Date created: 2016/11/24

# How to monitor sensors on ATTEM Rev.2

| Revision history of this document | | |
|---|---|---|
| **Revision number** | **Date** | **Changes** |
| 1 (original) | 2016/06/01 | - |
| 2 | 2016/11/24 | Information about features of supported DPM is added. |

| Revision history of ATTEM | | |
|---|---|---|
| **Version** | **Date of release** | **Change** |
| V1.0.1 | 2015 10/1 | - |
| V1.0.2 | 2015/10/15 | - The password of administrator has been changeable on ATTEM Configurator.<br>- The new tool for deleting logged data manually has been included in ATTEM.<br>- It has been able to stop (or reduce) the data sampling to reduce communication traffic to TEM. |
| V1.1.0 | 2015/10/30 | - Several default value of ATTEM Configurator has been changed.<br>- It has been able to output logged data within the specified period.<br>- It has been able to output logged data also as a CSV file.<br>- Width of lines and diameter of points in the graph has been customizable on ATTEM LogViewer. |
| V1.2.0 | 2015/11/16 | - Not only in “Detail”-tab but also in “Summary”-tab, selected date and time has become to be shown as a red line on ATTEM LogViewer.<br>- It has been able to define your own Parameter Group in “Summary”-tab of ATTEM LogViewer.<br>- It has been able to control the number of graphs which are ordered in each line in “Summary”-tab on ATTEM LogViewer. |
| V1.3.0 | 2015/11/27 | - The Y-Axis of each graphs on ATTEM LogViewer has become expandable. |
| V1.4.0 | 2015/12/21 | - It has been able to edit setting-items of multiple TEM-parameters in parallel on ATTEM Configurator. |
| V1.5.1 | 2016/5/13 | - Layout of “Common”-tab has changed on ATTEM Configurator.<br>- It has become able to monitor and log the data of optional sensors.<br>- It has become able to count the number of times of events happened on TEM.<br>- It has been able to create weekly reports or daily reports as pdf files automatically. |

# Table of contents

# 1. Summary

ATTEM can monitor and log the data of optional sensor via digital panel meters (DPM) from V1.5.1.
(For example, water flow rate, water temperature, room temperature, and so on)
Each sensor need a DPM, and multiple DPM can connect ATTEM via signal converter.
At this time, ATTEM can connect up to 10 sensors (DPMs).

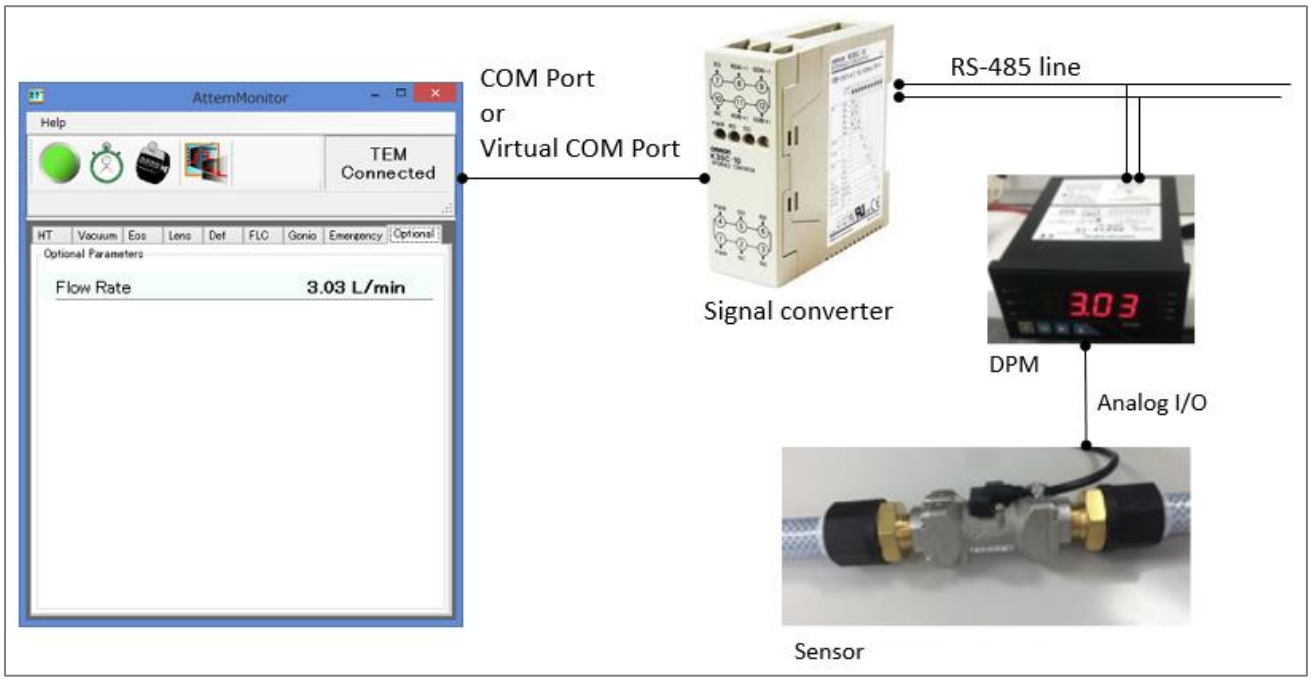


Figure 1-1: Overview

# 2. Terminology

## 2.1. About DPM and signal converter.

Connecting optional sensor to ATTEM, DPM and signal converter is necessary.

DPM is a device which digitalize and displays analog output of optional sensor.
Each value is indicated on DPMs, and it can be obtained by ATTEM via serial communication.

This version support several models of A5000-series (Watanabe Electric Industry) or K3GN-series (OMRON Corporation).

Each DPM need have unique Unit Number to connect signal converter.

Usually, only one signal converter is needed even connecting multiple DPMs.
At this time only K3SC-10 (OMRON Corporation) was tested communication to ATTEM.

# 3. Required instruments

## 3.1. Sensors and DPMs

- The same number of DMPs as sensors are needed.
- DPMs must be chosen from models contained in Table 3-1.
- Each DPM must be equipped with RS-485 output.
- Matching between DPM and sensor is important.

**Table 3-1 Supported models of DPM[1]**

| Series | Supported models in the series | | | |
|---|---|---|---|---|
| K3GN | K3GN-NDC-FLK DC24V | | | |
| | K3GN-NDT1-FLK DC24V | | | |
| | K3GN-PDC-FLK DC24V | | | |
| | K3GN-PDT2-FLK DC24V | | | |
| | K3GN-NLC-FLK DC24V | | | |
| | K3GN-NLT1-FLK DC24V | | | |
| A5000 | A5114-01 | A5124-01 | A5214-01 | A5224-01 |
| | A5114-02 | A5124-02 | A5214-02 | A5224-02 |
| | A5114-03 | A5124-03 | A5214-03 | A5224-03 |
| | A5114-04 | A5124-04 | A5214-04 | A5224-04 |
| | A5114-05 | A5124-05 | A5214-05 | A5224-05 |
| | A5114-06 | A5124-06 | A5214-06 | A5224-06 |
| | A5114-07 | A5124-07 | A5214-07 | A5224-07 |
| | A5114-08 | A5124-08 | A5214-08 | A5224-08 |
| | A5114-09 | A5124-09 | A5214-09 | A5224-09 |
| | A5114-10 | A5124-10 | A5214-10 | A5224-10 |
| | A5114-11 | A5124-11 | A5214-11 | A5224-11 |
| | A5114-12 | A5124-12 | A5214-12 | A5224-12 |
| | A5114-13 | A5124-13 | A5214-13 | A5224-13 |
| | A5114-14 | A5124-14 | A5214-14 | A5224-14 |
| | A5114-15 | A5124-15 | A5214-15 | A5224-15 |
| | A5114-16 | A5124-16 | A5214-16 | A5224-16 |
| | A5114-17 | A5124-17 | A5214-17 | A5224-17 |
| | A5114-18 | A5124-18 | A5214-18 | A5224-18 |

[1] Features of these DPM are shown in 5.3(p16) of this document. To know more detailed and accurate information, check web-pages of the manufacturer.

## 3.2. Signal Converter

- Signal converter must be able to convert RS-485 interface into COM Port (or Virtual COM Port) interface.
- Usually, a signal converter can connect multiple DPMs. However different kinds (e.g. A5000-series and K3GN-series) of DPMs cannot connect to same signal converter.

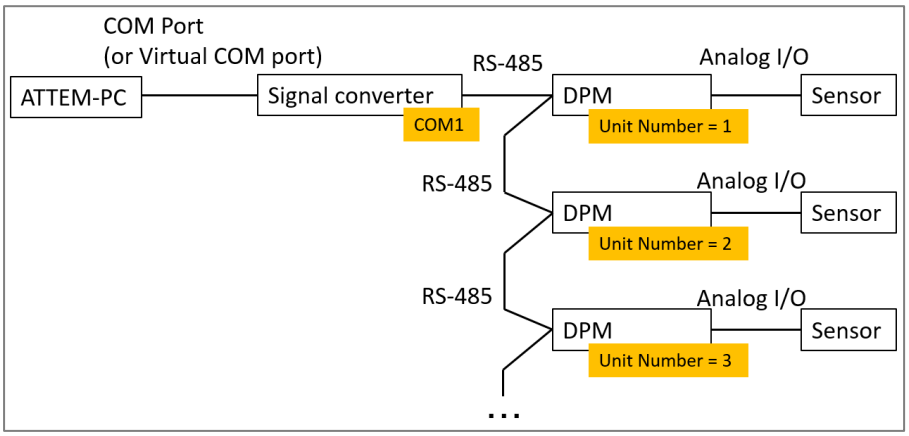


**Figure 3-1: An example of communication environment when using single kind of DPMs**

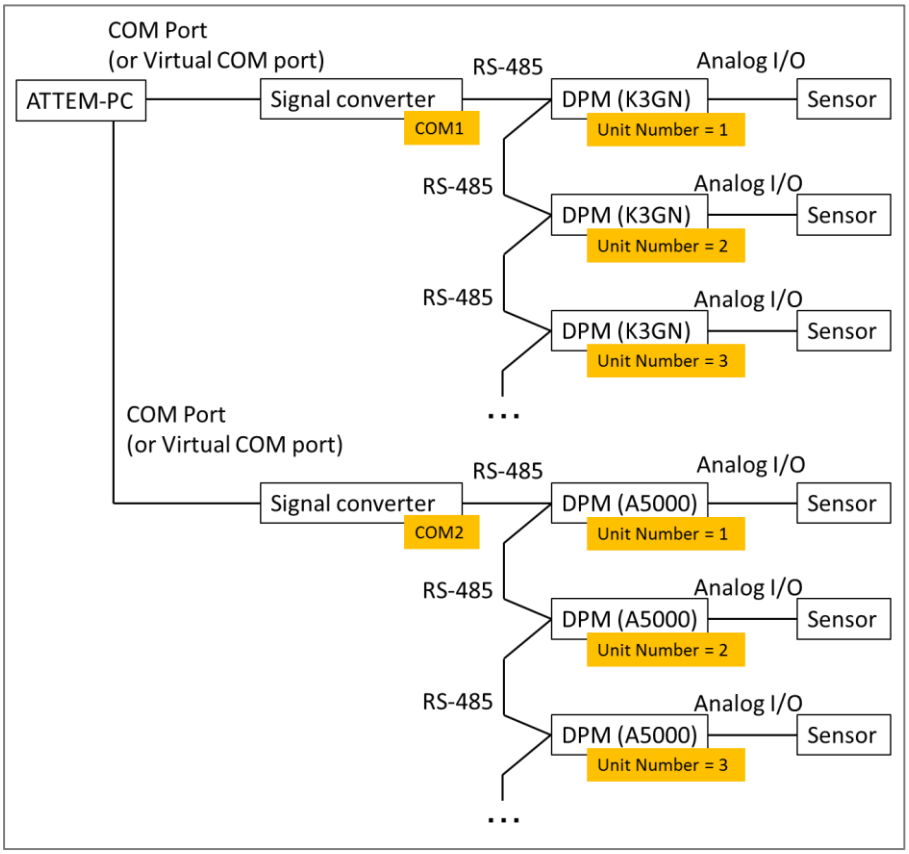


**Figure 3-2: An example of communication environment when using both K3GN and A5000**

# 4. Installation

## 4.1. Establish a communication environment

(1) Connect each DPM by RS-485 line.

(2) Connect the line to signal converter.

(3) Set parameters to communicate (baud rate, data bits, stop bits, and parity).

(4) Set unique Unit Number to each DPM.

(5) Install device driver of signal converter and connect it to the PC.

## 4.2. Configure ATTEM

For each DPM, do both 4.2.1 and 4.2.2 procedure using ATTEM Configurator.

### 4.2.1. Assign a DPM to a defined ATTEM-parameter

(1) Select “Optional DataSource”-tab from “Common”-tab on ATTEM Configurator.

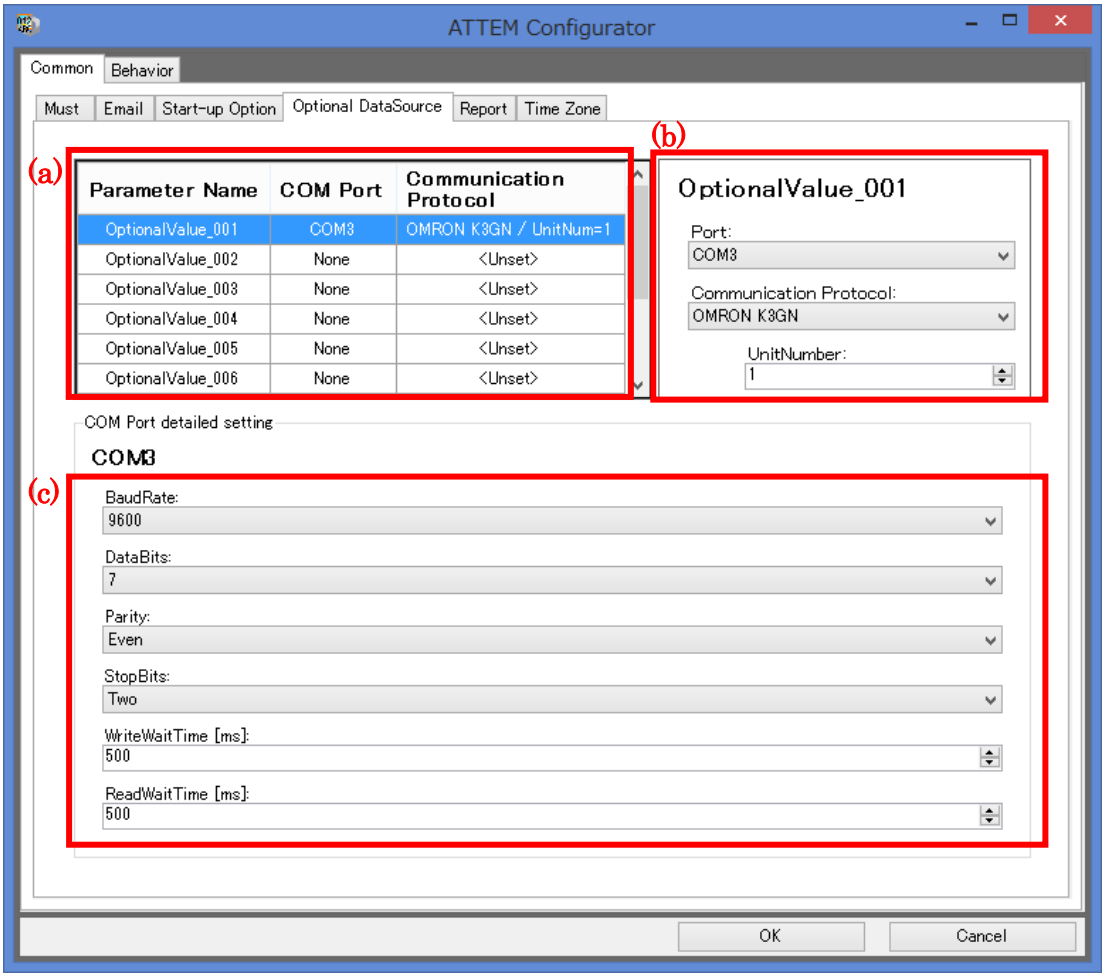


Figure 4-1: "Optional DataSource"-tab

(2) From top-left table ((a) in Figure 4-1) in the screen, choose a parameter to assign the DPM to.

(3) Edit communications settings of the parameter ((b) in Figure 4-1) in accordance with following table.

**Table 4-1: Items for communications settings**

| | |
|---|---|
| Port | Select COM Port Number of signal converter to which the DPM is connected. |
| Communication Protocol | Select the series-name of the DPM. |
| Unit Number | Select the Unit Number of the DPM. |

(4) Set parameters to communicate (baud rate, data bits, stop bits, and parity). ((c) in Figure 4-1)

## 4.2.2. Configure the parameter for monitoring and logging

### 4.2.2.1. Display a settings screen of the parameter

(1) Select “Optional parameter”-tab from “Behavior”-tab on ATTEM Configurator.

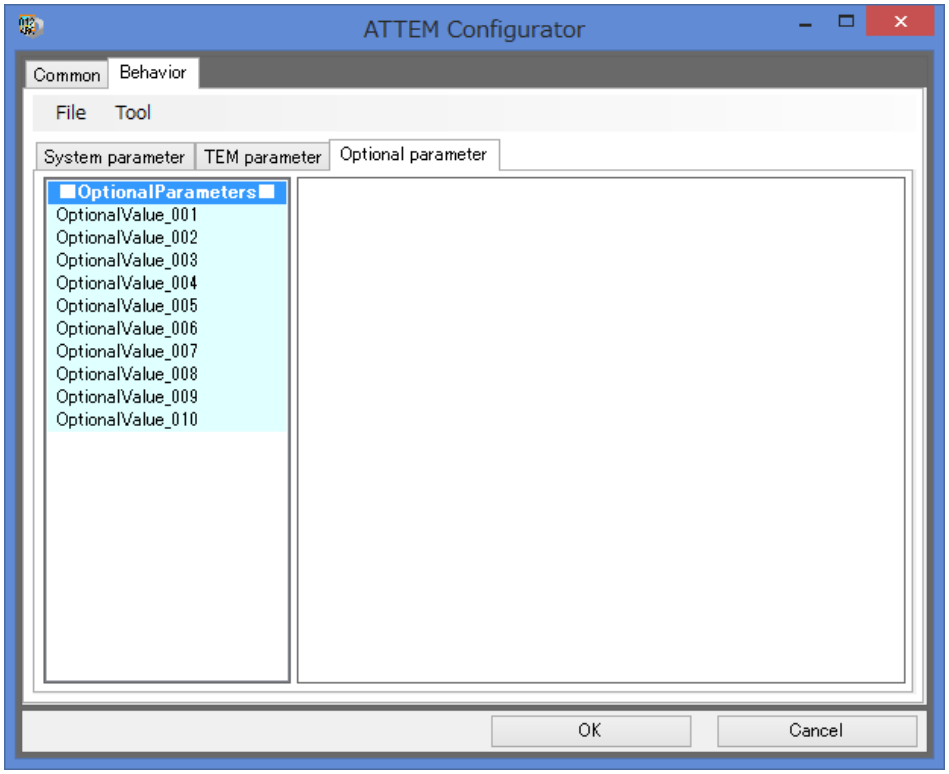


**Figure 4-2: "Optional parameter"-tab**

(2) From left list in the screen, select the parameter. Then, a settings screen will be appeared.

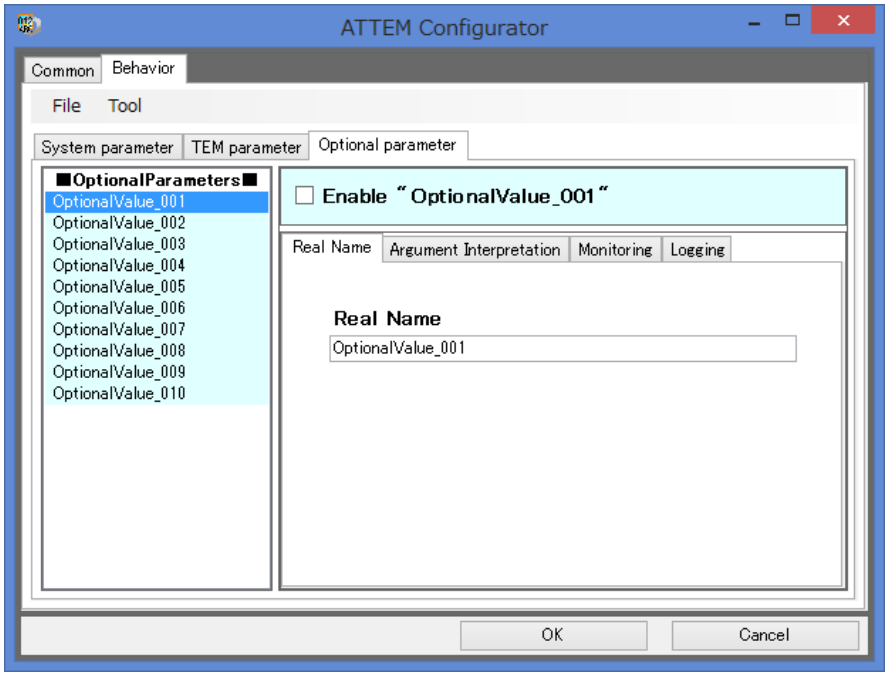


**Figure 4-3: Settings screen of a parameter**

### 4.2.2.2. Activate monitoring and logging

(1) Check Enable-box which is located at the top of the settings screen.

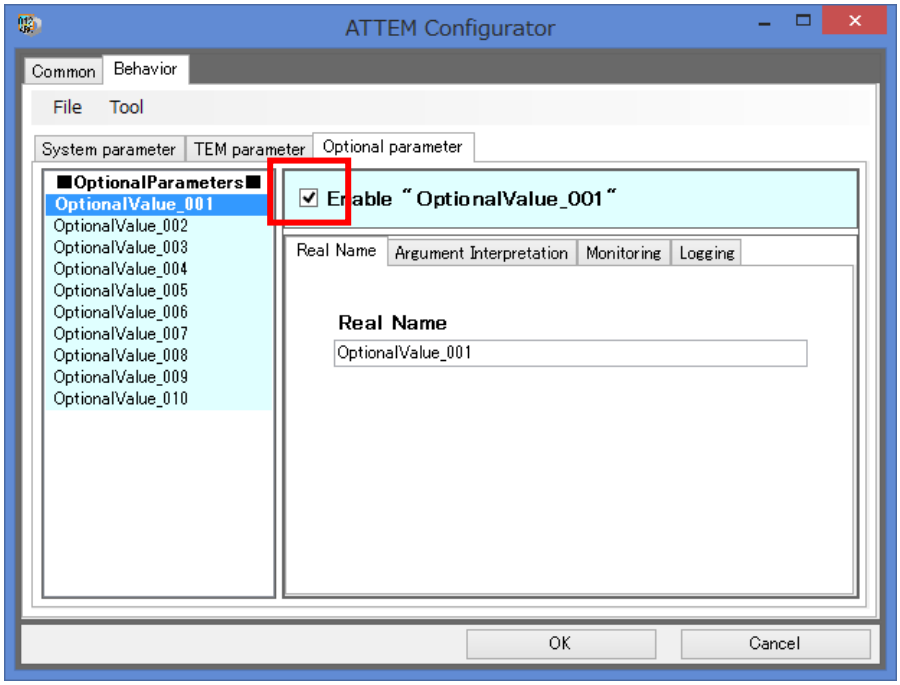


**Figure 4-4: Checked Enable-box**

### 4.2.2.3. Configure display name of the parameter

(1) Change the contents of the "Real Name" in the "Real Name"-tab of the setting-screen.

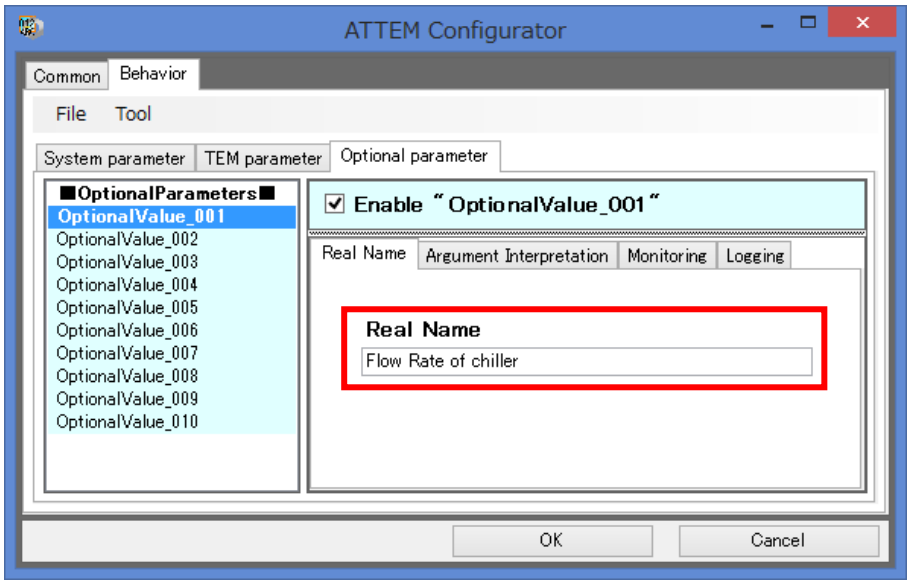


**Figure 4-5: An example of configured display name**

### 4.2.2.4. Configure unit

(1) Select “Argument Interpretation”-tab from the settings screen.

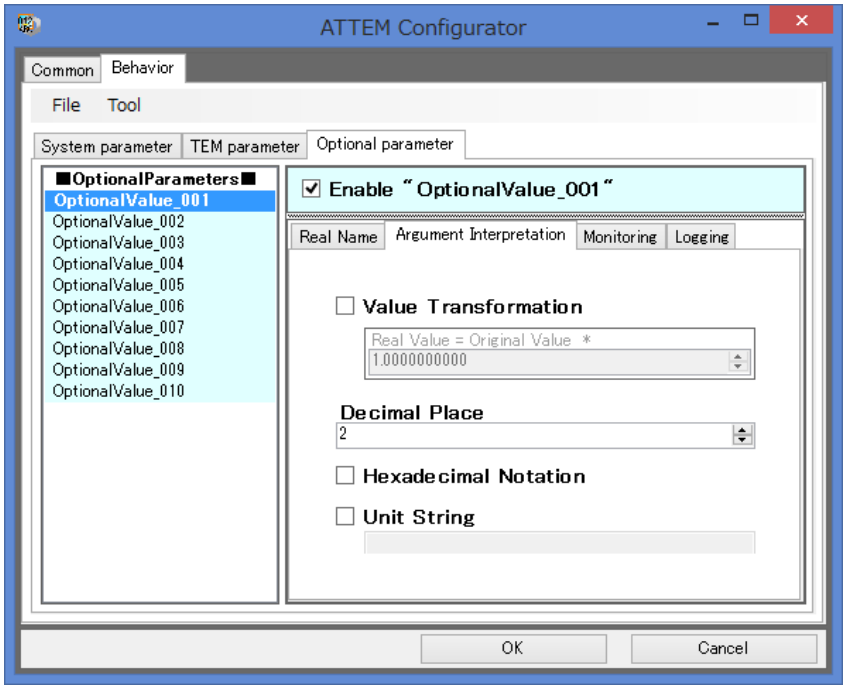


**Figure 4-6: “Argument Interpretation”-tab**

(2) Check “Unit String”-box.

(3) Enter the unit into “Unit String”.

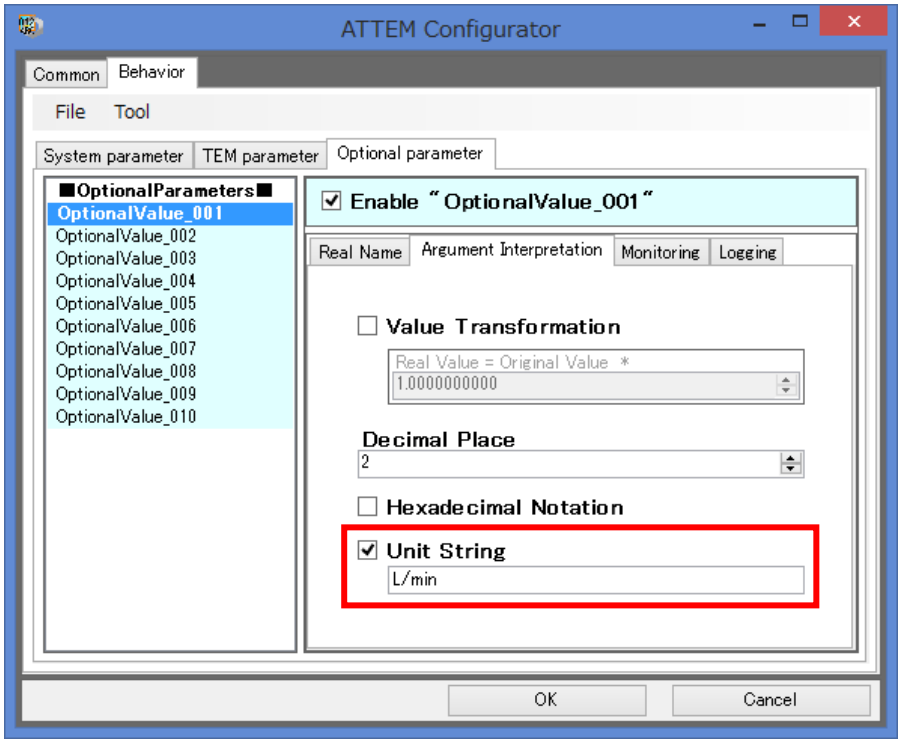


**Figure 4-7: An example of configured unit**

# 5. Supplements

## 5.1. Tested signal converter

As a signal converter, K3SC-10 (OMRON Corporation) was tested with ATTEM.

**Figure 5-1: Image of K3SC-10**

K3SC-10 is equipped with two kind of interfaces (RS-232C and USB) for connection to PC. In these two interfaces, only USB was tested.

K3SC-10 behaves as a virtual COM Port when connected to PC via an USB cable.
In this case, the COM Port Number can be checked by searching “Ports (COM & LPT)” on Device Manager of the PC.

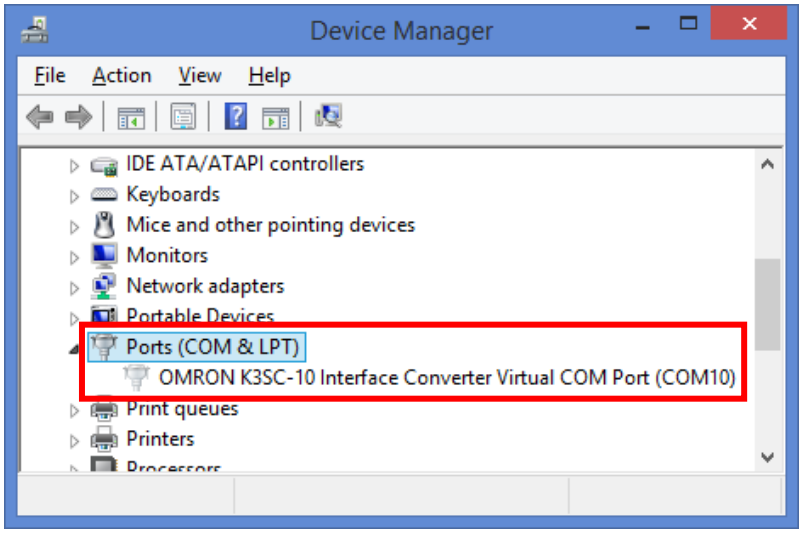


**Figure 5-2: "Port (COM & LPT)" in Device Manager**

## 5.2. Example of combinations of DPM and sensor

### 5.2.1. Example 1

| | | |
|---|---|---|
| Sensor | **Model** | **FD-Q10C (Water flow sensor)** |
| | Maker | Keyence Corporation |
| | Image |  **Figure 5-3: Image of FD-Q10C** |
| | NPS | ・1/4<br>・3/8 |
| | Maximum rated flow | ・20L/min (when adjusted to 1/4 NPS)<br>・30L/min (when adjusted to 3/8 NPS) |
| | Output type | 4-20mA DC current |
| | Description | This flow rate sensor works being attached to outside of the pipe. |
| DPM | **Model** | **K3GN-NDT1-FLK DC24V** |
| | Maker | OMRON Corporation |
| | Image |  **Figure 5-4: Image of K3GN-NDT1-FLK DC24V** |
| | Input type | DC voltage, DC current, NPN open corrector |
| | Range | ・4~20 mA<br>・1~5 V, ±5 V, ±10 V<br>・~30 Hz, ~5 kHz |
| | Output type | RS-485 |
| | Description | Using the range of 4-20 mA, analog output of FD-Q10C can be converted to digitalized flow rate value by this model. |

Match

### 5.2.2. Example 2

| | | |
|---|---|---|
| Sensor | **Model** | **TW-093 (Water flow sensor)** |
| | Maker | TOKYO KEISO CO. LTD. |
| | Image |  <br>**Figure 5-5: Image of TW-093** |
| | Maximum rated flow | 10 L/min |
| | Output type | NPN open corrector |
| | Frequency | ~55 Hz |
| | Description | Turbine flow rate sensor. |
| DPM | **Model** | **A5214-15** |
| | Maker | Watanabe Electric Industry Co. Ltd. |
| | Image |  <br>Match<br>**Figure 5-6: Image of A5214-15** |
| | Input type | NPN open corrector |
| | Range | ・0.1Hz~200Hz<br>・1Hz~2kHz<br>・10Hz~20kHz<br>・100Hz~200kHz |
| | Output type | RS-485 |
| | Description | Using the range of 0.1-200Hz, analog output of TW-093 can be converted to digitalized flow rate value by this model. |

# 5.3. Features of supported DPM

## 5.3.1. Features of K3GN Series

| Model Name | Output | Input |
|---|---|---|
| ~~K3GN-NDC DC24V~~ | ~~Relay contact~~ | ● DC current (4~20mA)<br>● DC voltage (1~5V, ±5V, ±10V)<br>● No-voltage contact (30 Hz max)<br>● NPN open collector (5 kHz max) |
| **K3GN-NDC-FLK DC24V** | Relay contact + **RS-485** | |
| ~~K3GN-NDC-L1 DC24V~~ | ~~Relay contact + DC current~~ | |
| ~~K3GN-NDC-L2 DC24V~~ | ~~Relay contact + DC voltage~~ | |
| ~~K3GN-NDT1 DC24V~~ | ~~NPN open collector~~ | |
| **K3GN-NDT1-FLK DC24V** | NPN open collector + **RS-485** | |
| ~~K3GN-NDT1-L1 DC24V~~ | ~~NPN open collector + DC current~~ | |
| ~~K3GN-NDT1-L2 DC24V~~ | ~~NPN open collector + DC voltage~~ | |
| ~~K3GN-PDC DC24V~~ | ~~Relay contact~~ | ● DC current (4~20mA)<br>● DC voltage (1~5V, ±5V, ±10V)<br>● No-voltage contact (30 Hz max)<br>● PNP open collector (5 kHz max) |
| **K3GN-PDC-FLK DC24V** | Relay contact + **RS-485** | |
| ~~K3GN-PDT2 DC24V~~ | ~~PNP open collector~~ | |
| **K3GN-PDT2-FLK DC24V** | PNP open collector + **RS-485** | |
| ~~K3GN-NLC DC24V~~ | ~~Relay contact~~ | ● Minute DC voltage (±199.9 mV, ±19.99 mV)<br>● No-voltage contact (30 Hz max)<br>● NPN open collector (5 kHz max) |
| **K3GN-NLC-FLK DC24V** | Relay contact + **RS-485** | |
| ~~K3GN-NLT1 DC24V~~ | ~~NPN open collector~~ | |
| **K3GN-NLT1-FLK DC24V** | NPN open collector + **RS-485** | |

## 5.3.2. Features of A5000 Series

Model Name: A5 □ □ □ — □□

| Series | Power | Display | Output | Input | description |
|---|---|---|---|---|---|
| A5 | | | | | A5000 Series |
| | 1 | | | | AC100~240V ±10% |
| | 2 | | | | DC9~60V |
| | | 1 | | | Single |
| | | 2 | | | Multiple |
| | | | ~~0~~ | | ~~None~~ |
| | | | ~~1~~ | | ~~HI & LO setpoint~~ |
| | | | ~~2~~ | | ~~Analog output~~ |
| | | | ~~3~~ | | ~~RS-232C~~ |
| | | | 4 | | RS-485 ← Must be equipped with RS-485 output to work together with ATTEM. |
| | | | ~~5~~ | | ~~HI & LO setpoint + analog output~~ |
| | | | ~~6~~ | | ~~HI & LO setpoint + analog output + RS-232C~~ |
| | | | ~~7~~ | | ~~HI & LO setpoint + analog output + RS-485~~ |
| | | | | 01 | DC voltage (±99.99 mV) |
| | | | | 02 | DC voltage (±999.9 mV, ±9.999 V, ±99.99 V, ±600.0 V) |
| | | | | 03 | DC current (±9.999 mA, ±99.99 mA, ±999.9 mA) |
| | | | | 04 | AC voltage AVG (0~99.99 mV, 0~999.9 mV, 0~9.999 V) |
| | | | | 05 | AC voltage AVG (0~99.99 V, 0~600.0 V) |
| | | | | 06 | AC voltage RMS (0~99.99 mV, 0~999.9 mV, 0~9.999 V) |
| | | | | 07 | AC voltage RMS (0~99.99 V, 0~600.0 V) |
| | | | | 08 | AC current AVG (0~9.999 mA, 0~99.99 mA, 0~999.9 mA) |
| | | | | 09 | AC current AVG (0~5 A) |
| | | | | 10 | AC current RMS (0~9.999 mA, 0~99.99 mA, 0~999.9 mA) |

| | | | | | |
|---|---|---|---|---|---|
| | | | | 11 | AC current RMS (0~5A) |
| | | | | 12 | Resistance<br>(0~99.99 Ω , 0~999.9 Ω , 0~9.999 k Ω , 0~99.99 k Ω) |
| | | | | 13 | Thermocouple (K, J, T, S, R, B) |
| | | | | 14 | RTD (Pt100) |
| | | | | 15 | Frequency (Open collector, Logic, Magnet)<br>(0.1~200Hz, 1Hz~2kHz, 10Hz~20kHz, 100Hz~200kHz) |
| | | | | 16 | Frequency (Voltage pulse)<br>(0.1~200Hz, 1Hz~2kHz, 10Hz~20kHz, 100Hz~200kHz) |
| | | | | 17 | Strain gauge |
| | | | | 18 | Process<br>(DC 1~5V, DC 4~20mA) |