

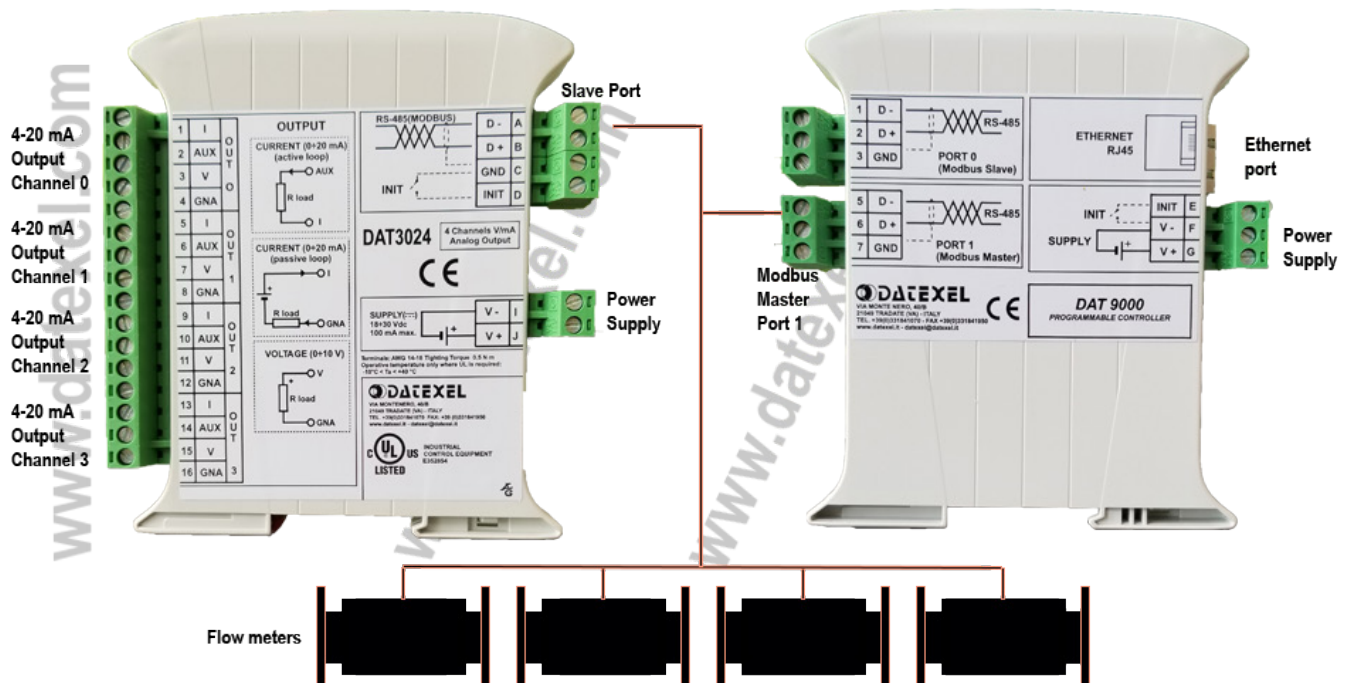
DATEXEL LLC

Introducing DEV 9K Version2 with converting four Modbus Flow meters to 4-20 mA.

This application is converting four RS485 Modbus RTU Flow meters to four 4-20mA outputs using a Modbus RTU Master Controller DAT9000 and a Modbus RTU to 4-20mA Converter DAT3024.

Start-up.

1. It is important that you identify the Address, Baud rate, Parity, and Stop bit of the Flow meters. They must all be the same. Identify the actual register which stores the flow rate.
2. You can connect to the DAT9000 V2 with Ethernet, uUSB or on the RS485 Slave port. For this application we have decided to connect with the Ethernet Port using a cross-over Cat-5 cable.



Wiring connections for DAT3024, DAT9000 and Modbus Flow Meters.

1. Connect power to the DAT9000 Version 2 Modbus RTU Master Controller, DAT3024 Modbus RTU to 4 channel 4-20 mA output converter and the Flow meters.
2. Connect the DAT3024 and the Flow meters Modbus Slave ports to the DAT9000 Modbus Master Port.
3. Connect Cat 5 crossover cable to the Ethernet port and PC.
4. Connect a multimeter to 4-20 mA output channel 0.
5. Download Dev9K Version 2 software from Datexel download page and run software.

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Call 561 779 5660 for Technical Support.

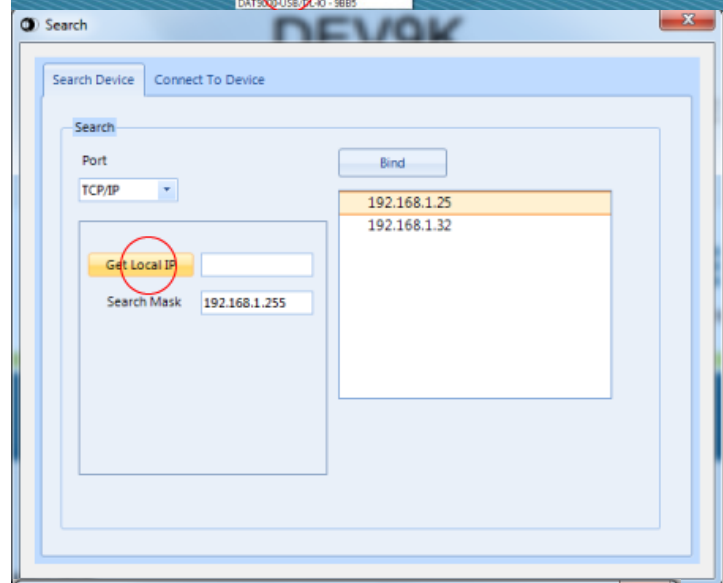
Connecting to the Dev 9K V2.

1. Select English.
2. Select DAT9000 from the drop down menu.
3. Click Connect.



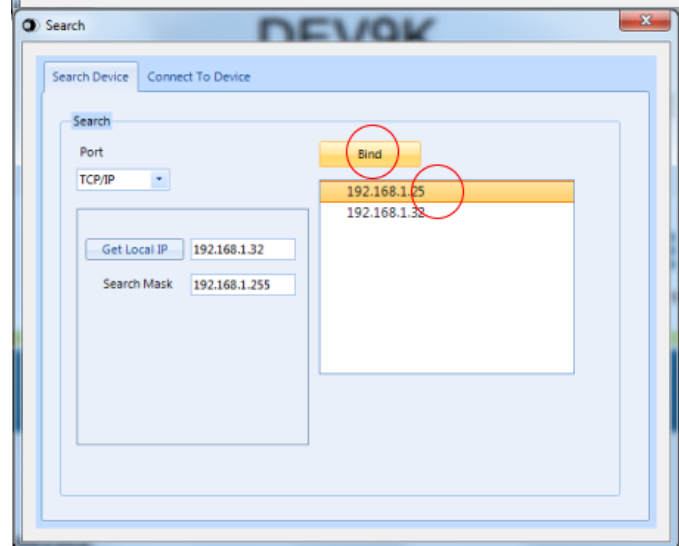
Search for the Modbus Master.

1. Click Get Local IP.
2. This will display the Local IP address of the PC.



Bind the IP address.

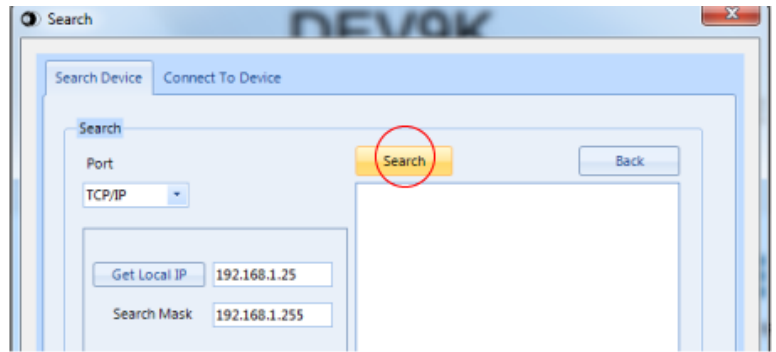
1. Click on the IP address of the network of the DAT9000.
2. Click Bind.



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Search for the Modbus Controller.

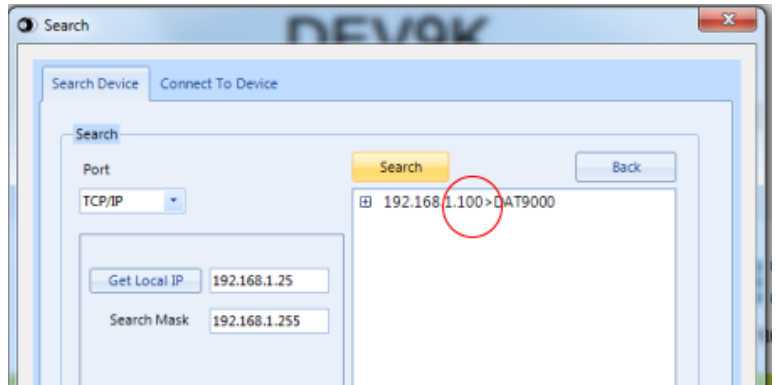
1. The Search Button should appear.
2. Click Search.



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The IP Address appears.

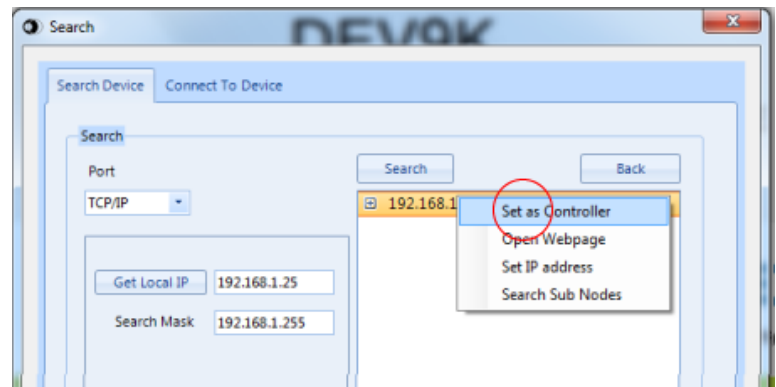
1. The IP address on the DAT9000 should appear along with the identification of the DAT9000 module.
2. If the IP address does not appear turn off the virus protect or firewall and check that you have a cross-over cable.



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Set as Controller.

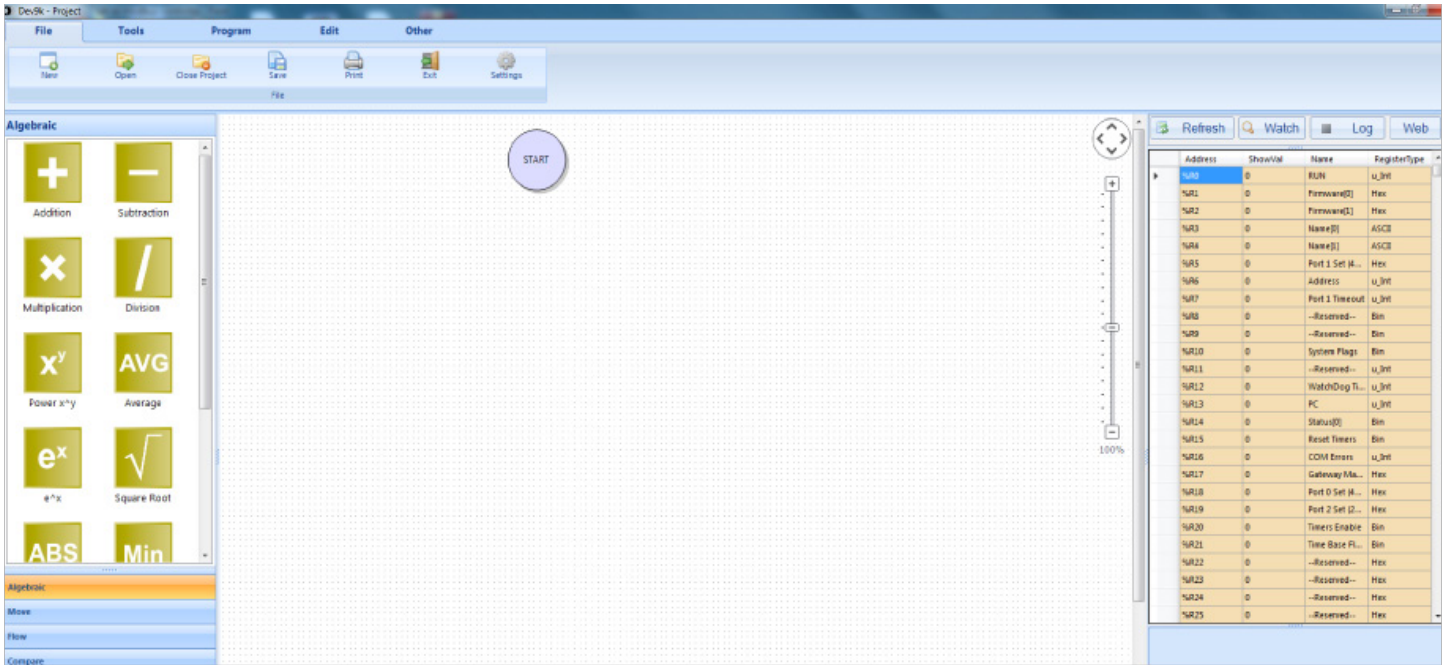
1. Right click "Set as Controller.
2. The Program page should now open.



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The Control screen opens.

This is the main control screen for the Dev 9k Version 2. From here you can configure the Communication ports. Design and save new projects and open existing projects. In the left panel you have the function blocks. The center is the layout page for the program with the START position. On the right panel you have the registers. By Clicking the Refresh you can see what is stored in the registers.

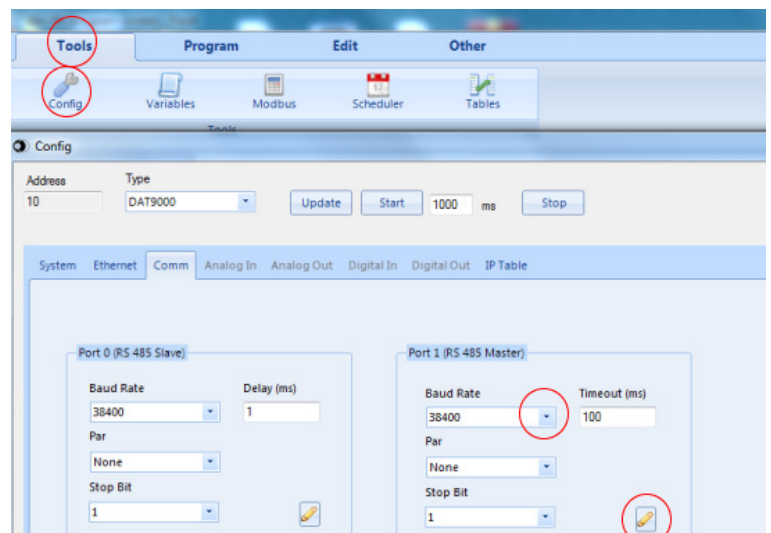


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Set the Communication port.

The Modbus Controller can only communicate with the Flow Meter and the DAT3024 if all the Modbus ports have the same Communication settings and different Addresses. The DAT9000 will be the Master so Port 1 (RS485 Master) needs to be set up.

1. To change the Communication settings of the DAT9000 Master port click Tools.
2. Click Config.
3. Change the settings to conform to the Flow meter and the DAT3024.
4. The Flow meter and the DAT3024 are set at 38400 Baud Rate.
5. Click the pencil to write to the DAT9000.



Start to design the program.

It is best to break down the project into parts. The first part will be to obtain the flow reading from one of the Flow Meters. The Flow Meter has address 20(your flow meter will have a different address), we are going to read register 40015 and place into the DAT9000 on register 35. We will be using a Read Input and must remove 40001 from the register table so the actual Register we use on the read Input Function Block will be 14.

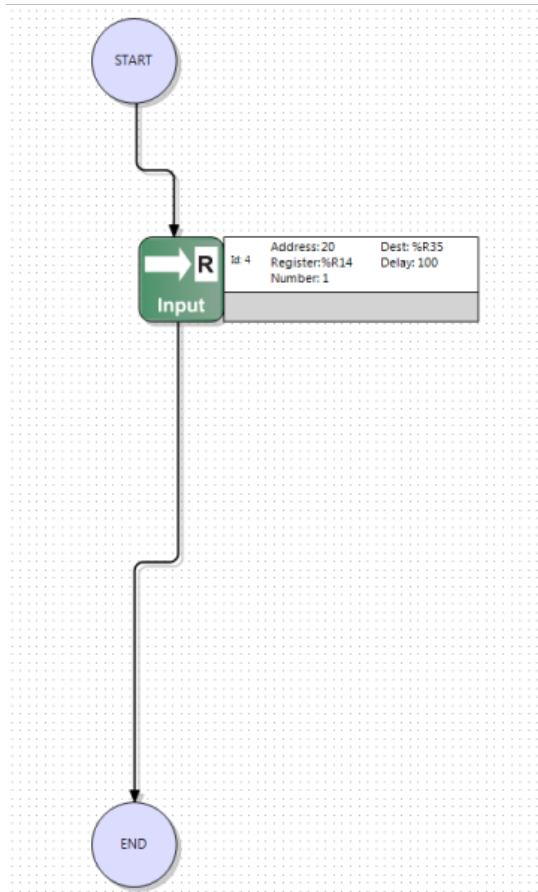
1. Click the Read/Write label on the lower left panel.
2. Drag the Read Input Function block to below the Start Icon.
3. The Insert Data Block will open and you can enter the data needed to obtain the Register.
4. Address 20, Register 14, Number 1 (we only need the flow input register), Dest 35 (we will store the register reading in Register 35 on the DAT9000) Click OK.

The screenshot displays a PLC programming software interface. On the left, a 'Read/Write' panel is visible, containing six function blocks: 'Read Register', 'Read Input', 'Write Single', 'Write Multiple', 'Read Device', and 'Write Device'. The 'Read Input' block is circled in red. Below this panel is a vertical menu with categories: Algebraic, Move, Flow, Compare, Bitwise, Shift, and Read/Write. The 'Read/Write' category is highlighted in orange and also circled in red. The main workspace shows a ladder logic diagram with a 'START' button, a 'Read Input' block, and an 'END' button. The 'Read Input' block is connected to the 'START' button. An 'Insert Data' dialog box is open, showing the following fields: Address (20), Register (14), Number (1), Dest (35), Delay (100), Break (Enabled), and Comment. The 'Address' field is circled in red. The 'OK' button at the bottom right of the dialog is also circled in red. A vertical link on the right side of the dialog reads 'Click to Open Description'.

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Complete the first stage of the project.

1. Hover over the bottom of the Start circle until a hand is present and pull the line generated down to the Read Input function block.
2. Do the same from the Read Input Function block to the top of the End circle.
3. Click Compile and OK.
4. Click File.
5. Click Save.
6. Save as flow-read.



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Downloading the program to the Modbus Master.

1. Click Program.
2. Click Connect if not connected to the DAT9000. It could have timed out. The bottom of the panel should say Connected.
3. Click Debug.
4. Now the Download is visible and click "Download".
5. Accept the download twice.
6. Click Release.
7. Click Refresh and there should be a reading in %R35. As the Flow changes so should the reading in Register 35.
8. Should no reading be present in R35 check the communication port settings or wiring.

The screenshot shows a software interface with a table of registers. The table has columns for Address, ShowVal, Name, and RegisterType. Register %R35 is highlighted with a red circle and shows a value of 274.

Address	ShowVal	Name	RegisterType
%R17	00FF	Gateway Ma...	Hex
%R18	0501	Port 0 Set (4...	Hex
%R19	0500	Port 2 Set (2...	Hex
%R20	11111111 11...	Timers Enable	Bin
%R21	00001000 00...	Time Base Fl...	Bin
%R22	0059	--Reserved--	Hex
%R23	3423	--Reserved--	Hex
%R24	0219	--Reserved--	Hex
%R25	0419	--Reserved--	Hex
%R26	0000	--Reserved--	Hex
%R27	0000	--Reserved--	Hex
%R28	0000	--Reserved--	Hex
%R29	0000	--Reserved--	Hex
%R30	0000	--Reserved--	Hex
%R31	0000	--Reserved--	Hex
%R32	0000	--Reserved--	Hex
%R33	0000	--Reserved--	Hex
%R34	0000	--Reserved--	Hex
%R35	274		Int
%R36	0		Int
%R37	0		Int

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Second stage of the project.

Scale function block.

The scale function block converts the flow rate zero and span into a number that the DAT3024 can read.

1. Delete the line from the Read Input to the end.
2. Click Algebraic on the bottom left panel.
3. Drag out Scale function block (bottom function block).
4. The Insert Data block should open.
5. Enter 35 in the Source box (this is where the flow is stored on the DAT9000).
6. Set the SpanIn to the 500 (or whatever the span is of your flow meter).
7. Set ZeroIn to 0 (or whatever the zero is of your flow meter).
8. Set Dest to 40, the location of the scaled output.
9. Set Span Out to 20000. This is equal to 20.000 mA.
10. Set Zero Out to 4000. This is equal to 4.000 mA.
11. Block 1. We are only writing to 1 block.
12. Click OK.

The 'Insert Data' dialog box is shown with the following settings:

Source	35	uint
SpanIn	500	K_Fit
ZeroIn	0	K_Fit
Dest	40	uint
SpanOut	20000	K_Fit
ZeroOut	4000	K_Fit
Block	4	
Break	<input checked="" type="checkbox"/> Enabled	
Comment		

Buttons: OK, Click to Open Description

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Write function block.

The write function block writes the 4-20 mA to the DAT3024 Modbus RTU.

1. Click the Read/Write label on the bottom left panel and drag out Write Device.
2. Select the DAT3024.
3. Remote address is 1. The address of the DAT3024.
4. From 0 can stay.
5. To 3 can stay.
6. Source is the 40 where we stored it in the Scale Function Block.
7. Click OK.

The 'Insert Data' dialog box is shown with the following settings:

Delay	100	
Data		
Device	Dat3024	
Remote Address	1	
Resource	Analog Out	
From	0	
To	3	
Source	40	uint
Break	<input checked="" type="checkbox"/> Enabled	
Comment		

Buttons: OK, Click to Open Description

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Check the 4-20mA output.

1. The three function boxes are complete. Save the project, connect again to the DAT9000 and download the project and release.
2. Register 35 indicates 298 which is the flow rate from the Flow meter.
3. Register 40 indicates 13536 which is the output from the scale function block and indicates the 4-20 mA output times 1000. The 13536 equals to 13.536 mA and this register is written into the registers in the DAT3024. The multimeter on the output of the DAT3024 Modbus Slave reads 13.56 mA.

The screenshot displays a ladder logic diagram on the left and a Modbus register table on the right.

Ladder Logic Diagram:

- START** (Circle) connects to **Input** (R) (Green box).
- Input** (R) connects to **Scale** (I) (Yellow box).
- Scale** (I) connects to **Write Device** (W) (Green box).
- Write Device** (W) connects to **END** (Circle).

Modbus Register Table:

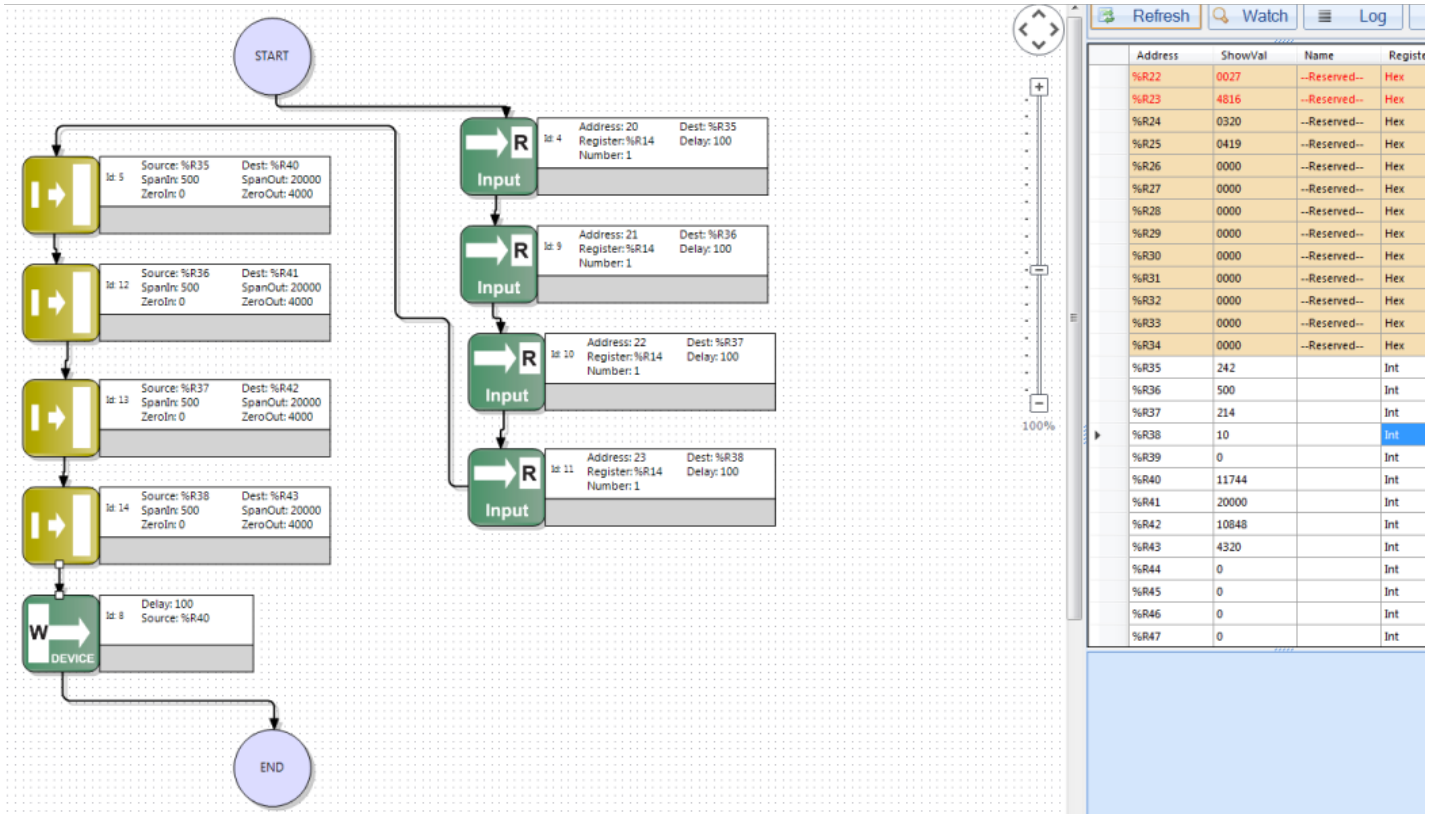
Address	ShowVal
%R17	00FF
%R18	0501
%R19	0500
%R20	11111111 11111111
%R21	00000110 00000001
%R22	0045
%R23	5023
%R24	0219
%R25	0419
%R26	0000
%R27	0000
%R28	0000
%R29	0000
%R30	0000
%R31	0000
%R32	0000
%R33	0000
%R34	0000
%R35	298
%R36	0
%R37	0
%R38	0
%R39	0
%R40	13536
%R41	0
%R42	0

Below the table, there is a section for 'ID', 'Delay', and 'Source'.

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Third and final stage.

1. Add 3 more Input registers, 1 for each off the additional Flow Meters.
2. Add 3 more Scale Function Blocks.
3. Save the project and download and check the operation. In the diagram you can see the registers with the correct readings and calculations.



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Explanation of the Project.

- Connected to a DAT9000 Modbus Master with Ethernet.
- Configured the DAT9000 Modbus Master to be a Modbus Controller.
- Set up communication ports on the Flow Meters, Modbus Controller and DAT3024 Modbus analog output slave.
- Read the internal registers of the flow meter and transferred it to the Modbus Master Controller.
- With the uses of function blocks, converted the actual flow rate in the a 4-20 mA.
- Sent and wrote the registers from the Modbus Controller to the Modbus analog output slave.