(yyyy:Year / MM:Month / dd:Day / hh:Hour / mm:Minute / ss:Second)

The data will be saved in the following format.

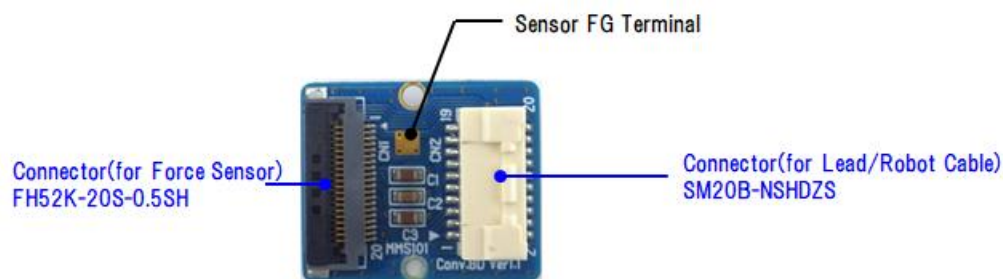
	A	B	C	D	E	F	G	H	I	J
1	count[time]	Measured	Interval[us]	DataUpda	S1Fx[N]	S1Fy[N]	S1Fz[N]	S1Mx[Nm]	S1My[Nm]	S1Mz[Nm]
2	0	0.008	8036	8	-1.025	-0.436	-20.68	-0.00862	0.01854	0.00531
3	1	0.009	1004	1	-1.012	-0.451	-20.655	-0.00859	0.01869	0.00566
4	2	0.01	1004	1	-1.027	-0.434	-20.672	-0.00852	0.01876	0.00492
5	3	0.011	1007	1	-1.026	-0.457	-20.714	-0.00847	0.0187	0.00514
6	4	0.012	1007	1	-1.019	-0.476	-20.687	-0.0085	0.01869	0.00544
7	5	0.013	1006	1	-1.032	-0.455	-20.688	-0.00871	0.01868	0.00538
8	6	0.014	1004	1	-1.019	-0.45	-20.709	-0.00867	0.01878	0.00517
9	7	0.015	1004	1	-1.031	-0.455	-20.699	-0.00862	0.01878	0.00568

4 Board configuration

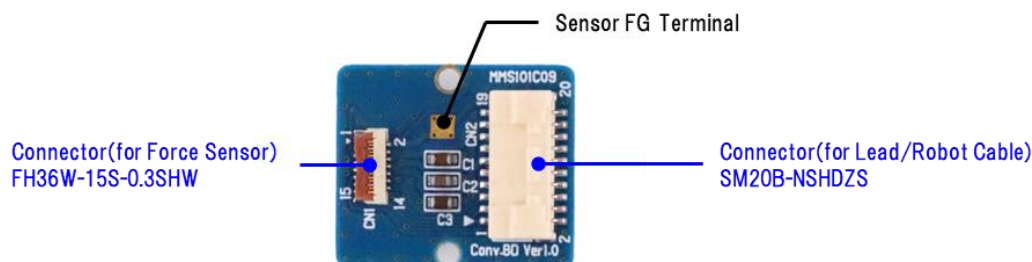
4-1 Evaluation Board: ForceSensorMultiFingerBoard Ver.3.0



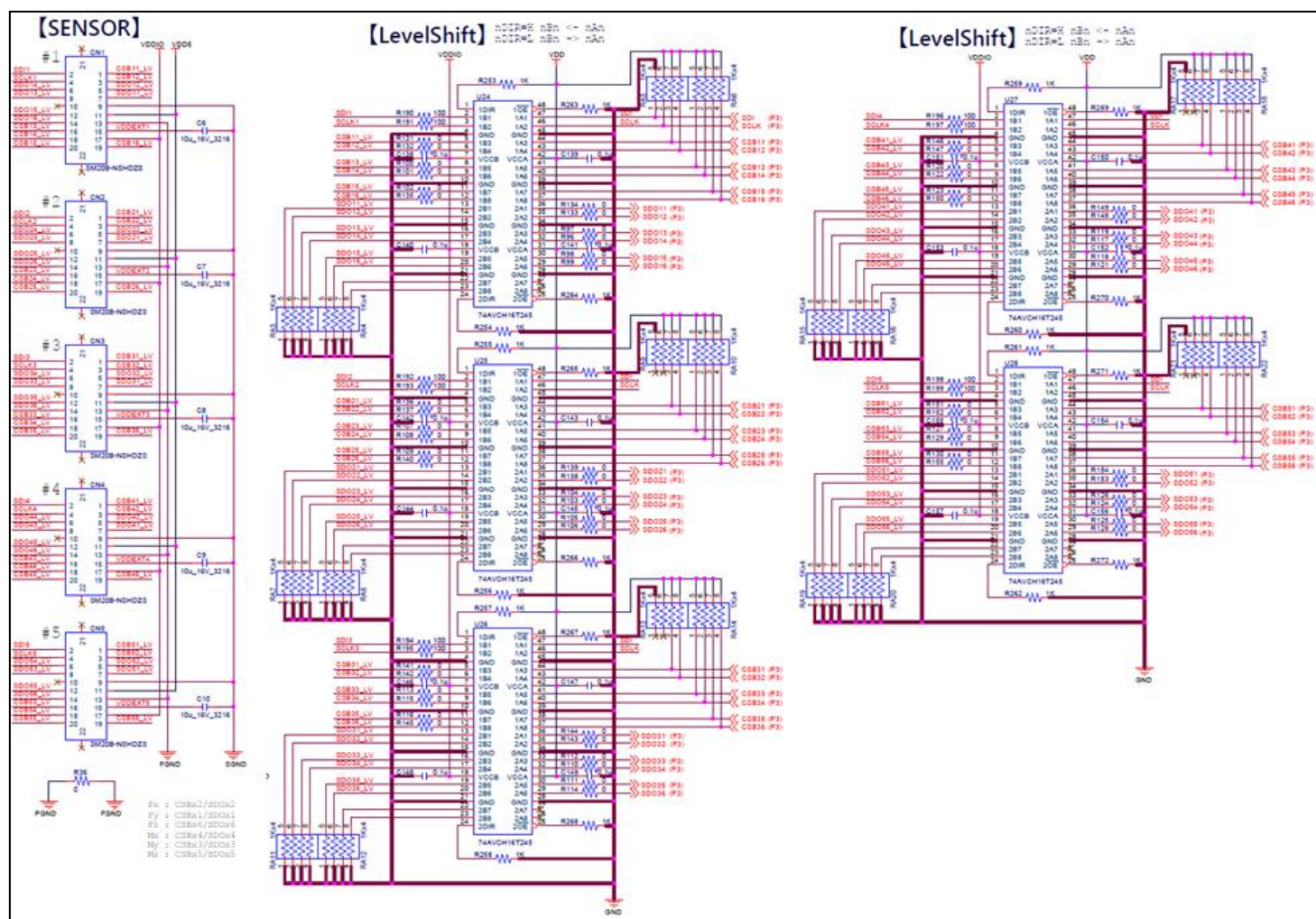
4-2 Conversion Board: MMS101B Conv.BD Ver.1.1

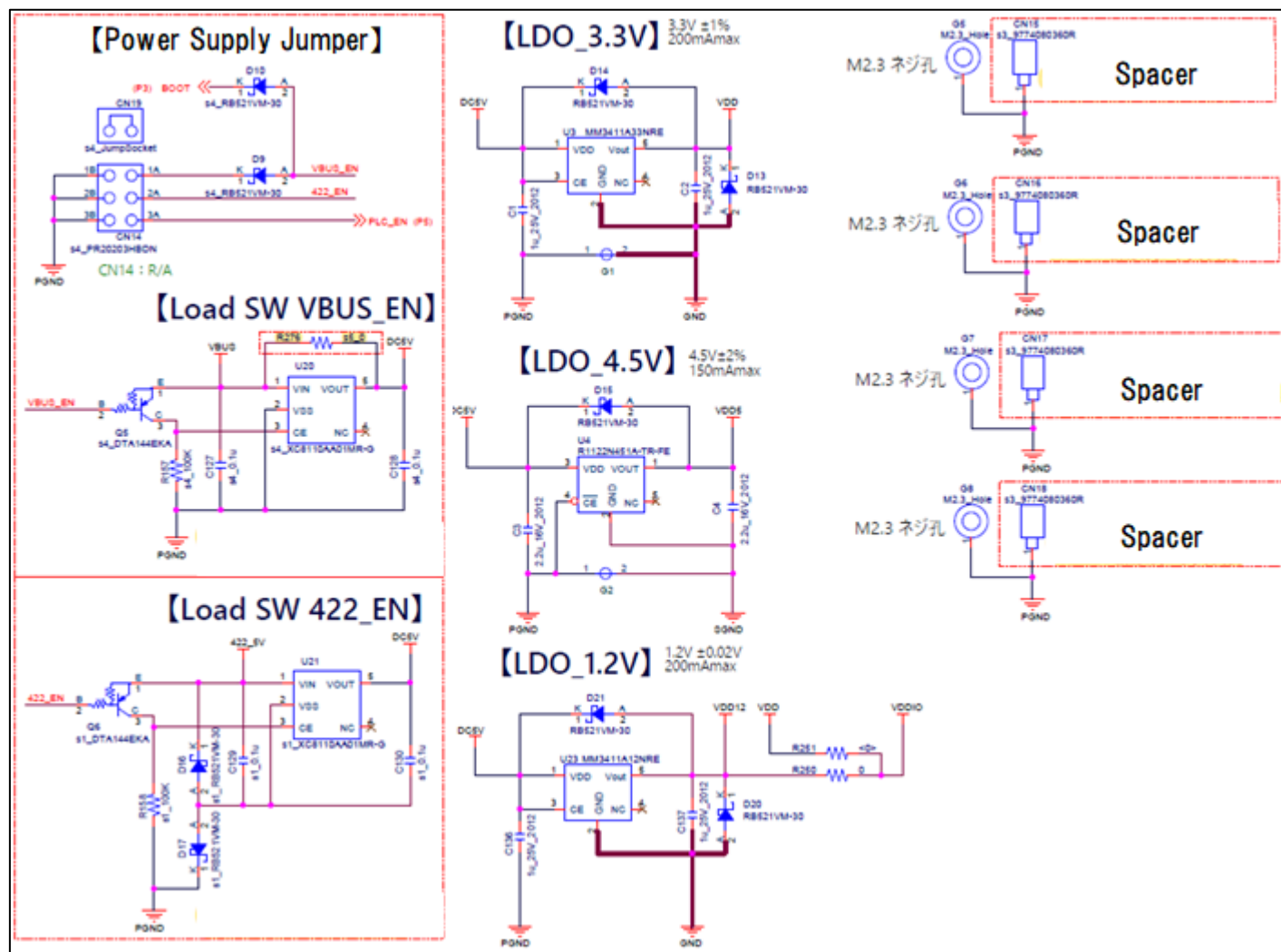


4-3 Conversion Board: MMS101C Conv.BD Ver.1.0



5-1 Evaluation Board: ForceSensorMultFingerBoard Ver.3.0

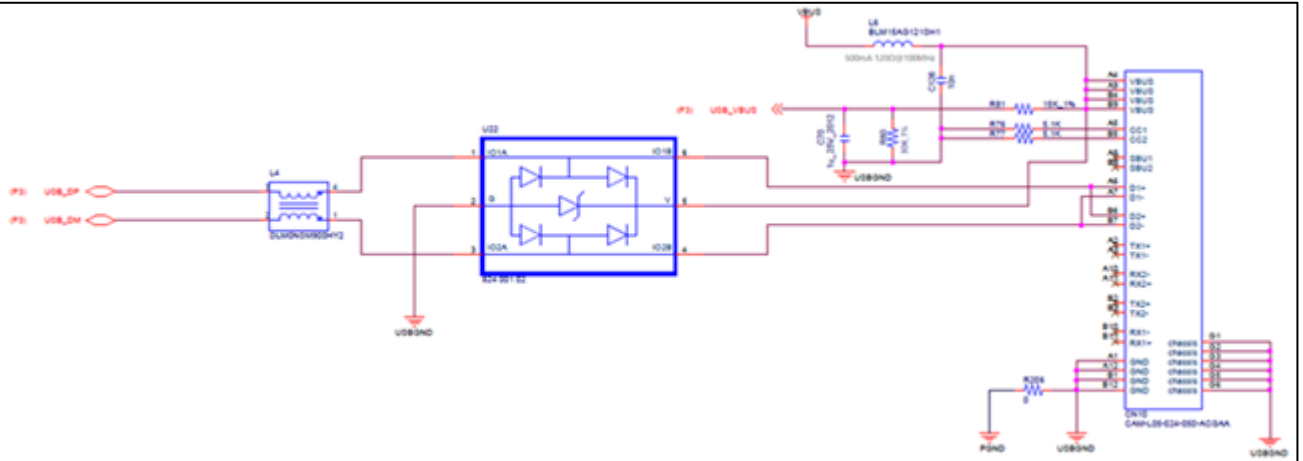






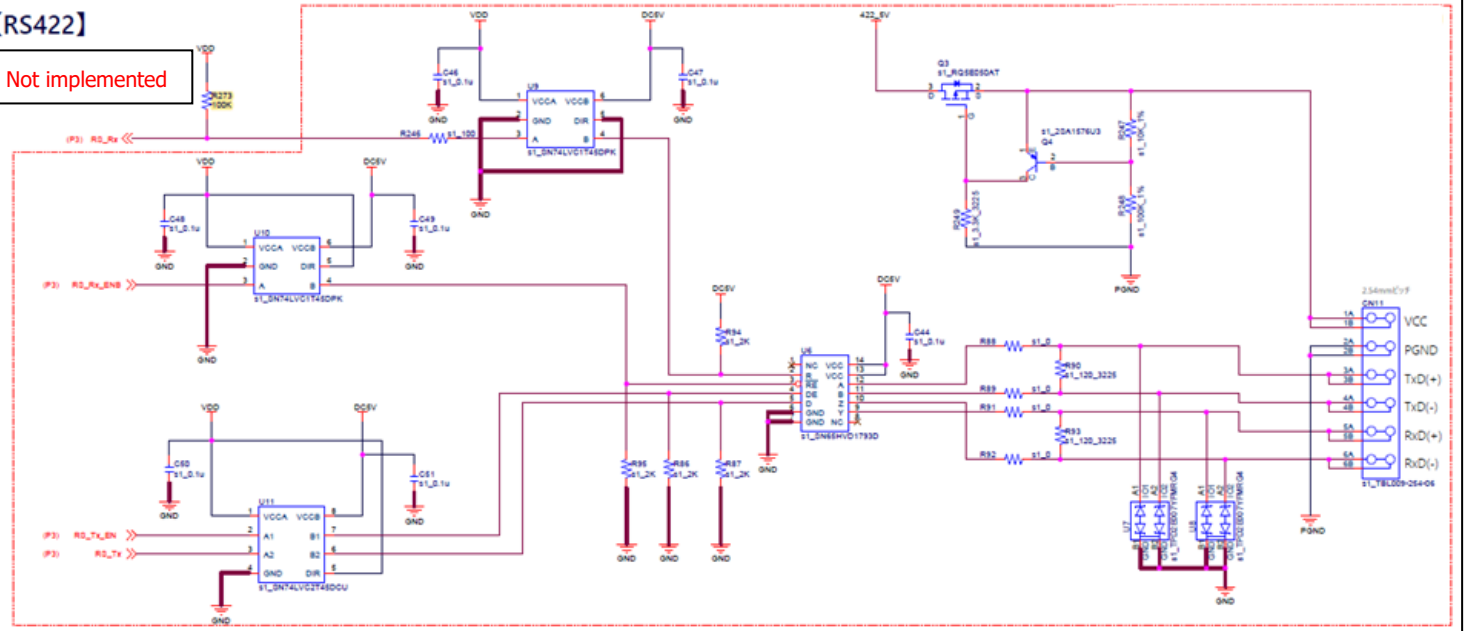


【USB】

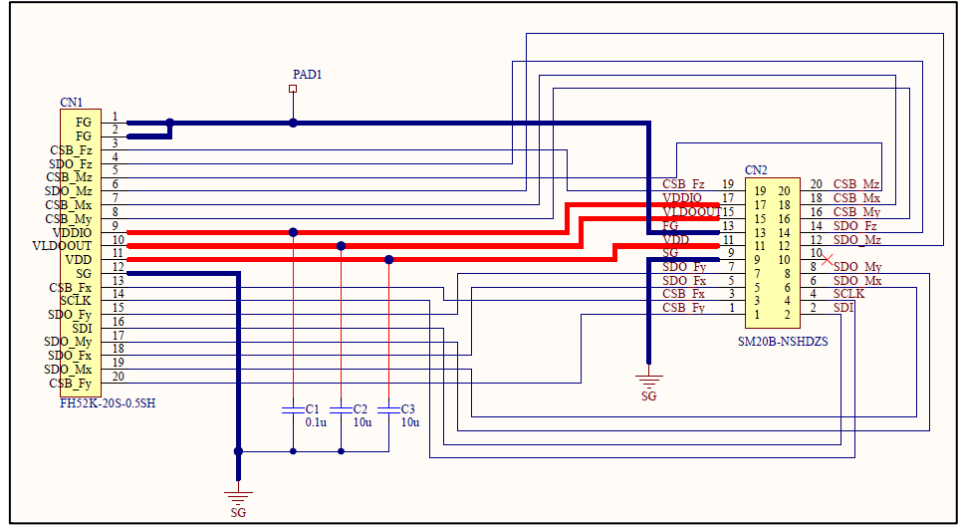


【RS422】

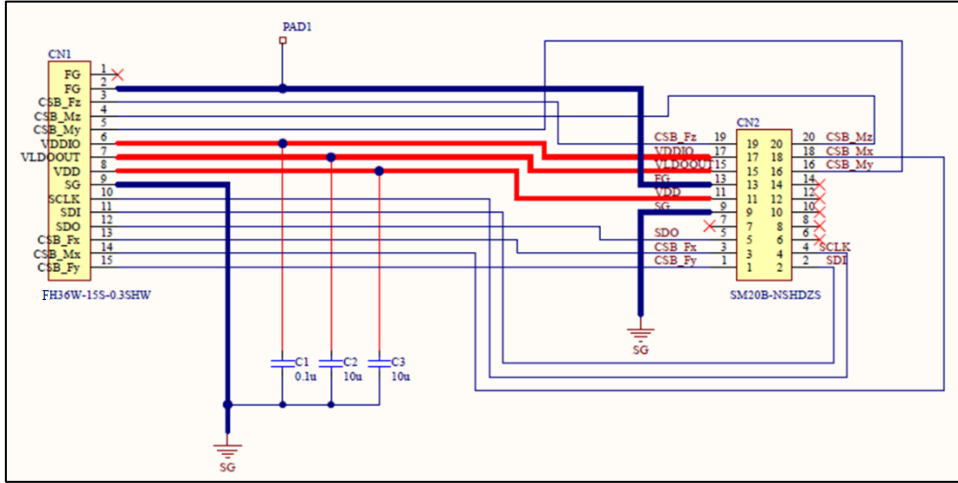
Not implemented

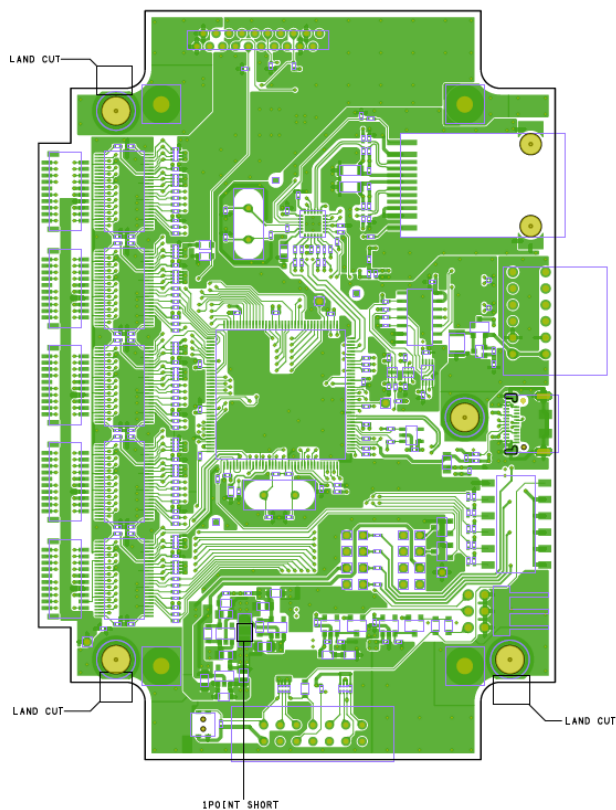


5-2 Conversion Board: MMS101B Conv.BD Ver.1.1

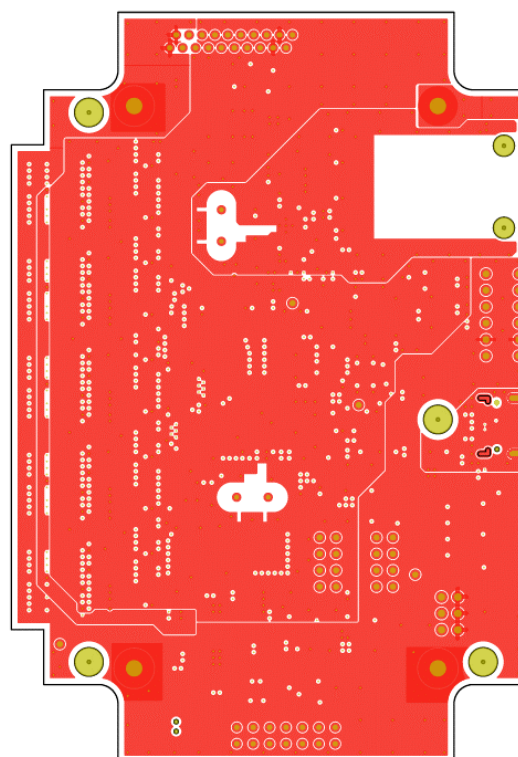


5-3 Conversion Board: MMS101C Conv.BD Ver.1.0

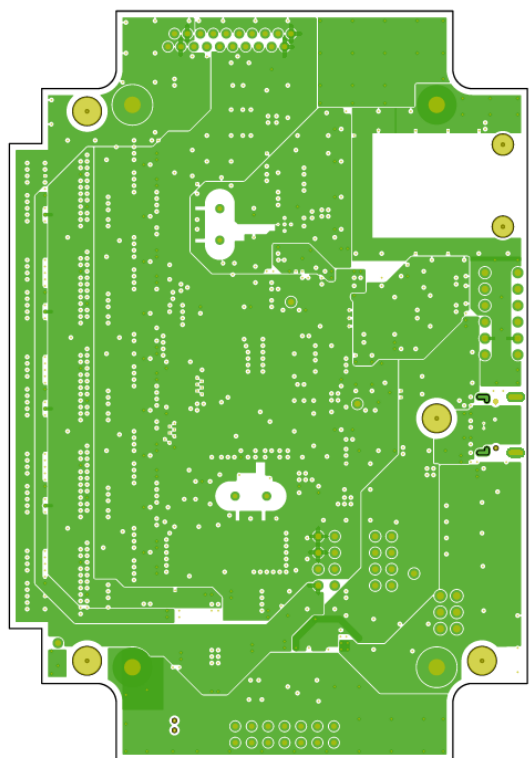




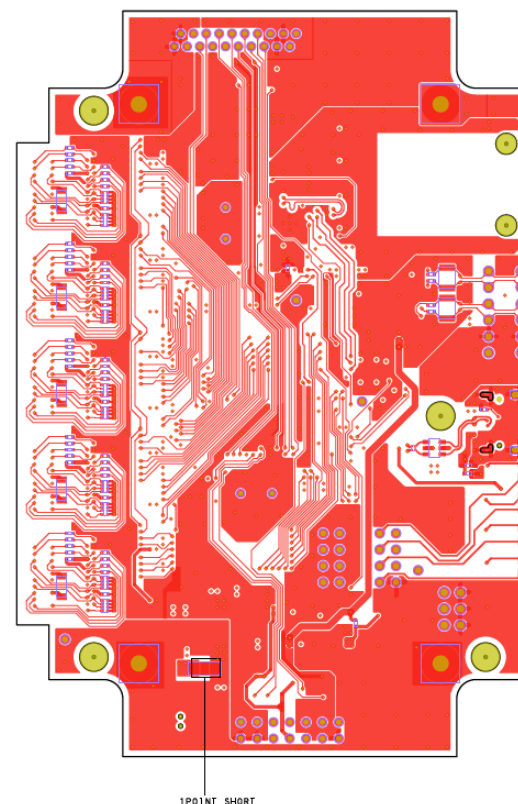
Pattern (Component side)



Pattern (L2)



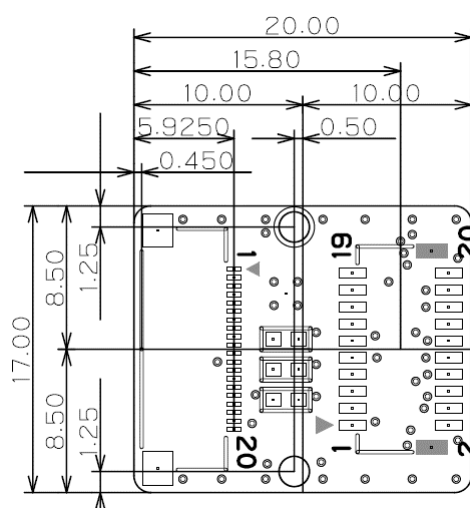
Pattern (L3)



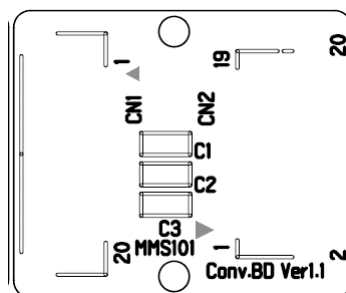
Pattern (Solder side)

6-2 Conversion Board: MMS101B Conv.BD Ver.1.1

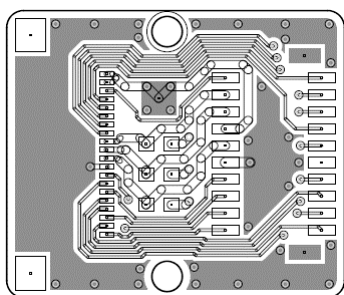
Mounting hole: $\Phi 1.8$



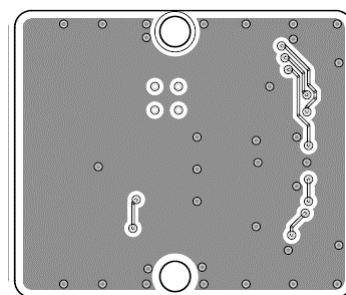
Dimensions (Unit: mm)



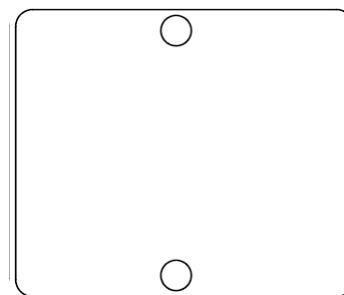
Component placement



Pattern (Component side)



Pattern (L2)



Pattern (Solder side)

7 BOM list

7-1 Evaluation Board: ForceSensorMultiFingerBoard Ver.3.0

Designator	Model	Maker	Parts name	Value	Q'ty
U1	R5F565N4ADFB#10 (R5F565NxxxFB (*3))	Renesas	MCU	-	1
U3	MM3411A33NRE	MITSUMI	LDO	-	1
U4	R1122N451A-TR-FE	RICOH	LDO	-	1
U2	LAN8720Ai-CP	Microchip	RMII	-	1
U13	24AA02E48T-I/OT (24AA02E48T-E/OT (*3))	Microchip	EEPROM	-	1
U6 (*1)	SN65HVD1793D	Texas Instruments	RS422/RS485	-	1
U7, U8 (*1)	TPD2E007YFMRG4	Texas Instruments		-	2
U9, U10 (*1)	SN74LVC1T45DPKR	Texas Instruments	Level Shifter	-	2
U11 (*1)	SN74LVC2T45DCUR	Texas Instruments	Level Shifter	-	1
U21 (*1)	XC8110AA01MR-G	Torex Semicon	Load Switch	-	1
U20 (*1)	XC8110AA01MR-G	Torex Semicon	Load Switch	-	1
U22	82400102	Würth Elektronik		-	1
U23	MM3411A12NRE	Mitsumi	LDO		1
U24, U25, U26, U27, U28	74AVCH16T245DGG,18 (74AVC16T245DGG,118 (*3)) (SN74AVCH16T245GR (*3)) (SN74AVC16T245DGG (*3))	Nexperia (Nexperia) (Texas Instruments) (Texas Instruments)	Level Shifter	-	5
Q1, Q2	DTC144EKAT146	Rohm		-	2
Q6 (*1)	DTA144EKAT146	Rohm		-	1
Q5 (*1)	DTA144EKAT146	Rohm			1
Q4 (*1)	2SA1576U3T106Q	Rohm		-	1
Q3 (*1)	RQ5E050ATTCL	Rohm		-	1
D1	SML-A12U8TT86	Rohm	LED	-	1
D2	SML-A12P8TT86	Rohm	LED	-	1
D3	SML-A12Y8TT86	Rohm	LED	-	1
D4	SML-A12D8TT86	Rohm	LED	-	1
D8, D13, D14, D15, D18, D19, D20, D21	RB521VM-30TE-17	Rohm	Schottky Diode	-	8
D16, D17 (*1)	RB521VM-30TE-17	Rohm	Schottky Diode	-	2
D9, D10 (*1)	RB521VM-30TE-17	Rohm	Schottky Diode	-	2
X1	HC-49/S3-24MHZ	Kyusyu Dentsu	Xtal	24MHz	1
X2	HC-49/S3-25MHZ	Kyusyu Dentsu	Xtal	25MHz	1
R5, R12, R36, R96, R97, R98, R99, R100, R101, R102, R103, R104, R105, R106, R107, R108, R109, R110, R111, R112, R113, R114, R115, R116, R117, R118, R119, R120, R121, R122, R123, R124, R125, R126, R127, R128, R129, R130, R131, R132, R133, R134, R135, R136, R137, R138, R139, R140, R141, R142, R143, R144, R145, R146, R147, R148, R149, R150, R151, R152, R153, R154, R155, R161, R164, R206, R250	RK73Z1ETTP	KOA	Resistor	0	67

(*1) Not mounted.

(*2) Art work

(*3) Substitutes

Designator	Model	Maker	Parts name	Value	Q'ty
R88, R89, R91, R92 (*1)	RK73Z1ETTP	KOA	Resistor	0	4
R276	RK73Z1ETTP	KOA	Resistor	0	1
R7, R8, R9, R10	RK73H1ETTP49R9F	KOA	Resistor	49.9	4
R246 (*1)	RK73B1ETTP101J	KOA	Resistor	100	1
R90, R93 (*1)	RK73B2ETTD121J	KOA	Resistor	120	2
R28, R31, R32, R35	RK73B1ETTP331J	KOA	Resistor	330	4
R26, R27	RK73B1ETTP511J	KOA	Resistor	510	2
R18, R19, R20, R21, R34, R253, R254, R255, R256, R257, R258, R259, R260, R261, R262, R263, R264, R265, R266, R267, R268, R269, R270, R271, R272	RK73B1ETTP102J	KOA	Resistor	1k	25
R86, R87, R94, R95 (*1)	RK73B1ETTP202J	KOA	Resistor	2k	4
R249 (*1)	RK73B2ETTD332J	KOA	Resistor	3.3k	1
R16, R72, R73, R162, R163, R252	RK73B1ETTP472J	KOA	Resistor	4.7k	6
R76, R77	RK73B1ETTP512J	KOA	Resistor	5.1k	2
R1, R225, R275	RK73B1ETTP103J	KOA	Resistor	10k	3
R247 (*1)	RK73H1ETTP1002F	KOA	Resistor	10k	1
R6	RK73H1ETTP1212F	KOA	Resistor	12.1k	1
R81	RK73H1ETTP1502F	KOA	Resistor	15k	1
R80	RK73H1ETTP3002F	KOA	Resistor	30k	1
R17, R22, R23, R24, R25, R29, R33, R273, R274	RK73B1ETTP104J	KOA	Resistor	100k	9
R158 (*1)	RK73B1ETTP104J	KOA	Resistor	100k	1
R157 (*1)	RK73B1ETTP104J	KOA	Resistor	100k	1
R248 (*1)	RK73H1ETTP1003F	KOA	Resistor	100k	1
R11	RK73B1ETTP105J	KOA	Resistor	1M	1
RA1, RA2	YC124-JR-074K7L	YAGEO	Resistor	4.7k	2
RA3, RA4, RA5, RA6, RA7, RA8, RA9, RA10, RA11, RA12, RA13, RA14, RA15, RA16, RA17, RA18, RA19, RA20, RA21, RA22	YC124-JR-071KL	YAGEO	Resistor	1k	20
R4, R251 (*1)	-	-	Resistor	0	2
R71 (*1)	-	-	Resistor	1k	1
R242, R243, R244, R245 (*1)	-	-	Resistor	4.7k	4
C24, C31, C32, C33, C34	GRM1552C1H100JA01D	muRata	Capacitor	10p	5
C22, C23, C35, C36	GRM1552C1H180JA01D	muRata	Capacitor	18p	4
C111, C126	GRM155R71H103KA88D	muRata	Capacitor	10n	2

(*1) Not mounted.

(*2) Art work

(*3) Substitutes

Designator	Model	Maker	Parts name	Value	Q'ty
C11, C12, C14, C15, C16, C17, C18, C19, C20, C21, C27, C30, C75, C112, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157	GRM155R71H104KE14D	Murata	Capacitor	0.1u	34
C44, C46, C47, C48, C49, C50, C51, C129, C130 (*1)	GRM155R71H104KE14D	muRata	Capacitor	0.1u	9
C127, C128 (*1)	GRM155R71H104KE14D	muRata	Capacitor	0.1u	2
C13	GRM188R71E224KA88D	muRata	Capacitor	0.22u	1
C1, C2, C25, C70, C136, C137	GRM219R71E105KA88D	muRata	Capacitor	1u	6
C3, C4	GRM21BR71C225KA12L	muRata	Capacitor	2.2u	2
C6, C7, C8, C9, C10, C113, C114	C3216X7R1C106K160AC	TDK	Capacitor	10u	7
L4	DLM0NSM900HY2D	muRata	Inductor		1
L1, L6	BLM15AG121SH1D	muRata	Inductor		2
CN7	J3011G21DNLT	Pulse Electronics	Connector	-	1
CN10	CAM-L05-024-050-ACGAA	MITSUMI	Connector	-	1
CN1, CN2, CN3, CN4, CN5	SM20B-NSHDZS-TF	JST	Connector	-	5
CN6	XG4C-1431	Omron	Connector	-	1
CN11 (*1)	TBL009-254-06GY-2GY	CUI Devices	Connector	-	1
CN14 (*1)	PR20203HBDN	METZ	Connector	-	1
CN12 (*1)	2-84984-0	TE Connectivity	Connector	-	1
CN15, CN16, CN17, CN18 (*1)	9774080360R	Würth Elektronik	Connector	-	4
SW1	EDSP06SGLFNTU04	TE Connectivity	Switch	-	1
SW2	SOV-168HST	MITSUMI	Switch	-	1
G1, G2 (*2)	-	-		-	2
G5, G6, G7, G8 (*2)	-	-		-	4
TH1, TH2, TH3, TH4, TH5, TH6, TH7, TH8, TH9, TH10, TH11, TH12, TH13, TH14, TH15, TH16, TH17, TH18, TH19, TH20 (*2)	-	-	Through hole	-	20
CN19 (*1)	MJS-1305B	HIROSUGI		-	1

(*1) Not mounted.

(*2) Art work

(*3) Substitutes

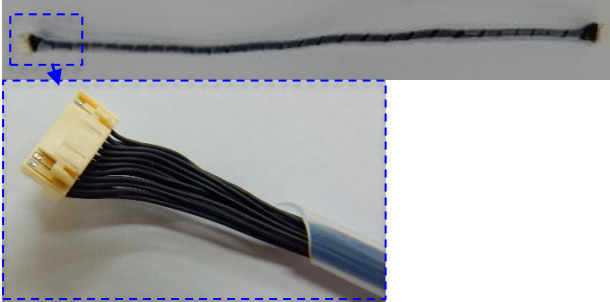
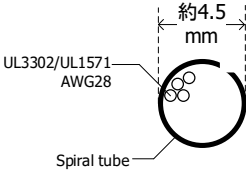
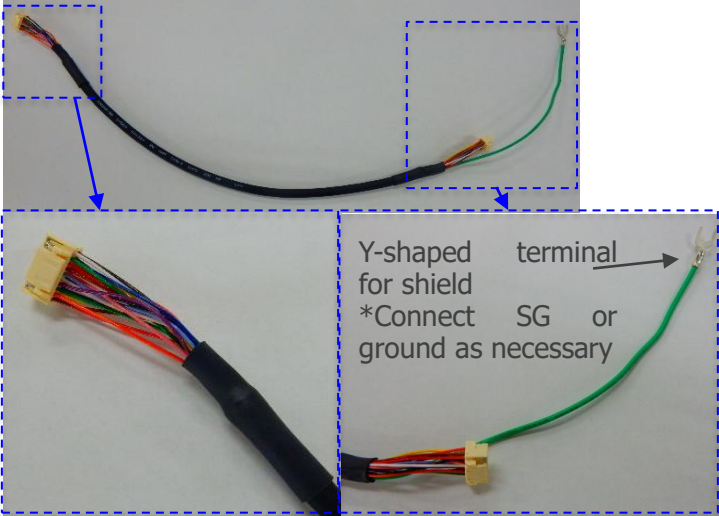
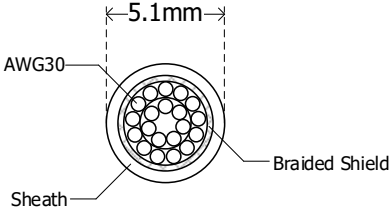
7-2 Conversion Board: MMS101B Conv.BD Ver.1.1

Designator	Model	Maker	Parts name	Value	Q'ty
C1, C3	GRM188R61E106KA73D	muRata	Capacitor	10u	2
C2	CGA3E2X7R1H104K080AA	TDK	Capacitor	0.1u	1
CN1	FH52K-20S-0.5SH	Hirose Electric	Connector	20pin	1
CN2	SM20B-NSHDZS	JST	Connector	20pin	1

7-3 Conversion Board: MMS101C Conv.BD Ver.1.0

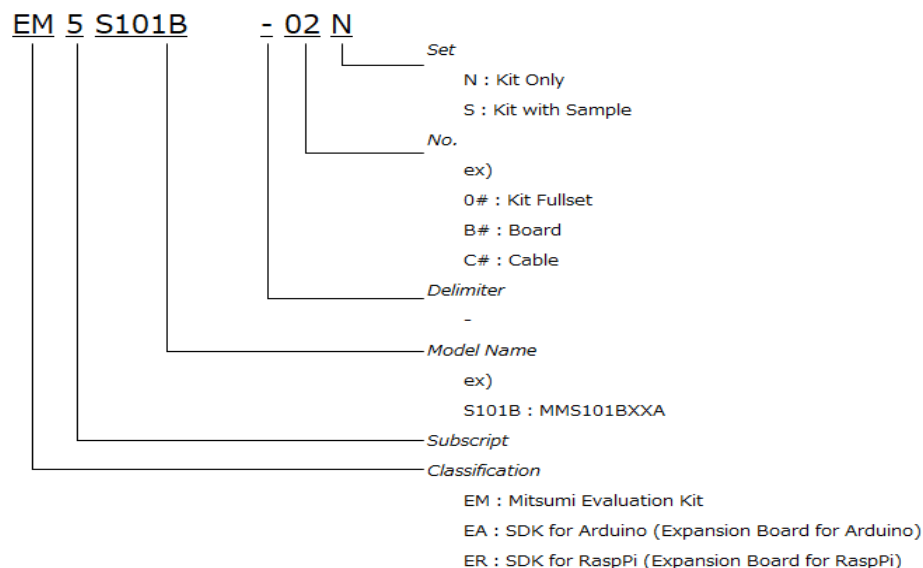
Designator	Model	Maker	Parts name	Value	Q'ty
C1, C3	GRM188R61E106KA73D	muRata	Capacitor	10u	2
C2	CGA3E2X7R1H104K080AA	TDK	Capacitor	0.1u	1
CN1	FH36W-15S-0.3SHW	Hirose Electric	Connector	15Pin	1
CN2	SM20B-NSHDZS	JST	Connector	20Pin	1

8 Cable Specification

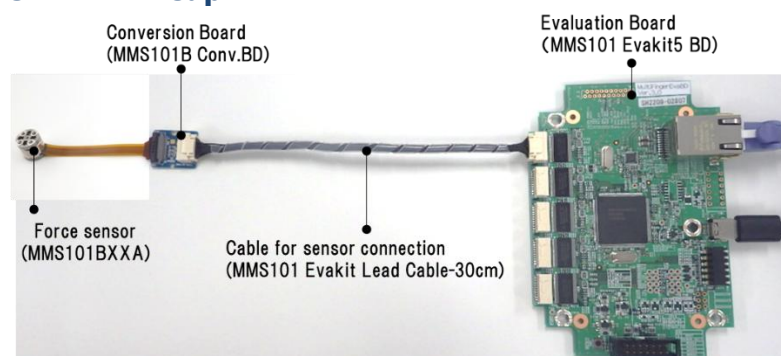
Cable Type	Cable length	Cable appearance
Lead cable	15, 30cm	<div><p>Cable line : UL3302 AWG28 (FURUKAWA ELECTRIC CO., LTD.) UL1571 AWG28 (OKI ELECTRIC CABLE CO., LTD.)</p><p>●</p><p>UL3302/UL1571 AWG28</p><p>Spiral tube</p><p>約4.5 mm</p><p>• Housing : NSHDR-20V-Z (J.S.T.MFG. CO., LTD)</p></div>
Robot cable	30, 60, 150cm	<div><p>Y-shaped terminal for shield *Connect SG or ground as necessary</p><p>Cable line : RMDHII-SB (21913) (DYDEN CORPORATION)</p><p>5.1mm</p><p>AWG30</p><p>Sheath</p><p>Braided Shield</p><p>• Housing : NSHDR-20V-Z (J.S.T.MFG.CO., LTD.) • Shade terminal (Y type) : 0.3Y-3 (NICHIFU CO., LTD.)</p></div>

9 Ordering Information

9-1 PO No. Description



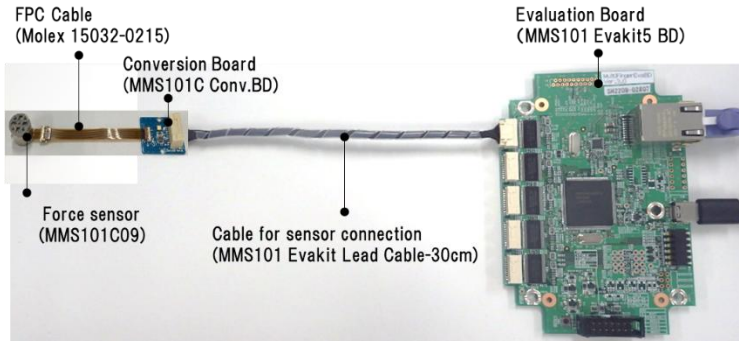
9-2 Lineup



PO No.	Details			Contents			
	Product Name	Kit Name	Set	Main Contents	Sample	Accessory1	Accessory2
MMS101B							
EM5S101B-02N	MMS101BXXA	MMS101 Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101B Conv.BD	MMS101 Evakit Lead Cable 30cm
EM5S101B-02S	MMS101BXXA	MMS101 Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101BXXA	MMS101B Conv.BD	MMS101 Evakit Lead Cable 30cm
EM5S101B-B1	MMS101BXXA	MMS101B Conv.BD	Accessory	MMS101B Conv.BD	-	-	-
EM5S101B-C1	MMS101BXXA	MMS101 Evakit Lead Cable 15cm	Accessory	MMS101 Evakit Lead Cable 15cm (*1)	-	-	-
EM5S101B-C2	MMS101BXXA	MMS101 Evakit Lead Cable 30cm	Accessory	MMS101 Evakit Lead Cable 30cm (*1)	-	-	-
EM5S101B-C3	MMS101BXXA	MMS101 Evakit Robot Cable 30cm	Accessory	MMS101 Evakit Robot Cable 30cm (*1)	-	-	-
EM5S101B-C4	MMS101BXXA	MMS101 Evakit Robot Cable 60cm	Accessory	MMS101 Evakit Robot Cable 60cm (*1)	-	-	-
EM5S101B-C5	MMS101BXXA	MMS101 Evakit Robot Cable 150cm	Accessory	MMS101 Evakit Robot Cable 150cm (*1)	-	-	-

MMS101B (Cable variation)							
EM5S101B-01N	MMS101BXXA	MMS101B Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101B Conv.BD	MMS101 Evakit Lead Cable 15cm
EM5S101B-01S	MMS101BXXA	MMS101B Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101BXXA	MMS101B Conv.BD	MMS101 Evakit Lead Cable 15cm
EM5S101B-03N	MMS101BXXA	MMS101B Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101B Conv.BD	MMS101 Evakit Robot Cable 30cm
EM5S101B-03S	MMS101BXXA	MMS101B Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101BXXA	MMS101B Conv.BD	MMS101 Evakit Robot Cable 30cm
EM5S101B-04N	MMS101BXXA	MMS101B Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101B Conv.BD	MMS101 Evakit Robot Cable 60cm
EM5S101B-04S	MMS101BXXA	MMS101B Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101BXXA	MMS101B Conv.BD	MMS101 Evakit Robot Cable 60cm
EM5S101B-05N	MMS101BXXA	MMS101B Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101B Conv.BD	MMS101 Evakit Robot Cable 150cm
EM5S101B-05S	MMS101BXXA	MMS101B Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101BXXA	MMS101B Conv.BD	MMS101 Evakit Robot Cable 150cm

(*1) This accessory has common specifications for both MMS101B and MMS101. It can be used with either.

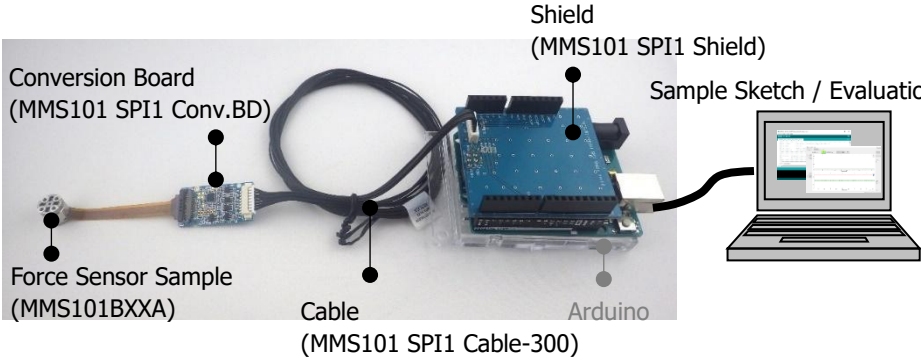
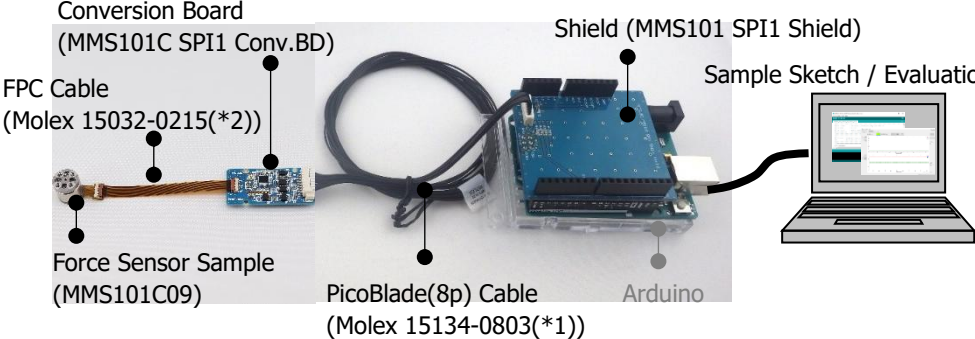
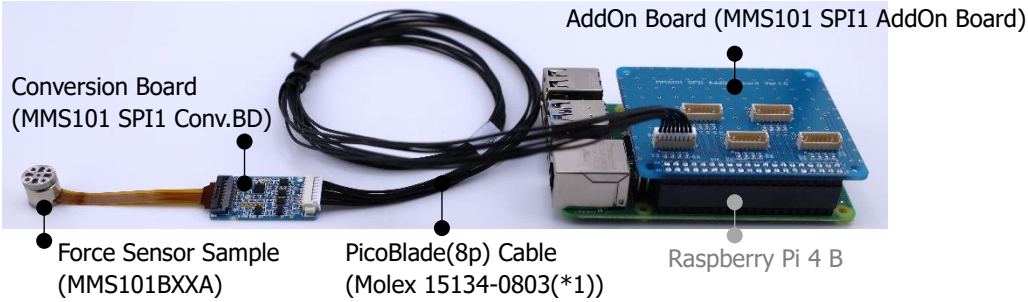
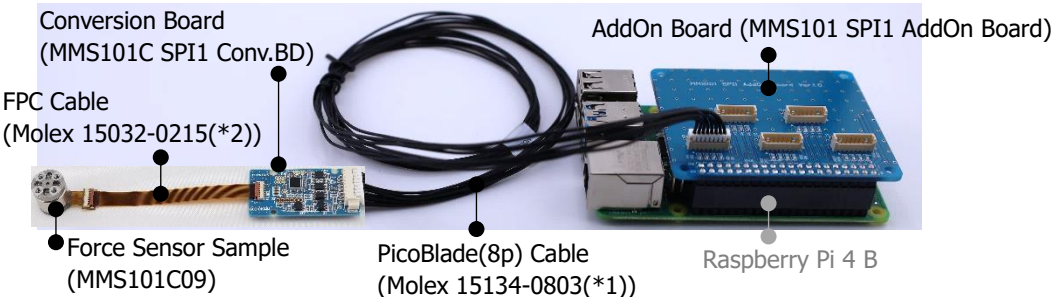


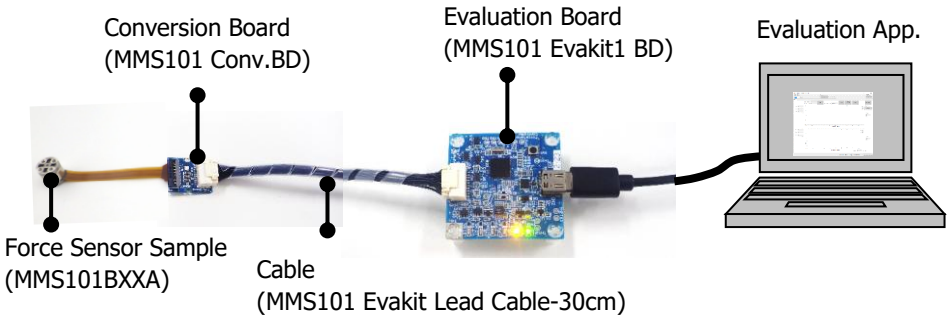
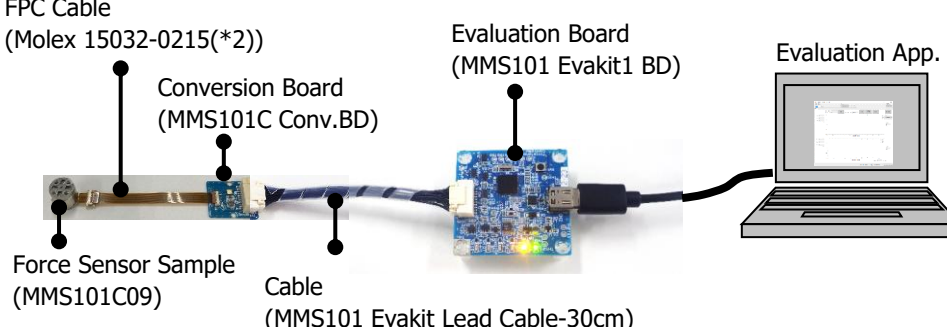
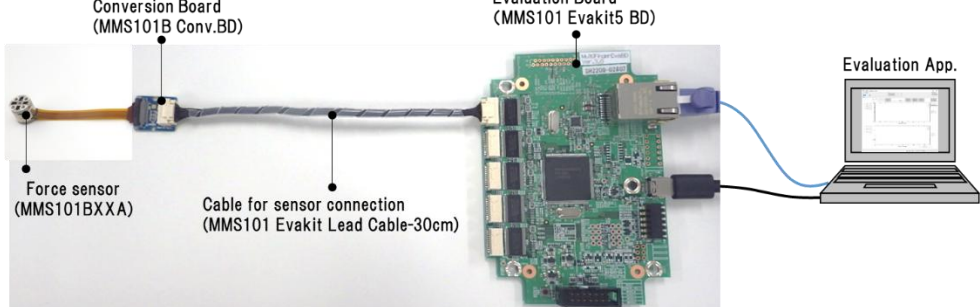
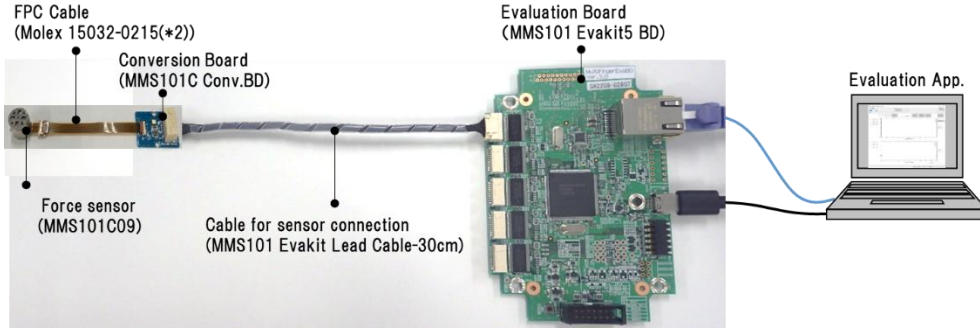
PO No.	Details			Contents			
	Product Name	Kit Name	Set	Main Contents	Sample	Accessory1	Accessory2
MMS101C							
EM5S101C-02N	MMS101C09	MMS101C Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Lead Cable 30cm
EM5S101C-02S	MMS101C09	MMS101C Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101C09	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Lead Cable 30cm
MMS101C (Cable variation)							
EM5S101C-01N	MMS101C09	MMS101C Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Lead Cable 15cm
EM5S101C-01S	MMS101C09	MMS101C Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101C09	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Lead Cable 15cm
EM5S101C-03N	MMS101C09	MMS101C Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Robot Cable 30cm
EM5S101C-03S	MMS101C09	MMS101C Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101C09	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Robot Cable 30cm
EM5S101C-04N	MMS101C09	MMS101C Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Robot Cable 60cm
EM5S101C-04S	MMS101C09	MMS101C Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101C09	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Robot Cable 60cm
EM5S101C-05N	MMS101C09	MMS101C Evakit5	Kit Only	MMS101 Evakit5 BD	no	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Robot Cable 150cm
EM5S101C-05S	MMS101C09	MMS101C Evakit5	Kit with Sample	MMS101 Evakit5 BD	MMS101C09	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	MMS101 Evakit Robot Cable 150cm
EM5S101C-B1	MMS101C09	MMS101C Conv.BD	Accessory	MMS101C Conv.BD +FPC Cable (Molex 15032-0215(*1))	-	-	-

(*1)The equivalent product is the Molex FPC cable (Model No. 15032-0215).

If you need additional purchases or different lengths, please use commercially available FPC cable.

9-3 Evaluation Kit List

Evaluation Kit Name	Configuration / Features
MMS101 SDK for Arduino	 <p>Force Sensor Sample (MMS101BXXA)</p> <p>Conversion Board (MMS101 SPI1 Conv.BD)</p> <p>Cable (MMS101 SPI1 Cable-300)</p> <p>Shield (MMS101 SPI1 Shield)</p> <p>Sample Sketch / Evaluation App.</p> <p>Arduino</p> <p>◆External Communication : USB</p> <p>◆Arduino is not included.</p>
	 <p>Force Sensor Sample (MMS101C09)</p> <p>Conversion Board (MMS101C SPI1 Conv.BD)</p> <p>FPC Cable (Molex 15032-0215(*2))</p> <p>PicoBlade(8p) Cable (Molex 15134-0803(*1))</p> <p>Shield (MMS101 SPI1 Shield)</p> <p>Sample Sketch / Evaluation App.</p> <p>Arduino</p> <p>◆External Communication : USB</p> <p>◆Arduino is not included.</p>
MMS101 SDK for Raspberry Pi	 <p>Force Sensor Sample (MMS101BXXA)</p> <p>Conversion Board (MMS101 SPI1 Conv.BD)</p> <p>PicoBlade(8p) Cable (Molex 15134-0803(*1))</p> <p>AddOn Board (MMS101 SPI1 AddOn Board)</p> <p>Raspberry Pi 4 B</p> <p>◆Up to five sensors can be connected.</p> <p>◆Raspberry Pi is not included.</p>
	 <p>Force Sensor Sample (MMS101C09)</p> <p>Conversion Board (MMS101C SPI1 Conv.BD)</p> <p>FPC Cable (Molex 15032-0215(*2))</p> <p>PicoBlade(8p) Cable (Molex 15134-0803(*1))</p> <p>AddOn Board (MMS101 SPI1 AddOn Board)</p> <p>Raspberry Pi 4 B</p> <p>◆Up to five sensors can be connected.</p> <p>◆Raspberry Pi is not included.</p>

MMS101 Evakit1	 <p>Conversion Board (MMS101 Conv.BD)</p> <p>Evaluation Board (MMS101 Evakit1 BD)</p> <p>Evaluation App.</p> <p>Force Sensor Sample (MMS101BXXA)</p> <p>Cable (MMS101 Evakit Lead Cable-30cm)</p> <p>◆External communication: USB</p>
	 <p>FPC Cable (Molex 15032-0215(*2))</p> <p>Evaluation Board (MMS101 Evakit1 BD)</p> <p>Evaluation App.</p> <p>Force Sensor Sample (MMS101C09)</p> <p>Cable (MMS101 Evakit Lead Cable-30cm)</p> <p>◆External communication: USB</p>
MMS101 Evakit5	 <p>Conversion Board (MMS101B Conv.BD)</p> <p>Evaluation Board (MMS101 Evakit5 BD)</p> <p>Evaluation App.</p> <p>Force sensor (MMS101BXXA)</p> <p>Cable for sensor connection (MMS101 Evakit Lead Cable-30cm)</p> <p>◆External communication: Ethernet / USB</p> <p>◆Up to five sensors can be connected (Only in Ethernet).</p>  <p>FPC Cable (Molex 15032-0215(*2))</p> <p>Evaluation Board (MMS101 Evakit5 BD)</p> <p>Evaluation App.</p> <p>Force sensor (MMS101C09)</p> <p>Cable for sensor connection (MMS101 Evakit Lead Cable-30cm)</p> <p>◆External communication: Ethernet / USB</p> <p>◆Up to five sensors can be connected (Only in Ethernet).</p>

(*1) The equivalent product is the Molex PicoBlade(8p) cable (Model No. 15134-0803).

If you need additional purchases or different lengths, please use commercially available PicoBlade(8p) cable.

(*2) The equivalent product is the Molex FPC cable (Model No. 15032-0215).

If you need additional purchases or different lengths, please use commercially available FPC cable.

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