Instructions for SMV 3000 Multivariable Configuration (MC) Data Sheets

Similar to the TC option for ST 3000 transmitters, the MC option for the SMV 3000 provides a service to our customers which results in the transmitter leaving the factory completely configured for their specific application. There is no doubt that the configuration of the SMV 3000 is more complex than the configuration of the ST 3000 due to the following:

SMV 3000 requires configuration of differential pressure, static pressure, temperature and flow variables.

PV4, the flow variable, requires flow data for Standard Flow or Dynamic Flow Compensation. Dynamic flow compensation requires specific flow parameters such as type of primary element, bore diameter etc.

This following will explain configuration terms and guide you in completing the MC Option Sheets (4 pages) so that the FMPM factory can provide this service efficiently without error. These sheets must be faxed to Lawrence Vanell (602-313-3263) or mailed electronically to Lawrence.Vanell@IAC.Honeywell.Com in FI Applications Engineering at the time of order. MC option sheets faxed after the SMVs have been ordered will delay the shipment. Inaccurate information or incomplete information will also result in delayed shipments.

See SMV 3000 Multivariable Configuration Sheets - MC option provided on Excel spreadsheet - MOption.XLS. You can also find this file on the Honeywell M&C Intranet. Also, for more information concerning configuration of the SMV 3000, please see the SCT 3000 software help files.

Step 1 - Honeywell S.O. Number
Complete the Honeywell Order Number for our reference.

Step 2 - Model Number
Complete the SMV 3000 model number as entered on order.

General Configuration Section

Step 3 - Tag I.D. Number
The engineering tag identification for the customer's transmitter. Can not be more than 8 digits.

Step 4 - Scratch Pad
Data that can be stored inside the transmitter. As an example, customer could enter date of calibration. 32 spaces are maximum.

Step 5 - Mode of Operation
This determines whether the transmitter will provide an analog output (4 - 20 mA) for one of the process variables or the Honeywell DE digital output for as many as all 4 process variables. Analog mode is the default.

Step 6 - Analog Output Choice
If analog mode of operation is chosen in Step 5, you now must choose which process variable to output. The choices are PV1 = differential pressure, PV2 = static pressure, PV3 = temperature and PV4 = compensated flowrate. PV4 is the default. Choose only one.
Step 7 - PV DE Mode Broadcast
If DE mode of operation is chosen in Step 5, you now must choose how many process variables to output to the TDC/TPS control system. Remember, to output PV4 to the controller, you must turn on all process variables. The SV secondary variable for the SMV 3000 is meter body temperature. The default is PV1 On.

Step 8 - Line Filter
This choice is dependent on the frequency of the power supply for the transmitter. 60 Hz is the default.

Step 9 - Failsafe Direction
This is a hardware configuration. You choose to have the jumper on the SMV 3000 main board configured for upscale burnout or downscale burnout in case of a critical transmitter failure. Upscale is the default.

**Differential Pressure - PV1 - Configuration Section**

Step 10 - PV1 Output Conformity
Determines the output function for PV1- differential pressure. Linear provides 4 - 20 mA output linear to dp and Square Root provides 4 - 20 mA output as the square root of differential pressure. This choice has no affect on flow calculation in PV4. Linear output is default.

Step 11 - PV1 Damping
Damping can be used to provide more averaging of the PV measurement and provide a more stable output. Higher damping time in seconds could be used when the process measurement is changing rapidly. Default is 0 seconds.

Step 12 - PV1 Eng. Units
The output for differential pressure can be provided based on different engineering units. Differential pressure in Inches of H2O at 39 deg. F is the default.

Step 13 - PV1 Range
Choose the range of differential pressure for the 4 - 20 mA analog output. For example, a LRV = 50 Inches H2O and a URV = 400 Inches H2O would result in a 4 mA output signifying 50 inches H2O and a 20 mA output signifying 400 inches H2O. The defaults are LRV = 0 and URV = 100 Inches H2O at 39 deg. F.

**Static Pressure - PV2 - Configuration Section**

Step 14 - PV2 Damping
Damping can be used to provide more averaging of the PV measurement and therefore provide a more stable output. Higher damping time in seconds, could be used when the process measurement is changing rapidly. Default is 0 seconds.

Step 15 - PV2 Engineering Units
The output for static pressure can be provided based on different engineering units. Static pressure in PSI is the default. Whether the pressure measurement is Absolute or Gauge depends on the transmitter model chosen. SMA models will output Absolute for the pressure measurement and SMG models will output Gauge for the pressure measurement.
Step 16 - PV2 Range
Choose the range of static pressure for the 4 - 20 mA analog output. For example, a LRV = 50 psia and a URV = 600 psia would result in a 4 mA output signifying 50 psia and a 20 mA output signifying 600 psia. The defaults are LRV = 0 and URV = 750 psia for SMA125 model and LRV = 0 and URV = 1000 psig for SMG170 model.

Step 17 – Barometric Pressure
Enter the barometric pressure at your location. This should only be entered if you have selected the SMG170, which measures gauge pressure. The barometric pressure is added to the gauge pressure and used in the flow calculation – PV4. The default is 14.7 psia.

**Process Temperature - PV3 - Configuration Section**

Step 18 - PV3 Damping
Damping can be used to provide more averaging of the PV measurement and therefore provide a more stable output. Higher damping time in seconds, could be used when the process measurement is changing rapidly. Default is 0 seconds.

Step 19 - PV3 Probe Type
The SMV 3000 will accept resistance and millivolt inputs from Resistance Temperature Detectors (RTDs) and Thermocouples (TCs). The following are acceptable: 100-Ohm Platinum DIN RTD, Type T Thermocouple, Type J Thermocouple, Type K Thermocouple and Type E Thermocouple. The 100-Ohm Platinum DIN RTD is the default.

Step 20 - PV3 Engineering Units
The output for process temperature can be provided based on different engineering units. Process temperature in degrees Celsius is the default.

Step 21 - PV3 Range
Choose the range of process temperature for the 4 - 20 mA analog output. For example, a LRV = 200 deg. C. and a URV = 900 deg. C. would result in a 4 mA output signifying 200 deg. C. and a 20 mA output signifying 900 deg. C. The defaults are LRV = -200 and URV = 450 deg. C.

Step 22 - PV3 Cold Junction Compensation
Only applies for a SMV 3000 configured for one of the four Thermocouples. Internal provides Thermocouple compensation based on the termination assembly temperature and is the default. You can also choose an external temperature for cold junction compensation. If external is chosen, you must supply the temperature.

Step 23 - PV3 TC Fault Detection
Determines status of SMV 3000 output should a RTD or Thermocouple sensing or compensation wire breaks. If Fault Detection is on, the transmitter will drive its temperature output upscale or downscale (critical status) as determined by the Failsafe Configuration jumper in the event of an open RTD or TC lead condition. The same conditions will result for an open RTD sensing lead or any TC lead in a SMV 3000 with the fault detection off. But, an open RTD compensation lead will automatically be reconfigured to operate without the compensation lead, which avoids a critical status condition. For example, with Fault Detection off, the SMV 3000 would automatically configure a 3 wire RTD with broken compensation lead to a 2 wire RTD without a Critical Status flag. The Fault Detection default is On.

Step 24 - PV3 Output Characterization
Choose whether you want the transmitter to provide a linear output, which is proportional to temperature for PV3 input, or a non-linear output which is proportional to resistance for RTD input or millivolts or volts for TC input. Linear output proportional to temperature is the default.
Flow - PV4 - Configuration Section

You will have a choice of flow configuration for the SMV 3000. You can choose Dynamic Flow Configuration for the Primary Elements listed on the MC option sheets. Or, if you are using a Primary Element that is not listed in the Dynamic Flow Section, you should use the Standard Flow Equations.

Step 25 - Flow Configuration Not Needed
If the SMV 3000 is being used as a multivariable transmitter for PV1, PV2 and/or PV3 and does not need flow calculated and output as PV4, check the box and do not complete the PV4- Flow Section.

Dynamic Flow Compensation Section
The SMV 3000 allows the customer to choose Dynamic Flow Compensation for the Primary Elements listed on the MC option sheets. If you do not see your Primary Element listed, use the Standard Flow Compensation Section below.

Step 26 – Flow Element Type
Select the Flow Element Type. Also, enter the material of the primary element (example is 304SS), the bore diameter of the primary element in inches and the design temperature of the fluid. Material bore diameter and design temperature of fluid can be found from the Primary Element Sizing Sheet.

Step 27 - Fluid State
Enter the physical state of the fluid to be measured. Select steam, gas or liquid.

Step 28 – Flow Data
Enter the design (flowing) pressure, design (flowing) temperature and design (flowing) density for gas applications. Enter the Standard (base) density for gas and liquid applications when choosing Volumetric flow at Standard Conditions. Do not enter any data here for steam applications.

Step 29 - Fluid Name
Enter the name of the fluid you want to measure. Examples are air, hydrogen, water etc. Must be completed. If a custom liquid is chosen (a liquid not listed in the SCT 3000 Fluid Database), you must complete the Density and Viscosity vs. Temperature in the Custom Liquid section.

Step 30 - Pipe Properties
Enter material of the process pipe, pipe schedule (example is Schedule 40S) and internal diameter of the pipe in inches. Data can be found in the primary element sizing sheet.

Step 31 - Isentropic Exponent
Used in the Gas Expansion factor calculation, this value can be found in the primary element sizing sheet. Not needed for liquid applications.

Standard Flow Compensation Section
This section allows you to configure the SMV 3000 for Standard Flow Compensation. Standard Flow Compensation can be used in conjunction with any primary flow element to compensate for the temperature, pressure and/or density of steam, gas or liquids. The following data that is needed should come from the Primary Element Sizing Sheet. (You do not have to complete this section if you have already completed the Dynamic Flow Compensation Section.)

Step 32 - Fluid State
Enter the physical state of the fluid to be measured. Select steam, gas or liquid.

Step 33 - Fluid Name
Enter the name of the fluid you want to measure. Examples are air, hydrogen, water etc.
Step 34 - Flow Data
Normal Flowrate – Enter the Flowrate at normal conditions from the primary element sizing sheet.
Normal DP – Enter the Differential Pressure produced at normal flowrate from the sizing sheet.
Design Pressure – Enter the absolute pressure at flowing conditions or design conditions.
Design Temperature – Enter the process temperature at flowing conditions or design conditions.
Design Density – Enter the density at flowing or design conditions. Design density is only needed for steam applications.
Standard Density – Enter the density at Standard Conditions (standard temperature and pressure). This is required for gas and liquid applications when Volumetric flow at standard conditions is needed.

Step 35 - Flow Compensation
When using the Standard Compensation section, you can choose if you want pressure and/or temperature compensation or no compensation at all for gases. Full compensation is the default. Full compensation is the only available choice for steam and liquid measurements.

General Flow Configuration Section
Step 36 - PV4 Range
Choose the range of flowrate for the 4 - 20 mA analog output. For example, a LRV = 0 m³/hr and a URV = 1500 m³/hr would result in a 4 mA output signifying 0 m³/hr and a 20 mA output signifying 1500 m³/hr. The defaults are LRV = 0 and URV = 100,000 m³/hr. You can also configure the URL or Upper Range Limit for flowrate. The URL should be equal to or greater than the URV. The URL default is 100,000 m³/hr.

Step 37 - PV4 Engineering Units (Volumetric)
If your liquid or gas application requires volumetric units, select from the list. Notice CFM and CFH are volumetric units. The units will signify Actual Volumetric Flowrate or Volumetric Flowrate at Standard Conditions depending on step 37. Please note that Mass units must be chosen for steam applications. The default is m³/hr.

Step 38 – Type of Volumetric Flowrate Units
Some customers want to measure the Actual Volumetric Flowrate of gases and liquids while others (Oil and Gas Industry) want to measure Standard Volumetric Flowrate (volumetric flowrate corrected to Standard temperature and pressure). Select either Standard or Actual. If you choose Standard, you will need to enter the Standard Density in the Dynamic Flow Compensation or Standard Flow Compensation sections.

Step 39 - PV4 Engineering Units (Mass)
Select the mass unit based on your application. The default is t/hr. Note that all steam applications require mass units.

Step 40 - PV4 Engineering Units (Custom)
If you need engineering units that are not supported in the Volumetric or Mass units section, you should specify this custom unit. The maximum number of spaces (numbers or letters) is 8. An example of a custom unit is SCFD – Standard Cubic Feet per Day. This unit is not supported as a standard unit is the Volumetric Flow Units section. Therefore, it is treated as a custom unit. If your custom unit is a mass unit, you will need to provide the conversion factor from the base mass unit of tons/hr to your custom unit. If your custom unit is a volumetric unit, you will need to provide the conversion factor from the base volumetric unit of m³/hr to your custom unit. For example, you would need to enter a conversion factor of 847.55 to convert a m³/hr to a SCFD – Standard Cubic Feet per Day. Enter the conversion factor in the space provided.
Step 41 - PV4 Damping
Damping can be used to provide more averaging of the PV4 calculation and therefore provide a more stable output. Higher damping time in seconds, could be used when the process measurement is changing rapidly. Default is 0 seconds.

Step 42 - PV4 Low Flow Cutoff
You can choose low and high (low flow cutoff) limits for the transmitter output based on the flow calculation. The transmitter will cut off the current output when the flow rate reaches the configured low limit and will keep the output at zero percent (4 mA) until the flowrate rises to the configured high limit. This helps avoid errors caused by flow pulsation in range values close to zero. You can configure limit values in selected engineering units between 0 and 30% of the URV for PV4. The defaults are zero for low and high.

Step 43 - PV4 Failsafe
This step allows you to specify the actions of the flow output (PV4), if there is a failure with the static pressure (PV2) or process temperature (PV3) measurements.

a. If you choose PV2 Failsafe Off, and the static pressure measurement fails, a non-critical message will appear - Bad AP Compensation PV4. For Standard Flow Compensation, the flow continues to be calculated based on the Design Pressure that was entered in the Standard Flow Compensation Section. For Dynamic Flow Compensation, the flow continues to be calculated based on the default pressure. Enter the default pressure that you want to the flow calculation based on.

b. If you choose PV2 Failsafe On, and the static pressure measurement fails, flow - PV4 will not be calculated and will go to failsafe.

c. If you choose PV3 Failsafe Off, and the process temperature measurement fails, a non-critical message will appear - Bad PT Compensation PV4. For Standard Flow Compensation, the flow continues to be calculated based on the Design Temperature that was entered in the Standard Flow Compensation Section. For Dynamic Flow Compensation, the flow continues to be calculated based on the default temperature. Enter the default temperature that you want the flow calculation based on.

d. If you choose PV3 Failsafe On, and the process temperature measurement fails, PV4 will not be calculated and will go to failsafe.

Step 44 – Custom Liquid
Only supply data when using the SMV 3000 to measure the flowrate of a custom liquid. If you choose a liquid that is not supported by the SCT 3000 Fluid Database, you must provide the data – temperature vs. density and temperature vs. viscosity – so that the SMV 3000 can be set up to compensate for density and viscosity. You must provide at least 5 points for compensation. If you do not want to compensate for density and viscosity, provide 1 point for each. This will be the viscosity at flowing conditions and the density at flowing conditions.

Step 45 - Configured by:
Enter your name, date and phone number so that Honeywell may contact you if we have questions.

If you have any questions concerning the SMV 3000 or MC option, please contact Honeywell Field Instrument 1-800-423-9883 (USA & Canada) or 215-641-3610 (International) email HFS-TAC-Support@Honeywell.com