pCOM Specification

* There is a possibility of interference during the operation of corresponding radio equipment.

Revision 1.97

November 8, 2022

Updated By: **SH. Youn**

Approval Signatures :	Name (Job Position)	Name (Job Position)	Name (Job Position)
	Date:	Date:	Date:

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Revision History:

| Rev.	Date/ Initials	Location	Description of Change
1.0	2018.06.27./ SH. Youn	All	- Initially Released
1.1	2018.12.11./ SH. Youn	All	- Changed the specification to 16Bit Version
1.2	2019.01.22./ SH. Youn	All	- Product Code Configuration changed, 16Bit Cable added, Filter Case Size changed Current consumption revised
1.3	2019.04.23./ SH. Youn	All	-Product Code Configuration changed, Specification for 6A CurrentFilter added, Filter Case for 6A added. Belt/Board Cable color on the Connector Specification is changed (White/Black) and Input circuit current is revised
1.4	2019.05.08./ SH. Youn	Connector Specification	- AMP Connector (16Bit) Specification is added
1.5	2019.07.25./ SH. Youn	Main Motion Function USER SERIAL	- Motion function is added - USER SERIAL description is added - Product code configuration is changed - iMAN is changed to iMAN+
1.6	2019.10.10./ SH. Youn	Connector Specification, Product Code Configuration	- I/O connector specification is changed - Product code configuration is changed
1.7	2019.11.19./ SH. Youn	Product Code Configuration Main pins functions	- VHL Maker information revised - Details for the Input pins floating treatmentisadded
1.8	2020.02.19./ SH. Youn	6. Main Specification of the Product 7. Tools Specification 8. Connector Specification 9. LED Indication Details 11. Main communication functions 12. Main motion functions	- USER Serial Data transmitted amount revised - Filter Case carving is added - Cable color of 8 Bit product is changed - GO LED turn off time changed - User serial function revised - Motion function revised
1.9	2020.10.06/ SH. Youn	3. Product Code Configuration 6. Main Specification of the Product 8. Connector Specification	- Typo corrected and code system revised - Typo on RF communication band corrected - Certificate phrase inserted - 16 Bit current consumption revised and 8 Bit current consumption added - Connector related details are distinguished as a separate document
1.91	2022.05.12/ SH. Youn	3. Product Code Configuration	- New I/O Connector specification is added
1.92	2022.05.17/ SH. Youn	3. Product Code Configuration	- New Maint, User Connector specification is added

1.93	2022.05.24/ SH. Youn	3. Product Code Configuration	- New User Connector specification is added
1.94	2022.06.20/ SH. Youn	6. Main Specification of the Product	- Cable specification is revised
1.95	2022.07.26/ SH. Youn	6. Main Specification of the Product 11. Main communication functions 7. Tools Specification	- Communication cycle is revised, Data transmission amount is revised - Filter Case drawing is revised
1.96	2022.08.18/ SH. Youn	3. Product Code Configuration 6. Main Specification of the Product	- Insert cable related text - Insert maximum cable length statement
1.97	2022.11.08/ SH. Youn	3. Product Code Configuration	- 'AA' specification change

1. Product Introduction

CTS-pCOM series is the product developed to control remote IO with existing power line on the remote IO controlling system that is using the power line and communication media separately.

Input and Output data and additional information can be transmitted and received through the power line connected between two devices and also, it is designed to be operated stably in a noisy environment.

In particular, this product provides optimal solution to transmit the controlling information as it uses 24V power line to be supplied through the belt which is supporting the Hand area when controlling the Hand of the OHT.

VHL (OHT)

Hoist control part

Belt (+24V Power+Data)

Hand control part

FOUP
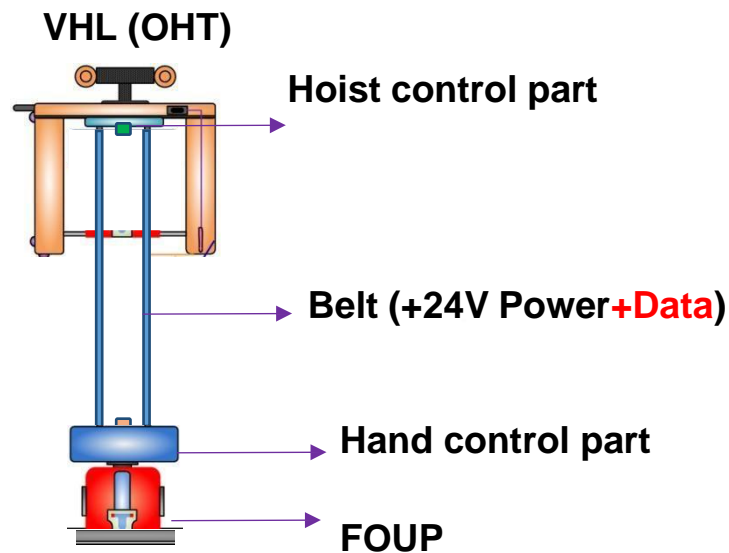
2. Characteristics of the Product

- **Wired communication available using previously installed +24V power line**
- **Easily applicable structure without major change of existing system**
- **Long distance communication is available even when used with the belt used structure**
- **16 Bit I/O information and user information can be transmitted**
- **16 Bit I/O can be expanded (RS-232: Maintenance Serial Port)**
- **Wireless monitoring of I/O information is available**
- **Log storage and wireless download is available**
- **Safety function is reinforced with various additional function**
- **Convenience of maintenance increased using various log information**
- **Influence for the system is minimized using high frequency modulation system**
- **Optimized communication environment setup function is available while considering the circumjacent noise.**

3. Product Code Configuration

Code System

CTS-pCOM-AA-B-CD-dd-ee-fgh-ij-kkk-lll-mmm-nnn

AA	8/16bits Select
08	8bit
16	16bit
A8	8bit
AF	16bit

B	Master/slave 용 Select
S	Slave 용
M	Master 용

C	Reserved
0	0
0	0

D	USER Serial Select
2	RS-232
5	RS-485

dd	VHL Maker
SE	SEMES
DA	DAIFUKU
MU	Muratec
SF	SynusTech
SA	SFA

ee	Filter Current
03	3A
06	6A

nnn	PLC Cable Length(mm)
030	300
040	400

mmm	User Serial Cable Length(mm)
000	No cable
030	300
040	400

lll	Maint Serial Cable Length(mm)
000	No cable
010	100
020	200

kkk	I/O Cable Length(mm)
000	No cable
030	300
040	400

i	PLC-Board Direction
0	No connector
1	Molex 5557-02
2	WAGO 734-102/037-000
3	WAGO 734-302

j	PLC-Belt Direction
0	No connector
1	Molex 5559-02
2	WAGO 734-302
3	WAGO 734-102/037-000

f	I/O Connector
0	No connector
1	HIF-26D-1.27R
2	SMR-12V-N+SMR-12V-N
3	HIF-26D-1.27R+HIF-26D-1.27R
4	SMR-18V-N+SMR-18V-N+SMR-5V-N
5	AMP 1-1318118-9 + 1-1318119-4
6	SMR-10V-N+SMR-12V-N
7	SMR-12V-N+SMR-12V-N+SMR-12V-N+SMR-12V-N
8	Molex Molex 35572-03 (or 35155-0300)(Only Power Cable)
9	Molex 51103-0200 (Only Power Cable)

g	Maint Serial Connector
0	No connector
1	Molex 3p (51103-0310)
2	JST SMR-03V-N
3	9P DSUB(Female)

h	User Serial Connector
0	No connector
1	Molex 3p (51103-0310)
2	JST SMR-03V-N
3	AMP 1-1318120-3
4	9P DSUB(Female)
5	Molex 4p (5559-04)

pCOM   pCOM Specification

pCOM

IN   OUT   CTS-pCOM

kkk

I/O CONNECTOR

lll

MAINT

MAINT
SERIAL
CONNECTOR

mmm

USER

USER
SERIAL
CONNECTOR

nnn

BELT
CONNECTOR

PLC

105

ee : FILTER CURRENT

105

BOARD
CONNECTOR

※ **Product composition : It consists of a pair of Master and Slave, and the components are as shown in the drawing above.**

CanTops
(주)캔탑스

Example of Product Code)

Classification	Code

8Bit Master

CTS-pCOM-08-M-02-SE-03-222-11-040-010-030-030

AA	8/16Bits Select
08	8bit

B	Master/slave 용 Select
M	Master

CD	User Serial Select
02	RS-232

VHL Maker	
SE	SEMES

Filter Current	
03	3A

f	I/O Connector
2	SMR-12V-N+SMR-12V-N

g	Maint Serial Connector
2	JST SMR-03V-N

h	User Serial Connector
3	JST SMR-03V-N

nnn	PLC Cable
Length(mm)030	300

mmm	485/232 Cable Length(mm)
030	300

lll	Maint Serial Cable Length(mm)
010	100

kkk	I/O Cable
Length(mm)040	400

i	PLC-Board
1	DirectionMolex 5557-02

j	PLC-Belt
1	DirectionMolex 5559-02

8Bit Slave

CTS-pCOM-08-S-02-SE-03-222-33-040-010-040-030

AA	8/16Bits Select
08	8bit

B	Master/slave 용 Select
S	Slave

CD	User Serial
08	SelectRS-232

VHL Maker	
SE	SEMES

Filter Current	
03	3A

f	I/O Connector
2	SMR-11V-N+SMR-12V-N

g	Maint Serial Connector
2	JST SMR-03V-N

h	User Serial Connector
2	JST SMR-03V-N

nnn	PLC Cable Length
(mm)030	300

mmm	485/232 Cable Length (mm)
040	400

lll	Maint Serial Cable Length(mm)
010	100

kkk	I/O Cable Length(mm)
040	400

i	PLC-Board
Direction3	JST 734-302

j	PLC-Belt Direction
3	JST 734-102/037-000

16Bit Master

CTS-pCOM-16-M-05-SE-06-422-22-040-010-030-030

AA	8/16Bits Select
08	16bit

B	Master/slave 용 Select
M	Master

CD	User Serial
04	SelectRS-485

VHL Maker	
SE	SEMES

Filter Current	
06	6A

f	I/O Connector
4	SMR-18V-N+SMR-18V-N+SMR-5V-N

g	Maint Serial Connector
2	JST SMR-03V-N

h	User Serial Connector
3	JST SMR-03V-N

nnn	PLC Cable Length(mm)
030	300

mmm	485/232 Cable Length(mm)
030	300

lll	Maint Serial Cable Length(mm)
010	100

kkk	I/O Cable Length(mm)
040	400

i	PLC-Board Direction
2	WAGO 734-102/037-000

j	PLC-Belt Direction
2	WAGO JST 734-302

16Bit Slave

CTS-pCOM-16-S-05-SE-06-322-11-040-010-030-030

AA	8/16Bits Select
16	16bit

B	Master/slave 용 Select
S	Slave

CD	User Serial Select
04	8bit

VHL Maker	
SE	SEMES

Filter Current	
06	6A

f	I/O Connector
3	HIF-26D-1.27R+HIF-26D-1.27R

g	Maint Serial Connector
2	JST SMR-03V-N

h	User Serial Connector
3	JST SMR-03V-N

nnn	PLC Cable Length(mm)
030	300

mmm	485/232 Cable Length(mm)
030	300

lll	Maint Serial Cable Length(mm)
010	100

kkk	I/O Cable Length(mm)
040	400

i	PLC-Board Direction
1	Molex 5557-02

j	PLC-Belt Direction
1	Molex 5559-02

4. System Block Diagram (Ex, VHL)
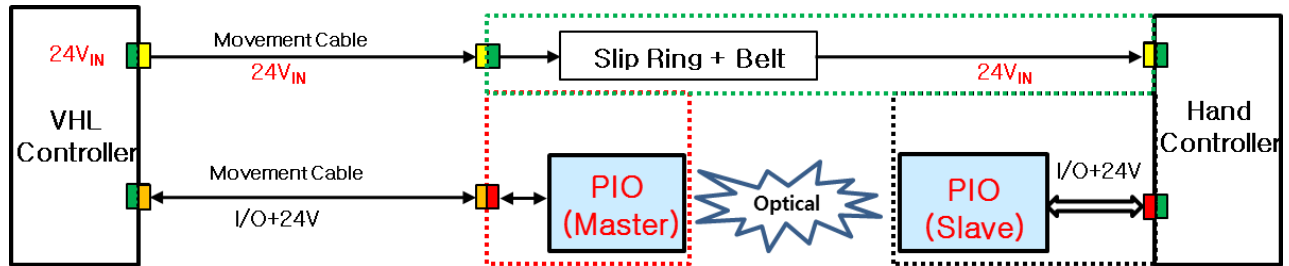
< Block Diagram of VHL Inside Hoist device: Before>
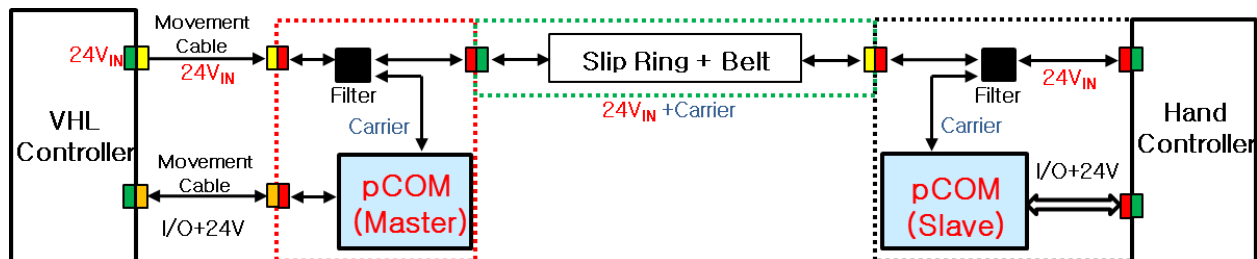
< Block Diagram of VHL Inside Hoist device: Example of the use of pCOM >

Above diagram is an example of the configuration of Hoist device to be used for the Loading & Unloading of the target object to be returned from VHL in vertical direction. CanTops does not sell Slip Ring and Belt from above configuration, and Slip Ring and Belt to be suitable for the characteristics of pCOM need to be selected separately. In many cases, existing components can be used as they are and the user needs to select optimized one through the interlocking test with pCOM.

1) **pCOM (Master)**
   This is a communication module to be used on the VHL controller side which will be operated by receiving 24V power from VHL controller, and transmitting and receiving the modulated signals for the communication by connecting the pCOM Cable to 24V power line to be supplied to Hand part.

2) **pCOM (Slave)**
   This is a communication module to be connected to the Hand controller and 24V power will be supplied to Hand controller and pCOM Slave by connecting pCOM Cable to the provided 24V power line.

5. Input / Output Circuit

Input Circuit: Max. 1.7mA. This will be connected to the Output circuit to be interfaced with pCOM.
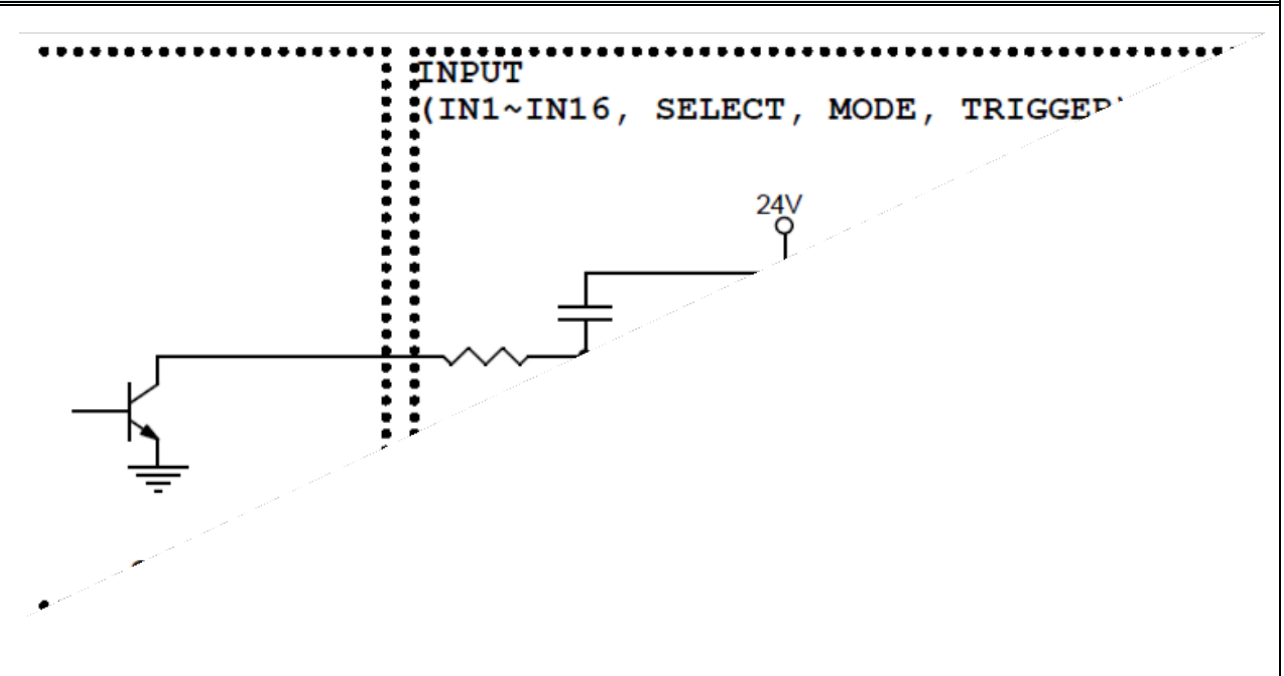
Output Circuit: NPN type Open Collector, Max. operating current is 20mA / 30V $V_{CE\ max}$ will be connected to the circuit of the product to be interfaced with 100mV / 10mA, pCOM.
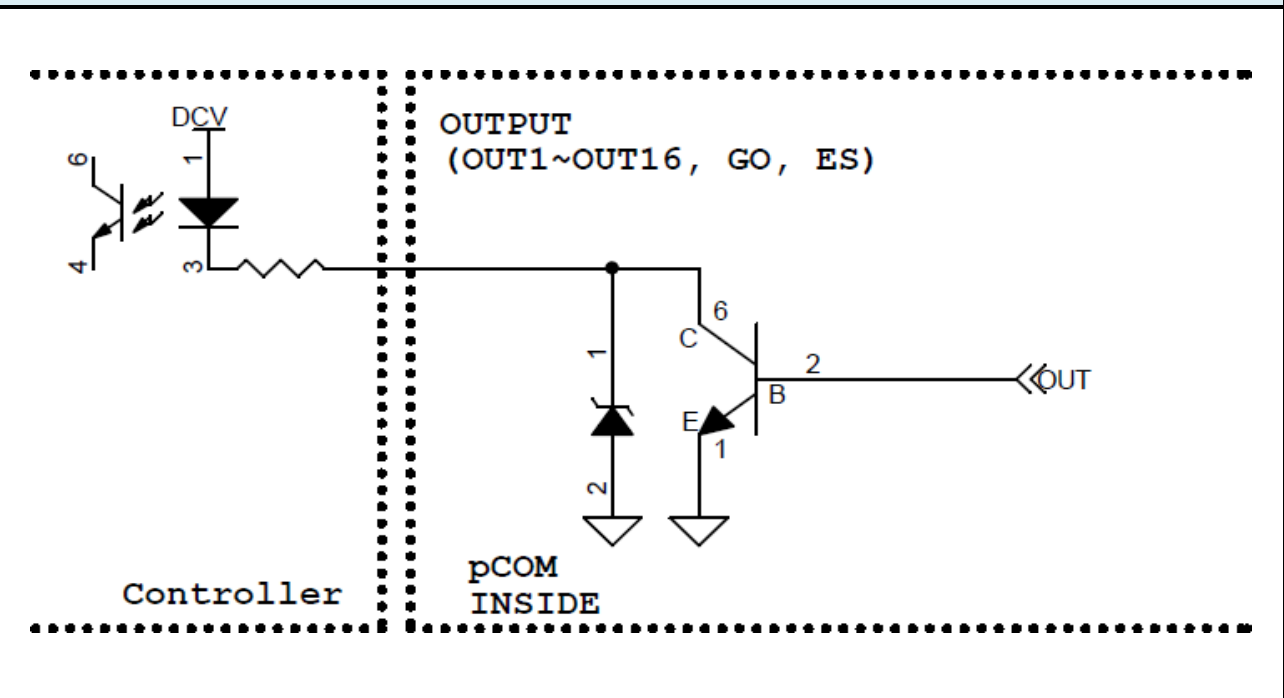
6. Main Specification of the Product

Classification	Detailed Item	Contents
Indicator (LED)	**GO**	**Will be turned on when communication between master and slave pCOMs are started.**
	STATE	**This is a Watchdog signal and it will be flickering to indicate the status of operation.**
	Rx	**This will be turned on when communication data is entered into pCOM.**
	Tx	**This will be turned on when communication data comes out from pCOM.**
	IN	**This indicates the operation status of input port (16Bit)**
	OUT	**This indicates the operation status of output port (16Bit)**
External device connection (LED)	**Connector**	**Master pCOM: Optional**
		Slave pCOM: Optional
	Cable	**Common specification for both 8 Bit / 16 Bit : 28AWG x 38C + 26AWG x 2C Shield Cable length : 3m (Max)**
	Input	**16 Bit Input, Transistor IN, 24V On : 10mA, Off : Lower than 0.1mA**
	Output	**16 Bit Output, Open Collector, NPN, 30V Max. operation current 20mA**
	I/O transmission time	**Max 38ms**
Power line communication function	**Main function**	**Input / Output data transmission [*2] User / Monitoring information transmission**
	Communication media	**24V Power line**
	Communication distance	**10m (winding & unwinding type structure belt), 18m (normal wire)**
	Communication method	**1:1 Communication, Half Duplex**
	Communication error check	**CRC-16**
	Communication cycle	**Approx. 13ms (Max)**
Maint serial communication function	**Main functions**	**For manager 16 Bit Input / Output expansion data setup / checkup [*3] Monitoring information checkup [*5]**
	Communication media	**RS-232C**
	Communication speed	**57600bps**
User serial communication function	**Main functions**	**User information transmission [*4]**
	Communication media	**RS-232C/RS-485**
	Communication speed	**Variable (9600/19200/38400/57600/115200bps)**
	Data transmission quantity (power line communication)	**Approx. 10KB/S**
Safety and additional functions	**Power measuring function**	**Max : 30V, 20ms cycle**
	Slope / Wobbling / Impact	**3 axes acceleration sensor and 3 axes gyroscope are used, 5ms cycle**
RF communication function	**Main functions**	**Communication data monitoring using iMAN+[*6], F/W update, LOG download, parameter change**
	Communication media	**2.4GHz ISM Band, Bandwidth 1MHz**

	Band Width	2,402~2,480MHz [*1)]
	Safety Functions	Serial No. (ID) identifying function, CRC-16
	Communication method	1:1 Communication, Half Duplex
	ID Setup	pCOM ID No. to prevent the interference with adjacent pCOM. This is consisted of 5 digit ASCII code: 00001~FFFFF
	Channel (CH) Setup	This is a communication frequency to be used for the wireless communication. Frequency needs to be managed to prevent the radio interference between adjacent pCOMs. This is consisted of 3 digit ASCII code: 000 ~122
	ID/CH Management	Each product will be set with different ID No. (B96A7-xxxxx) when ship out from the factory and the CH will be set with the same value (CH=0) [*7)] CH needs to be changed (0~122) depending on the environment of use.
	Operation distance	Within 2m However, there must be no interfering objects in the middle of radio not disconnecting and stable communication environment
Environment	Storage environment	Storage temperature: -25 ~ 70°C Storage humidity: 5 ~ 95% RH (however, no condensation is allowed)
	Operation environment	Operation temperature: 0 ~ 40°C Operation humidity: 35~85% RH (however, no condensation is allowed) Vibration: Lower than 4~150 Hz, 4.9m/s^2
Power	Input voltage	DC 24V±10%
	Current consumption	16 Bit: Lower than 150mA @24V
		8 Bit: Lower than 100mA @24V
Case material		Polycarbonate
Size (WxHxD)		50x66x20mm (connector extruded area excluded)
Weight		Approx. 300g (IO cable length 1.5m)

*1) This can be used in such an environment as there is no frequency interference with other wireless devices (wireless LAN, Bluetooth, etc.).

*2) Input / Output data means 16 Bit Input / Output and 16 Bit Input / Output Expansion.

  ※ **16 Bit I/O allocates and uses the data to be required for the real time based transmission.**

  ※ **16 Bit I/O expansion (RS-232) data will allocate the other data.**

*3) Input / Output Expansion data will be configured through the serial for Maint and supports 16bit/ 16bit.

  ※ **I/O expansion data can be set and verified through the response after the serial transmission is made to [controller pCOM].**

*4) User's information means the user exclusive data to be transmitted between the products (ex. [OHT↔ Hand]) and pCOM does not get involved for corresponding information.

*5) Monitoring information means the one for the additional functions provided by pCOM and it can be the information for 24V power of Hand part and optional functions.

*6) iMAN+ means pCOM management tool to be provided by CanTops Co., Ltd.

*7) CH 0 means 2400MHz band width.

※ 81ˢᵗ channel will be used for [pCOM ↔ iMAN+] Wireless Link when RF

ID/CH is acquired.

7. Tools Specification

※ **Size is subject to be changed.**

Main Case (unit: mm) - SILK : 16bit

Cable

2- 4.3mounting hole
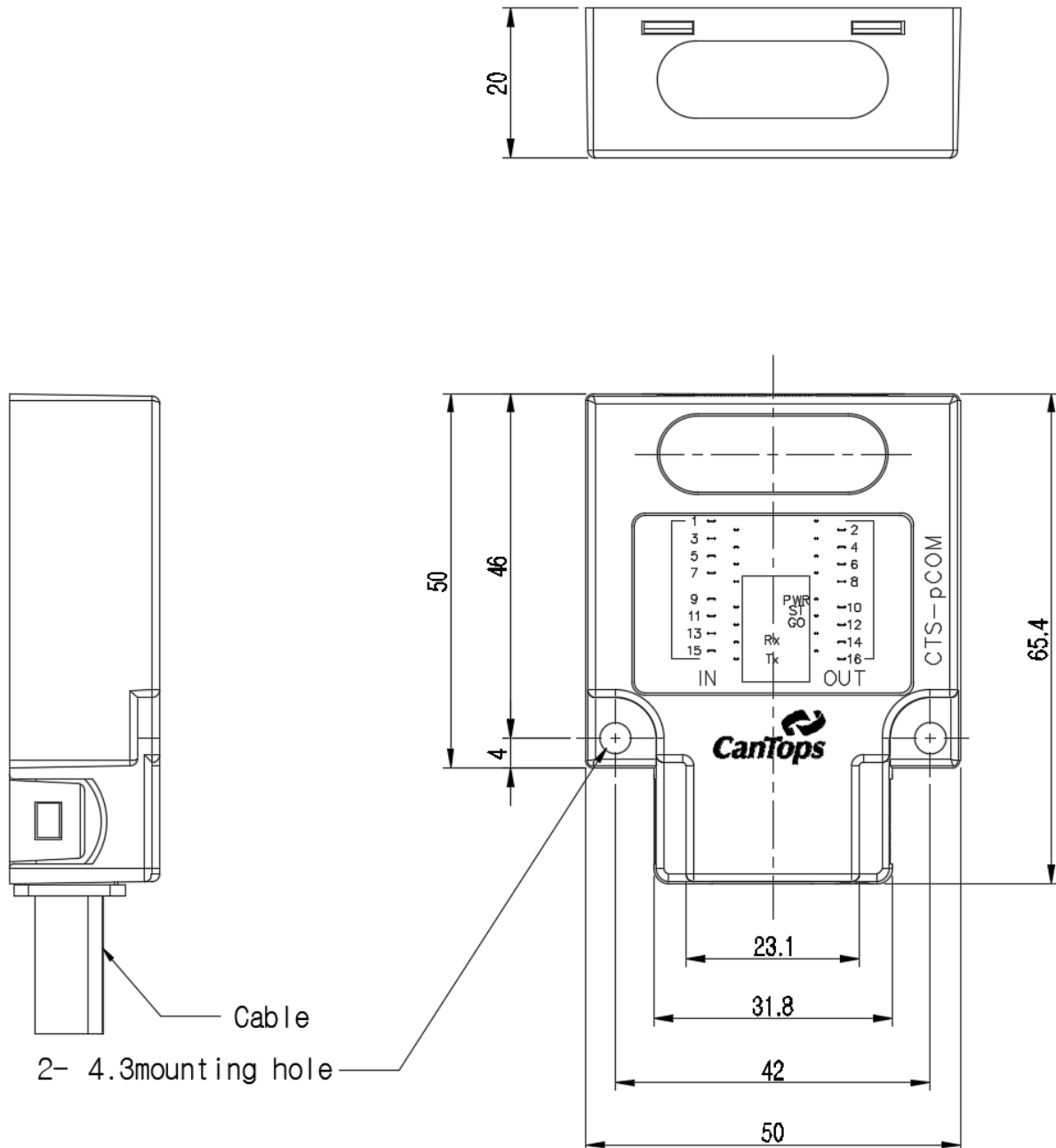
Filter Case-3A (unit: mm)
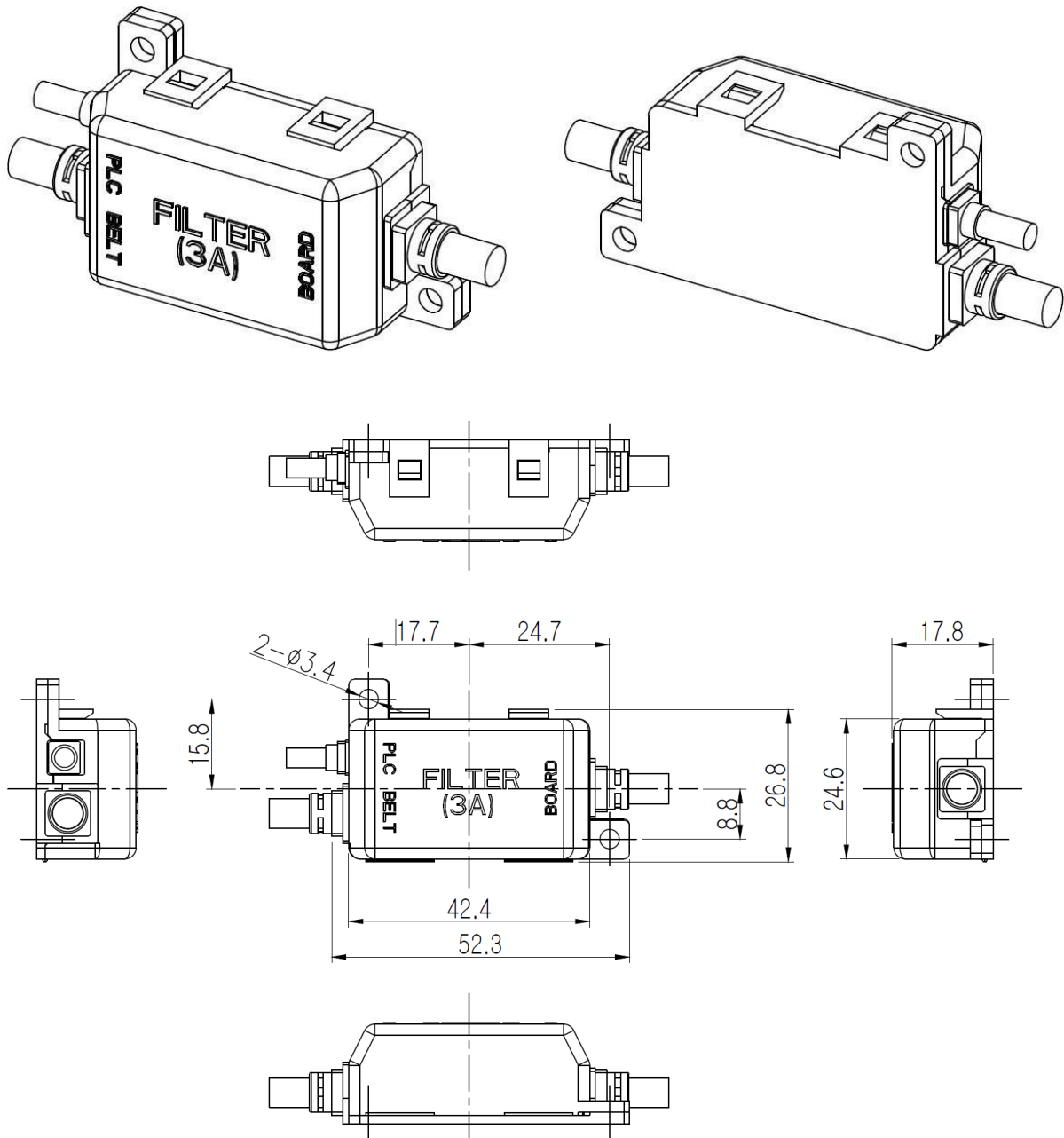
Filter Case-6A (unit: mm)
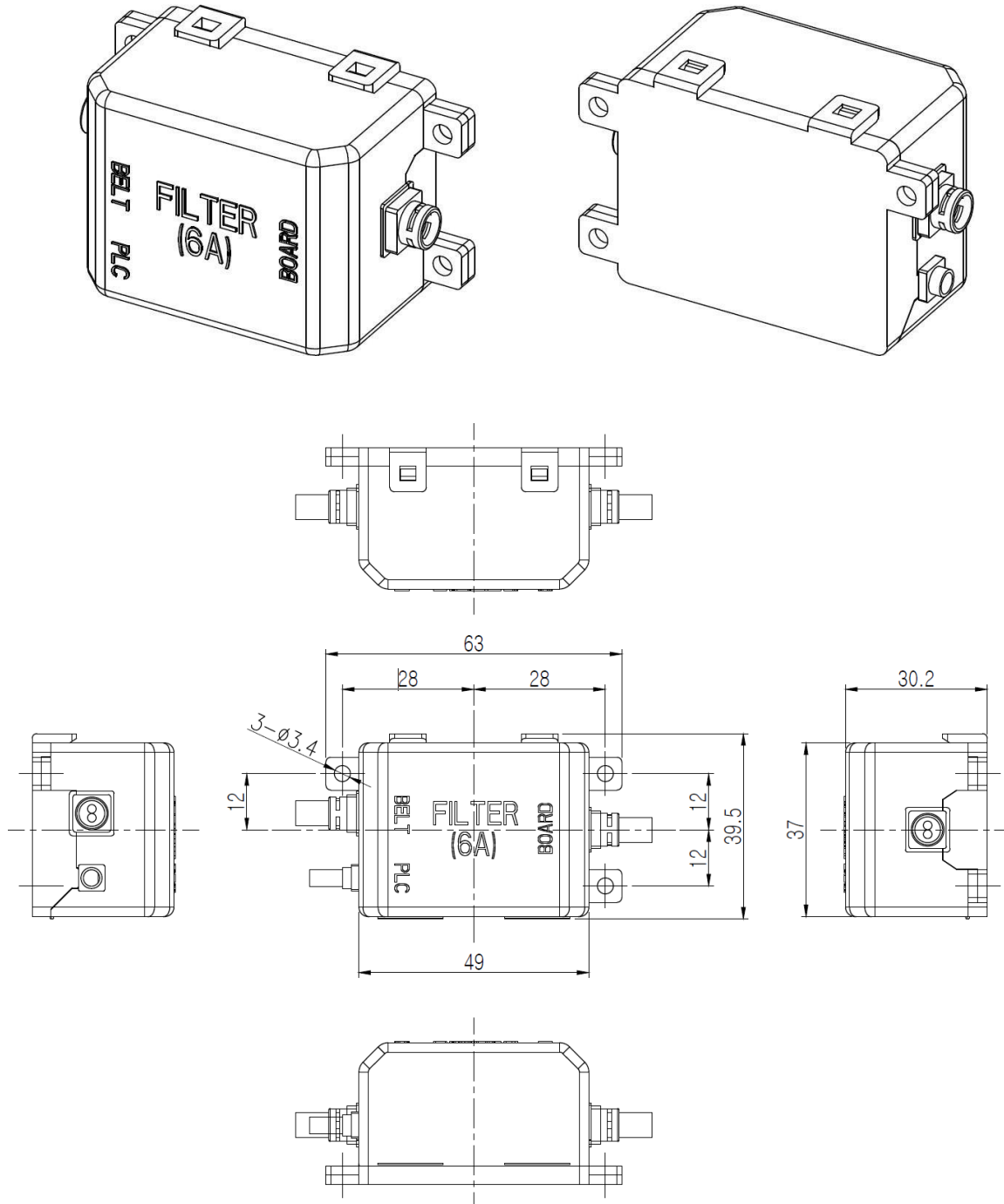
8. Connector Specification
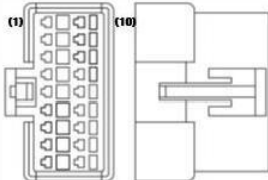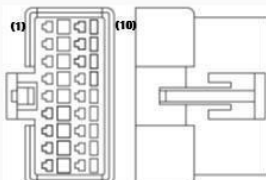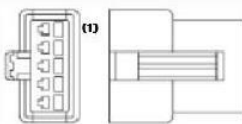
※ **Below is an example of connection of the connectors. Please contact us when changing the Cable specification.**

1) For 16 Bit Slave

➢ **SMR-18V-N, SMR-05V-N, SMR-03V-N Connector**

■ CTS-pCOM-16-S-05-dd-ee-422-33-kkk-lll-mmm-nnn

Function	SMR-18V-N Pin No	Color	Function	SMR-18V-N Pin No	Color
IN 1	1	White (Black1)	OUT 1	1	Orange (Black1)
IN 2	2	White (Black2)	OUT 2	2	Orange (Black2)
IN 3	3	White (Black3)	OUT 3	3	Orange (Black3)
IN 4	4	White (Black4)	OUT 4	4	Orange (Black4)
IN 5	5	White (Red1)	OUT 5	5	Orange (Red1)
IN 6	6	White (Red2)	OUT 6	6	Orange (Red2)
IN 7	7	White (Red3)	OUT 7	7	Orange (Red3)
IN 8	8	White (Red4)	OUT 8	8	Orange (Red4)
IN 9	9	Yellow (Black1)	OUT 9	9	Gray (Black1)
IN 10	10	Yellow (Black2)	OUT 10	10	Gray (Black2)
IN 11	11	Yellow (Black3)	OUT 11	11	Gray (Black3)
IN 12	12	Yellow (Black4)	OUT 12	12	Gray (Black4)
IN 13	13	Yellow (Red1)	OUT13	13	Gray (Red1)
IN 14	14	Yellow (Red2)	OUT 14	14	Gray (Red2)
IN 15	15	Yellow (Red3)	OUT 15	15	Gray (Red3)
IN 16	16	Yellow (Red4)	OUT 16	16	Gray (Red4)
+VIN	17	White	-	17	-
GND	18	Black	-	18	-
Control Connector	SMR-05V-N		SELECT	1	PINK (Red2)
			GO	2	PINK (Black1)
			MODE	3	PINK (Red1)
			TRIGGER	4	PINK (Red3)
			ES	5	PINK (Black2)
Maint Serial Connector	SMR-03V-N		Maint-TxD	1	Black
			Maint-RxD	2	Brwon
			GND	3	Red

User Serial Connector	**SMR-03V-N**	USER-TxD	1	**Black**
		USER-RxD	2	**Brwon**
		GND	3	**Red**
Board	**734-302**	GND	1	**Black**
		24V	2	White
Belt	**734-102/037-000**	P-	1	**Black**
		P+	2	White

Cable connection diagram	SMR-11V-N, SMR-12V-N

2) For 16 Bit Master

➢ SMR-18V-N, SMR-05V-N, SMR-03V-N Connector

■ CTS-pCOM-16-M-05-dd-ee-422-22-kkk-lll-mmm-nnn

Function	SMR-18V-N Pin No	Color	Function	SMR-18V-N Pin No	Color
IN 1	1	White (Black1)	OUT 1	1	Orange (Black1)
IN 2	2	White (Black2)	OUT 2	2	Orange (Black2)
IN 3	3	White (Black3)	OUT 3	3	Orange (Black3)
IN 4	4	White (Black4)	OUT 4	4	Orange (Black4)
IN 5	5	White (Red1)	OUT 5	5	Orange (Red1)
IN 6	6	White (Red2)	OUT 6	6	Orange (Red2)
IN 7	7	White (Red3)	OUT 7	7	Orange (Red3)
IN 8	8	White (Red4)	OUT 8	8	Orange (Red4)
IN 9	9	Yellow (Black1)	OUT 9	9	Gray (Black1)
IN 10	10	Yellow (Black2)	OUT 10	10	Gray (Black2)
IN 11	11	Yellow (Black3)	OUT 11	11	Gray (Black3)

pCOM			pCOM Specification		
IN 12	**12**	Yellow (Black4)	**OUT 12**	**12**	Gray (Black4)
IN 13	**13**	Yellow (Red1)	**OUT13**	**13**	Gray (Red1)
IN 14	**14**	Yellow (Red2)	**OUT 14**	**14**	Gray (Red2)
IN 15	**15**	Yellow (Red3)	**OUT 15**	**15**	Gray (Red3)
IN 16	**16**	Yellow (Red4)	**OUT 16**	**16**	Gray (Red4)
+VIN	**17**	White	**-**	**17**	**-**
GND	**18**	**Black**	**-**	**18**	**-**
Control Connector	**SMR-05V-N**		**SELECT**	**1**	PINK (Red2)
			GO	**2**	PINK (Black1)
			MODE	**3**	PINK (Red1)
			TRIGGER	**4**	PINK (Red3)
			ES	**5**	PINK (Black2)
Maint Serial Connector	**SMR-03V-N**		**Maint-TxD**	**1**	**Black**
			Maint-RxD	**2**	**Brwon**
			GND	**3**	**Red**
User Serial Connector	**SMR-03V-N**		**USER-TxD**	**1**	**Black**
			USER-RxD	**2**	**Brwon**
			GND	**3**	**Red**
Board	**734-102/037-000**		**GND**	**1**	**Black**
			24V	**2**	White
Belt	**734-302**		**P-**	**1**	**Black**
			P+	**2**	White
Cable connection diagram			**SMR-18V-N, SMR-18V-N, SMR-05V-N**		

IN 1 White (black1) [1]
IN 2 White (black2) [2]
IN 3 White (black3) [3]
IN 4 White (black4) [4]
IN 5 White (Red1) [5]
IN 6 White (Red2) [6]
IN 7 White (Red3) [7]
IN 8 White (Red4) [8]
IN 9 Yellow (Black1) [9]
IN 10 Yellow (Black2) [10]
IN 11 Yellow (Black3) [11]
IN 12 Yellow (Black4) [12]
IN 13 Yellow (Red1) [13]
IN 14 Yellow (Red2) [14]
IN 15 Yellow (Red3) [15]
IN 16 Yellow (Red4) [16]
+VIN White [17]
GND black [18]

OUT 1 Orange (Black1) [1]
OUT 2 Orange (Black2) [2]
OUT 3 Orange (Black3) [3]
OUT 4 Orange (Black4) [4]
OUT 5 Orange (Red1) [5]
OUT 6 Orange (Red2) [6]
OUT 7 Orange (Red3) [7]
OUT 8 Orange (Red4) [8]
OUT 9 Gray (black1) [9]
OUT 10 Gray (black2) [10]
OUT 11 Gray (black3) [11]
OUT 12 Gray (black4) [12]
OUT 13 Gray (Red1) [13]
OUT 14 Gray (Red2) [14]
OUT 15 Gray (Red3) [15]
OUT 16 Gray (Red4) [16]
(NC) X [17]
(NC) X [18]

SELECT PINK (Red2) [1]
GO PINK (black1) [2]
MODE PINK (Red1) [3]
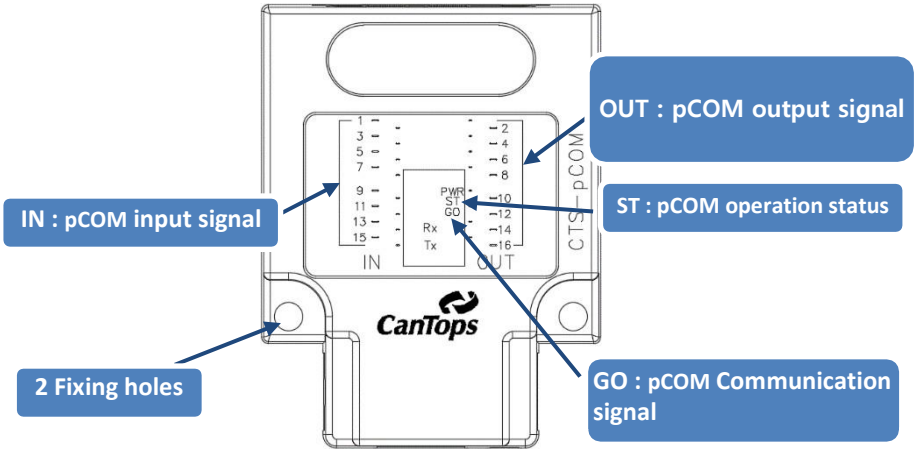TRIGGER PINK (Red3) [4]
ES PINK (black2) [5]

9. LED INDICATION DETAILS

LED		Indication Details
1~16	**IN**	Indicates the operation of pCOM internal input circuit. Will be turned on during Low state
	OUT	Indicates the pCOM internal output status. Will be turned on during TR On.
GO		Will be turned on when communication between master and slave pCOM is established. GO LED and Output Off time after the disconnection of communication would be approx. 0.5 sec, and it can be set between 0.070 ~ 2.500 using <R> command.

STATE Note 1)		This will be used as a Watchdog signal to check the status of the inside of this product.
		
		※ Turned on continuously
		※ Cycle
		   - Master: 0.25 s
		   - Slave: 1s
		   - When communication initialization is failed, 2s ~ 4s

LED layout drawing		

10. Main Pins Functions

Signal	How to use
Mode (Input)	**Input to select the mode of pCOM** ▪ **Enter Low** [*1] **: Slave Mode (no need to connect anything from outside as it is connected from inside of pCOM to GND)** ▪ **Enter High** [*1] **or process floating** [*2] **: Master Mode (OHT)**
Select (Input)	**Input to operate pCOM communication** ▪ **Low Input: Stop the communication function of pCOM** ▪ **Enter High or process Floating: start operation of the communication function of pCOM**
Trigger (Input)	**Input for the try of [pCOM ↔ iMAN+] wireless Link (RF ID/CH acquisition)** ▪ **When it is in normal state. Enter Low at VHL Controller (maintenance)** ▪**When auto link between iMAN+ and pCOM is required. When enter High (up to 10 times, it tries Trigger with iMAN+ once a sec. However, High state needs to be maintained)** ※ **Time difference between Low -> High input should be longer than 1 sec.** ▪ **If wireless ID of pCOM for iMAN+ is acquired / when acquisition is failed / when acquisition is not required, enter Low** ▪ **Enter High or process Floating: Trigger function will not be used**
GO (Output)	**GO LED will be turned On when communication between Master and Slave pCOM is established (NPN open collector On)**
ES (Output)	**Status notification for pCOM option information** ▪ **It detects when it is higher than certain level of slope of Hand due to the sagging, etc. of the belt, and also detects wobbling and impact during Hoist operation and displays them using ES signal. (NPN Open Collector On)**

*1) Enter Low: 0V of power, Enter High: 24V of power

*2) Process Floating: Inside pull-up, No electrical connection

➢ **Mode Description**

Master Mode	**This is a mode to be used by attaching on OHT. System transmits the input data (I/O, Serial) to the power line if the Select signal is Open and set to operate pCOM.** **System displays the received data (I/O, Serial) if there is a response (receipt) after the transmission.**
Slave Mode	**This is a mode to be used by attaching on Hand. System will be in receiving standby state if the Select signal is Open and set to operate pCOM, and also, System displays the received data (I/O, Serial) if the data is received from Master through power line communication and transmits the input data (I/O, Serial) to Master pCOM through power line.**

※ **For I/O, output of received data will be applied on a real time basis, and for Serial, system will respond when there is a serial command from the controller.**

11. **Main Communication Functions**

Power line communication

■ **Characteristics**
- **This is the main communication media which transmits the I/O and additional data.**

■ **Function**
- **Communication cycle: approx. 13 ms (Max)**
- **Packet information: I/O data + User information + Monitoring information**
- **Data information**

	Input (16 points)/ Output (16points)	**Input (16 points)/ Output (16points)**	**User information**

- **Monitoring information: Voltage, communication status**
- **PLC output strength can be adjusted automatically**

Wireless

■ **Characteristics**
- **It operates at the maintenance point only and communicates with iMAN+.**

■ **Function**
- **[pCOM ↔ iMAN+] Link**
  - ✓ **pCOM ID/CH transmission**
- **Monitoring data**
  - ✓ **I/O information**
  - ✓ **Communication status information**
- **Maintenance**
  - ✓ **Log collection**
  - ✓ **Parameter change**
  - ✓ **FW download**

※ **This product uses 2.4GHz wireless Wi-Fi band, and it may have interference when it is used with the same frequency band width wireless devices. Therefore, in order to use this product without interference, please choose the frequency band width that does not have interference with the other wireless devices.**

[pCOM ↔ iMAN+] Link method	

[Method 1]

- **Attach wireless ID of pCOM on Hand part when manufacturing VHL.**
- **Operator can enter corresponding ID on iMAN+ manually and use during maintenance work [method 2]**
- **Output the [Trigger signal] to pCOM from VHL when maintenance is required.**
  - ※ **[Trigger signal] means the output signal to be transferred from VHL to pCOM.**

> ※ **pCOM performs the Link operation automatically with iMAN+ when entering the Trigger signal and acquires the wireless ID.**

User Serial

■ Characteristics

- **Communication speed (9600/19200/38400/57600/115200bps) and parity (none, even, odd) can be set**

※ **Default**

Communication speed	Data Bit	Parity	Stop Bit
115200	8	none	1

- **Data transmission quantity (power line transmission) : approx. 10KB/S**

※ **5 Bytes can be transferred per each of data communication cycle (3ms)**

- **User serial buffer size can be set: 100 ~ 2000 Byte**

※ **Default: 500 Byte**

■ Function

- **pCOM transfers the User serial data through PLC.**
- **Input data transfers up to 17 Byte at each of the pCOM data transmission point.**
- **Data received through PLC will be transferred to User Serial immediately.**

■ Cautions

- **User data can be transferred when the communication between pCOMs is established (GO On).**
- **User data can be delayed when pCOM communication is delayed.**
- **Data loss can be occurred when "User serial buffer size" is exceeded if the input speed of User Data is faster than the PLC data transmission speed continuously.**
- **pCOM does not guarantee the loss of User Serial data.**
- **User Serial transmission can be accomplished only when it responds after at least 2 ms passed once the User Serial data is received when pCOM User Serial 485 communication is used.**

12. Main Motion Functions

Specification

■ **AXIS ASSIGNMENT**

+X   +Z

+Y
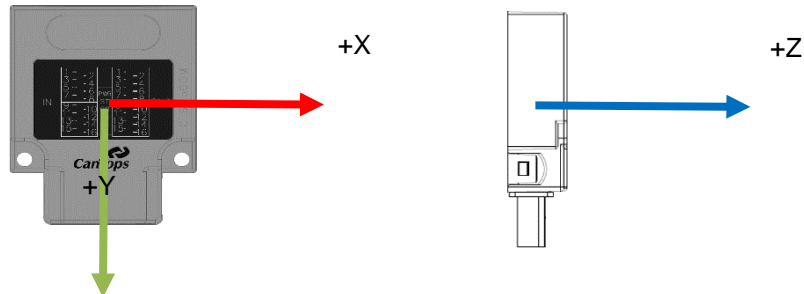
※ **When installed vertical to z axis on pCOM surface, vertical axis to the surface is z axis depending on the installation direction.**

■ **Motion output**

Classification		Value	Unit	Remarks
Accuracy at pause state (X / Y Axis)		< 0.2	Degree	Except Z axis
Accuracy during in motion (X / Y Axis)		< 3	Degree	Except Z axis
Angle Resolution		0.01	Degree	
Output Range	X Axis	-90 ~ +90	Degree	Default : 0˚
	Y Axis	-90 ~ +90	Degree	Default : 0˚
	Z Axis	0 ~ 360	Degree	Default : 180˚

※ **Z axis has a drift and does not guarantee the accuracy.**

Slope

■ **Characteristics**

　・ **Slope will be decided by verifying the pCOM posture information.**

Slope due to the belt error will be detected
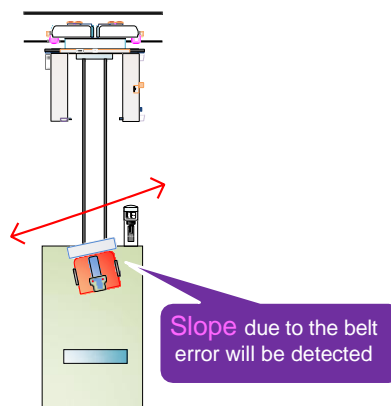
■ **Characteristics**
   · **Data information**

Classification	Master	Slave
Standard	X, Y, Z angle	X, Y, Z angle

   · **System will treat it as an error when slope is detected**
      ✓ **ES signal output**
      ✓ **Motion information record**

※ **System detects when the motion of the other side is in horizontal and stop state.**

Wobbling

■ **Characteristics**
   · **System judges the wobbling by verifying the posture information of pCOM.**

Wobbling due to the belt looseness error will be detected

■ **Function**
   · **Data information**

Classification	Master	Slave
Standard	X, Y, Z angle	X, Y, Z

   · **System will treat it as an error when wobbling is detected**
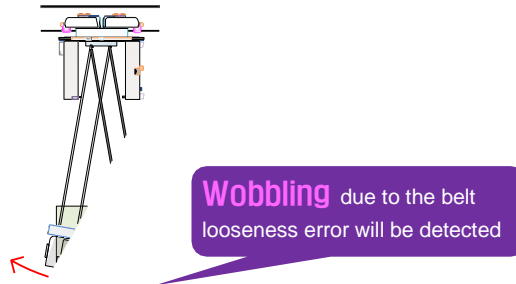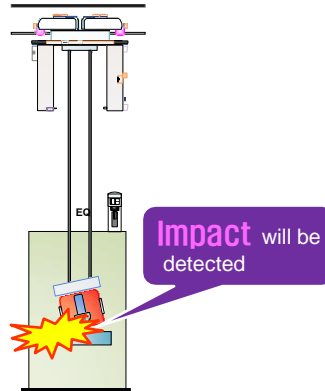   ✓ **ES signal output**
      ✓ **Motion information record**

※ **System detects when the motion of the other side is in horizontal and stop state.**

Impact

■ **Characteristics**
- **Impact higher than certain level will be detected by acquiring the motion information of pCOM.**

■ **Function**
- **Data information**

Classification	Master	Slave
Standard	3 axes integrated acceleration of gravity [G]	3 axes integrated acceleration of gravity [G]

- **System will treat it as an error when impact is detected**
  - ✓ **ES signal output**
  - ✓ **Motion information record**

Vibration

■ **Characteristics**
- **Vibration information will be transferred by acquiring the pCOM motion information.**

■ **Function**
- **Data information**

| Classification	Master	Slave
Standard	Frequency : 10 ~ 100Hz Acceleration : m/s^2[Peak]	Frequency : 10 ~ 100Hz Acceleration : m/s^2[Peak]

※ **Vibration information is a simple measurement which accuracy is not guaranteed. Precise measuring instrument needs to be used when it is found not accurate. It cannot be measured during in motion state.**

Motion information verifying method

■ Use of iMAN+
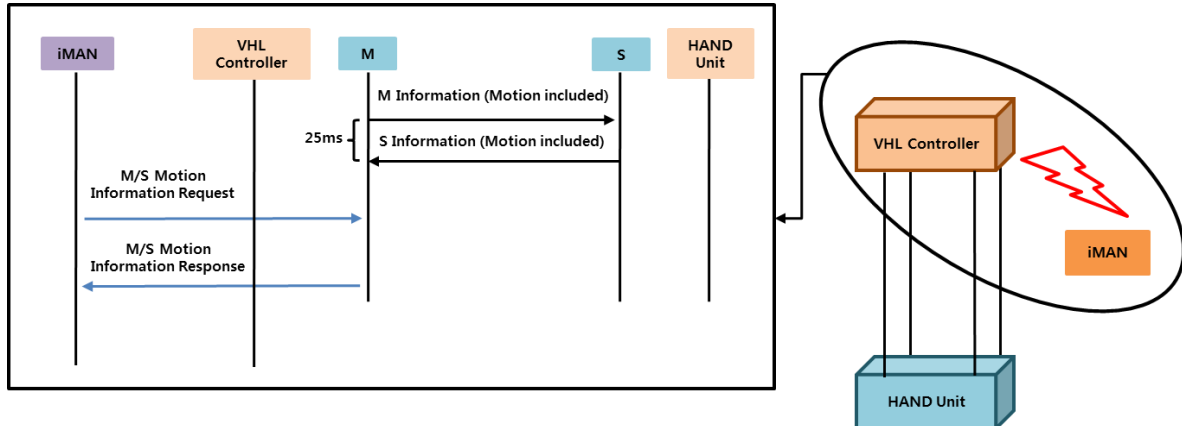
■ Use of Maintenance Serial
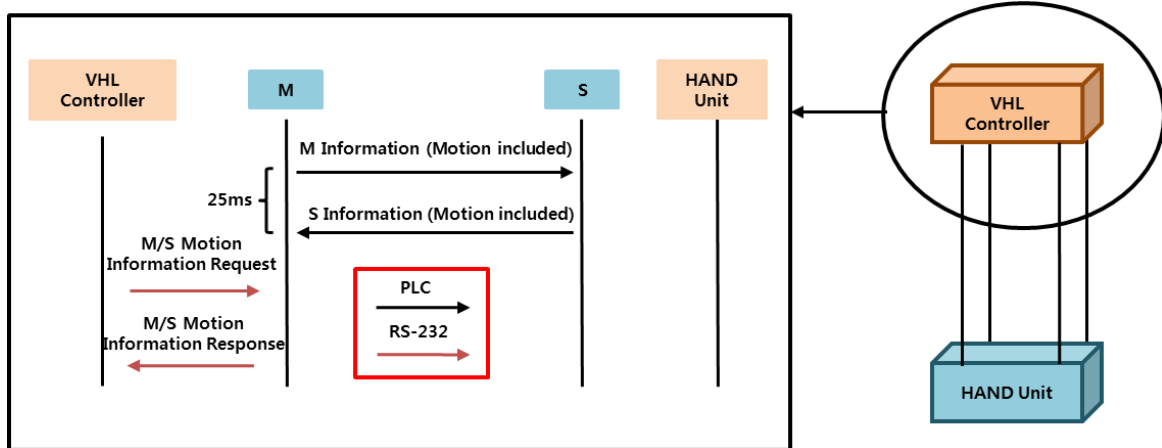
Motion command list

■ Characteristics
- **Parameter can be set using Maintenance Serial and iMAN+.**
- **Serial Commands on Chapter 13 will be used for the standard command & response method.**

Command	Function	Set value	Length (BYTE)	Remarks
MINFO	Motion information verification	ASCII Code	2	
MTINFO	TARGET motion information verification	ASCII Code	2	
ML	Motion log download	-	-	

※ Please refer to "pCOM serial communication specification" for the commands.
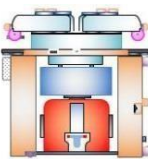
※ Commands can be added or modified during development.

Motion Precautions

■ **Cautions**
- **pCOM must be in no motion state when setting up the horizontal state**
- **It needs to be reset if the horizontality is set and horizontality error is too big.**
- **There should be no change of motion for 3 seconds for the sake of motion stabilization during the initial operation stage.**
- **You can acquire the motion information of the target when the communication between pCOMs is established (GO On).**
- **Motion information of the target can be delayed when pCOM communication is delayed.**

13. Serial Command

Communication specification				
Interface	**Communication speed**	**Data Bit**	**Parity**	**Stop Bit**
RS-232C	57,600	8bit	None	None

Standard command / response

Item		Size	무자 **Contents** HEX		
			Character	**HEX**	
Headx	x=0	1	<	3Ch	
	x=1	1	[	5Bh	
Command		Changeable by each command	Set the character string by each of command		
Separator		1	=	3Dh	
Preset value		Changeable by each command	Set the preset value		
SUM Note 1)		2	Set the hexadecimal number of the lower 1 Byte of the command, separator and preset value by 1 Byte as ASCII Code 2 character.		
Tailx	x=0	1	>	3Eh	
	x=1		]	5Dh	

Note 1) Example of SUM mark

Classification	Command		separator		Preset value					
Character	M		=		1		SUM		**ASCII Code**	
HEX	4Dh	+	3Dh	+	31h	=	B	B	**42h**	**42h**

※ **All contents use ASCII Code, and English character are case-sensitive. SUM uses upper case only**

Command list				
Command	**Function**	**Preset value**	**Length (BYTE)**	**Remarks**
O	OHT	ASCII Code	6	Set once
II	16 Bit input setup / input response	ASCII Code	4	pCOM based
IO	16 Bit input setup / input response	ASCII Code	4	pCOM based
UB	User Serial Baudrate	ASCII Code	1	
UP	User Serial Parity	ASCII Code	1	
UL	User Serial Buffer Length	ASCII Code	4	
US	Remained User Serial storage space	ASCII Code	4	
CUD	User Serial Buffer Clear	-	-	
L	Log download	-	-	
T	Current time set	ASCII Code	23	
V	Version verification	ASCII Code	4	
R	Number of communications retry	ASCII Code	3	
C	RF Channel setup	ASCII Code	3	
A	RF ID Setup	ASCII Code	5	

※ Please refer to the "pCOM serial communication specification" for the commands.

※ Commands can be added or modified during development

*) Specification of this product is subject to be changed without notice to improve the performance of the product.

Warning
This device is a Class A product. This device may cause radio interference in residential area, in which case users may need to take suitable counter actions.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.