Technical Information

SMARTDAC+ GM and UPM100
Power Monitoring Package
Wiring and Setup Guide

TI 77C01H01-01EN

YOKOGAWA

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How to use this manual

This manual provides a technical description, installation precautions, and application examples for the Power Monitoring Package, consisting of the SMARTDAC+ Data Acquisition System GM and the UPM100 Power Monitor.

Notice

- The contents of this manual are subject to change without notice as a result of continuing improvements to the instrument's performance and functions.
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1. Overview

The Power Monitoring Package is a power monitoring system designed for smallscale applications. It consists of the SMARTDAC+ GM, the UPM100 Power Monitor, and a CTW fixed wire type current transformer. You can also select instruments and communication functions to meet your needs including RS-485 or Ethernet (with a VJET RS-485 to Ethernet converter).

2. Device configuration and related documents

Devices in the system

Device	Model (Ex.)	Specifications	Notes
Data logger	GM10-□□□/MT/MC/WH	Supports MATH & reports/ communication channels/ integral bar graph	(*1)
Data logger power supply	GM90PS-1N1W0/WH		
Data logger base	GM90MB-01N0		
Power monitor	UPM100-□□□□□-20		
Current transformer	CTW□□		

*1: Please be sure to specify the option codes /MT, /MC and /WH.
Please be sure to specify / C3 for RS45 communication.
Suffix code /WH cannot be combined with suffix code /AS.

Related documents

General specifications

Title	Number
Data Acquisition System GM	GS 04L55B01-01EN
Model UPM100 Universal Power Monitor	GS 77C01H01-01EN
Models CTW15 and CTW35 Clamp-on Current Transformers	GS 77C01W03-01E
Models CTW10, CTW20, CTW100, and CTW130 Clamp-on Current Transformers	GS 77C01W02-01E

User's manual

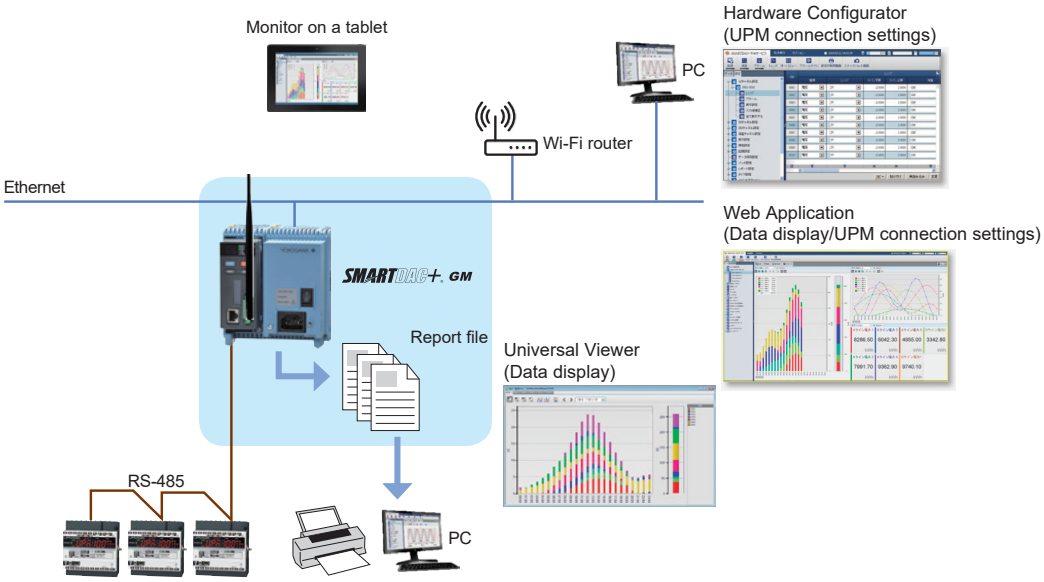
Title	Number
Data Acquisition System GM User's Manual	IM 04L55B01-01EN
Data Acquisition System GM First Step Guide	IM 04L55B01-02EN
Model GM10 Integration Bar Graph Function (/WH) User's Manual	IM 04L55B01-07EN
SMARTDAC+ STANDARD Hardware Configurator User's Manual	IM 04L61B01-02EN
SMARTDAC+ STANDARD IP Address Configurator	IM 04L61B01-03EN
SMARTDAC+ STANDARD Universal Viewer User's Manual	IM 04L61B01-01EN
UPM100 Universal Power Monitor User's Manual	IM 77C01H01-00EN
UPM100, UPM101 Universal Power Monitor Communications Functions User's Manual	IM 77C01H01-10EN
Models CTW15 and CTW35 Clamp-on Current Transformers	IM 77C01W03-01E
Models CTW10, CTW20, CTW100, and CTW130 Clamp-on Current Transformers	IM 77C01W02-01E

You can download new versions of electronic documents from the following website.

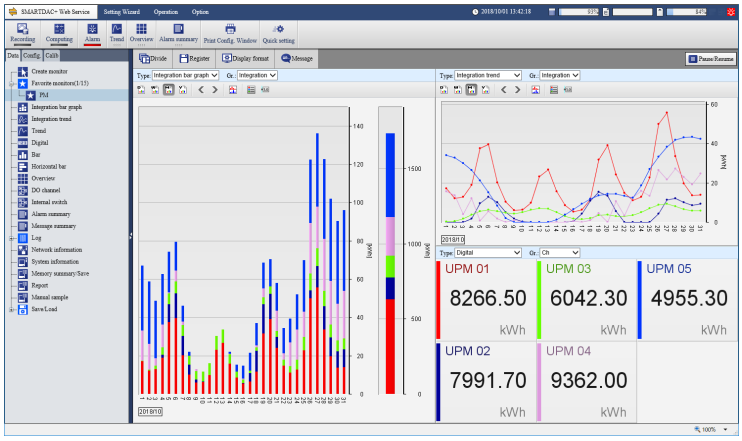
http://www.yokogawa.com/ns/powercert/im/

3. Package specifications

System architecture example



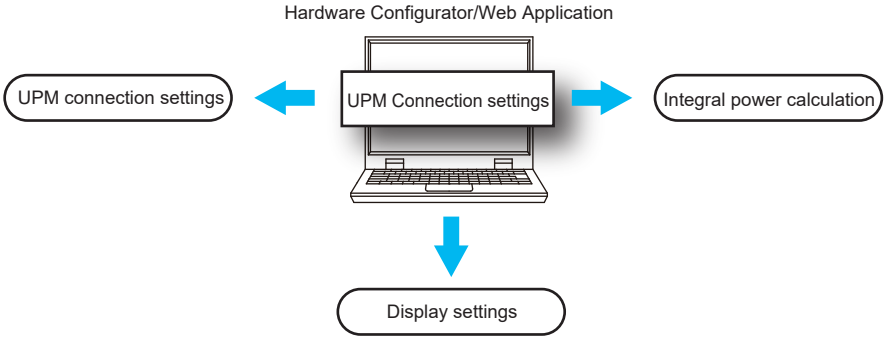
Max. connected power monitors (UPM100)	GM10-1: 20 GM10-2: 30
Communication specifications	Select from the following: RS-485 or Ethernet (RS-485/Ethernet converter; when using VJET)
Functions	You can acquire watt-hours from the power monitor (UPM100) and display digital values, intetration bar graphs, and integral trends on the web application. You can also create hourly reports. Also, to assign power monitor channels and enter formulas, you can automatically assign each required channel simply by registering your devices on the UPM100 connected hardware configurator or the web application's wizard.
Displays	Integration bar graph, integration trend, digital, list
Display language	English, Korean, Japanese



Web application display example

4. UPM connection settings

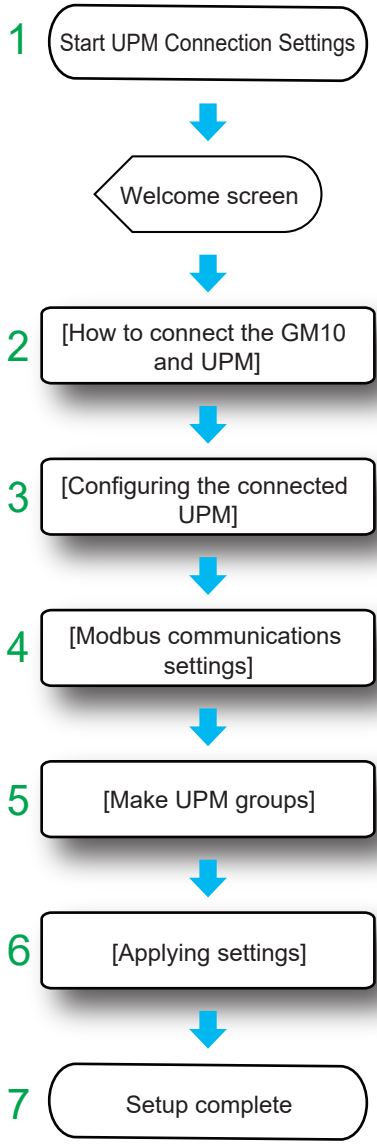
UPM Connection Settings is a settings wizard that implements all of the GM settings needed to connect the GM and UPM and display integration bar graphs. By using UPM Connection Settings, you can easily enter all of the settings needed for communication and display of integral graphs. You can use it with the hardware configurator (version 4.05.01 or later) and the web application (version 4.05.01 or later).



UPM connection settings file

With UPM Connection Setup, you can save your settings to a file (.wzu). Later, when expanding or changing your configuration, you can load the current UPM configuration (saved settings) on UPM Connection Setup and easily edit the settings.

UPM Connection Settings workflow



Start UPM Connection Settings.

Precautions are displayed before UPM Connection Settings starts.
From this screen you can load UPM connection settings files.*

Select a communication mode for connecting the GM and UPM.
For Ethernet, select a gateway device.

Configure the settings (device tags, models, parameters, connection destination numbers, etc.) of the connected UPM.

Configure communication settings: Modbus master (RS-485), Modbus client (Ethernet)

Configure UPM group names and groupings for displaying integral graphs.

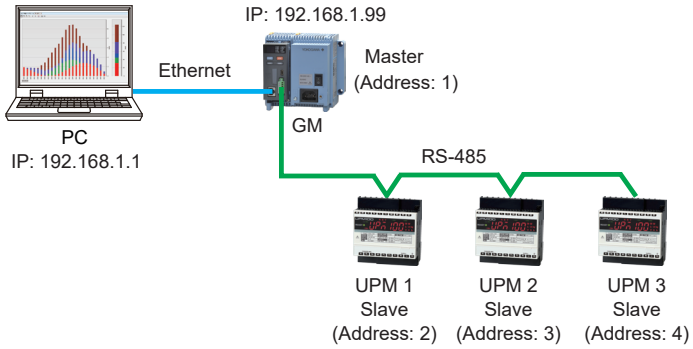
Apply settings on the GM.

Settings are complete.
Completed settings can be saved to a UPM Connection Settings file.*

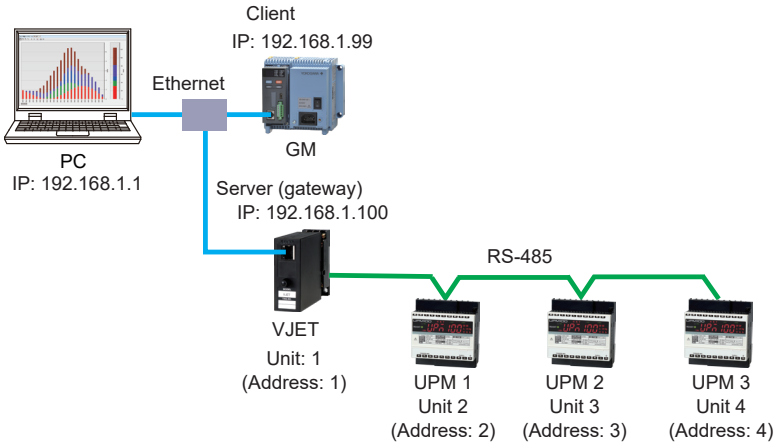
* A file containing the contents of the settings saved by UPM Connection Settings. To expand or change configuration, you can simply load and edit them on UPM Connection Settings.

Examples of connections for communication

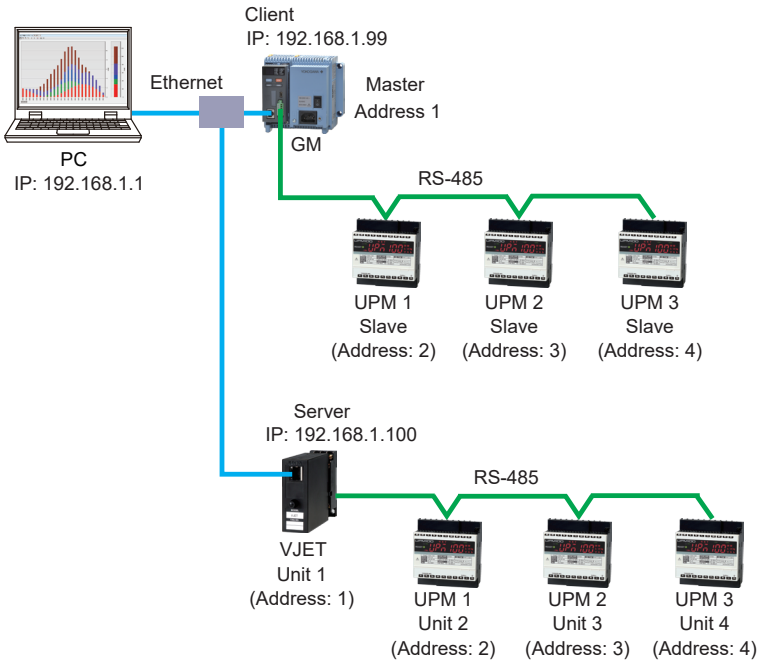
RS-485 connection



Ethernet connection



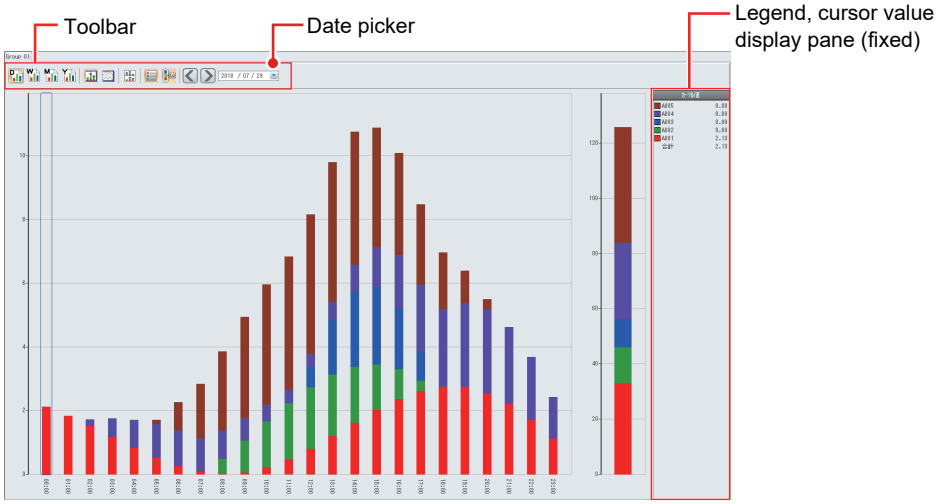
RS-485 and Ethernet connection



5. Universal Viewer

Screens

Integral graph display



Item	Description
Date setting	Specify the date of the integral graph to display.
Legend and cursor value display area	The legend and cursor value are docked on the right edge of the screen

Two graph comparison

You can compare two integral graphs of any dates.

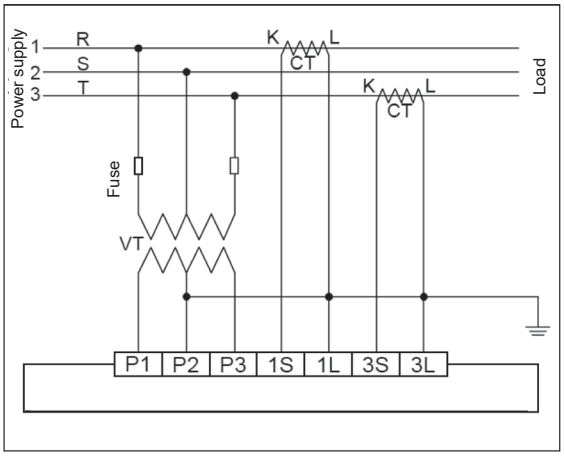
Item	Description
Date setting (upper)	Specify the date of the upper integral graph.
Date setting (lower)	Specify the date of the lower integral graph.

6. Power monitor wiring precautions

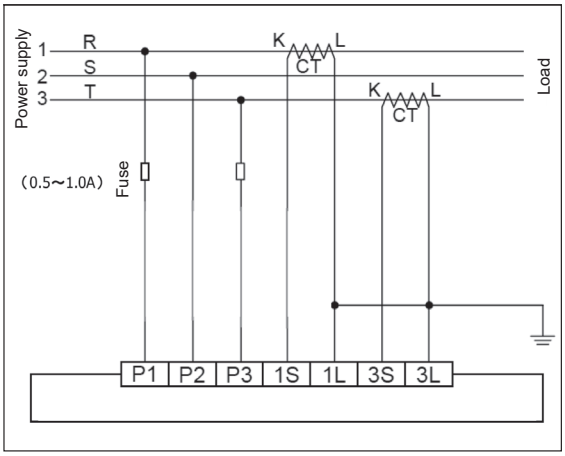
UPM100 Power Monitor wiring example

Wiring without a VT (3 phase 3 wire example)

With a VT



Without a VT



Note: If not using a VT, do not ground P2.

This is an example with the UPM100, but the voltage input wiring is also the same on the PR300 and UPM101.

Selecting a fuse

If not using a VT, insert a fuse of 0.5–1.0 A into lines P1 and P3.

Setting the VT and CT ratios

What are the VT and CT ratios?

Generally, when measuring high voltage and high current transformer signals, you use a VT (voltage transformer) and CT (current transformer). The ratio between the primary and secondary voltage and current ratings are the VT and CT ratios. With these ratios, a power monitor can convert the primary voltage and current of the VT and CT and display the electrical quantities.

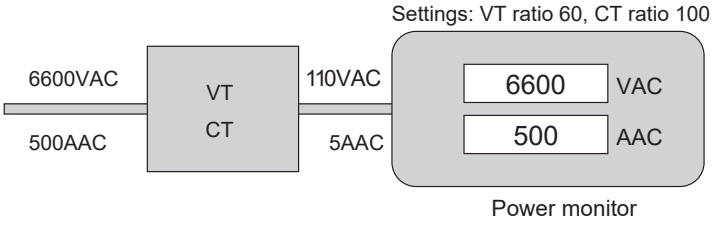
VT ratio: VT primary/secondary voltage rating

Ex.: VT ratio = 6600 VAC/110 VAC = 60

CT ratio: CT primary/secondary current rating

Ex.: CT ratio = 500 AAC/5 AAC = 100

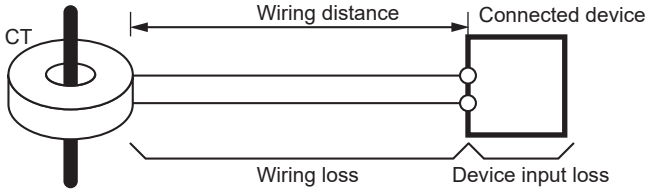
If not using a VT or CT, each ratio is 1.



CT load rating and wiring length

CT load rating

For the rated load, use a value within the sum of the wiring loss between the CT and the device connected to the secondary side, and the input loss to the device connected to the secondary side. The load rating notation could be, for example, “0.5 VA, 2.5 VA.”



CT rated load ≧ wiring loss + input loss of device connected to the secondary side

To calculate wiring loss, see “Checking the wiring distance and material” and “Detailed example (approximation using the CTW10).”

Checking the wiring distance and material

The wiring loss increases in proportion with the wiring distance. The total wiring length is the round trip distance.

Approximate wiring material resistance (ex.)

Nominal cross section 1.25 mm = approx. 18 Ω/km

Nominal cross section 2.0 mm = approx. 10 Ω/km

Detailed example (approximation using the CTW10)

CT: Primary/secondary rated current: 100 A/1A

CT load rating: 0.5 VA

Wiring distance: 15 m, input loss of device connected to secondary side: 0.2 VA

- When using wiring material of nominal cross section 1.25 mm^2

  Wiring resistance R = 18 Ω/km × 0.015 km × 2 (round trip) = 0.54 Ω

  Wiring loss ≈ I^2R = (second. rated current)^2 × wiring resistance = 1 × 1 × 0.54 = 0.54 VA

  Condition: CT rated load ≥ wiring loss + input loss of device cnctd. to secondary side

  0.5 ≥ 0.54 + 0.2 = 0.74 VA

This does not meet the condition.

- When using wiring material of nominal cross section 2.00 mm^2

  Wiring resistance R =10 Ω/km × 0.015 km × 2 = 0.3 Ω

  Wiring loss ≈ I^2R = (secondary rated current)^2 × wiring resistance = 1 × 1 × 0.3 = 0.3 VA

  Condition: CT rated load ≥ wiring loss + input loss of device cnctd. to secondary side

  0.5 ≥ 0.3 + 0.2 = 0.5 VA

This does meet the condition.

CT handling precautions

CT inspection and maintenance precautions

Do not perform work while measuring lines are live. If the secondary side is open while CT current is flowing, high voltage occurs on the secondary side. This can cause insulation to degrade, and if left as-is, can cause burning and accidents and is extremely dangerous.

When maintenance is complete, before turning on the power, you must check the CT's secondary side connection (short).

The CTW series of fixed wire type current transformers have built-in hazardous voltage suppressors that function when the secondary side is open. In the unlikely case that the secondary side is released, it will prevent burns and accidents.

When there is abnormal UPM100 power monitor measured data

Q. Voltage and current measurements on the power monitor are correct, but power integration either doesn't occur, or there are small values. What should I check?

A. Check the active power.

If the active power turns negative or extremely small, check the points below. The active power is negative when the power is regenerating.

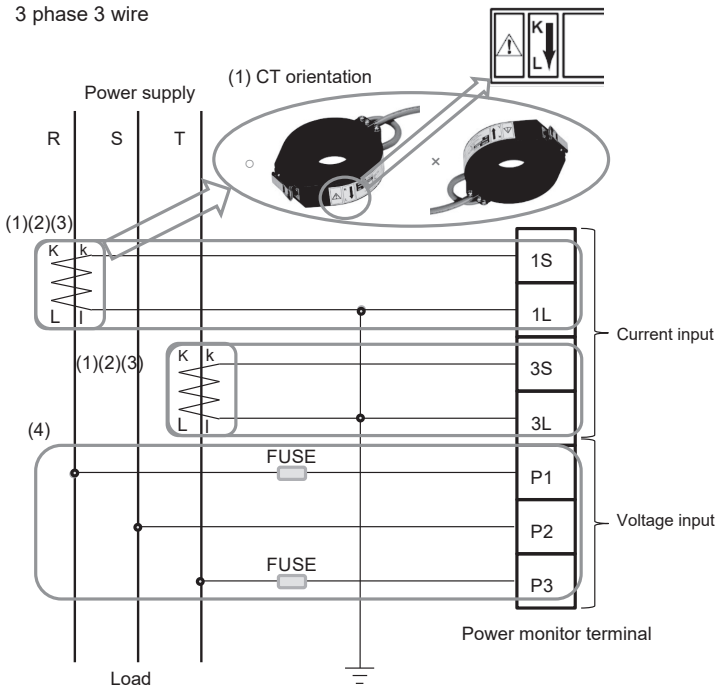
Points to check (3 phase 3 wire)

(1) Is the CT installed in the correct orientation?

(2) Is the CT installed to the R and T phases?

(3) Is the R phase side of the CT connected to 1S and 1L, and the T phase side connected to 3S and SL? Also check the CT secondary side polarity (k, l).

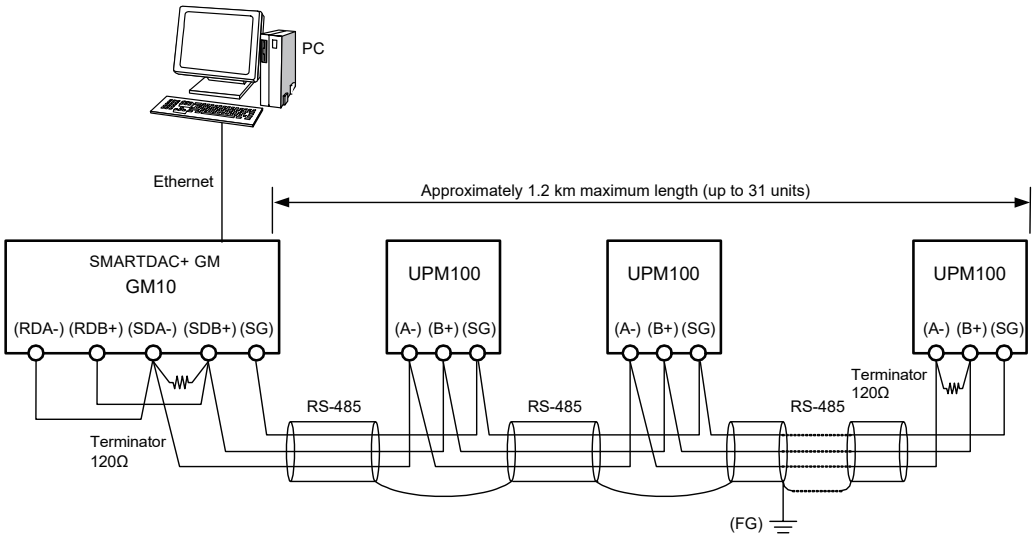
(4) Are R, S, and T wired to P1, P2, and P3?



Check the installation for other phase and wiring schemes as well.

Wiring RS-485 communication

Wiring for communication between the Data Acquisition System GM and the UPM100 Power Monitor (RS-485 4 wire <=> 2 wire)

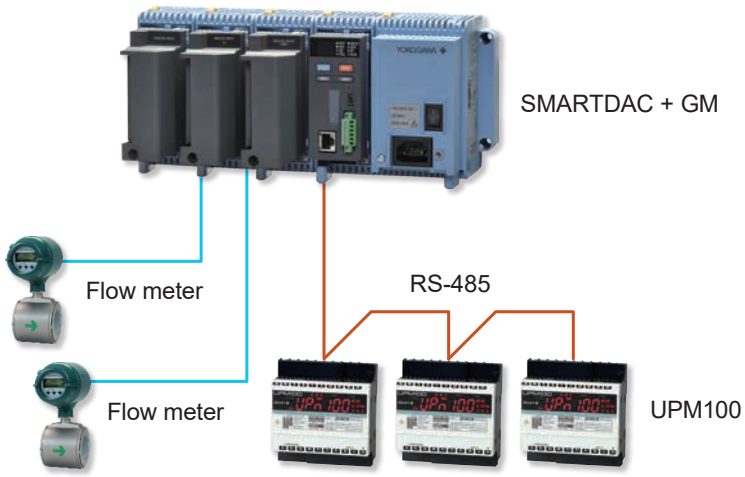


7. Power package application

Example of simultaneous measurement of quantities of vapor, gas, and other substances

You can add a pulse module (for acquiring flow meter pulses) and measure flow quantities of power, vapor, and gas.

System architecture



For the pulse input module, use the GX90XP from the SMARTDAC+ SMARTDAC+ series.

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