

MW100 MVTool™
Configuration Software
MW180-2
User's Manual

1st Edition: March 2007YK)
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IM MW180-02E
Ed02

Thank you for purchasing the MW100 Data Acquisition Unit.

This user's manual contains useful information about the functions and operating procedures of the MW100 MVTool Configuration Software and lists the handling precautions of the software. To ensure correct use, please read this manual thoroughly before beginning operation.

Notes

- This manual describes the MW100 MVTool configuration software.
 - The contents of this manual are subject to change without prior notice as a result of continuing improvements to the software's performance and functions. The figures given in this manual may differ from those that actually appear on your screen.
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Revisions

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License Agreement on Configuration tool for MW100

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MW100 MVTool™ Configuration Software Instruction Manual

MW180-02

IMMW180-02E 2nd Edition

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Chapter 1 Functional Description

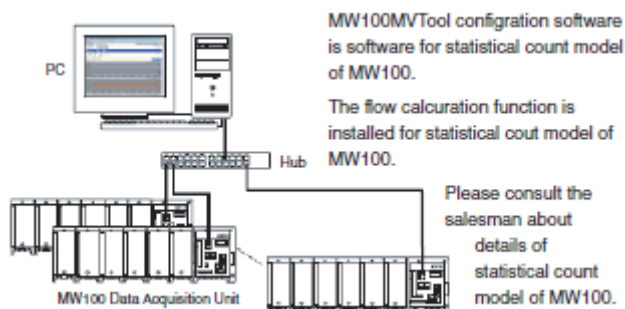
1. Functional Description

1.1. System Overview

Overview of the MW100 Data Acquisition Unit (MW100)

The MW100 Data Acquisition Unit (hereinafter referred to as the MW100) comprises a main module equipped with an Ethernet port and CF slot, an input and output module that performs signal inputs and outputs, and a base plate on which these modules are mounted and connected to. It is easy to perform configuration from a PC, and it is also possible to collect, calculate, and monitor measured data.

Example: Connection with a PC (1: n)



For more information, refer to the MW100 Data Acquisition Unit User's Manual (IM MW100-1-E).

MW100MVTool Configuration Software (MW180-2)

The MW100MVTool Configuration Software is software that is used to configure the flow calculation function on the MW100. This software is started on the PC, and after configuration of the flow function is completed, it downloads the configuration data to the MW100 through the use of communication. Flow calculation is performed on the MW100 based on the downloaded configuration data.

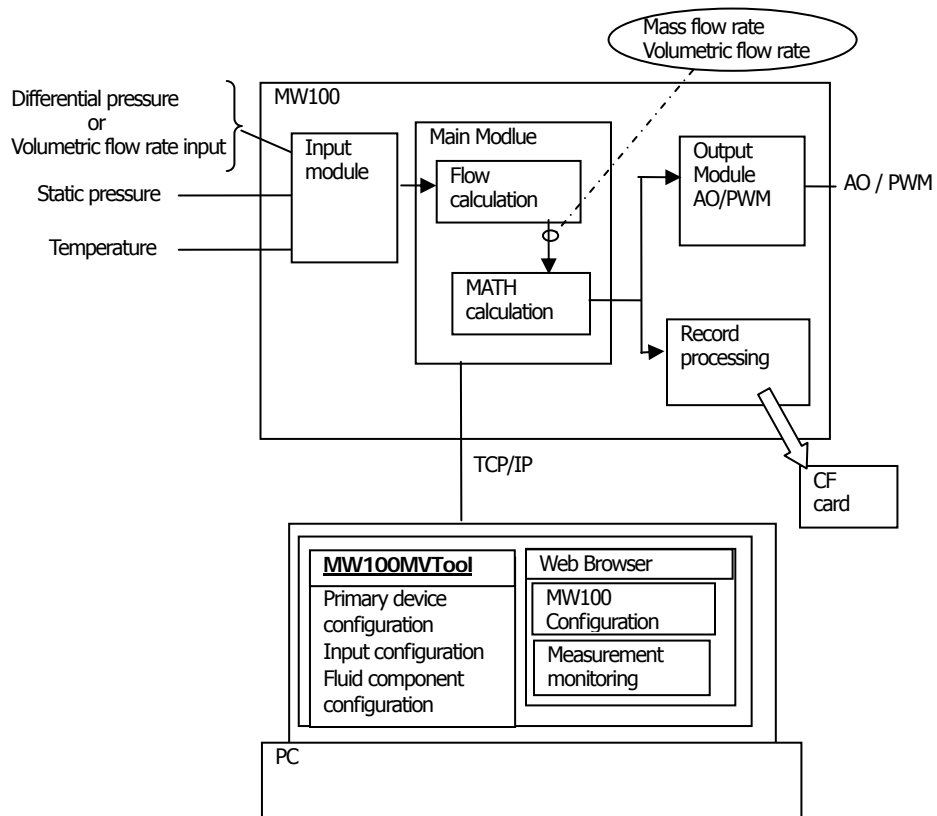
This function is described in the following sections.

1.2. Flow Calculation Function

- A flow calculation function that measures a flow rate based on a differential pressure that is generated by the primary element on the path of the pipe.
- Temperature pressure compensation is performed in real time on the primary element and fluid component to compensate the flow rate.
- Up to 10 flow measurements can be performed.
- Flow calculation is performed on the MW100.
- The following operations can be performed by specifying a MATH calculation expression on the MW100.
 - Analog output (AO) and PWM output from the MW100 output module
 - Recording to the CF card
 - Real time monitoring and viewing of recorded (saved) data can be performed on a PC.
- The MATH calculation allows for performing integral flow calculation based on the flow rate.
- Differential pressure, static pressure, and temperature from the field are input using the MW100 analog input module, and the like.

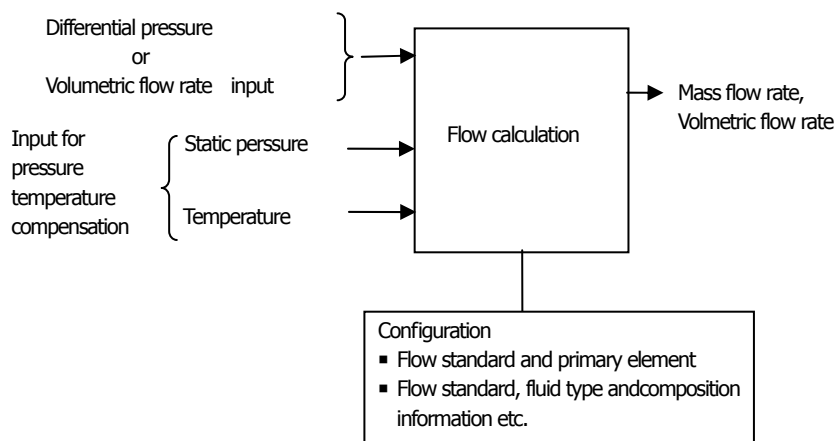
Block Diagram

The following block diagram shows the relation between the MW100 and the MW100MVTool.



Flow Calculation Block

The following shows a flow calculation block.



1.3. Requirements for the PC System Environment

PC

IBM PC/AT compatible Pentium 400 MHz or higher (Pentium III 1 GHz or higher is recommended) Main memory 512 MB or higher

OS (Operating system)

Microsoft Windows XP with SP1 or later, English version

CD-ROM drive

A CD-ROM drive that can be used in the OS is required Used when installing this software

Hard disk Free space:

1 GB or more is recommended Format: NTFS Rotation: 72000 rpm or higher recommended (using the fastest hard drive possible is recommended)

Display

XGA (1024 . 768 pixels) or higher resolution 256 colors or more

Ethernet port

Ethernet that can be used in the OS (10BASE-T or 100BASE-T) is required

1.4 License Number

1.4.1 MVTool License Number

The MVTool license number is a unique number that is allocated to each user who purchased the product.

This number indicated as a License No, along with the model name, on a label attached to the CD case.

License No: HHJJ-KLL-MMMMM-NNNNN

Registration of the License Number

The MW100MVTool requires entering the user name and user ID when it is started for the first time.

This tool can be used if this license number is registered as a user ID.

Chapter 2 Installation and Login

2. Installation and Login

2.1. Installation

The following describes the procedure to install the MW100MVTool.

Note -----

- If you want to reinstall the MW100MVTool, be sure to uninstall the existing tool first.
 - If the procedure is not performed correctly, operation may become unstable.
 - For more information on the procedure, refer to the section "Uninstallation."
-

1. Power on the PC and start Windows.
2. Disable the standby mode of the PC. The installation of this tool will be completed in a couple of minutes. If the standby mode is activated during installation, correct operation cannot be guaranteed, because MWMVTool logs process values periodically in online status.

It is recommended to disable the automatic turn-off function by accessing the Power Options Properties dialog box by selecting Start - Control Panel - Power Options in Windows of the PC.

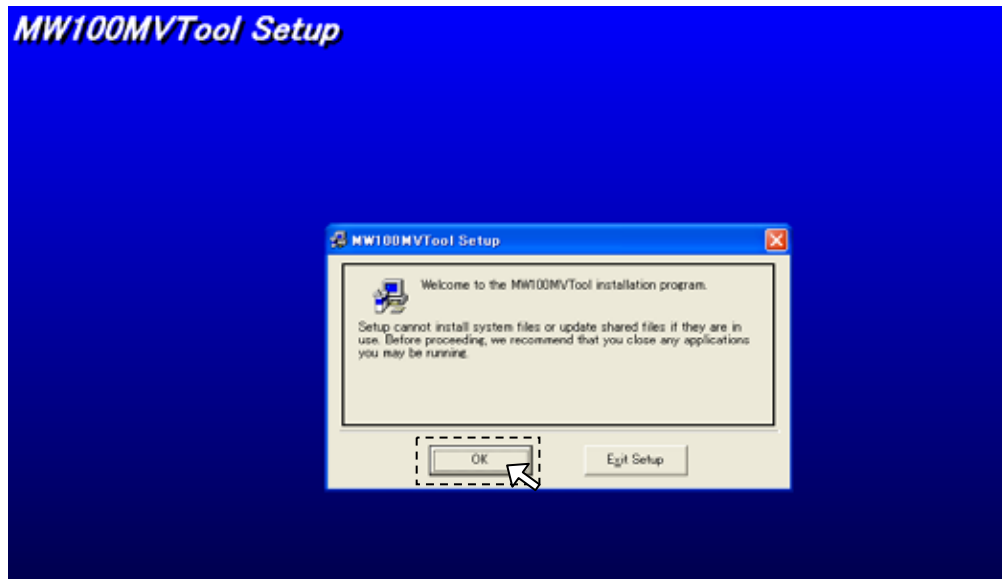
[Power Options Properties]
Power Schemes tab
Turn off hard disks: Never
System standby: Never
System hibernates: Never

Advanced Tab Some PC keyboards have a sleep button. It is recommended to disable this button by selecting "Do nothing" for "When I press the sleep button on my Computer."

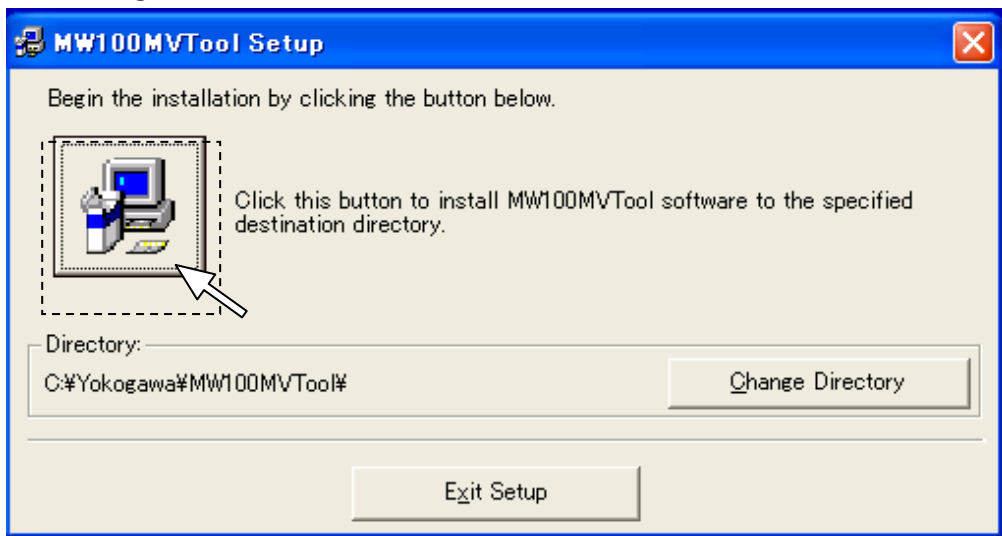
Hibernate Tab
Do not select the option "Enable hibernation."

3. Starting Setup Program
In case where autorun is enabled:
When you insert the CD-ROM into the drive, the setup program will start automatically.
- In case where autorun is disabled:
Double-click the CD-ROM icon in My Computer to open the CD-ROM drive window.
Double-click SETUP.EXE in the Installer folder.

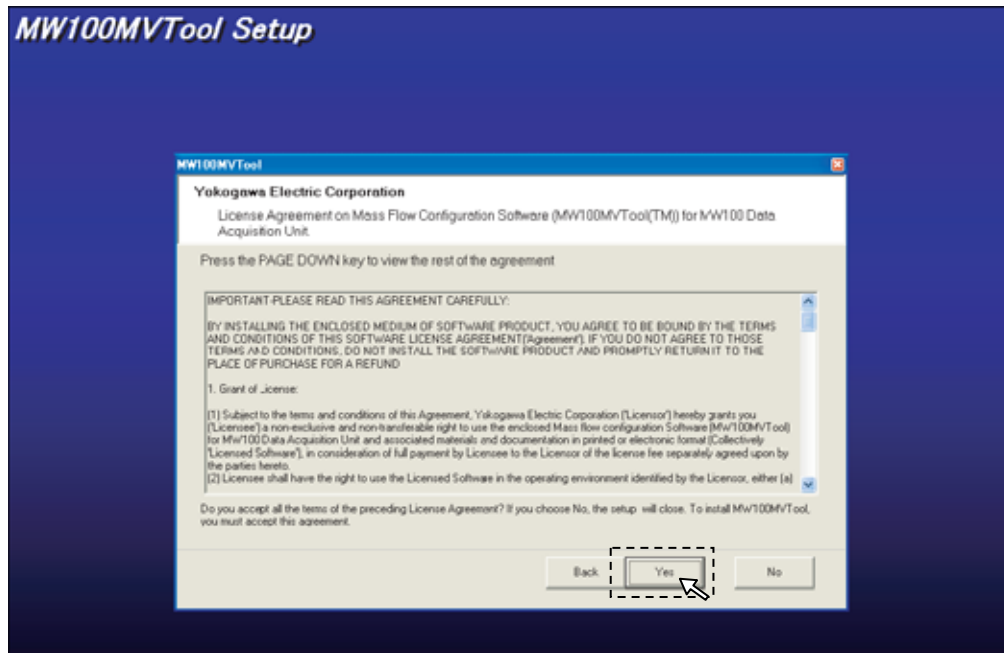
4. Click OK.



5. Enter the installation destination directory and then click the Install button.
By default, the installation destination directory is
C:/Yokogawa/MW100MVTool.

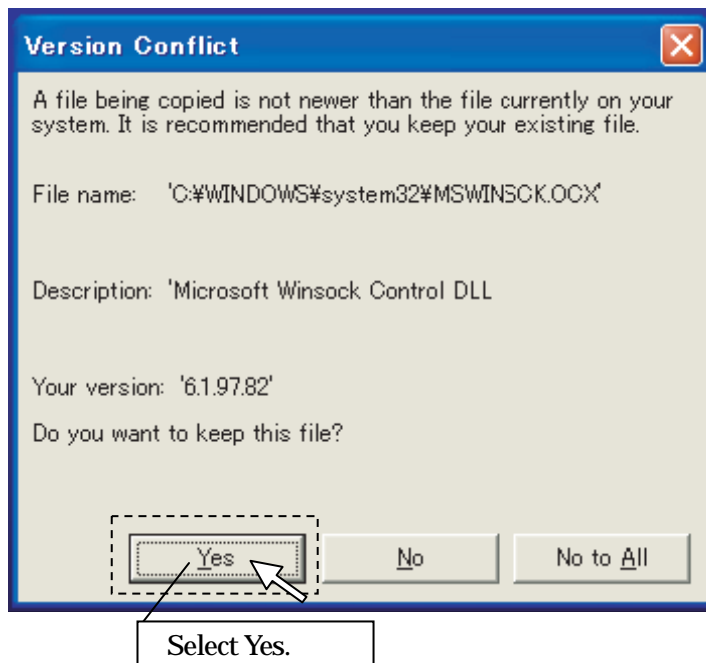


6. If you agree with the terms of the License Agreement, click Yes. If you do not agree, click No to terminate the installation.



7. When you click Next, the installation process starts.

8. If the Version Conflict window pops up, select Yes.
(Clicking Yes means the current DLL file will not be overwritten.)



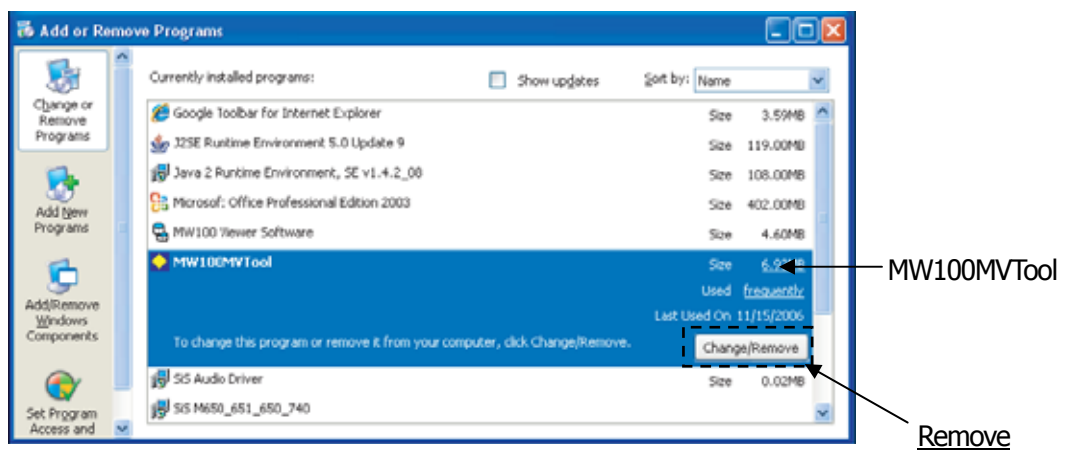
9. Click the Complete button to complete the installation process.

2.2. Uninstallation

The following describes the procedure to uninstall MW100MVTool.

Note

- Follow the procedure below to uninstall the tool. Otherwise, the tool will not be able to be uninstalled correctly.
- If you want to reinstall the tool, be sure to uninstall the current tool first.



1. In Windows, open Start - Control Panel - Add or Remove Programs, select MW100MVTool, and then click Change/Remove.

If there are multiple MW100MVTools, remove all the tools.

If ST6UNST.* generates the message "Cannot open" during the operation, do not delete that tool.

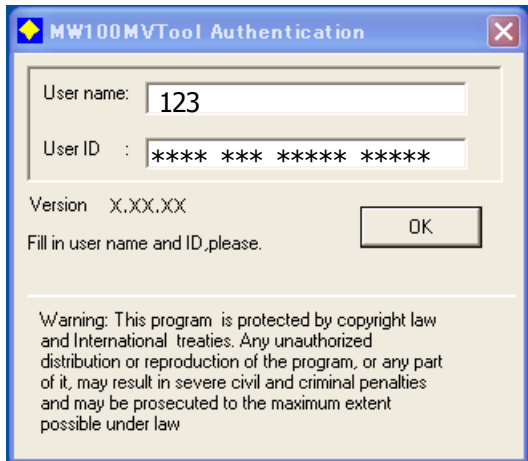
2.3. Login

When MW100MVTool is started, the following screen appears.

Immediately after installation, enter the following items and then click OK.

User name (the name of the user)

User ID (License No. included on the label attached to the CD case)



If the user ID is the correct license number, the main menu of MW100MVTool appears.



The next time the tool is started, just click OK, because the user name and user ID are already registered.

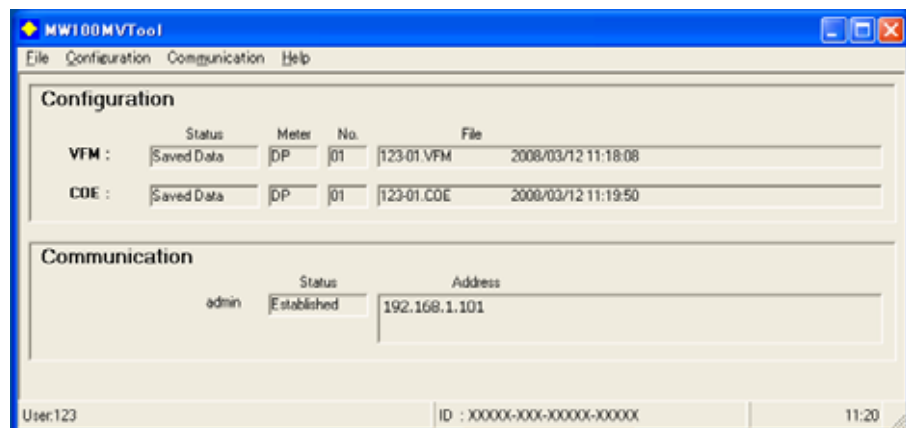
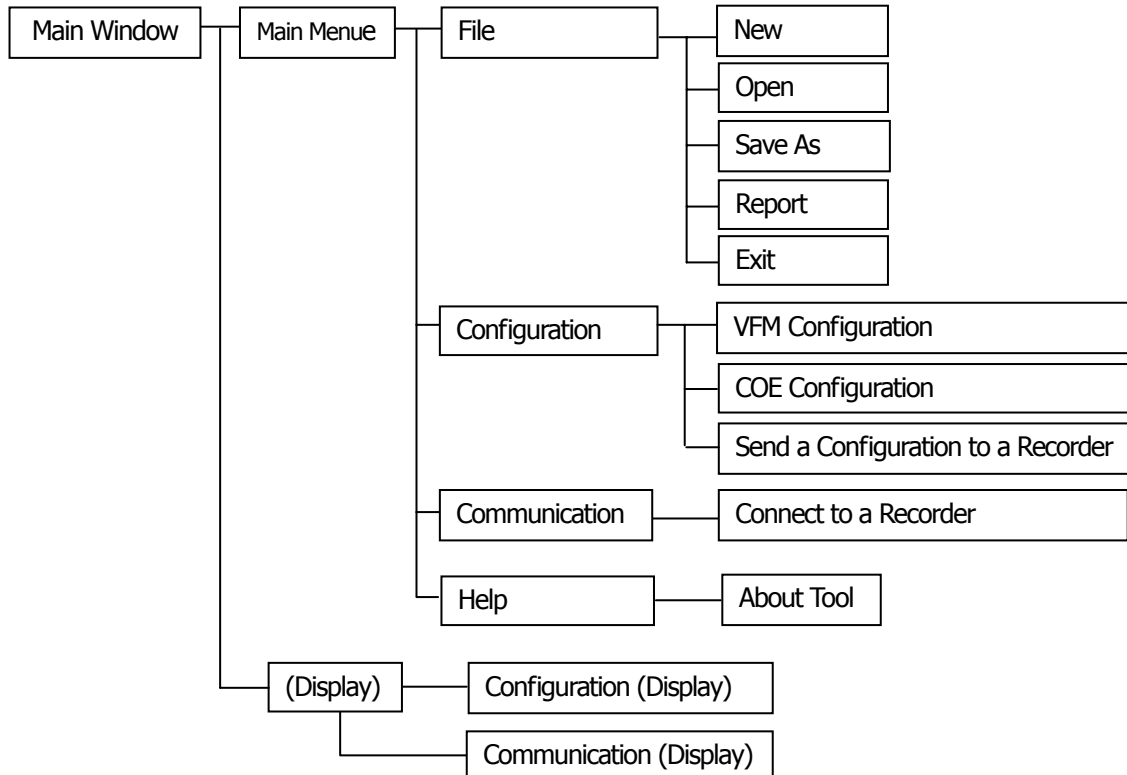
Only one MW100MVTool can be started on a single PC.

Note-----
Please check the version number. If the number does not correlate with the one printed the label of the CD, the installation may be failed.

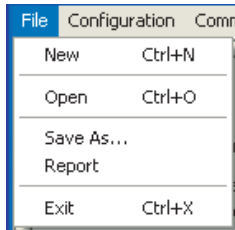
Chapter 3. Main Window

3. Main Window

Main Window is the top screen of MW100MVTool. Main Menu allows you to access various types of processing required for flow calculations, to save and open configuration data, and to access communication configuration processing. In addition, Main Window allows you to view the saved file information and connection to the MW100.



a) File Menu



a-1) New Ctrl+N

Clears all the current configurations of MW100MVTool.

However, the user name and user ID are not cleared by this operation.

a-2) Open Ctrl+O

Specifies a configuration file and reads the configuration data.

a-3) Save As

Saves the configuration data in the configuration file.

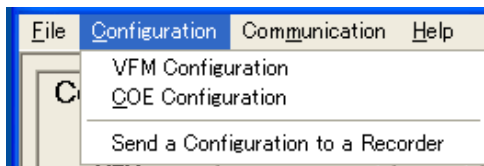
a-4) Report

Outputs the current configuration information as a report.

a-5) Exit Ctrl+X

Exits the program.

b) Configuration Menu



b-1) VFM Configuration

Configures VFM. When the configuration is completed, it is possible to select to save a file or download to the MW100.

b-2) COE Configuration

Selects a flow standard, configures the primary element, and configures the fluid standard, fluid type and composition. When the configuration is completed, it is possible to select downloading to the MW100.

b-3) Send a Configuration to a Recorder

Downloads configurations for flow calculations to the MW100.

c) Communication Menu



c-1) Connect to a Recorder

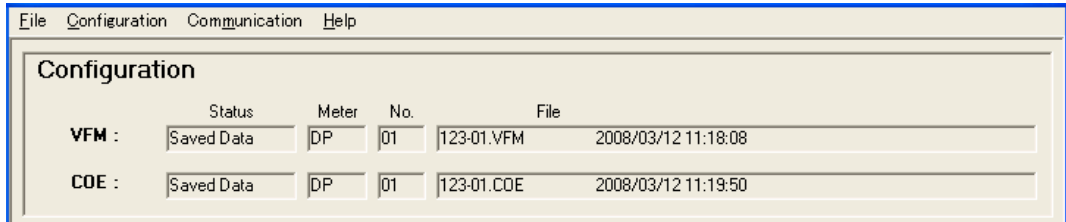
Configures the connection to the MW100.

d) Help



d-1) About Tool Displays information about MW100MVTool.

e) Configuration (Display)



e-1) Type of Configuration

Type of each configuration.

Type of configuration	Content
VFM	Specify units, ranges and channel numbers of inputs and outputs.
COE	Selects a flow standard, configures the primary element, and configures the fluid standard, fluid type and composition.

e-2) Status

Setting situation of each configuration.

Status	Meaning
No data	Not configured
No Saved Data	After configuration, the tool was exited without the file being saved.
Saved Data	After configuration, data was saved to the file. An existing file was opened.
Broken Off	Displayed when the configuration process was canceled part way through.

e-3) No.

Number of each configuration

No.	Configuration	Meaning
1-10	VFM configuration	VFM number 1 to 10
1-10	COE configuration	COE number 1 to 10

e-4) Meter

Meter type of each configuration.

Meter type	Meaning
Off	OFF
DP	DP transmitter
Vortex	Vortex flow meter

Note-----

If the meter type of VFM configuration does not correlate with the one of COE configuration, outputs are error.

e-5) Name

File name of each configuration.

Configuration	File Name
VFM Configuration	***- 'vfm number.VFM' date Example: 123-01.VFM
COE Configuration	*** - 'coe number'.COE date Example: 123-01.COE

f) Communication (Display)

Status	Address
admin	192.168.1.101
Established	

f-1) User name

User name of MW100 user setting

communication condition	description
closed	Nothing
established	user name

f-2) Status

Communication condition.

Status	Meaning
Closed	Not connected to the MW100
Established	Communication with the MW100 is established

f-3) Address

Address
Address of the MW100 that is connected
Example: 192.168.1.101

Chapter 4. VFM Configuration

4. VFM Configuration

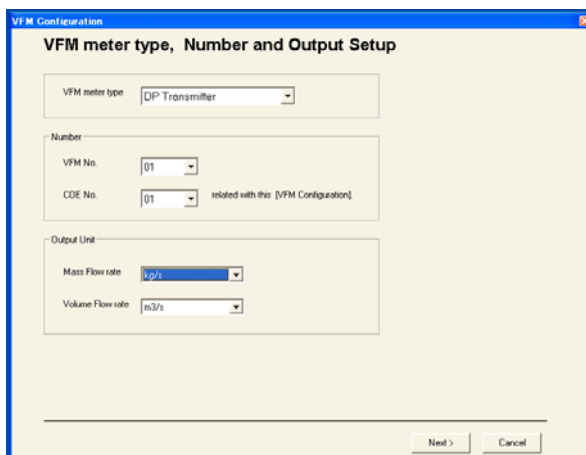


Unit, range and channel number of inputs are specified for VFM Configuration.

Unit of outputs are specified for VFM Configuration.

These configurations are specified every vfm number.

After configuration is completed, it is possible to select to save file or download to the MW100.



4.1. VFM meter type

Indicates VFM meter type of each VFM configuration

VFM meter type
DP Transmitter
Vortex flow meter
Off

Note

If the meter type of VFM configuration does not correlate with the one of COE configuration, outputs are error.

4.2. Number

4.2.1 VFM No. (vfm number)

The VFM configuration is specified every vfm number

The vfm number is selected from 1 to 10.

4.2.2 COE No. (coe number)

Every VFM configuration must related with a COE configuration^{*1} because of flow calculation.

^{*1} Flow standard, primary device, fluid standard, fluid type and composition

The COE configuration is determined by the selection of a coe number.
The coe number is selected from 1 to 10.

4.3 Output unit

4.3.1 The unit of Mass flow rate

Unit	Contents	
kg/s	kilograms per second	SI unit system
kg/min	kilograms per minute	
kg/h	kilograms per hour	
kg/d	kilograms per day	
t/min	metric tons per minute	Ton corresponding to m in the SI unit system
t/h	metric tons per hour	
t/d	metric tons per day	
g/s	grams per second	SI unit system
g/min	grams per minute	
g/hour	grams per hour	
lb/s	pounds per second	US pound
lb/min	pounds per minute	
lb/h	pounds per hour	
lb/d	pounds per day	
short ton/min	short tons per minute	Short ton corresponding to the US pound
short ton/h	short tons per hour	
short ton/d	short tons per day	

4.3.2 The unit of Volumetric flow rate

Unit	Contents	
m ³	cubic meters per second	SI unit system
m ³ /min	cubic meters per minute	
m ³ /h	cubic meters per hour	
m ³ /d	cubic meters per day	
L/s	liters per second	Simultaneous use of SI unit
L/min	liters per minute	
L/h	liters per hour	
ML/d	mega liters per day	
gal/s	gallons per second	U.S. gallon
GPM	gallons per minute	
gal/h	gallons per hour	
Mgal/d	mega gallons per day	
CFS	cubic feet per second	
CFM	cubic feet per minute	
CFH	cubic feet per hour	
ft ³ /d	cubic feet per day	

4.4 Input

Meter = DP transmitter

The differential pressure, static pressure and temperature are specified below when DP transmitter selected.

The screenshot shows the 'VFM Configuration' window with the 'Input Setup' tab selected. The 'Meter' is set to 'DP' and 'VFM No.' is '01'. The 'Static Pressure/Temperature compensation' is set to 'Static Pressure and Temperature'. The 'Specify Units, Ranges and Channel Numbers' section contains a table with the following data:

	Channel No	Unit	LRV	URV
Differential Pressure	001	kPa	0.0	100.0
Static Pressure	011	kPa	0.0	2000.0
Temperature	021	Setting on a Recorder	<input checked="" type="checkbox"/>	0.0

Below the table, there is a 'Caution' note: 'If you select Cxxx or Kxx channel No., LRV and URV are NOT used by conversion. You should also set recorder channel spans [AI Channel Setting, MATH Channel Setting etc..].' and a URL: <http://192.168.1.101>. The 'Differential Pressure Low Cut' is set to 'ON' and '0.0 %'. The 'Absolute/Gauge' dropdown is set to 'Absolute'. Navigation buttons '< Back', 'Next >', and 'Cancel' are at the bottom.

Meter = Vortex flow meter

Input Volumetric flow rate, static pressure and temperature are specified below when vortex flow meter is selected.

The screenshot shows the 'VFM Configuration' window with the 'Input Setup' tab selected. The 'Meter' is set to 'Vortex' and 'VFM No.' is '01'. The 'Static Pressure/Temperature compensation' is set to 'Static Pressure and Temperature'. The 'Specify Units, Ranges and Channel Numbers' section contains a table with the following data:

	Channel No	Unit	LRV	URV
Input Volumetric Flow rate	001	m3/s	0.0	100.0
Static Pressure	011	kPa	0.0	2000.0
Temperature	021	Setting on a Recorder	<input checked="" type="checkbox"/>	0.0

Below the table, there is a 'Caution' note: 'If you select Cxxx or Kxx channel No., LRV and URV are NOT used by conversion. You should also set recorder channel spans [AI Channel Setting, MATH Channel Setting etc..].' and a URL: <http://192.168.1.101>. The 'Input Volumetric Flow rate Low Cut' is set to 'ON' and '2.0 %'. The 'Absolute/Gauge' dropdown is set to 'Absolute'. Navigation buttons '< Back', 'Next >', and 'Cancel' are at the bottom.

4.4.1 Static Pressure/Temperature compensation

Static Pressure/Temperature compensation is used to determine inputs.

Differential pressure/Input Volumetric flow rate are not related with it.

Static Pressure/Temperature compensation	Contents
Static Pressure and Temperature	Both temperature and pressure will be input and measured by the MW.
Static Pressure (Temperature unused)	Only Pressure is input and measured
Temperature(Static Pressure unused)	Only Temperature is input and measured

This setting is constrained by fluid type and operation range of the corresponding COE configuration.

If this setting does not correlate with these conditions, outputs are error.

VFM configuration	COE configuration	
Static Pressure/Temperature compensation	Fluid type	Operation Range
Static Pressure and Temperature	Natural gas	-
	Superheated steam	
Static Pressure (Temperature unused)	Saturated steam	selecting static pressure
Temperature(Static Pressure unused)		selecting temperature

4.4.2 Differential Pressure (Only DP transmitter)

A unit, an input channel, and ranges of differential pressure are specified.

Unit

The unit can be selected from the following options.

The same unit is used for LRV and URV.

Unit	Contents	
Pa	pascal	SI unit system
kPa	kilopascal	
MPa	megapascal	
mbar	millibar (mb)	CGS unit system
bar	bar	
psi	pounds per square inch	
mmHg	millimeter of mercury (=Torr)	
mmH2O@4C	millimeter column of water at 4 degC	
mmH2O@20C	millimeter column of water at 20 degC	
inH2O@4C	inch column of water at 4degC	
inH2O@68F	inch column of water at 68 degF	
kgf/cm2	kilogram force per square centimeter	

Channel (Refer to instruction manual of MW100)

The channel can be selected from the following options.

Channel No	Description	Data Conversion method
001- 060	Measurement channel Range conversion 1 to 60 channels	Range conversion
A001 - A300	MATH channel 1 to 300 channels	
K01 - K60	Constant channel 1 to 60 channels	Used without conversion
C001 - C300	Communication input channel 1 to 300 channels	

Range conversion

LRV and URV and the span by channel are used to convert the pressure values for the channel.

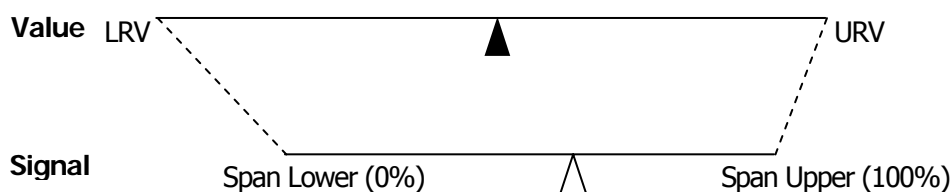
Specify so that LRV is smaller than URV.

Range conversion can be performed only for the case where the input is a measurement channel or a MATH channel. (Input the values as is for the constant channel and communication input channel.)

The following shows a range conversion formula.

$$\text{Value} = \left(\frac{(\text{Channel Value} - \text{"Span Lower"}) \times (\text{URV} - \text{LRV})}{\text{"Span Upper"} - \text{"Span Lower"}} \right) + \text{LRV}$$

Item	Content	Configuration and input data
Value	Differential pressure input	-
LRV	Differential pressure lower limit value	MW100MVTool
URV	Differential pressure upper limit value	
Channel Value	Input data	MW100 Data Acquisition Unit (Refer to instruction manual of MW100)
Span Lower	Input range lower limit	
Span Upper	Input range upper limit	



The following table shows the combination of Span Upper and Span Lower of the MW100 that are used for conversion.

Category	Calc	Span	
		Lower	Upper
Measurement channel	OFF * ²	Measure Span	
	Delta* ³		
	Scale* ⁴	Measure Scale	
MATH channel		MATH Span	
Constant channel		None	
Communication input channel			

Example for measurement channel

Conditions for input signal Suppose that the signal is a 1 to 5V signal and the lower limit of 1V is 100 kPa, and the upper limit of 5V is 500 kPa.

Configuration on MW100MVTool In VFM Configuration, select the unit kPa on the Diff Pres. line for the differential pressure (or on the Pres. line for the static pressure), and select 100 kPa for LRV and 500 kPa for URV.

Configuration on the MW100 Configuration on the measurement channel on which signals are input (in the case where the measurement channel is Calc = Off)

Diff Pres. (or Pres.)	Unit	kPa
	LRV	100
	URV	500

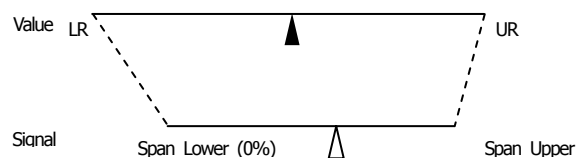
Calc	Calc = Off
Span Lower	1.0
Span Upper	5.0
Mode	VOLT
Range	6VH (6V and 20V OK)

Measurement channel input

For more information on configuration, refer to the section "Configuring Measurement Channel" of the Data Acquisition Unit User's Manual (IM MW100-1).

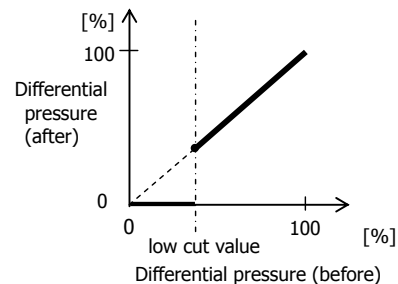
(Example)

$$\text{Value} = \left(\frac{(3.1 - 1) \times (500 - 100)}{5 - 1} \right) + 100$$



Differential pressure low cut

On/Off	low cut value
OFF	nothing
ON	select from 0-20 [%]



*² This setting is recommended.

*³ Configuration and calculation can be performed but this setting is not recommended.

*⁴ Configuration and calculation can be performed but this setting is not recommended.

4.4.3 Input volumetric flow rate (Only vortex flow meter)

A unit, an input channel, and ranges of input volumetric flow rate are specified.

Unit

The unit option is equivalent to volumetric flow rate of output.

Channel

The option is equivalent to the differential pressure.

Range conversion

LRV and URV and the Span by channel are used to convert input volumetric flow values for the channel.

Specify so that LRV is smaller than URV.

Range conversion is performed only for the case where the input is a measurement channel or MATH channel. (Input the values as is for the constant channel and communication input channel.)

The following shows a range conversion formula.

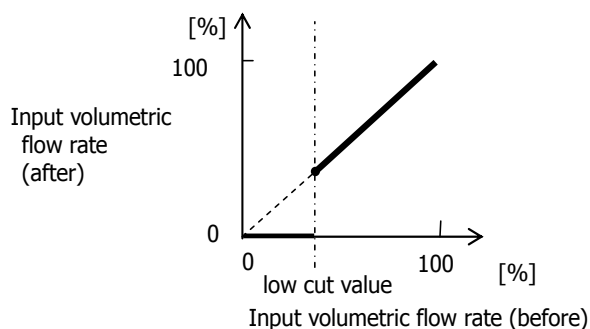
$$\text{Value} = \left(\frac{(\text{Channel Value} - \text{"Span Lower"}) \times (\text{URV} - \text{LRV})}{\text{"Span Upper"} - \text{"Span Lower"}} \right) + \text{LRV}$$

Item	Content	Configuration and input data
Value	Input volumetric flow rate	-
LRV	Input volumetric flow rate lower limit value	MW100MVTool
URV	Input volumetric flow rate Upper limit value	
Channel Value	Input data	MW100 Data Acquisition Unit (Refer to instruction manual of MW100)
Span Lower	Input range lower limit	
Span Upper	Input range upper limit	

Span Upper and Span Lower that are used for conversion on the MW100 are equivalent to the differential pressure.

Input volumetric flow rate low cut

On/Off	low cut value
OFF	nothing
ON	select from 0-20 [%]



4.4.4 Static Pressure

Specify the static pressure unit, input channel, and range.
Gauge pressure/absolute pressure can be selected.

Unit

The unit option is equivalent to the differential pressure input.

Channel

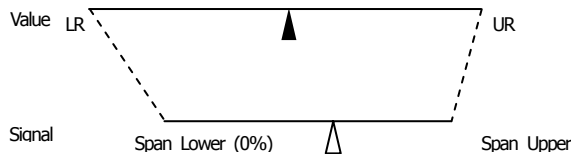
The option is equivalent to the differential pressure input.

Range conversion

- LRV and URV and the Span by channel are used to convert pressure values for the channel.
- Specify so that LRV is smaller than URV.
- Range conversion is performed only for the case where the input is a measurement channel or MATH channel. (Input the values as is for the constant channel and communication input channel.)
- The following shows a range conversion formula.

$$\text{Value} = \left(\frac{(\text{Channel Value} - \text{"Span Lower"}) \times (\text{URV} - \text{LRV})}{\text{"Span Upper"} - \text{"Span Lower"}} \right) + \text{LRV}$$

Item	Content	Configuration and input data
Value	Static pressure input	-
LRV	Static pressure lower limit value	MW100MVTool
URV	Upper limit value	
Channel Value	Input data	MW100 Data Acquisition Unit (Refer to instruction manual of MW100)
Span Lower	Input range lower limit	
Span Upper	Input range upper limit	



Span Upper and Span Lower that are used for conversion on the MW100 are equivalent to the differential pressure.

Selection of gauge pressure/absolute pressure

Item	Unit	Value
Absolute		
Gauge	A selected value is displayed in the unit of static pressure.	A value that was converted from 1atm level* ⁵

*⁵ It is possible to change the default value (1atm conversion).

4.4.5 Temperature

Specify the temperature channel.

Unit

The unit of the temperature channel is subject to the unit specified on the MW100.

Channel

The option is equivalent to the differential pressure input

Range conversion

- LRV and URV and the Span by channel are used to convert temperature values for the channel.
- Specify so that LRV is smaller than URV.
- But range conversion can not be performed if temperature check back is not checked.

$$\text{Value} = \left(\frac{(\text{Channel Value} - \text{"Span Lower"}) \times (\text{URV} - \text{LRV})}{\text{"Span Upper"} - \text{"Span Lower"}} \right) + \text{LRV}$$

Item	Content	Configuration and input data
Value	Static pressure input	-
LRV	Static pressure lower limit value	MW100MVTool
URV	Upper limit value	
Channel Value	Input data	MW100 Data Acquisition Unit (Refer to instruction manual of MW100)
Span Lower	Input range lower limit	
Span Upper	Input range upper limit	

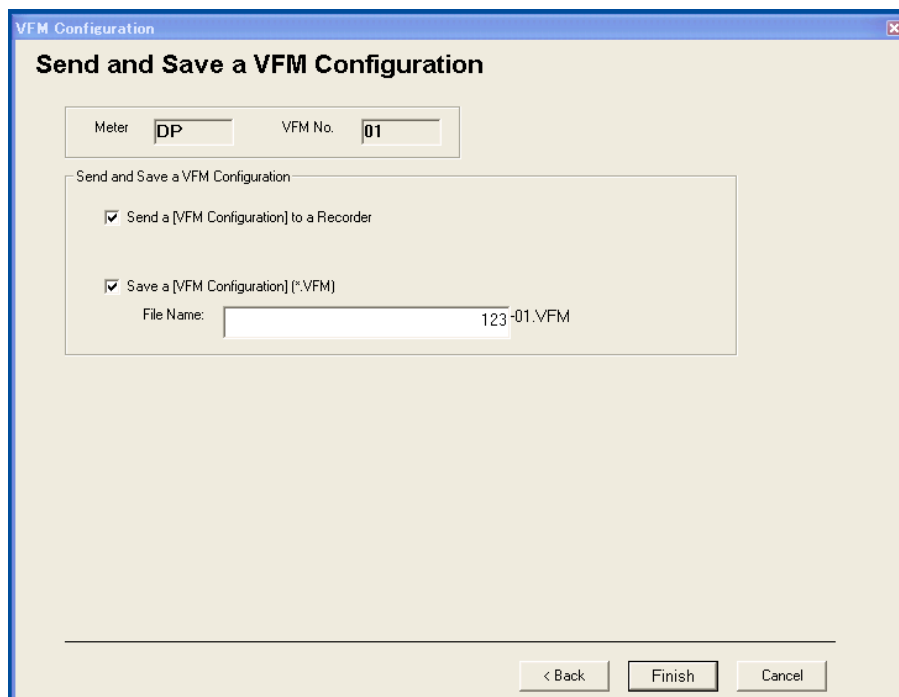
4.5 Saving Configuration and Downloading to the MW100

Confirm the configurations in the VFM Configuration.

Download the VFM Configuration to the MW100..Save the VFM Configuration to a file.

Note -----

It is only possible to download the VFM Configuration to the MW100.
when the MW100 stops measurement.



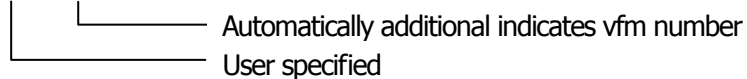
The screenshot shows a dialog box titled "VFM Configuration" with a sub-header "Send and Save a VFM Configuration". At the top, there are two input fields: "Meter" with the value "DP" and "VFM No." with the value "01". Below these, there are two checked checkboxes: "Send a [VFM Configuration] to a Recorder" and "Save a [VFM Configuration] (*.VFM)". Under the second checkbox, there is a "File Name:" label followed by a text input field containing "123-01.VFM". At the bottom of the dialog, there are three buttons: "< Back", "Finish", and "Cancel".

- a) Send a [VFM configuration] to a Recorder. [Downloading to the MW100]
To download the VFM Configuration, select the checkbox. Clicking the Finish button starts downloading.
The download destination is the MW100 that is currently connected.
The download destination can be specified by selecting communication.
Connect to a Recorder in Main Menu. For more information, refer to the chapter "Communication with the MW100."
- b) Saving the VFM Configuration to the file, select the checkbox. Clicking the Finish button starts saving.
"- (hyphen)" + "vfm number" is automatically added to the file name.
(without an extension) that was described in the dialog box.
Note that the part that is automatically added cannot be specified by the user.

The maximum number of characters for the file name is 24 (the maximum number of characters that can be specified by the user is 17).

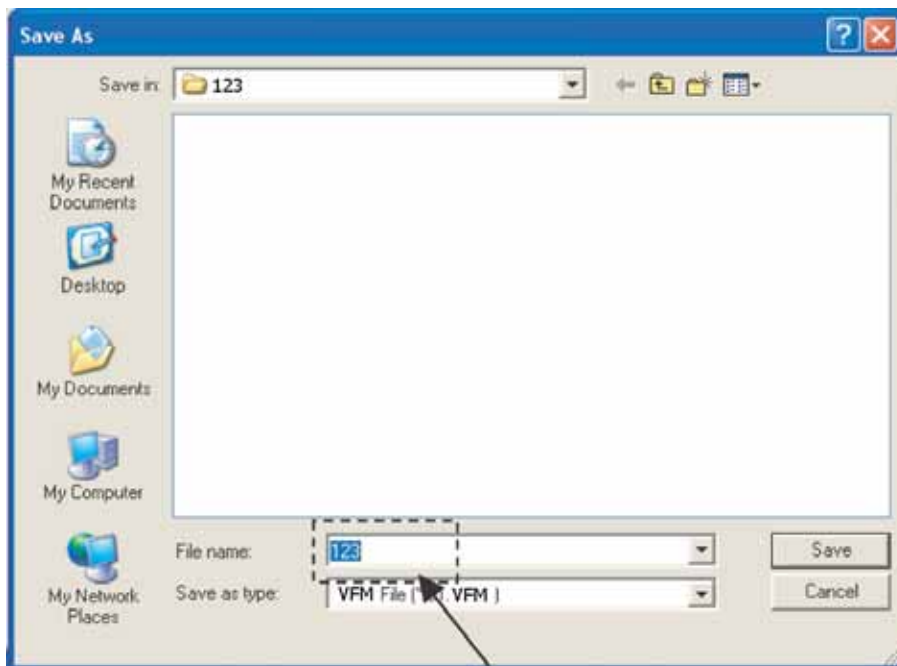
Extension		VFM
File name (excluding extension)	Characters used	Single-byte character (\'/\'/:\'*\'?\'< >\' \' or \'. cannot be used)
	Conditions	'- (hyphen)' + 'vfm number' vfm number: 01 to 10
Number of characters		Up to 24 characters (Out of which, 3 characters are for the extension and 1 character is for the \'. period.)
Directory name Characters used		Single-byte character (\'/\'/:\'*\'?\'< >\' or \' \' cannot be used)

Example: 123-01.VFM



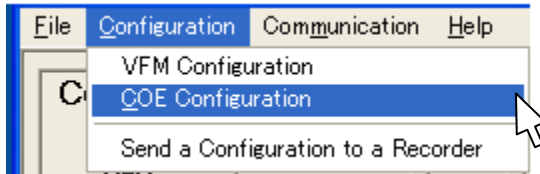
Specify just the name.

The vfm number and extension (.VFM) are added automatically. No input is required.



Specify just the name.
The vfm number and extension (VFM) are added automatically.

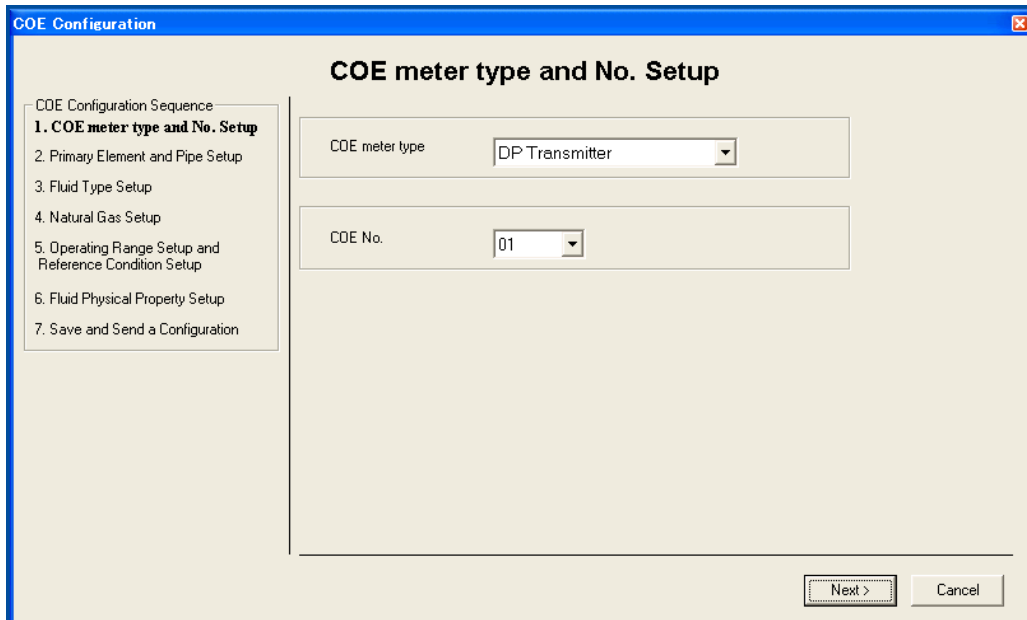
Chapter 5 COE configuration



The flow standard, primary element, fluid standard, fluid type and composition are specified for COE Configuration.

These parameters are configured every coe number.

After configuration is completed, it is possible to select to save a file or download to the MW100.

A screenshot of the 'COE Configuration' dialog box. The title bar reads 'COE Configuration'. The main area is titled 'COE meter type and No. Setup'. On the left, there is a 'COE Configuration Sequence' list with seven items: 1. COE meter type and No. Setup (highlighted), 2. Primary Element and Pipe Setup, 3. Fluid Type Setup, 4. Natural Gas Setup, 5. Operating Range Setup and Reference Condition Setup, 6. Fluid Physical Property Setup, and 7. Save and Send a Configuration. The main area contains two input fields: 'COE meter type' with a dropdown menu showing 'DP Transmitter', and 'COE No.' with a dropdown menu showing '01'. At the bottom right, there are two buttons: 'Next >' and 'Cancel'.

5.1. COE meter type

Indicates COE meter type of each COE configuration.

COE meter type
DP Transmitter
Vortex flow meter
Off

Note-----
If the meter type of VFM configuration does not correlate with the one of COE configuration, outputs are error.

5.2 COE No. (coe number)

There are 10 coe numbers*⁶ and it is possible to specify 01 to 10.

Configuration is performed by selecting a coe number.

*⁶ Flow standard, primary element, fluid standard, fluid type and composition are configured by coe number.

5.3 Primary Element and Pipe

5.3.1 Configuration

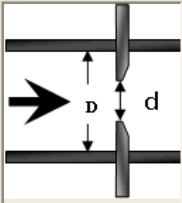
COE Configuration

Primary Element and Pipe Setup

Meter: **DP**
COE No.: **01**

COE Configuration Sequence

1. COE meter type and No. Setup
- 2. Primary Element and Pipe Setup**
3. Fluid Type Setup
4. Natural Gas Setup
5. Operating Range Setup and Reference Condition Setup
6. Fluid Physical Property Setup
7. Save and Send a Configuration



Primary Element

Type: **Orifice**

Category [Standard]: **Orifice Flange Taps [AGA No.3 1992]**

Diameter (d): **100** mm at **20** deg C

Material: **304 Stainless Steel**

Pipe

Diameter (D): **200** mm at **20** deg C

Material: **Carbon Steel**

< Back Next > Cancel

a) Primary element, Standard

a-1) Type

Selects the type of primary element

Type	Description
Orifice	Orifice Plate
Nozzle	Nozzle
Venturi	Venturi Tube or Venturi Nozzle

a-2) Category [Standard]

Selects the fluid standard by type.

Description	Type	Standard
Orifice Flange Taps [AGA No.3 1992]	Orifice	AGA Report3 (1992)
Orifice Flange Taps [ASME MFC-3M 1989]		ASME MFC-3M (1989)
Orifice Corner Taps [ASME MFC-3M 1989]		
Orifice D and D/2 [ASME MFC-3M 1989]		
Orifice Flange Taps [ISO5167-2 2003]		[ISO5167-2 2003]
Orifice Corner Taps [ISO5167-2 2003]		
Orifice D and D/2 [ISO5167-2 2003]		
Orifice Flange Taps [ISO5167-1 1991]		ISO5167-1 (1991)
Orifice Corner Taps [ISO5167-1 1991]		
Orifice D and D/2 [ISO5167-1 1991]		
ASME FLOW NOZZLES [ASME MFC-3M1989]		Nozzle
ISA1932 nozzle [ISO5167-1 1991/ ISO5167-3 2003]	ISO5167-1 (1991)	
Long radius nozzle [ISO5167-1 1991/ ISO5167-3 2003]	ISO5167-3 (2003)	
ASME venturi tubes with a rough cast or fabricated convergent [ASME MFC-3M 1989]	Venturi	ASME MFC-3M (1989)
ASME venturi tubes with a machined convergent section [ASME MFC-3M 1989]		
Classical venturi tube 'as cast' convergent section [ISO5167-1 1991/ ISO5167-4 2003]		ISO5167 -1 (1991), ISO5167 -4 (2003)
Classical venturi tube with a machined convergent section [ISO5167-1 1991/ ISO5167-4 2003]		
Classical venturi tube with a rough-welded sheet-iron convergent section [ISO5167-1 1991/ ISO5167-4 2003]		
Venturi nozzle [ISO5167-1 1991/ ISO5167-3 2003]		ISO5167-1 (1991), ISO5167-3 (2003)

Note-----

The primary element diameter, pipe diameter and their ratio range differ depending on the fluid standard.

b) Primary element diameter

Configure the primary element diameter. Correct the expansion from a reference temperature using an expansion coefficient by material. Configuration range for the primary element is specified by standard. The following table shows the range.

b-1) primary element diameter and reference temperature Primary element diameter unit

Unit
mm
in

Reference temperature unit

Unit
degC
degF
Kelvin

b-2) Primary element material

Material
304 Stainless Steel
316 Stainless Steel
Carbon Steel
Hastelloy C
Monel

c) Pipe mechanism

Configure the pipe mechanism. Correct the expansion from a reference temperature using an expansion coefficient by material. Enter an inside diameter of the pipe for the pipe diameter.

c-1) Pipe diameter (inside diameter) and reference temperature

Pipe diameter unit

Same as the unit of primary element diameter

Reference temperature unit

Same as the unit of primary element diameter

c-2) Pipe material

Material
304 Stainless Steel
316 Stainless Steel
Carbon Steel
Hastelloy C
Monel

5.3.2 Conditions

Conditions for configuring the primary element diameter (d), pipe diameter (D), and primary element diameter/pipe diameter (d/D) are recommended for the MW100.

Conditions by standard are shown in the table below.

Description	Primary element Diameter [d]	Pipe Diameter [D]	d/D [β]	
Orifice flange taps [AGA No.3 1992]	0.45- [in]	2- [in]	0.1-0.75	
	11.4-[mm]	50-[mm]		
Orifice Flange Taps[ASME MFC-3M 1989]	-	50-900[mm]	-	
Orifice Corner Taps [ASME MFC-3M 1989]				
Orifice D and D/2 [ASME MFC-3M 1989]				
Orifice Flange Taps [ISO5167 -2 2003]	12.5-[mm]	50-1000[mm]	0.1-0.75	
Orifice Corner Taps [ISO5167 -2 2003]				
Orifice D and D/2 [ISO5167 -2 2003]				
Orifice Flange Taps [ISO5167 -1 1991]				
Orifice Corner Taps [ISO5167 -1 1991]				
Orifice D and D/2 [ISO5167 -1 1991]			0.2-0.75	
ASME FLOW NOZZLES [ASME MFC-3M1989]	high beta ratio nozzle	-	100-750[mm]	0.5-0.8
	low beta ratio nozzle			0.2-0.5
	throat tap flow nozzle			0.25-0.5
ISA1932 nozzle [ISO5167-1 1991/ ISO5167-3 2003]		50-500 [mm]	0.3-0.8	
Long radius nozzle [ISO5167-1 1991/ ISO5167-3 2003]		50-630 [mm]	0.2-0.8	
ASME venturi tubes with a rough cast or fabricated convergent [ASME MFC-3M 1989]		100-1200 [mm]	0.3-0.75	
ASME venturi tubes with a machined convergent section [ASME MFC-3M 1989]		50-250 [mm]	0.3-0.75	
Classical venturi tube 'as cast' convergent section [ISO5167-1 1991/ ISO5167-4 2003]		100-800 [mm]	0.3-0.75	
Classical venturi tube with a machined convergent section [ISO5167-1 1991/ ISO5167-4 2003]		50-250 [mm]	0.4-0.75	
Classical venturi tube with a rough-welded sheet-iron convergent section [ISO5167-1 1991/ ISO5167-4 2003]		200-1200 [mm]	0.4-0.7	
Venturi nozzle [ISO5167-1 1991/ ISO5167-3 2003]	50- [mm]	65-500 [mm]	0.316-0.775	

5.4 Fluid type, Operating range, reference condition and physical property

The following shows the configuration content for this item.

- Select a fluid standard and fluid type.
- For natural gas and steam, specify a composition.
- Specify the upper and lower limits in the pressure and temperature ranges in the physical properties table.
- Specify a reference pressure and reference temperature.

Output physical property tables and physical property values according to the details of configuration.

- A density table in the specified pressure and temperature ranges.
- Densities at a reference pressure and reference temperature
- A viscosity table in the specified temperature range
- Isentropic exponent

5.4.1 Fluid Standard and Fluid Type

The screenshot shows a software window titled "COE Configuration" with a sub-tab "Fluid Type Setup". On the left, a "COE Configuration Sequence" list includes: 1. COE meter type and No. Setup, 2. Primary Element and Pipe Setup, 3. Fluid Type Setup (highlighted), 4. Natural Gas Setup, 5. Operating Range Setup and Reference Condition Setup, 6. Fluid Physical Property Setup, and 7. Save and Send a Configuration. The main area contains a "Fluid Setup" section with two dropdown menus: "Category" set to "Natural Gas" and "Standard/Method" set to "AGA8 Detail Characterization Method". In the top right corner, there are two input fields: "Meter" with the value "DP" and "COE No." with the value "01". At the bottom right, there are three buttons: "< Back", "Next >", and "Cancel".

a) Category

Indicates a category.

Category
Natural Gas
Steam

b) Standard/Method

Indicates a fluid standard and method.

Category	Name/Method	Standard	Method
Natural Gas	AGA8 Detail Characterization Method	AGA Report 8	Detail
	AGA8 Gross Characterization Method 1		Gross 1
	AGA8 Gross Characterization Method 2		Gross 2
Steam	Superheated steam	IAPWS 97	-
	Saturated steam		-

5.4.2 Natural Gas

Enter a composition for the natural gas.

Enter a composition according to the standard and method.

5.4.2.1 AGA Report8 Detail

- There are 21 types of components.
- Mole by component is displayed in percentage.
- The sum of total moles [%] is displayed in Total Mole [%]. When the total mole is 100.0[%], you can proceed to the next step. When the total mole is not 100.0[%], you cannot proceed to the next step.
- Use the Standardize button to make the sum 100%. A new mole [%] for each component is a relative ratio of the mole [%] immediately before execution.
- Use the Reset button to reset the Total Mole and Component Mole to 0[%].

COE Configuration

Natural Gas Setup

Meter:
 COE No.:

Category: **Natural Gas**
 Name/Method: **AGA8 Detail Characterization Method**

Mole Component

Standardize Reset Total Mole: %

No	Component	Mole (%)	No	Component	Mole (%)
1	Methane (CH4)	90	12	n-Butane (C4H10)	0
2	Nitrogen (N2)	0	13	Iso Pentane (C5H12)	0
3	Carbon Dioxide (CO2)	0	14	n-Pentane (C5H12)	0
4	Ethane (C2H6)	10	15	n-Hexane (C6H14)	0
5	Propane (C3H8)	0	16	n-Heptane (C7H16)	0
6	Water (H2O)	0	17	n-Octane (C8H18)	0
7	Hydrogen Sulfide (H2S)	0	18	n-Nonane (C9H20)	0
8	Hydrogen (H2)	0	19	n-Decane (C10H22)	0
9	Carbon Monoxide (CO)	0	20	Helium-4 (He)	0
10	Oxygen (O2)	0	21	Argon (Ar)	0
11	Iso Butane (C4H10)	0			

< Back Next > Cancel

a) Standardize and Reset buttons and Total Mole

Button	Processing
Standardize	Total Mole: 100% (However, 0 when all components are 0[%].) Each Component Mole: a relative ratio of the mole [%] immediately before execution
Reset	Total Mole: 0[%] Each Component Mole: 0[%]

Display	Content
Total Mole	Sum of Component Mole [%]

b) Component Table To perform configuration, click the mole [%] of the component to specify, enter a value that satisfies the valid range for the component, and press the Enter key. The following table shows 21 types of components and their valid ranges.

AGA Report8 Detail Component and Mole Valid Range

#	Component Mole Percent [%]		Mole Valid Ranges [%] (Expanded Range)
1	CH4	Methane	0 - 100
2	N2	Nitrogen	
3	CO2	Carbon Dioxide	
4	C2H6	Ethane	
5	C3H8	Propane	0 - 12
6	H2O	Water	0 - Dew Point
7	H2S	Hydrogen Sulfide	0 - 100
8	H2	Hydrogen	
9	CO	Carbon Monoxide	0 - 3
10	O2	Oxygen	0 - .21
11	C4H10	Isobutane	0 - 6
12		n-Butane	
13	C5H12	Isopentane	0 - 4
14		n-Pentane	
15	C6H14	n-Hexane	0 - Dew Point* ⁷
16	C7H16	n-Heptane	
17	C8H18	n-Octane	
18	C9H20	n-Nonane	
19	C10H22	n-Decane	
20	He	Helium	0 - 3
21	Ar	ARGON	0 - 1

*⁷ The upper limit of dew point is not checked by the tool.

AGA Report8 Detail Sum of Components and Mole Valid Range

Sum of Components Mole Percent [%]	Mole Valid Range [%] (Expanded Range)
C4H10 : Isobutane and n-Butane's sum	0 - 6
C5H12 : Isopentane and n-Pentane's sum	0 - 4

c) Messages The following shows messages that appear during configuration. The following shows representative message examples and actions to be taken.

Example 1

Message	Please push [Enter] when you change data
Content	Pressing the Enter key is required after completing configuration of Mole [%] for the component currently selected.
Action	Press the Enter key after configuration is completed.

Example 2

Message	The value of xxx mole (XXX) should be between 0 . yy%
Content	The mole value percentage for the (XXX) component is outside of the valid range.
Action	Change the mole value percentage for the (XXX) component so that it is within the valid range.

Example 3

Message	The Total mole value shouldn't exceed 100%. Current total mole is zzz%
Content	The total mole is not 100[%].
Action	Method 1: Use the Standardize button to make the value 100[%]. Method 2: Change the Mole [%] for the component so that the total mole is 100[%].

5.4.2.2 AGA Report 8 Gross 1

COE Configuration

Natural Gas Setup

Meter:
COE No.:

Category: **Natural Gas**
Name/Method: **AGA 8 Gross Characterization Method 1**

Mandatory

Real gas relative density: at 60 degF, 14.73 psi abs

Carbon dioxide (CO2) mole: %

Volumetric gross heating value: at 60 degF, 14.73 psi abs

Optional

Hydrogen (H2) mole: %

Carbon monoxide (CO) mole: %

< Back Next > Cancel

The following shows the configuration items and valid ranges for AGA Report 8 Gross 1.

a) AGA Report 8 Gross 1 Mandatory Input and Valid Range

Contents	Valid Range (Expanded Range)		Remark
		Unit	
Real Gas Relative Density	0.554 - 0.87		at 60degF, 14.73 psi abs (15.56degC, 101.56 kPa abs)
CO2 Carbon Dioxide Mole	0 - 30	%	
Volumetric Gross Heating Value	17.76 - 42.87	MJ/m3	at 60degF, 14.73 psi abs
	477 - 1150	BTU/ft3	(15.56degC, 101.56 kPa abs)

Volumetric Gross Heating Value Unit

Unit
MJ/m3
BTU/ft3

b) AGA Report8 Gross 1 Optional Input and Valid Range

5.4.2.3 AGA Report 8 Gross 2

The following shows the configuration items and valid ranges for AGA Report8 Gross 2.

a) AGA Report 8 Gross 2 Mandatory Input and Valid Range

Contents		Valid Range (Expanded Range)	Unit	Remark
Real Gas Relative Density		0.554 - 0.87	-	at 60degF, 14.73 psi abs (15.56degC, 101.56 kPa abs)
CO2	Carbon Dioxide Mole	0 - 30	%	
N2	Nitrogen Mole	0 - 50		

b) AGA Report8 Gross 2 Optional Input and Valid Range

Contents		Valid Range (Expanded Range)	Unit	Remark
H2	Hydrogen Mole	0 - 10	%	
co	Carbon Monoxide Mole	0 - 3		

5.4.3 Fluid Operating Range

- The configuration values here are only used to calculate the density.
- The configuration values here are only used to calculate isentropic exponent and viscosity.
- Fluid Operating Ranges are difference from 'input ranges' of a VFM configuration.

Note

this setting is constrained by 'static pressure/temperature compensation' of the corresponding VFM configuration.

If this setting does not correlate with these conditions, outputs are error.

VFM configuration	COE configuration	
Static Pressure/Temperature compensation	Fluid type	Operation Range
Static Pressure and Temperature	Natural gas Superheated steam	-
Static Pressure (Temperature unused)	Saturated steam	selecting static pressure
Temperature(Static Pressure unused)		selecting temperature

- Specifies the upper and lower limits in the pressure and temperature ranges for the physical properties table.
- Specify the pressure limits so that the lower pressure limit is smaller than the upper pressure limit.
- The lower pressure limit and the upper pressure limit are absolute only (not gauge pressure).
- The lower pressure limit and the upper pressure limit are not out of the valid range, though it depends on the combination of settings on this screen.
- Specify the values so that the lower temperature limit is smaller than the upper temperature limit.
- The lower temperature limit and the upper temperature limit are not out of the valid range, though it depends on the combination of settings on this screen.

5.4.3.1 Natural Gas

Specifies the upper and lower limits in the pressure and temperature ranges, and a reference pressure and reference temperature for the natural gas.

COE Configuration

Operating Range Setup and Reference Condition Setup

Meter:
COE No.:

Category: **Natural Gas**
Name/Method: **AGA8 Detail Characterization Method**

Operating Range

Static Pressure: to

Temperature: to

Reference Condition

Reference conditions are used in calculation of reference density and volumetric flow rate at these conditions. Calculation dose not have influence even if reference conditions are set out of [Operating Range].

Reference Static Pressure: kPa abs
Reference Temperature: deg C

< Back Next > Cancel

1) Upper and lower limits in the pressure range

Unit	AGA8 Detail	AGA8 Gross1 or Gross2
	Valid value	
kPa absolute	0.0000005 - 275000.0	0.0000005 - 12000.0
bar absolute	0.000000005 - 2750.0	0.000000005 - 120.0
psi absolute	about 0.00000007 - 39885.4	about 0.00000007 - 1740.45

2) Upper and lower limits in the temperature range

Unit	AGA8 Detail	AGA8 Gross1 or Gross2
	Valid value	
degC	(-273.15) - 9726.85	(-10.15) - 64.85
degF	(-459.67) - 17540.33	(-13.73) - 148.73
Kelvin	0.0 - 10000.0	263 - 338

5.4.3.2 Superheated steam

COE Configuration

Operating Range Setup and Reference Condition Setup

Meter:
COE No.:

Category: **Steam**
Name/Method: **Superheated Steam**

Operating Range

Static Pressure: to

Temperature: to

Reference Condition

Reference conditions are used in calculation of reference density and volumetric flow rate at these conditions. Calculation does not have influence even if reference conditions are set out of [Operating Range].

Reference Static Pressure: kPa abs
Reference Temperature: deg C

< Back Next > Cancel

1) Upper and lower limits in the pressure range

Unit	Valid value
kPa absolute	101.4179 - 12857.52
bar absolute	1.014179 - 128.5752
psi absolute	about 14.7095 - 1864.825

2) Upper and lower limits in the temperature range

Unit	Valid value
degC	100 - 450
degF	212 - 842
Kelvin	about 373.15 - 723.15

Note

If the temperature and pressure range value input for Fluid Operating Range Setup is too wide, there is a large probability that a density calculation error will occur.

Category	Information
Message	The operating condition is near the acceptable limits for liquid and gas
Contents	The operating range has included saturated steam saturation curve or compressed water area.
Action	You'd better set operating range in superheated steam area.

5.4.3.3 Saturated steam (Pressure)

Note

 this setting is constrained by 'static pressure/temperature compensation' of the corresponding VFM configuration.

If this setting does not correlate with these conditions, outputs are error.

VFM configuration	COE configuration	
Static Pressure/Temperature compensation	Fluid type	Operation Range
Static Pressure (Temperature unused)	Saturated steam	selecting static pressure

Upper and lower limits in the pressure range

Unit	Valid value
kPa absolute	0.6571 - 21043
bar absolute	0.006571 - 210.43
psi absolute	about 0.00953 - 3052.02

5.4.3.4 Saturated steam (Temperature)

Note -----

this setting is constrained by 'static pressure/temperature compensation' of the corresponding VFM configuration.

If this setting does not correlate with these conditions, outputs are error.

VFM configuration	COE configuration	
Static Pressure/Temperature compensation	Fluid type	Operation Range
Temperature(Static Pressure unused)	Saturated steam	selecting temperature

Upper and lower limits in the temperature range

Unit	Valid value
degC	100 - 450
degF	33.8 - 698
Kelvin	274.15 -643.15

5.4.3.5 Suitable setting of Operating Range

Reference example

As well, a calculation of steam density is not relate with Operating Range.

Set your application's operating range when measuring static pressure/temperature.

<Natural Gas>

Pressure span

It's better to set "pressure span" of Operating Range by about 50-80[%] of the upper pressure range in Operating Range.

Temperature span

It's better to set "temperature span" of Operating Range by more than about 25degC (40degF, 25Kelvin) of the upper temperature range in Operating Range.

<Steam>

Vortex flow meter

it is not necessary to set Operating Range

DP transmitter

is is necessary to set Operating Range. But a calculation of "steam density" is not related with Operating Range.

Pressure span

Upper pressure range	:	Pressure span
Up to 1000kPa(10bar, 150psi) abs	:	More than 500kPa(5bar,80psi)
Up to 5000kPa(50bar, 750psi) abs	:	More than 2000kPa(20bar,300psi)
Up to 10000kPa(100bar,1500psi) abs	:	More than 3000kPa(30bar,450psi)

Temperature span

It's better to set "temperature span" of Operating Range by more than about 20-25degC (30-40degF,20-25Kelvin) of the upper temperature range in Operating Range.

5.4.3.6 Message

Note -----

If the temperature and pressure range value for Fluid Operating Range Setup is too wide, there is a large probability that a density calculation error will occur.

Category	ERROR
Message	There exists calculation ERROR with the given input of pressure and temperature. Please fill out another value.
Contents	The specified pressure or temperature range is inappropriate. Enter another value.
Action	Specify an appropriate value instead of the specified pressure and temperature.

5.4.4 Reference Condition

- Reference condition is designated as a reference pressure and a reference temperature.
- Reference conditions are used in calculation of 'reference density' and 'output volumetric flow rate at reference condition.'
- Calculation does not have influence even if reference conditions are set out of 'operating range'
- The upper and lower limits of reference pressure are same as the one of operating range.
- The upper and lower limits of reference temperature are same as the one of operating range.

Note -----

this setting is constrained by 'static pressure/temperature compensation' of the corresponding VFM configuration.

If this setting does not correlate with these conditions, outputs are error.

VFM configuration	COE configuration	
Static Pressure/Temperature compensation	Fluid type	Operation Range
Static Pressure and Temperature	Natural gas Superheated steam	-
Static Pressure (Temperature unused)	Saturated steam	selecting static pressure
Temperature(Static Pressure unused)		selecting temperature

Superheated steam

Operating Range

Static Pressure: to kPa abs ▼

Temperature: to deg C ▼

Reference Condition

Reference conditions are used in calculation of reference density and volumetric flow rate at these conditions. Calculation dose not have influence even if reference conditions are set out of [Operating Range].

Reference Static Pressure: kPa abs

Reference Temperature: deg C

Saturated steam (Static pressure)

Static pressure ▼

Operating Range

Static Pressure: to kPa abs ▼

Temperature: to deg C ▼

Reference Condition

Reference conditions are used in calculation of reference density and volumetric flow rate at these conditions. Calculation dose not have influence even if reference conditions are set out of [Operating Range].

Reference Static Pressure: kPa abs

Reference Temperature: deg C

Saturated steam (Temperature)

Temperature			
Operating Range			
Static Pressure:	Unused	to	Unused kPa abs
Temperature:	200	to	250 deg C
Reference Condition			
Reference conditions are used in calculation of reference density and volumetric flow rate at these conditions. Calculation dose not have influence even if reference conditions are set out of [Operating Range].			
Reference Static Pressure:	Unused	kPa abs	
Reference Temperature:	200	deg C	

5.4.5 Dryness [Only Saturated steam]

Refers to the moisture content of the steam

Operating Range Setup and Reference Condition Setup		Meter	DP
Category:	Steam	COE No.	01
Name/Method:	Saturated Steam		
Dryness:	100	%	

5.4.6 Fluid Physical Property

Displays physical property tables and physical property values calculated based on the configuration in Fluid Operating Range.

- A density table in the specified pressure range and temperature range.
- A reference density for the reference pressure and reference temperature.
- A viscosity table in the temperature range.
- Isentropic exponent

5.4.6.1 Natural Gas

COE Configuration

Fluid Physical Property Setup

Category: **Natural Gas**
 Name/Method: **AGAB Detail Characterization Method**

Meter: **DP**
 COE No.: **01**

Density: Units: **kg/m3**
 Reference Density: **7.32320063** kg/m3

Density in the operating ranges

No	Pressure (kPa abs)	Temperature (deg C)	Density (kg/m3)
1	1000	20	7.3232006
2	1333.33333333	20	9.8401446
3	1666.66666667	20	12.39640906
4	2000	20	14.99280028
5	1000	40	6.82183586
6	1333.33333333	40	9.15064022
7	1666.66666667	40	11.50737744
8	2000	40	13.89230883
9	1000	60	6.3879099
10	1333.33333333	60	8.55730285
11	1666.66666667	60	10.74681515
12	2000	60	12.95645491

Viscosity: Units: **Pa sec**

No	Temperature (deg C)	Viscosity (Pa sec)
1	20	1.0268312E-05
2	33.33333333	1.0268312E-05
3	46.66666667	1.0268312E-05
4	60	1.0268312E-05

Isentropic Exponent
 Value: **1.3**

< Back Next > Cancel

If natural gas selected, viscosity and isentropic exponent are fixed values.

a) Density table

A density table calculated in the temperature range and pressure range for Fluid Operating Range. The density unit can be selected from the following options.

Unit
kg/m3
lb/ft3

b) Reference density

table A reference density for the reference pressure and reference temperature for Fluid Operating Range. The unit is that in the density table.

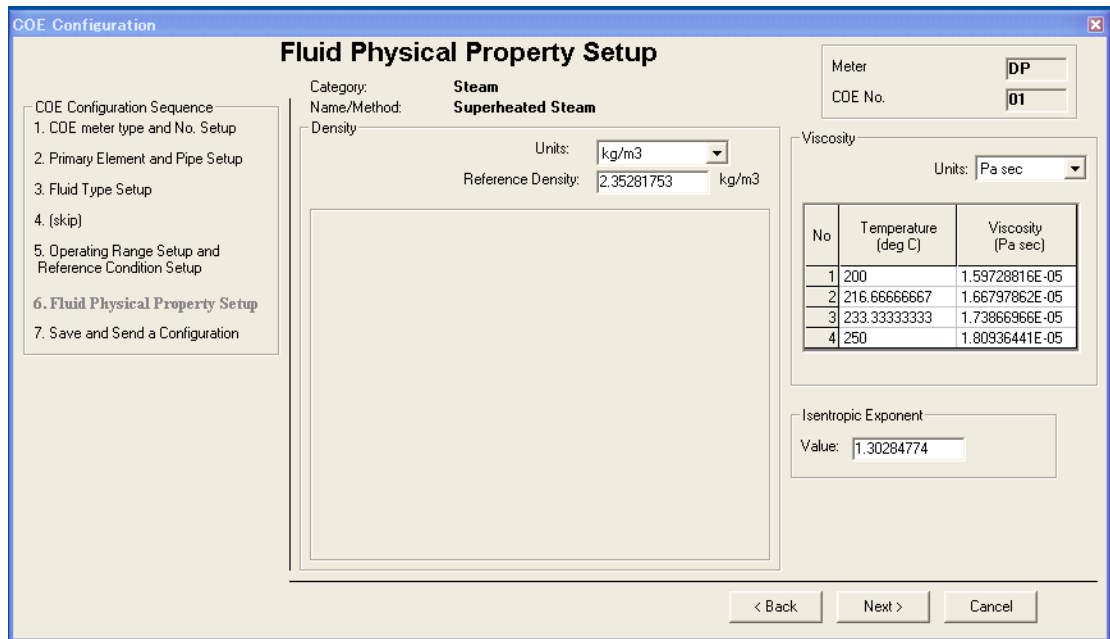
c) Viscosity table [Only DP Transmitter]

A viscosity in the temperature range for Fluid Operating Range. The viscosity unit can be selected from the following options.

Unit
Pa sec
lb ft-1 sec-1

d) Isentropic Exponent [Only DP Transmitter]

5.4.6.2 Steam (superheated steam, saturated steam)



a) Density table

Nothing here.

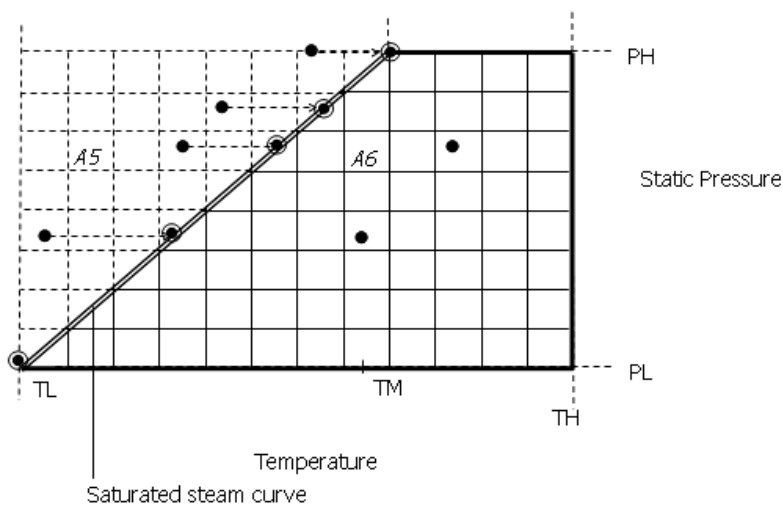
MW100 directly calculated the compensated density by static pressure/temperature.

b) Reference density

table A reference density for the reference pressure and reference temperature for Fluid Operating Range. The unit is that in the density table.

Unit
kg/m3
lb/ft3

b-1) compressed water region [Only Superheated steam]



Temperature	Value		
	TL	TM	TH
degC	100	330	450
degF	212	626	842

Static Pressure	Value	
	PL	PH
MPa	0.1014179	12.85752
psia	14.70941	1864.826

Area No	Pressure value	Temperature value	Reference Density
A5	above TL and left zone of saturated steam curve		the value on saturated steam curve compensated by 'pressure'
A6	Superheated area		The value in superheated zone

c) Viscosity table [Only DP Transmitter]

A viscosity in the temperature range for Fluid Operating Range. The viscosity unit can be selected from the following options.

Unit
Pa sec
lb ft-1 sec-1

d) Isentropic Exponent [Only DP Transmitter]

5.4.6.3 Message

Note

The following shows messages that appear during configuration. The following shows representative message examples and actions to be taken.

Category	ERROR
Message	The range specified in the step of FLUID OPERATING SETUP page is too narrow. Expand the range of Pressure or Temperature.
Contents	Since the specified upper or lower limit in the pressure or temperature range is inappropriate, a calculation error occurred. Re-specify the upper or lower limit in the pressure or temperature range.
Action	Expand the specified upper or lower limit in the pressure or temperature range on the previous screen (Fluid Operating Range).

5.5 Saving the Configuration and Downloading to the MW100

- Confirm the configuration for the COE configuration.
- Download the COE Configuration to the MW100.
- Save the COE Configuration in a file.

Note -----

It is recommended to download the COE Configuration to the MW100 when the MW100 stops measurement. It is possible to download the COE Configuration to the MW100 when the MW100 is starting MATH, however, a bump may occur to the output of flow calculation as a result of changes made when MATH is being started.

The screenshot shows a software window titled "COE Configuration" with a sub-dialog box titled "Save and Send a Configuration". On the left, a "COE Configuration Sequence" list includes steps 1 through 7, with step 7, "Save and Send a Configuration", highlighted. The main area of the dialog contains two input fields: "Meter" with the value "DP" and "COE No." with the value "01". Below these is a section titled "Send and Save COE Configuration" containing two checked checkboxes: "Send a [COE Configuration] to a Recorder" and "Save a [COE Configuration] (*.COE)". The "File Name:" field is populated with "123-01.COE". At the bottom right, there are three buttons: "< Back", "Finish" (which is highlighted with a dashed border), and "Cancel".

a) Downloading to the MW100

To download the COE Configuration to the MW100, select the checkbox. Clicking the Finish button starts downloading.

The download destination is the MW100 that is currently connected.

The download destination can be specified by selecting communication. Connect to a Recorder in Main Menu.

For more information, refer to the chapter "Communication with the MW100."

b) Saving to the file

To the COE Configuration to the file, select the checkbox. Clicking the Finish button starts saving.

'-(hyphen)' + 'coe number' + .COE is automatically added to the file

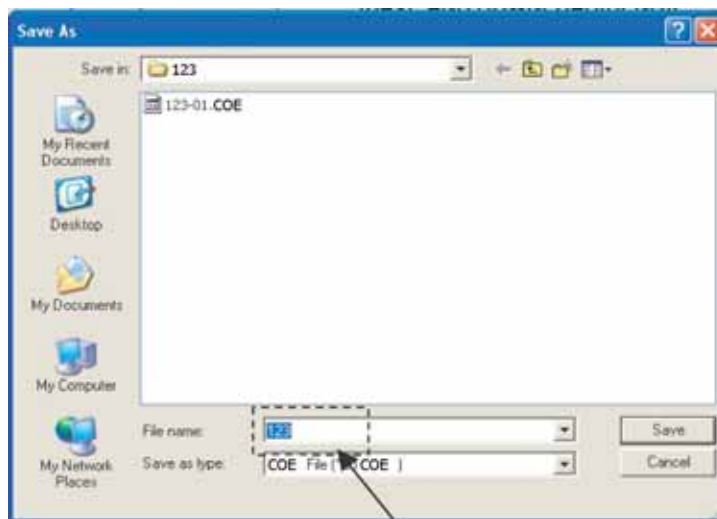
name (without an extension) that was described in the dialog box.

Note that the part that is automatically added cannot be specified by the user.

The maximum number of characters for the file name is 24 (the maximum number of characters that can be specified by the user is 17).

Extension		COE
File name (excluding extension)	Characters used	Single-byte character (/ ' \ : * ? ' " < > ' or ; cannot be used)
	Conditions	'-(hyphen) + 'coe number' coe number : 01 to 10
Number of characters		Up to 24 characters (Out of which, 3 characters are for the extension and 1 character is for the '.' period.)
Directory name Characters used		Single-byte character (/ ' \ : * ? ' " < > ' cannot be used)

Example: 123-01.COE



- Specify just the name.
- A coe number and extension (COE) are added automatically.

Chapter 6 Configuring Communication with the MW100

6. Configuring Communication with the MW100



Configuration of communication with the MW100 is performed by selecting Communication Connect to a Recorder in Main Menu.

- Specify a destination address to download a COE configuration and a VFM Configuration to the MW100.
- Specify the login name and password for the MW100.
- Establish communication with the MW100.

6.1 Communication method

Communication is performed using the TCP/IP protocol.

6.2 IP Setting

Specify the destination address to download a COE configuration and a VFM configuration to the MW100.

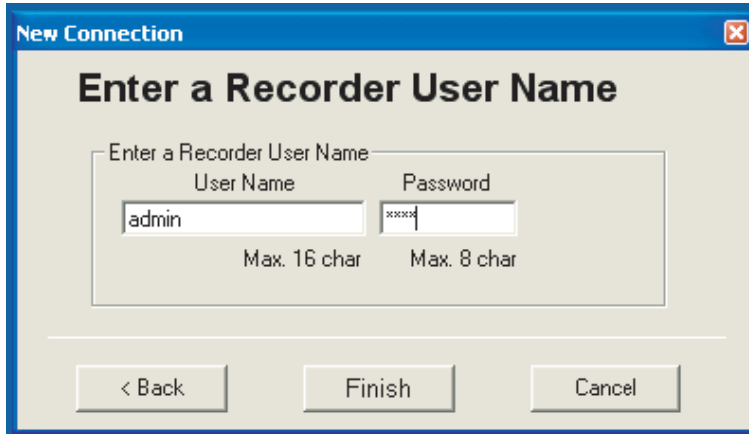
a) Specify an IP address.

Option selection	Address	Expression
Name	Address name	Specify a registered address.
IP	xxx.xxx.xxx.xxx Specify a decimal address. Use a period.	Specify an IP address.

b) Specify the port number. The default value for a port that is used between MW100MVTool and MW100 is 34318.

6.3 Login Name

To communicate with the MW100, the user name and password specified on the MW100 need to be specified in MW100MVTool.



The screenshot shows a dialog box titled "New Connection" with a close button in the top right corner. The main heading is "Enter a Recorder User Name". Below this, there is a sub-heading "Enter a Recorder User Name" and two input fields. The first field is labeled "User Name" and contains the text "admin", with "Max. 16 char" below it. The second field is labeled "Password" and contains masked characters "xxxx", with "Max. 8 char" below it. At the bottom of the dialog, there are three buttons: "< Back", "Finish", and "Cancel".

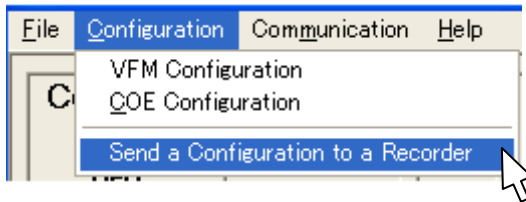
For more information on the user name and password, refer to the Data Acquisition Unit User's Manual (IM MW100-1E).

6.4 Communication with the MW100

Click the Finish button to establish communication with the MW100 from the communication configuration for the MW100. At this point, save the configuration for communication with the MW100.

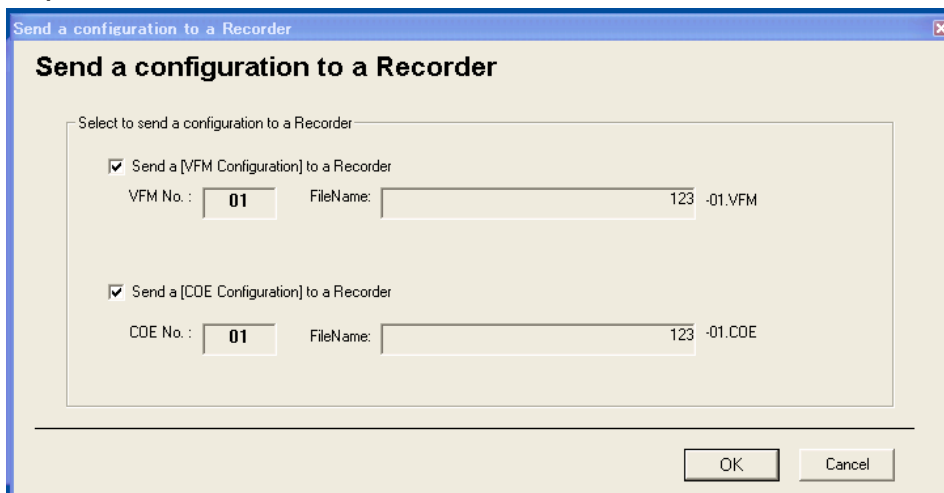
Chapter 7 Send a All configuration to a MW100

7. Send a All Configuration to a MW100



Batch downloading to the MW100 can be performed by selecting Configuration - Send a Configuration to a Recorder on Main Menu.

- Download a COE configuration to the MW100.
- Download a VFM configuration to the MW100.
- If there is no downloadable configuration data, downloading cannot be selected.
- After downloading is completed correctly, a prompt appears to ask whether to save the configurations to the file. When saving is selected, the configurations are saved (only when the VFM configurations and the COE configuration that have been sent are not stored in the file.).



- Download the VFM Configuration to the MW100. To download the VFM configuration to the MW100, select the checkbox. Clicking the OK button starts downloading.
- Download the COE Configuration to the MW100. To download the COE Configuration to the MW100, select the checkbox. Clicking the OK button starts downloading.

Note -----

The VFM Configuration can be downloaded only when the MW100 stops measurement. It is recommended to download the COE Configuration to the MW100 when the MW100 stops measurement. It is possible to download the COE Configuration to the MW100 when the MW100 is starting MATH, however, a bump may occur to the flow calculation output as a result of changes made when MATH is being started.

Chapter 8 Saving and Opening Configuration Data

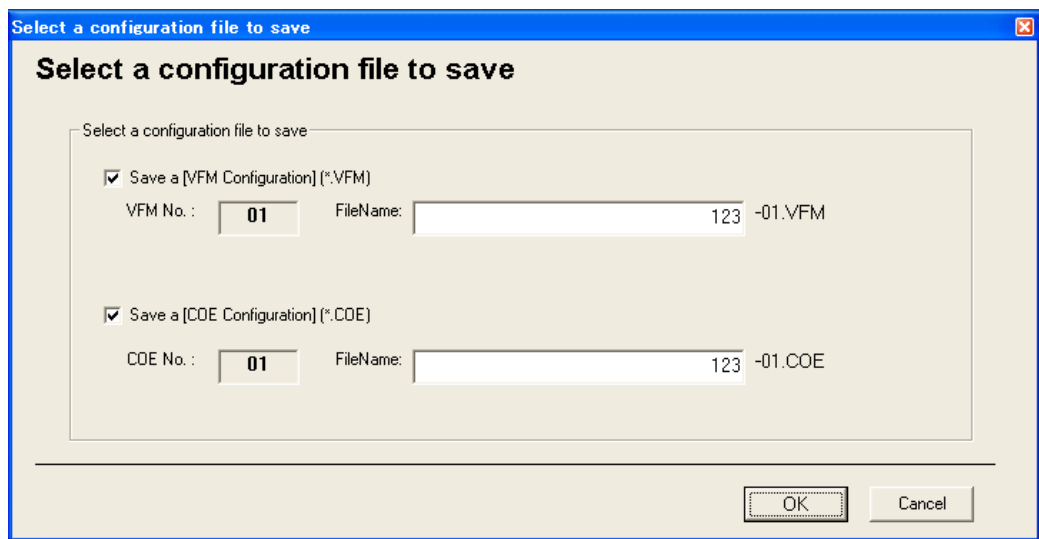
8. Saving and Opening Configuration Data

8.1 Saving Configuration Data

Saving the configuration data is performed by selecting File - Save on Main Menu.

- Save a VFM configuration in a file (*-'vfm number'.VFM)
- Save a COE configuration in a file (*- coe number .COE)

If there is no data to save available, saving cannot be selected.



a) Saving the VFM configuration in the file.

To save the VFM configuration in the file, select the checkbox. Clicking the OK button starts saving.

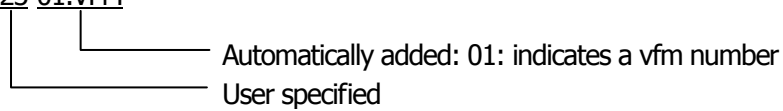
'-(hyphen)' + 'vfm number'.VFM is added automatically to the file name (without the extension) that was described in the dialog box.

Note that the part that is automatically added cannot be specified by the user.

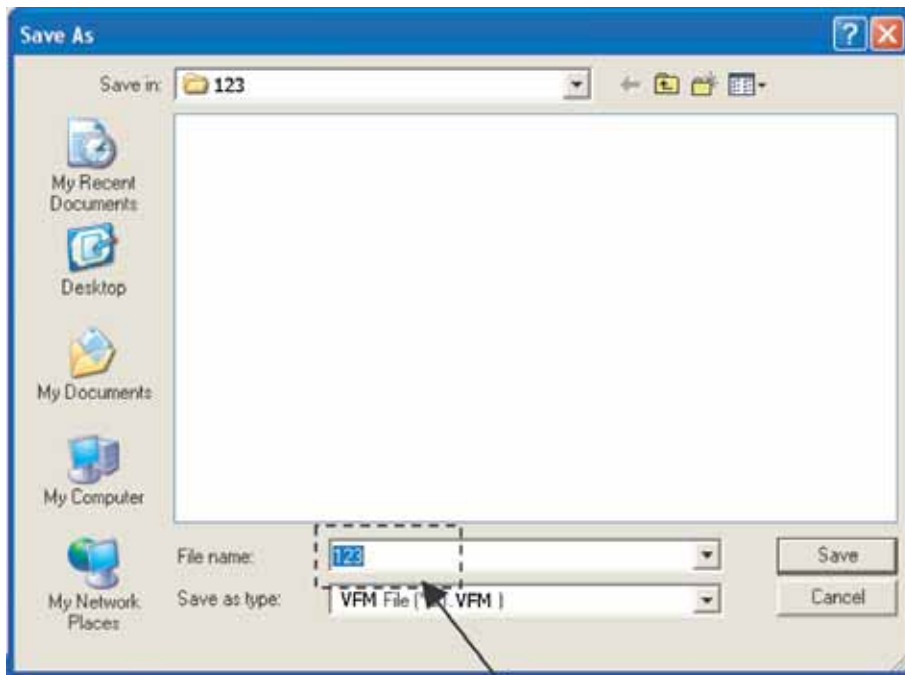
The maximum number of characters for the file name is 24 (the maximum number of characters that can be specified by the user is 17).

Extension		VFM
File name (excluding extension)	Characters used	Single-byte character ('/' '\': '* ' ? ' ' < > ' ' ' ; ' or ' ' ; ' cannot be used)
	Conditions	'-'(hyphen) +\vfm number vfm number: 01 to 10
Number of characters		Up to 24 characters (Out of which, 3 characters are for the extension and 1 character is for the '.' period.)
Directory name Characters used		Single-byte character ('/' '\': '* ' ? ' ' < > ' ' cannot be used)

Example: 123-01.VFM



User specified



Specify just the name.
Vfm number and extension (.VFM) are added automatically.

b) Saving the COE configuration in the file

To save the COE configuration in the file, select the checkbox. Clicking the OK button starts saving.

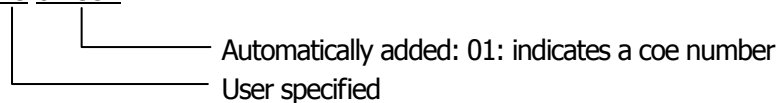
`-(hyphen)' + 'coe number'.COE is automatically added to the file name (without an extension) that was described in the dialog box.

Note that the part that is automatically added cannot be specified by the user.

The maximum number of characters for the file name is 24 (the maximum number of characters that can be specified by the user is 17).

Extension	.	.COE
File name (excluding extension)	Characters used	Single-byte character ('/' '\ ' ':' '*' '?' '<' '>' ' ' ';' or ',' cannot be used)
	Conditions	`-(hyphen)' + 'coe number' coe number : 01 to 10
Number of characters		Up to 24 characters (Out of which, 3 characters are for the extension and 1 character is for the '.' period.)
Directory name Characters used		Single-byte character ('/' '\ ' ':' '*' '?' '<' '>' or ' ' cannot be used)

Example: 123-01.COE



8.2 Opening Configuration Data

Saving configuration data is performed by selecting File - Open on Main Menu.

Open a VFM configuration from a file (*- vfm number .VFM).

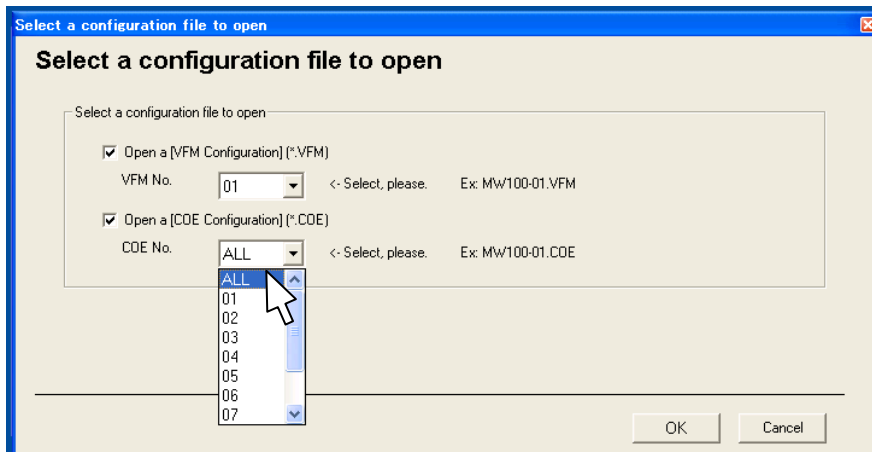
If you choose 'ALL' from drop down box, ALL VFM configuration file are shown.

If you choose one of number(1-10) from drop down box, only VFM configuration files of the number are shown.

Open the configuration data in a COE configuration from a file (*- coe number.COE).

If you choose 'ALL' from drop down box, ALL COE configuration file are shown.

If you choose one of number(1-10) from drop down box, only COE configuration files of the number are shown.



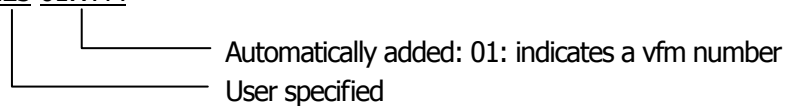
a) Opening the VFM Configuration from the file

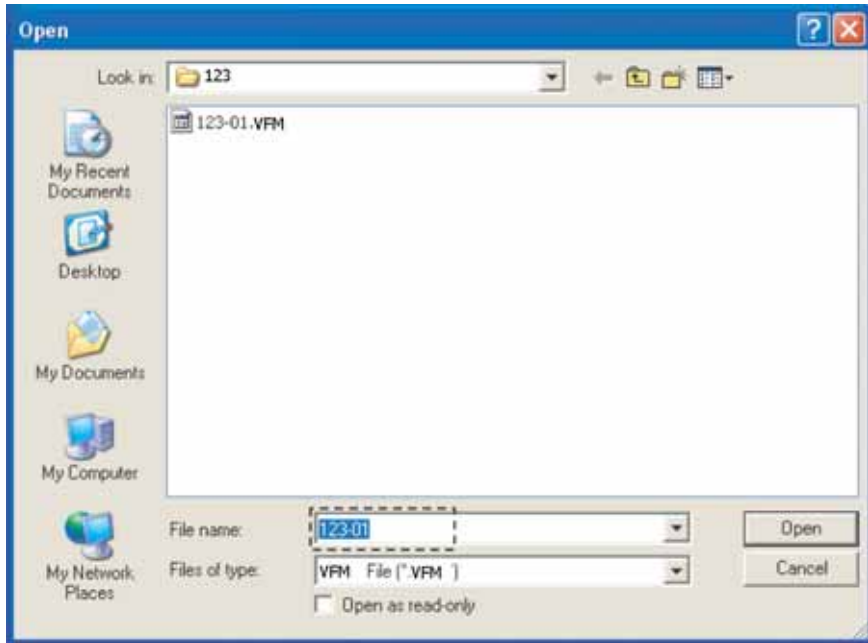
To open the VFM Configuration from the file, select the checkbox. Clicking the OK button starts opening.

Note that the file name to be selected must satisfy the following conditions.

Extension		.VFM
File name (excluding extension)	Characters used	Single-byte character (/ ' \ : * ? < > ' ; or ' ; cannot be used)
	Conditions	`-(hyphen) +\vfm number vfm number : 01 to 10
Number of characters		Up to 24 characters (Out of which, 3 characters are for the extension and 1 character is for the '.' period.)
Directory name used	Characters	Single-byte character (/ ' \ : * ? < > or cannot be used)

Example: 123-01.VFM





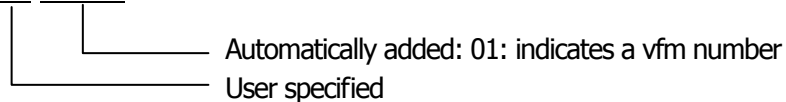
b) Opening the COE configuration from the file

To open the COE configuration from the file, select the checkbox. Clicking the OK button starts opening.

Note that the file name to be selected must satisfy the following conditions.

Extension		.COE
File name (excluding extension)	Characters used	Single-byte character ('/' '\': '* '?' '<' >' ' ' ' ' ; or ' ;' cannot be used)
	Conditions	'-'(hyphen) + 'coe number' coe number : 01 to 10
Number of characters		Up to 24 characters (Out of which, 3 characters are for the extension and 1 character is for the '.' period.)
Directory name Characters used		Single-byte character ('/' '\': '* '?' '<' >' or ' ' cannot be used)

Example: 123-01.COE



Chapter 9 Report Creation and Log

9. Report Creation and Log

9.1 Report Creation

Creating a report is performed by selecting File - Report on Main Menu.

- . Create the current configuration on MW100MVTool as a report.
- .The file is in CSV file format (*.CSV).

The following example shows the display details.
File name: 123.CSV

```
===== <<REPORT FILE>> =====
Reported Time: 03/15/2008 17:03:57

==[User Information]===
User Name: 123
User ID : XXXXX-XXX-XXXXX-XXXXX
=====

=[General Information]=
Program Name : MW100MVTool
Program Version : X.XX.XX
Common Set Version: 1.00.00
=====

==[Communication]=====
State : Established
Recorder IP : 192.168.1.101
Recorder Port : 34318
Recorder User Name: admin
Communication Type: EtherNet
=====
```

```

=====
==[VFM Configuration]=====
File Name      :      123-01.VFM
Saved Time     :      03/15/2008 16:41:03
File Format Version: 1.02.00
VFM No.       :      1
VFM meter type :      DP
COE No. related with this [VFM Configuration]. : 1

<Output Setup>
OutPut Mass Flow rate Unit :      kg/min
OutPut Volumetric Flow rate Unit :      m3/min

<Input Setup>
Low Cut :ON
Low Cut Value [%]: 1
Gauge Pressure or Absolute Pressure : Absolute Pressure

Differential Pressure Unit :      kPa
Static Pressure Unit :      kPa
Differential Pressure Recorder Channel No: 11
Static Pressure Recorder Channel No : 21
Temperature Recorder Channel No : 22
Differential Pressure Lower Range Value : 0
Differential Pressure Upper Range Value : 100
Static Pressure Lower Range Value : 0
Static Pressure Upper Range Value : 2000
Temperature Lower Range Value : 0
Temperature Upper Range Value : 500
=====

```

```

==[COE Configuration]=====
File Name      : 123-01.COE
Saved Time     :      03/15/2008 17:03:32
File Format Version: 1.02.00
COE No. : 1
COE meter type:      DP
<Primary Element and Pipe Setup>
Primary Element Type:      Venturi
Primary Element Name:      ASME Venturi Tubes With a rough Cast or Fabricated
Convergent [ASME MFC-3M 1989]
Primary Element Code:      17
Primary Element Diameter : 127
Primary Element Diameter Unit : mm
Primary Element Temperature : 20
Primary Element Temperature Unit: degC
Primary Element Material : 304 Stainless Steel
Pipe Diameter : 254
Pipe Diameter Unit : mm
Pipe Temperature : 20
Pipe Temperature Unit: degC
Pipe Material : Carbon Steel

```

<Fluid Type Setup>

Fluid Type : Gas
Fluid Category: Natural gas
Fluid Name: AGA8 Detail Characterization Method

<Mole Component Information>

Detail Total Mol		[%]: 100	
Methane	Mole<CH4>	[%]: 90	
Nitrogen	Mole<N2>	[%]: 0	
Carbon Dioxide	Mole <CO2>	[%]: 1	
Ethane	Mole<C2H6>	[%]: 5	
Propane	Mole<C3H8>	[%]: 3	
Water	Mole<H2O>	[%]: 0	
Hydrogen Sulfide	Mole<H2S>	[%]: 1	
Hydrogen	Mole<H2>	[%]: 0	
Carbon Monoxide	Mole <CO>	[%]: 0	
Oxygen	Mole<O2>	[%]:	0
Iso Butane	Mole<C4H10>	[%]: 0	
n-Butane	Mole<C4H10>	[%]: 0	
Iso Pentane	Mole<C5H12>	[%]: 0	
n-Pentane	Mole<C5H12>	[%]: 0	
n-Hexane	Mole<C6H14>	[%]: 0	
n-Heptane	Mole<C7H16>	[%]: 0	
n-Octane	Mole<C8H18>	[%]: 0	
n-Nonane	Mole<C9H20>	[%]: 0	
n-Decane	Mole<C10H22>	[%]: 0	
Helium-4	Mole<He>	[%]: 0	
Argon	Mole<Ar>	[%]: 0	

<Reference Condition>

<Reference Pressure and Reference Temperature Information>

Reference Pressure Unit : kPa abs
Reference Pressure : 101.325
Reference Temperature Unit: degC
Reference Temperature : 0

<Reference Density Information>

Reference Density Unit : kg/m3
Reference Density Value: 0.80755407

<Operating Range Setup>

Static Pressure Unit : kPa abs
Static Pressure Lower Range : 1000
Static Pressure Upper Range : 1500
Static Pressure Range Midpoint : 1250
Temperature Unit : degC
Temperature Lower Range : 30
Temperature Upper Range : 60
Temperature Range Midpoint : 45

<Physical Property Information>

<Density Information>

Density Unit	kg/m3		Density (kg/m3)
Pressure (kPa abs)	Temperature (deg C)		
1000	30		7.31146571
1166.666667	30		8.56022313
1333.333333	30		9.81780955
1500	30		11.08429945
1000	45		6.94276118
1166.666667	45		8.12367555
1333.333333	45		9.31148058
1500	45		10.50620797
1000	60		6.61126371
1166.666667	60		7.73199318
1333.333333	60		8.85813702
1500	60		9.98970227

<Viscosity Information>

Viscosity Unit	Pa sec	
Temperature (deg C)	Viscosity (Pa sec)	
30	1.02683E-05	
40	1.02683E-05	
50	1.02683E-05	
60	1.02683E-05	

<Isentropic Exponent Information>

Isentropic Exponent Value: 1.3

=====
[END]

9.2 Log

MW100MVTool records some operations in a history file.

File name	Content	Remark
MW100MVTool.log	Mainly saving to and opening the file, and communication with the MW100.	The file storage destination is the location where MW100MVTool program was stored when it was installed.
MW100MVTool_EtcInfo.log	Mainly the occurrence of calculation errors in the COE configuration	Maximum capacity: About 1000 KB

MW100MVTool.log

"2008-03-12 11:18:08", "SAVE", "Success ", "123-01.VFM", "saved configuration to a file"
"2008-03-12 11:19:50", "SAVE", "Success ", "123-01.COE", "saved configuration to a file"
"2008-03-12 11:20:03", "SEND", "Success ", "Login ", "10.0.233.70 Log in a Recorder"
"2008-03-12 15:51:25", "SAVE", "Cancel ", " * -01.COE", "Canceled to save configuration to a file"
"2008-03-12 15:51:35", "SEND", "Success ", "Login ", "10.0.233.70 Log in a Recorder"
"2008-03-12 15:51:42", "SEND", "Failure ", "TEMP *-01.COE", "10.0.233.70 Fail to Sent configuration to a Recorder"
"2008-03-12 15:52:00", "SAVE", "Success ", "123-01.COE", "saved configuration to a file"
date operation result information

Operation	Contents
OPEN	Configuration data was opened from the file.
SAVE * ⁸	Configuration data was saved to the file.
SEND * ⁹	Communication with the MW100 Log in once for communication.

MW100MVTool_EtcInfo.log

"2006-12-18 18:47:43", "Error", "600", -1, "Physical Calc lib Error- CL_CALC"
"2006-12-18 18:47:51", "Error", "600", 8, "Physical Calc lib Error- CL_RANK"
date kind code information

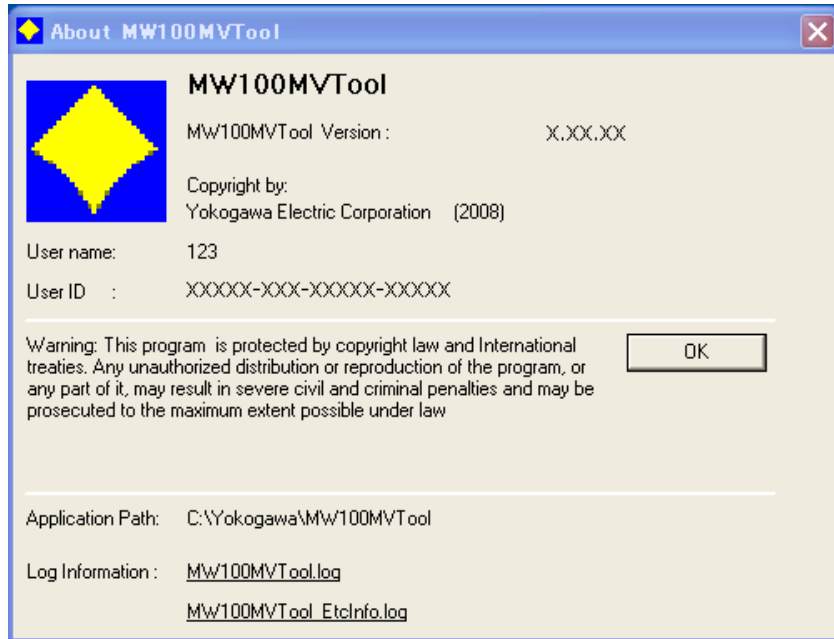
*⁸ When downloading to the MW100 is performed, data is downloaded in the state of TEMP number.extension, and the file name is downloaded to the MW100 when the file is saved.

*⁹ Same as above

Chapter 10 Help

10. Help

Displays information about the tool.



Chapter 11 Error Message and Warning Message

11. Error Message and Warning Message

The following shows representative error messages and warning messages.

Message Display: Displayed in the message box. Log File: Recorded to MW100MVTool_EtcInfo.log.

COE configuration setting

The following shows representative error or warning messages generated when configuration operations in COE configuration are performed.

1)

Category	ERROR	
Message		
	Display	There exists calculation ERROR with the given input of pressure and temperature. Please fill out another value.
	LogFile	Physical Calc lib Error . CL_CALC Log Code
Log Code & Sub Code	600	
	1	
Contents	The pressure or temperature configuration range is inappropriate. Enter another value.	
Action	Specify an appropriate value instead of the specified pressure or temperature value.	

2)

Category	ERROR	
Message		
	Display	The range specified in the step of [FLUID OPERATIONG SETUP] page is too narrow. Expand the range of Pressure or Temperature.
	LogFile	Physical Calc lib Error. CL_RANK
Log Code & Sub Code	600	
	8	
Contents	The upper or lower limit in the pressure or temperature range specified on the Fluid Operating Range screen is too narrow. Reconfigure the values.	
Action	Expand the specified upper or lower limit in the pressure or temperature range on the previous screen (Fluid Operating Range).	

When Communication with the MW100 is performed:

- When an errors occur or a warnings are generated, the following messages appear on the display.
- The following messages are representative examples.
- For more information on error messages, also refer to the section "Error Display" of the Data Acquisition Unit User's Manual (IM MW100-1E).

Category	Error No	Display Message	Action to be taken [] indicates the side on which the action is taken.
ERROR	E84	Incorrect coefficient coe number format.	[MW100MVTool] Select a correct number
	E85	Incorrect input channel number format or select nonexistent number.	MW100MVTool] Enter an appropriate MW100 channel number in the input (differential pressure,static pressure, and temperature).
	E83 E87 E88	Reseverd	
	E203	Cannot execute when in measurement mode.	[MW100] Change Setting Mode.
	E405	Not allowed to execute this command.	[MW100MVTool] Login at a level that allows execution of this command.
	E501	Login First	[MW100MVTool] First,finish logging in.
	E502	Login failed. Try again.	[MW100MVTool] Enter the correct user name and password.
	E503	Connection count exceeded the upper limit.	[MW100] Close unneeded connections and reconnect.
	E504	Connection has been lost.	[MW100MVTool] Try to make a new connection.
	E505	Connection has time out.	[MW100MVTool] Try to make a new connection.
WARNING	E508	Connecting has been failed	[MW100MVTool and MW100] Check the connection, and the like.
	E86	Sending configurations was aborted because of MATH executing.	[MW100] Not downloaded to the MW100. Changing the configuration in setting mode is recommended.