

Operating Instructions

ControlCare Application Designer

FOUNDATION Fieldbus Tutorial

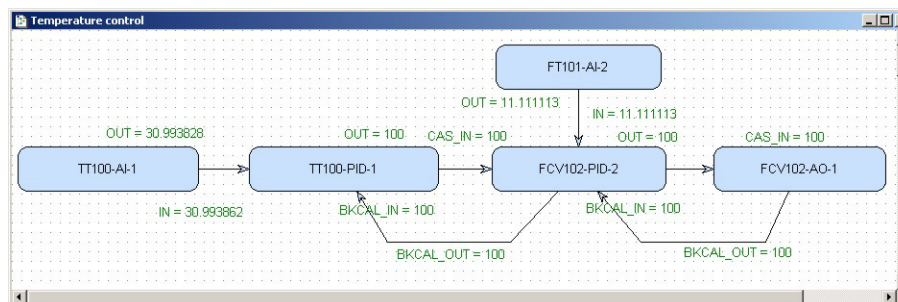
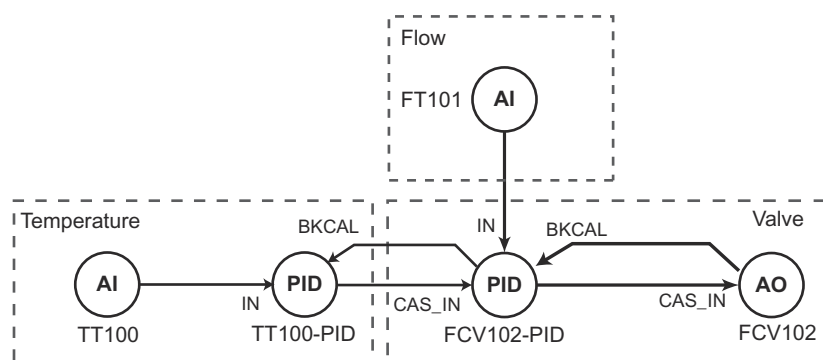


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Revision History

Product version	Manual	Changes	Remarks
2.01.xx	BA019S/04/en/08.05	Original manual	
2.02.xx	BA019S/04/en/07.06	Product	<ul style="list-style-type: none"> ■ FB schedule configured by drag&drop (Chap. 4.7) ■ Incremental download (Chap. 6.3)
2.03.xx	BA035S/04/en/06.07	Program	<ul style="list-style-type: none"> ■ New preferences dialog (packing) ■ Assign All Tags added
		Going on-line	<ul style="list-style-type: none"> ■ New HSE Network Tools program ■ New Field Controller Web Server program
		Trouble-Shooting	<ul style="list-style-type: none"> ■ New FC Tools program and firmware download ■ New Exchange procedure
2.04.xx	BA035S/04/en/12.08	Editorial	<ul style="list-style-type: none"> ■ Screenshots updated ■ Aliasing and Block Copy&Paste added as appropriate
2.05.xx	BA035S/04/en/06.10	General	<ul style="list-style-type: none"> ■ Update screenshots Version 2.05.xx
		Editorial	<ul style="list-style-type: none"> ■ Version, documentation table, Windows support
		Parameter the Devices	<ul style="list-style-type: none"> ■ Upload (also in Chapter 6.5)
		Trouble-Shooting	<ul style="list-style-type: none"> ■ FRC LED

Product Version

Details of product version and the individual components of Application Designer Suite can be seen in the About ControlCare dialog:

Start=>Programs=>Endress+Hauser=>ControlCare=>Tools=>About ControlCare

Registered Trademarks

PROFIBUS®

Registered trademark of the PROFIBUS User Organisation, Karlsruhe Germany.

FOUNDATION™ Fieldbus

Trademark of the Fieldbus Foundation, Austin, TX 78759, USA

HART®

Registered trademark of the HART Communication Foundation, Houston, USA

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1 Safety

1.1 Designated use

ControlCare is a field-based control system comprising hardware and software modules. It can be used to visualize, monitor and control production processes. The approved usage of the individual units used in the system can be taken from the corresponding parts of the operating instructions.

The software described in this particular manual allows a network connected to a ControlCare SFC162 FOUNDATION Fieldbus Field Controller to be engineered, configured and commissioned. In addition, appropriate control strategies can be built using the function blocks contained in the controller and connected devices.

1.2 Installation, commissioning and operation

ControlCare Field Controllers have been designed to operate safely in accordance with current technical safety and EU directives. Essential to their use is the ControlCare Application Designer software suite, which allows control strategies to be created for FOUNDATION Fieldbus and PROFIBUS I/O applications. Field devices, links, junction boxes, cables and other hardware comprising the Fieldbus system must also be designed to operate safely in accordance with current technical safety and EU directives.

If devices are installed incorrectly or used for applications for which they are not intended, or if the controller is not configured correctly, it is possible that dangers may arise. For this reason, the system must be installed, connected, configured, operated and maintained according to the instructions in this and the associated manuals: personnel must be authorised and suitably qualified.

1.3 Operational safety

Location

ControlCare Field Controllers must be mounted in a permanent and weather-protected location in a safe area. The environment shall be a metal cabinet or an installation frame with a well grounded mounting plane. The environment shall be protected.

Hazardous areas

The controller must be connected to networks operating in explosion hazardous areas via barriers or other safety components. When installing components in explosion hazardous areas:

- Ensure that all installation and maintenance personnel are suitably qualified
- Check that all equipment has the appropriate safety certificates
- Observe the specifications in the device certificates as well as national and local regulations.

This topic is discussed in BA013S (FOUNDATION Fieldbus Guidelines) and BA034S (PROFIBUS Guidelines).

EMC

All modules are suitable for industrial use and conform with the following standard, see Appendix:

- EN 61326: 1997/A1: 1998
Interference emission: Class A apparatus
Interference immunity: as per Annex A, industrial environment

Depending upon the environment in which the bus is operating, particular attention should be paid to the grounding of the bus cables. This topic is discussed in BA013S (FOUNDATION Fieldbus Guidelines) and BA034S (PROFIBUS Guidelines).

IP Address

Field Controller is normally configured from a workstation connected into the control system backbone. You will require a unique IP address to set it up.



Warning

- The use of IP addresses is strictly controlled. Usually your system administrator will be authorised to allocate unique addresses. Assigning an unauthorised address to a Field Controller may result in conflicts within your system and the failure of the associated devices!

It is recommended that ControlCare Field Controllers and OPC servers are not installed in an office network, as the large data packets exchanged between office equipment may lead to timeouts and intermittent communication errors. Ideally, the ControlCare system network should operate within its own IP domain; if this is not possible it should be separated from other parts of the network by a managed switch.

Since the system can be accessed and manipulated through the various Field Controller tools, it is advisable to control access both to the workstation and the folders in which the configuration is stored. Always make a back-up of the project.

Technical improvement

Endress+Hauser reserves the right to make technical improvements to its software and equipment at any time and without prior notification. Where such improvements have no effect on the operation of the equipment, they are not documented. If the improvements effect operation, a new version of the operating instructions is normally issued.

1.4 Conventions and icons

In order to highlight safety relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Safety conventions

Icon	Meaning
	A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned
	Caution! Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument
	Warning! A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument

1.5 ControlCare documents

Table 1.1 indicates the documents, planned and realized, containing safety relevant information, installation, commissioning and operating instructions for the equipment and software associated with Field Controller.

All documentation available at the time of release is included on the ControlCare CD-ROM and is installed in **Start=>Programs=>Endress+Hauser=ControlCare=Manuals** during set-up.

Component	Description	Document type	Designation	Order No.
System	ControlCare System Overview	Operating manual	BA016S/04/en	56004883
	ControlCare System Design	Operating manual	BA039S/04/en	Planned
	ControlCare System Specifications	Operating manual	BA040S/04/en	56004888
Software	Application Designer Overview	Operating manual	BA017S/04/en	70104301
	Application Designer: Local I/O Tutorial	Operating manual	BA032S/04/en	71095009
	Application Designer: FF Tutorial	Operating manual	BA019S/04/en	70101151
	Application Designer: PROFIBUS Tutorial	Operating manual	BA036S/04/en	70101152
	Application Designer: MODBUS Tutorial	Operating manual	BA037S/04/en	70101153
	Application Designer: IEC 61131-3 Ladder Logic Tutorial	Operating manual	BA038S/04/en	70101386
	Application Designer: IEC 61131-3 Structured Text Tutorial	Operating manual	BA056S/04/en	71060063
	Field Control (OPC) Servers	Operating manual	BA018S/04/en	71031428
	SFC162 Visitor	Operation manual	BA069S/04/en	71113457
Field Controller	Hardware Installation Guide	Operating manual	BA021S/04/en	56004885
	Commissioning and Configuration	Operating manual	BA035S/04/en	56004887
Function Blocks	Function Block Manual	Operating manual	BA022S/04/en	56004886
Set-Up	Getting Started	Operating manual	BA020S/04/en	56004884
General	FOUNDATION Fieldbus Guidelines	Operating manual	BA013S/04/en	70100707
	PROFIBUS Guidelines	Operating manual	BA034S/04/en	56004242

Tab. 1-1: ControlCare Documentation

2 Task Description

This tutorial describes all steps necessary for setting up the project described below. It does not aim to give an exhaustive account of Application Designer functions, but rather shows you one of a number of methods to reach your goal. The tags and names used in the tutorial are imaginary and will be different in a proper application. A full description of Application Designer functions is to be found in Application Designer Overview BA017S/04/en and Drawing Tool BA032S/04/en. Function block descriptions are to be found in BA022/04/en, Function Block manual.

2.1 Application

For this tutorial, the case of cascade control for a heat exchanger will be used, see Fig. 2-1.

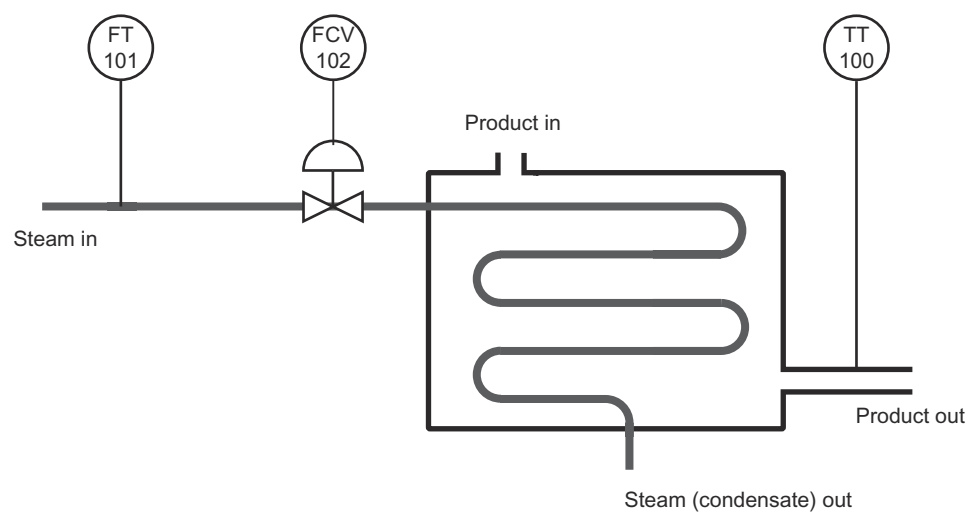


Fig. 2-1: Schematic diagram of heat exchanger application

A liquid flows through the heat exchanger and is heated by condensing steam. The controlled variable is the exit temperature of the liquid flowing through the exchanger. The manipulated variable is the steam flow to the exchanger. The temperature of the product defines the set point of the steam flow, which is controlled by a valve in order to avoid excessive waste of energy (=steam).

The example illustrated Control in the field: the corresponding control strategy is shown in Fig. 2-2.

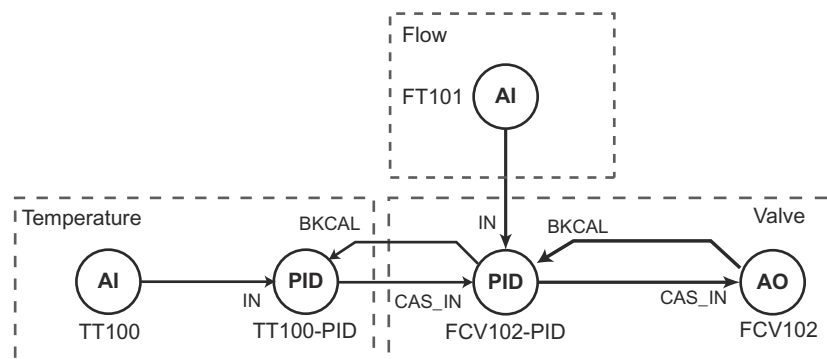


Fig. 2-2 Cascade control strategy for heat exchanger application

2.2 Network

The network is assumed to be constructed as shown in Fig. 2-3.

- The flowmeter is a Promass 83F, suitable for steam measurement
- The valve positioner is a Metso ND9103FN with control capability
- The temperature transmitter TMT162

All devices are equipped with a FOUNDATION Fieldbus H1 interface.

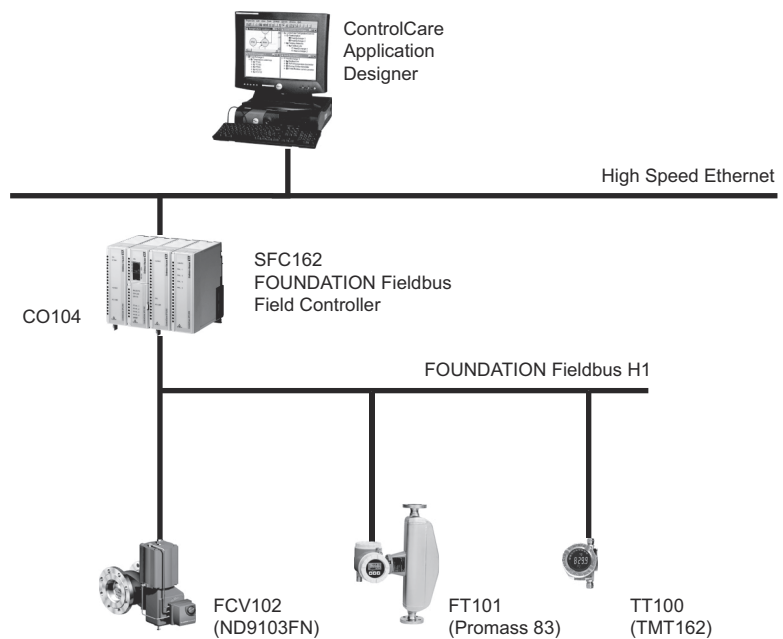


Fig. 2-3 Network for application example

As shown in Figure 2-2, the control will be done in the TMT162 temperature transmitter and the ND9103FN valve positioner. As far as traffic on the bus is concerned, this is the most efficient method. The user has, however, the alternative of performing all control in the SFC162 Field Controller, should this be preferred.

2.3 Preliminaries

2.3.1 Installation and commissioning

Before you can start the FOUNDATION Fieldbus tutorial, Application Designer must be installed on your computer, the SFC162 Field Controller installed and commissioned and a connection made to your computer. Instructions on how to do this are to be found in:

- Operating Instructions BA020S/04/en, Getting Started
- Operating Instructions BA021S/04/en, Field Controller: Hardware Installation
- Operating Instructions BA035S/04/en, Field Controller: Commissioning and Configuration

2.3.2 Device ID and tag

For a FOUNDATION Fieldbus system, each device that communicates has a unique bus address. Addresses are assigned automatically during the start-up of the system on the basis of the device ID. The device ID is a unique identifier that is based on a Manufacturer ID, device type and the serial number of the device. When the project goes online, the actual device IDs must be assigned to virtual devices that have been planned in Application Designer by using the Assign Tags procedure.

To aid the offline engineering of the network, it is necessary to keep a record of the measuring point tags (device tags), often as an Excel sheet. Measuring point tags are used in P&I diagrams to indicate the type of measurement or action performed at a particular location in a process. Table 2-1 below provides an example of how this might look for the application at hand.

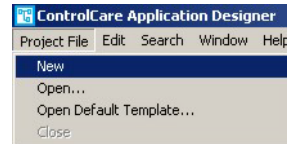
Area	Process Cell	Device	Vendor	Tag	Unit	Task
Pasteurization	Heat Exchanger	TMT162	E+H	TT100 TT100-PID	°C	Product temperature Temperature PID
Pasteurization	Heat Exchanger	Promass 83F	E+H	FT101	t/h	Steam flow
Pasteurization	Heat Exchanger	ND9103FN	Metso	FCV102 FCV102-PID	%	Steam valve positioner Flow PID
Pasteurization	Heat Exchanger	SFC162	E+H	CO104		Controller

Tab. 2-1: Measuring point tag list for tutorial application

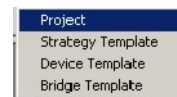
3 Create a FOUNDATION Fieldbus Network

3.1 Create a FF project

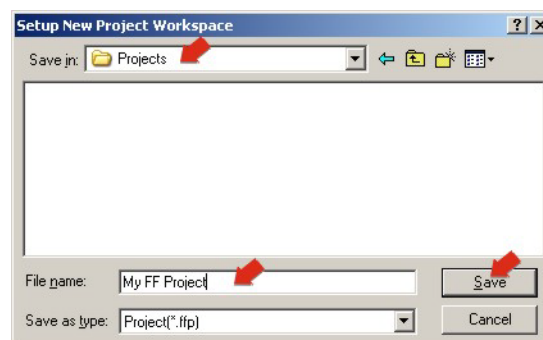
- 1 Start ControlCare Application Designer by clicking on the icon on your desktop or via **Start => Programs => Endress+Hauser => ControlCare => ControlCare Application Designer**
- 2 The project starts from a blank application screen
 - With the right mouse key select **Project File=>New**



- 1 The **Document Type** box appears: Click the option **Project**



- 2 The **New Project** dialog box opens:

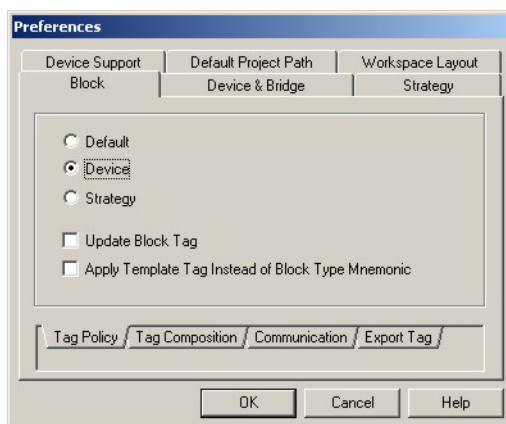


1. Choose the folder where the project will be saved.
 2. Type the name of the project in the File Name box.
 3. Click **Save**.
If the new project is not to be created, click **Cancel**.
- 3 ControlCare Application Designer automatically creates a folder with the entered file name within the selected folder.

3.2 Determine the naming preferences

Before you start, you can set preferences for the way your project is created. Of particular interest at this stage is the labelling of the function blocks.

- 1 Press **Project File => Preferences**
 - The **Preferences** Dialog appears



Tag Policy

Tag Policy determines how the blocks are labelled by default if no tag names are entered

- 1 Select the folder **Block** and the subfolder **Tag Policy**, then check the following buttons
 - **Device**
 - **Update Block Tag**
- 2 Press **OK** to confirm your selection
 - Application Designer will now automatically rename any blocks created in the control strategy window as they are assigned to the devices by adding the device tag as prefix.

Tag Composition

Tag Composition determines how the block identifiers are added to the block tag if no block name is entered.

- 1 Select the subfolder **Tag Composition**:
 - Enter a mnemonic separator: for this manual the setting was "-"
Default setting is "_" and mandatory for if flexible function blocks are to be used
 - Check **Prefix**
- 2 Press **OK** to confirm your selection
 - Application Designer will now automatically compose the blocks according to your selection, e.g. TagName-Block-n or TagName_Block_n.

Export Tag

Export Tag causes tags to be automatically exported every time the project goes online

- 1 Select the subfolder **Export Tag**
 - Check the **Automatic** button
 - Press **OK** to confirm your selection

Strategy

Strategy determines the default shape of the function block icons in the strategy window and also whether the aliasing function is enabled

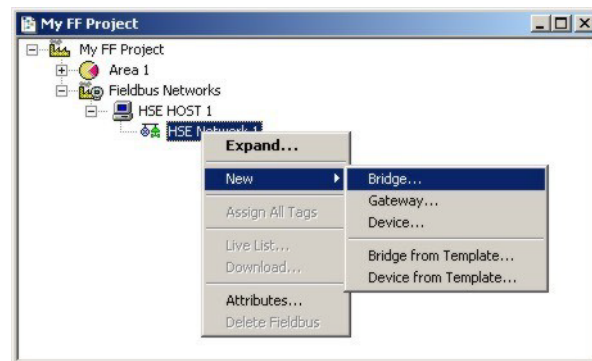
- 1 Select the subfolder **Strategy**
 - Select the default shape for function block objects
 - Select "Aliasing Input Dialog Box" if you want to use your own input and output labels in the strategy
 - Press **OK** to confirm your selection

3.3 Add a bridge (SFC162)

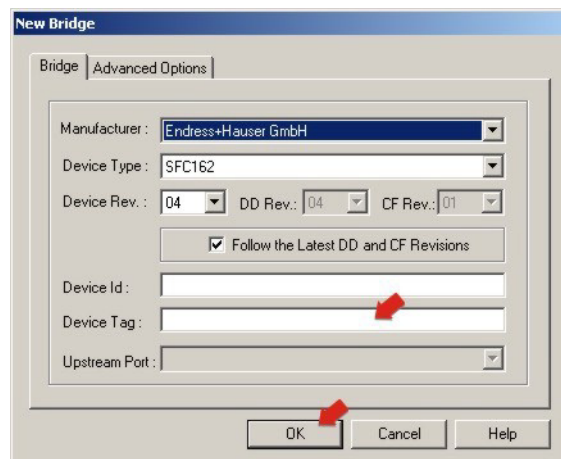
- 1 On saving, ControlCare Application Designer automatically creates a project, adding the HSE fieldbus network and the HSE Host
 - Click on + to expand the tree:



- 2 Now right-click on the **HSE Network** leaf and select **New=>Bridge**



- 3 The **New Bridge** dialog box appears:
Select the SFC162 Field Controller and type in a device TAG, in our case CO104



If you do not type in a tag, the default will be "Bridge n", where n is a consecutive number.

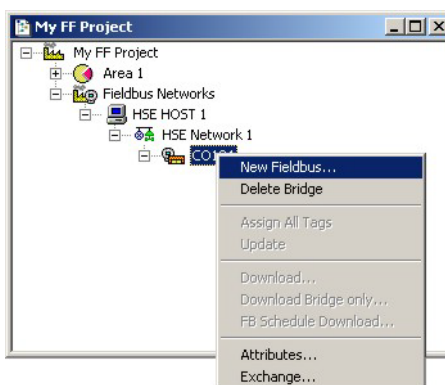
- 4 Press **OK** to create the Bridge.
- 5 Repeat Steps 1 to 4 for as many SFC162 Field Controllers as you have in your network.

3.4 Add a fieldbus segment

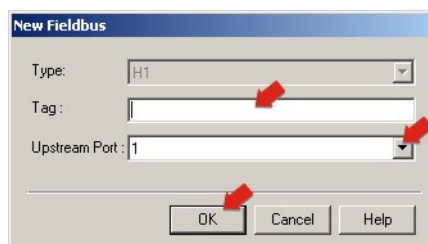
- 1 The project now looks like this:



- 2 Right click on the bridge you just created, here "CO104", and select **New Fieldbus**.



- 3 The **New Fieldbus** dialog box appears:
 - Enter a Fieldbus TAG,
 - Select the fieldbus port on the SFC162



- If you do not type in a tag, the default will be "Fieldbus n", where n is a consecutive number.

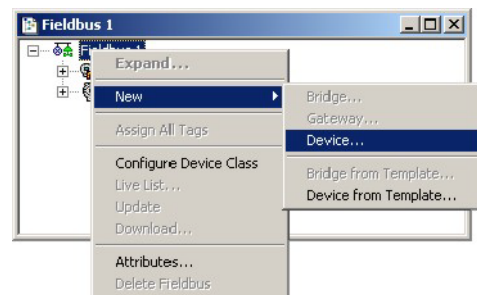
- 4 Press **OK** to create the Fieldbus.
- 5 Open **Project File**, then press **Save**, to save the project.
- 6 Repeat Steps 1 to 5 for as many fieldbus segments as are in use.

3.5 Add the devices

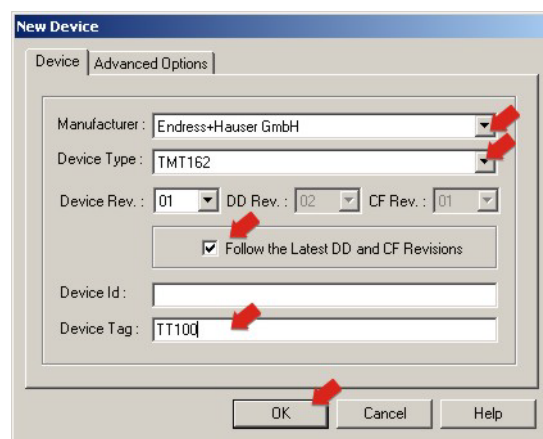
- 1 Click on the newly created **Fieldbus 1** leaf and select **Expand**



- 2 A new work space **Fieldbus 1** opens:
 - Right-click on the **Fieldbus 1** leaf and select **New** then **Device**



- 3 The **New Device** dialog appears



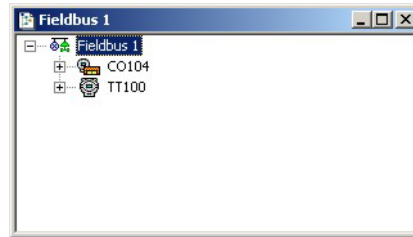
- Select the **Device Manufacturer** = Endress+Hauser
- Select the **Device Type** = TMT162
- Enter the **Device Tag** = TT100
If you do not type in a tag, the default will be "Device n", where n is a consecutive number
- Press **OK** to create the device

Note!



- Application Designer follows the latest DD and CF revisions by default.
- If you are working with devices with older DD and CF revisions, uncheck the checkbox and select the correct Device Revision.

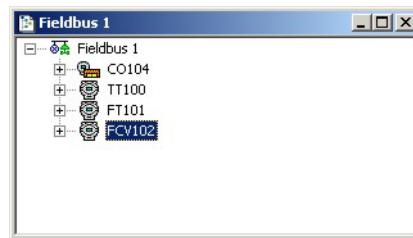
4 Your project now looks like this:



5 Repeat Steps 2 and 3 for the Promass 83 and the ND9103FN positioner

- Promass 83:
Manufacturer = Endress+Hauser
Device Type = Promass83
Device Tag = FT101
- ND9103FN:
Manufacturer = Metso Automation
Device Type = Metso FBLK Interface
Device Tag = FCV102

6 Your project should now look like this:



7 Open **Project File**, then press **Save**, to save the project.

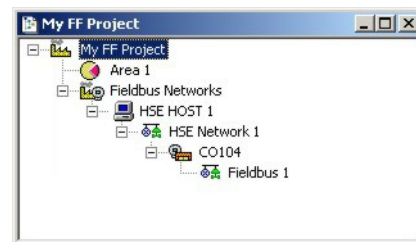
3.6 Export tags

Note!

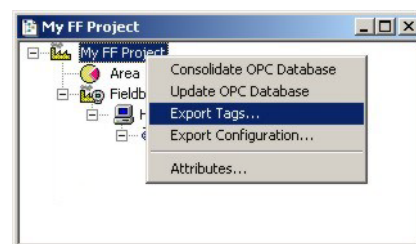


- You should use the **Export Tags** function everytime you change the configuration of the project, so that the OPC server information is always up-to-date.
- Application Designer can be set up to automatically export tags everytime the system goes online, see Chapter 3.2

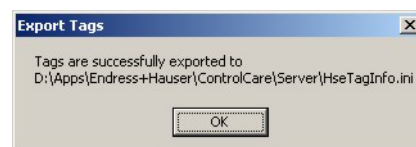
- 1 Active the project view by clicking in its workspace



- 2 Right click on the project name, a context menu appears



- 3 Select the option **Export Tags...**
 - The Export Tags dialog confirms the successful export



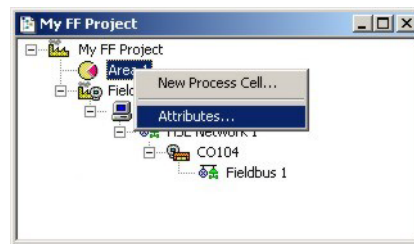
- Press **OK** to close the dialog
- 4 Open **Project File**, then press **Save**, to save the project

4 Create a Control Strategy

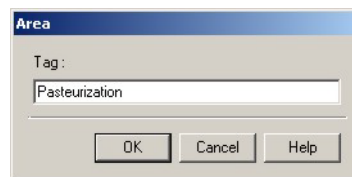
Having created a physical view of the process, the next step is to create control strategy. This is done in the logical view of the plant. This represents the plant as Areas/Process Cells in accordance with ISA S88/IEC 61518.

4.1 Add a Process Cell

- 1 Click on the "Area 1" leaf in the project and select **Attributes...**

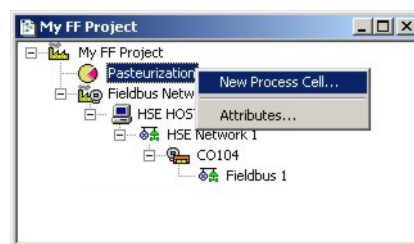


- 2 The **Attributes** dialog box appears

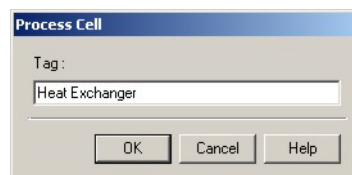


- Enter a name for the area, e.g. Pasteurization (see Table 2-1, Chapter 2.3)
- Click **OK** to store your changes

- 3 Click on the Area leaf again and select **New Process Cell...**



- 4 The **Process Cell** dialog box appears

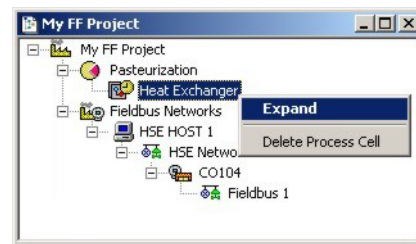


- Enter a name for the process cell, e.g. Heat Exchanger (see Table 2-1, Chapter 2.3)
- Click **OK** to store your changes

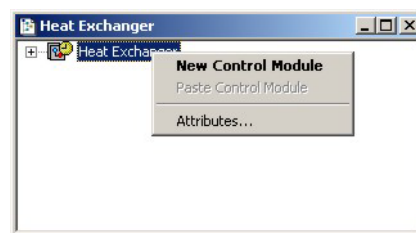
- 5 Open **Project File**, then press **Save Entire Configuration**, to save the project.

4.2 Add a Control Module

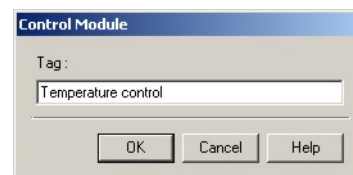
- 1 Right-click on the Process Cell leaf you just created and select **Expand**



- 1 A new window with the name of the leaf opens
 - Right-click on the top leaf and select **New Control Module**

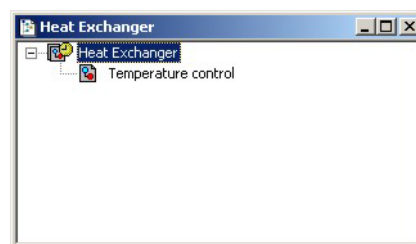


- 2 The **Control Module** dialog box appears



- Enter a name for the control module, e.g. Temperature Control (see Table 2-1, Chapter 2.3)
- Click **OK** to store your changes

- 3 The project now looks something like this:



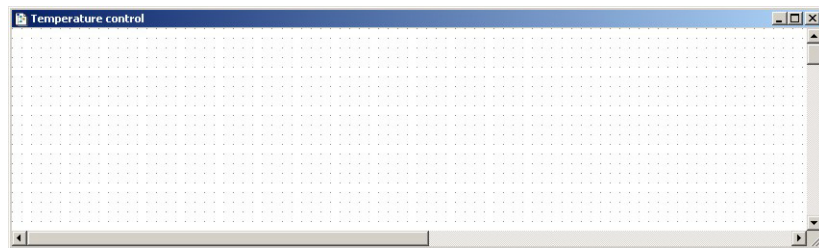
- 4 For a real project, Step 2 and 3 would be repeated until all the required control modules for a particular process cell have been added.
 - A Control Module (with all blocks and links) can be copied and then pasted to the Process Cell by selecting the appropriate context menu or using CTRL + C and CTRL + V
- 5 Open **Project File**, then press **Save Entire Configuration**, to save the project.

4.3 Create the function blocks

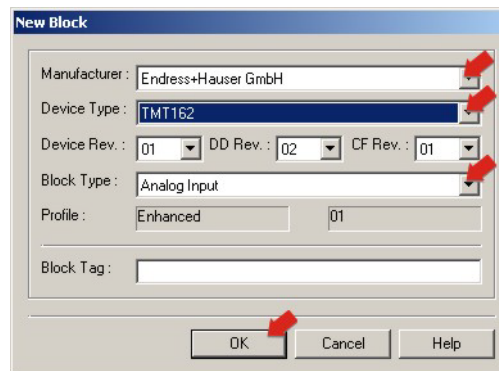
Note!



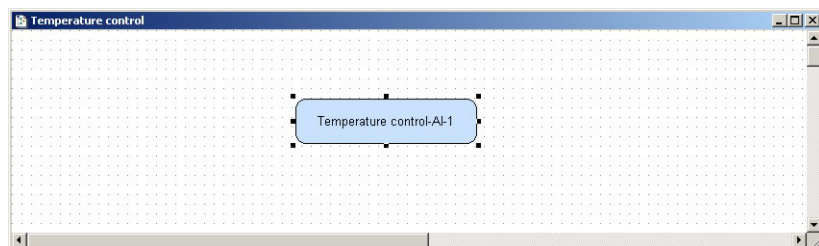
- The function blocks used in the tutorial are selected from the device manufacturer's device list. It is also possible to select standard function blocks from the "Fieldbus Foundation" list. This ensures that the control strategy can be executed in any device that supports a particular standard block, irrespective of vendor.
 - Endress+Hauser devices support standard function blocks and offer them in the manufacturer specific list.
- 1 Double-click on the control module leaf or right-click and select **Strategy** to open the **Control Strategy** workspace - this has the same name as the leaf



- 2 Press the Function Block button  in the toolbar and click in the workspace
 - The **New Block** dialog appears



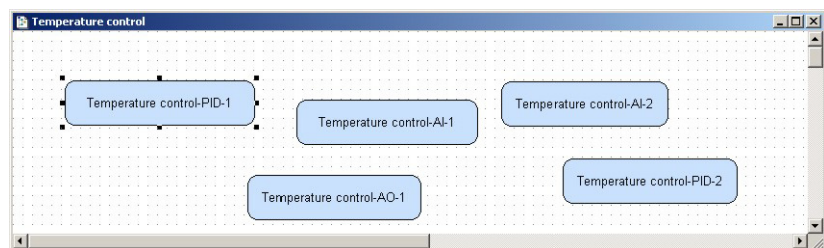
- Select the **Manufacturer** = Endress+Hauser
 - Select the **Device Type** = TMT162
 - Select the **Block Type** = Analog Input
 - Press **OK** to create the function block
- 3 The block now appears in the strategy window with the default name



4 Repeat Steps 2 and 3 for the Temperature PID, Flow AI, Flow PID and Valve AO blocks

- Temperature PID:
Manufacturer = Endress+Hauser
Device Type = TMT162
Block Type = PID Control
- Flow AI
Manufacturer = Endress+Hauser
Device Type = Promass83
Block Type = Analog Input*
- Flow PID
Manufacturer = Metso Automation
Device Type = FBLK Interface
Block Type = PID Control
- Positioner AO
Manufacturer = Metso Automation
Device Type = FBLK Interface
Block Type = Analog Output

5 The control strategy now looks like this



6 Open **Project File**, then press **Save Entire Configuration**, to save the project.

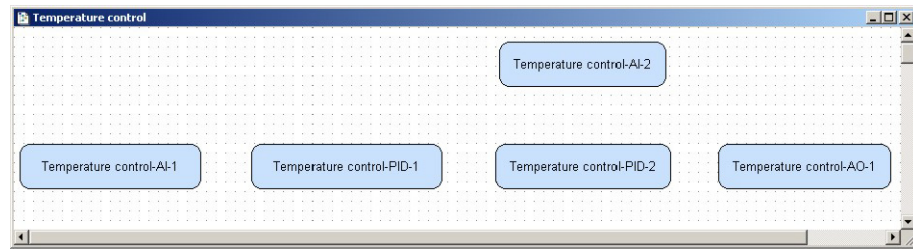
°Note!



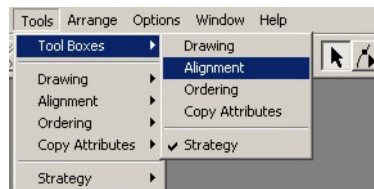
- The Promass 83 offers seven Analog Input blocks because it supports exactly this number.
- It does not matter which you select, the process value offered by each is determined by the channel setting, see Chapter 5.


4.4 Add the Function Block Links

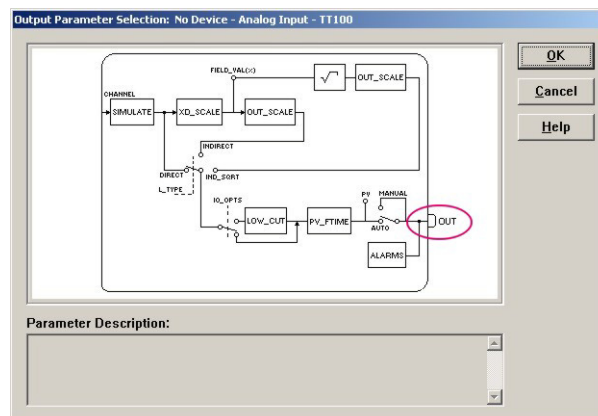
- 1 In the Control Strategy workspace position the blocks according to your strategy



- The blocks can be dragged and dropped by selecting and holding down the right mouse key
- The blocks can be aligned by selecting, then via **Tools => Alignment => e.g. Middle** followed by a click on the block to which the alignment is to be made
- The **Tools** menu also contains other standard drawing functions such as toolbars, standard shapes, line thickness, colours etc.

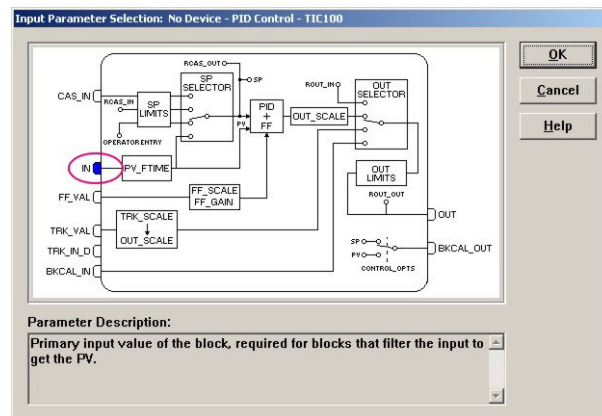


- 2 Click on **Function Block Link**  button in the tool bar, the cursor changes to a cross
 - Select the **Temperature AI block** with the cross: the **Output Parameter Selection** dialog appears

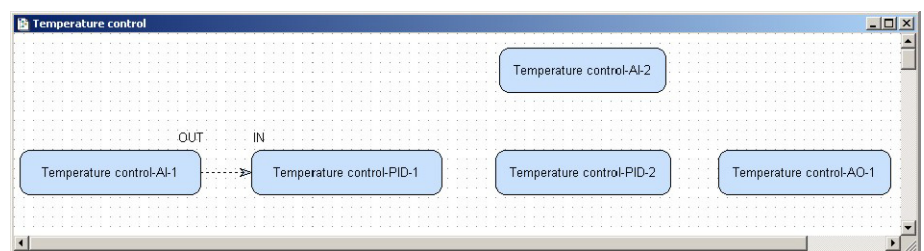


- 3 Click the box next to **OUT** – it changes color – then click on **OK**
 - The **Output Parameter Selection** dialog closes
 - The cursor is now connected to a blue dotted line
 - Place the Cursor in the Controller PID Block 1 and click to make the link

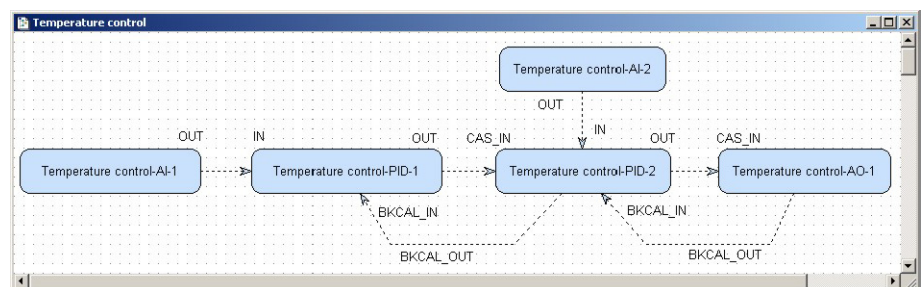
- 4 When the link is made, the **Input Parameter Selection** dialog for the PID block appears



- Click the box next to **IN** – it changes color – then click on **OK**
- 5 If the Aliasing Input dialog box is enabled, see Chapter 3.2, the **Rename** dialog now appears
- Enter the desired link name and press **OK**
 - If nothing is entered, the link retains the standard name
- 6 When the **Input Parameter Selection** dialog changes, the link is made and appears as below:



- The link appears as a dotted line because the function block has yet to be attached to a device
 - You may have to move the parameter legends "IN" and "OUT" by selecting and positioning with the left mouse key depressed
- 7 Repeat steps 2 to 5 and make the following links between the function blocks
- PID1 and PID2 = **OUT** to **CAS_IN**
 - PID2 and PID1 = **BKCAL_OUT** to **BKCAL_IN**
 - Flow AI to PID2 = **OUT** to **IN**
 - PID2 to Valve AO = **OUT** to **CAS_IN**
 - Valve AO to PID2 = **BKCAL_OUT** to **BKCAL_IN**
- 8 Your Control Strategy now looks something like this



- 9 Open **Project File**, then press **Save Entire Configuration**, to save the project.

4.5 Configure the strategy

FOUNDATION Fieldbus offers the possibility of storing complete control strategies as fully configured generic templates. This is especially useful when particular control strategies occur several times within a project. The strategies are stored independent of device assignment, which is performed as a separate step, see Chapter 4.7.

In this tutorial, the strategy will be configured to receive the incoming process values from the input blocks as % of full range, and to output a % value to the positioner.

4.5.1 Analog Input parameters

The function blocks **Temperature control-AI-1** and **Temperature control-AI-2**, for the TMT162 and Promass respectively, have to be configured. The basic parameters required are shown in Table 4-1. A full description of the parameters are to be found in the Operating Instructions

- BA224REN for TMT162
- BA065DEN for Promass 83F

Parameter	Function	Temperature TC100	Flow FC101
MODE BLOCK/TARGET	Normal operating mode of block	Auto	Auto
XD_SCALE/EU_100* XD_SCALE/EU_0 XD_SCALE/UNITS_INDEX	Upper range value for process variable Lower range value for process variable Unit of process variable	150 (max.850) -50 (min. -200) °C	18 0 t/h (unit)
OUT_SCALE/EU_100 OUT_SCALE/EU_0 OUT_SCALE/UNITS_INDEX	Upper range limit for output variable Lower range limit for output variable Unit of output variable	100 0 %	100 0 %
CHANNEL	Output channels of Transducer Block assigned to Analog Input Block. <ul style="list-style-type: none"> ■ TMT = Primary, RJ or Sensor value 1/2 depending on whether one or two sensors are connected ■ Promass = 1 to 7, depending on which type of process value is required 	Sensor Value 1	1 = mass flow
L_TYPE	Selects the type of linearisation for the input value. <ul style="list-style-type: none"> ■ Direct: PV value = OUT value, Identical XD_SCALE and OUT_SCALE ■ Indirect: PV value scaled to OUT value ■ Indirect Square Root: as Indirect but scaling with root function 	Indirect	Indirect
PV_FTIME	Output damping constant (in seconds).	1	1
*The range limits for the TMT162 temperature transmitter are determined by the transducer block parameters SENSOR_TYPE and PRIMARY_OUTPUT_TYPE. For SENSOR_TYPE = Pt100 and PRIMARY_OUTPUT_TYPE = SV_1 the transducer block outputs a temperature signal in the range -200°C to +850°C. The XD_SCALE and OUT_SCALE parameters generate the OUT value of the Analog Input block from any part of this range, in our case -50°C to 150°C.			

Tab. 4-1: Basic parameters for Analog Input blocks

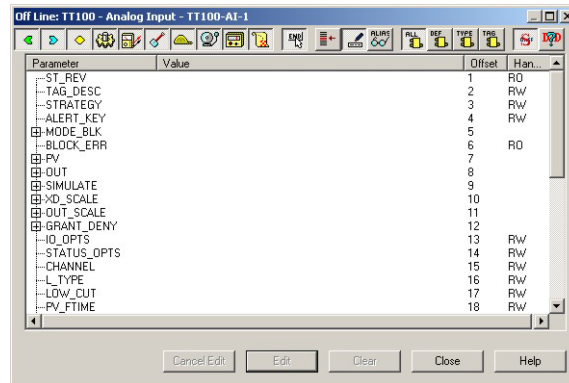
Order of parameters

Some block parameters have a write check based on the value of others parameters. It is therefore important to set the parameters in the order shown in Table 4-1 (the same order in which they are displayed in the **Off Line Characterization** dialog.

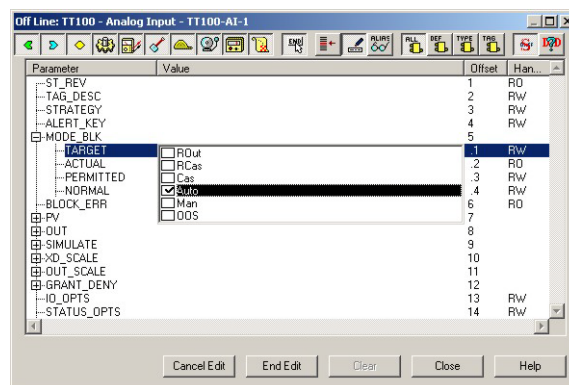
After characterization of the block, the parameters will appear in the FOUNDATION Fieldbus tree. If you find a parameter in the wrong position, it can be move by dragging and dropping to the correct one.

4.5.2 Characterize the Analog Input blocks

- 1 In the Control strategy workspace, double-click on the **Temperature control AI-1** block
 - The **Off Line Characterization** dialog opens
 - Press **All** to display all the parameters



- 2 The Mode Block **Target** must be set to **Auto**.



- Expand the **Mode Block** parameter tree
 - Double-click on the "Value space" next to the **Target** parameter
 - Select **"Auto"** from the drop-down menu
 - Press **End Edit** to register your change
- 3 Repeat this procedure for the remainder of the Temperature parameters in Table 4-1
 - Remember to press **End Edit** after every change
 - When all parameters have been entered, press **Close** to quit the Characterization dialog
 - 4 Repeat Steps 1 to 3 for the Flow parameters in the **Temperature control-AI-2** block
 - 5 Open **Project File**, then press **Save Entire Configuration**, to save the project.

4.5.3 Basic PID parameters

The Field Controller PID blocks must now be characterized. In practice, the values for the GAIN, RESET and RATE as well as the setpoint value SP for the temperature loop will be known. The other values determine the way the control is handled when the block moves from auto/cas or a process value has a bad status. See also ControlCare Function Block manual BA022S/04/en.

Parameter	Function	Temperature TC100	Flow FC101
MODE BLOCK/TARGET	Normal operating mode of block	Auto	CAS
SP/VALUE	Setpoint for product temperature	40%	–
PV_SCALE/EU_100	Upper range limit for process variable	100	100
PV_SCALE/EU_0	Lower range limit for process variable	0	0
PV_SCALE/UNITS_INDEX	Unit of process variable	%	%
OUTSCALE/EU_100	Upper range limit for output variable	100	100
OUTSCALE/EU_0	Lower range limit for output variable	0	0
OUTSCALE/UNITS_INDEX	Unit of output variable	%	%
CONTROL_OPTS	Sets control options for bad input	Bypass Enable	Bypass Enable
BYPASS	When ON, SP value is transferred to the OUT without the calculation of PID terms.	OFF	OFF
SP_RATE_DN	Rate of change from old to new, higher SP	0	0
SP_RATE_UP	Rate of change from old to new, lower SP	0	0
GAIN	Tuning constants for the P, I and D terms, of the PID block respectively.	1.5	2
RESET		0.1	0.2
RATE		0.5	0.6
SHED_OPT	Behaviour when shedding from remote mode	Normal shed, normal return	Normal shed, normal return

Tab. 4-2: Basic parameters for temperature and flow PID blocks

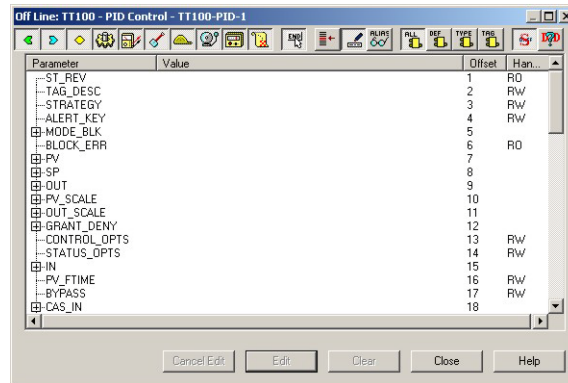
Order of parameters

Some block parameters have a write check based on the value of others parameters. It is therefore important to set the parameters in the order shown in Table 4-2 (the same order in which they are displayed in the **Off Line Characterization** dialog.

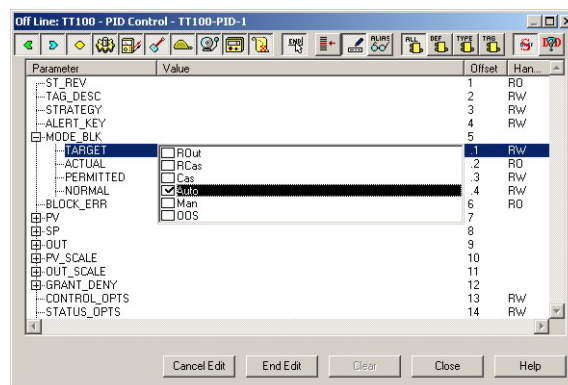
After characterization of the block, the parameters will appear in the FOUNDATION Fieldbus tree. If you find a parameter in the wrong position, it can be move by dragging and dropping to the correct one.

4.5.4 Characterize the PID blocks

- 1 In the Control strategy workspace, double-click on the **Temperature control PID-1** block
 - The **Off Line Characterization** dialog opens
 - Press **All** to display all the parameters



- 2 The Mode Block **Target** must be set to **Auto**.



- Expand the **Mode Block** parameter tree
 - Double-click on the "Value space" next to the **Target** parameter
 - Select **"Auto"** from the drop-down menu
 - Press **End Edit** to register your change
- 3 Repeat this procedure for the remainder of the Temperature PID parameters in Table 4-2
 - Remember to press **End Edit** after each entry
 - When all parameters have been entered, press **Close** to quit the Characterization dialog
 - 4 Repeat Steps 1 to 3 for the Flow PID parameters in the **Temperature control-PID-2** block
 - Remember to set the Block Mode **Target** to **CAS**
 - 5 Open **Project File**, then press **Save Entire Configuration**, to save the project.

4.5.5 Analog Output parameters

The function block **Temperature control- AO-1** for the ND9103FN now has to be configured. The basic parameters required are shown in Table 4-3. A full description of the parameters are to be found in the Operating Instructions

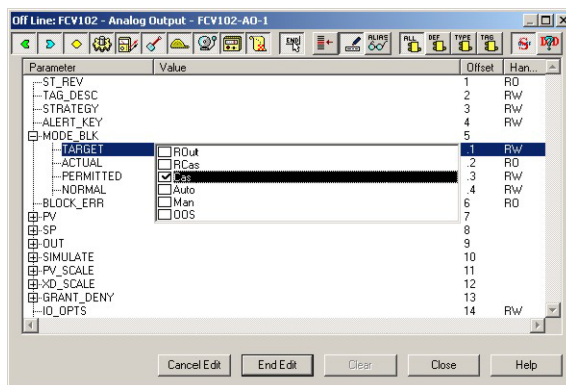
- ND9000F Users Guide, downloadable from www.metso.com

Parameter	Function	Positioner FCV102
MODE BLOCK/TARGET	Normal operating mode of block	Cas
PV_SCALE/EU_100 PV_SCALE/EU_0 PV_SCALE/UNITS_INDEX	Upper range limit for process variable Lower range limit for process variable Unit of process variable	100 0 %
XD_SCALE/EU_100 XD_SCALE/EU_0 XD_SCALE/UNITS_INDEX	Upper range limit for output variable Lower range limit for output variable Unit of output variable	100 0 %
CHANNEL	Defines the signal configuration between the AO block and transducer block.. <ul style="list-style-type: none"> ■ 1 = AO, valve control ■ 2 = AO, no transducer connected 	1 = valve control
SHED_OPT	Behaviour when shedding from remote mode	Normal shed, normal return

Tab. 4-3: Basic parameters for Analog Output block

4.5.6 Characterize the Analog Output block

- In the Control strategy workspace, double-click on the **Temperature control AO-1** block
 - The **Off Line Characterization** dialog opens
 - Press **All** to display all the parameters

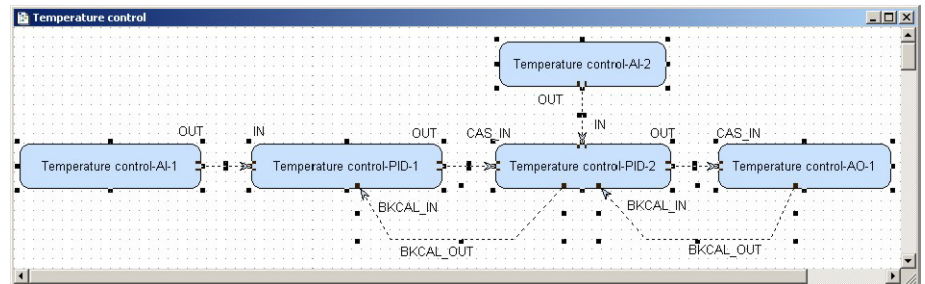


- The Mode Block **Target** must be set to **Cas**.
 - Expand the **Mode Block** parameter tree
 - Double-click on the "Value space" next to the **Target** parameter
 - Select **"Cas"** from the drop-down menu
 - Press **End Edit** to register your change
- Repeat this procedure for the remainder of the Temperature AO parameters in Table 4-3
 - Remember to press **End Edit** after each entry
- Open **Project File**, then press **Save Entire Configuration**, to save the project.

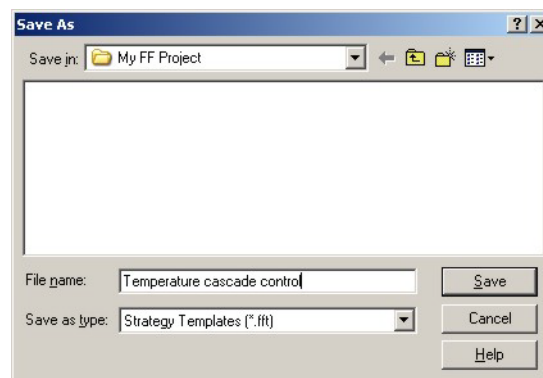
4.6 Store the strategy as a template


After configuration, the strategy can be stored as a template for similar applications using the same devices.

- 1 In the Strategy workspace, drag the mouse across the complete strategy with the lefthand button depressed, until all function blocks are selected



- 2 Now press the **Strategy Export** button  in the toolbar
 - The **Save As** dialog appears

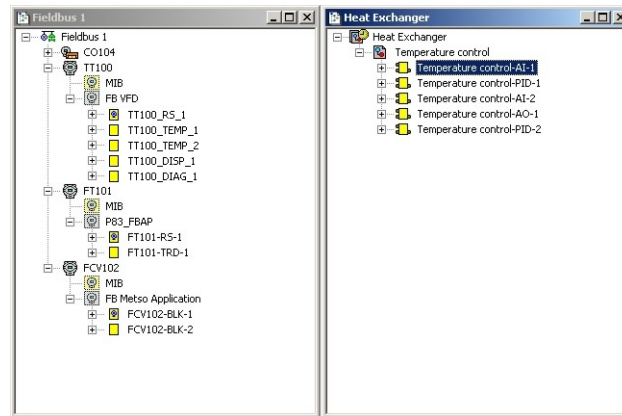


- If appropriate, browse to another folder
 - Enter a **File Name**
 - Press **Save** to save the strategy
- 3 The strategy can be imported again pressing the **Strategy Import** button  in the toolbar and double-clicking on the appropriate file name.

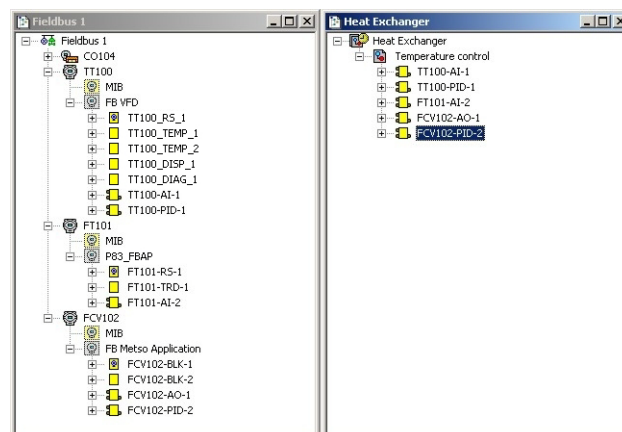
4.7 Assign the Function Blocks to the Devices

Now assign the function blocks in the control strategy to the devices where they are to run. The order of assignment determines the order of executions (can be changed by drag&drop).

- 1 Expand the **Fieldbus** workspace (Fieldbus 1) and the **Process Cell** workspace (Heat exchanger)



- Note that the Heat Exchanger tree now contains all the function blocks that you created in the Control Strategy workspace
- 2 Now drag and drop the **Temperature control-AI-1** block to the greyed Function Block Application leaf of the TT100 tree
 - When you drop the block, it is attached to tree
 - Its name changes to TT100-AI-1 in both views
 - You have now assigned the Temperature AI block to the temperature transmitter
 - 3 Repeat Step 2 for the other function blocks
 - **Temperature control-PID-1** => TT100
 - **Temperature control-AI-2** => FT101
 - **Temperature control-PID-2** => FCV102
 - **Temperature control-AO-1** => FCV102
 - 4 Your project now looks like this



- 5 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.5
- 6 Open **Project File**, then press **Save Entire Configuration**, to save the project.

5 Parameter the Devices

It is important to remember that the device parameters in the Transducer Block are an integral part of any FOUNDATION Fieldbus project. This has consequences in the way the devices can be parametered. There are three options:

- Off-line configuration in Application Designer for later download to the devices
- On-line configuration in FieldCare via DTMs for later upload into Application Designer
- Bench mode configuration with a handheld or at a local device interface, e.g. display, for later upload into Application Designer

Option 1 is available for all blocks and devices contained in the Application Designer FOUNDATION fieldbus library and would be normal practice.

Options 2 and 3 are available for all device transducer blocks with the exception of the Field Controller hardware configuration block. A description of how to configure using FieldCare and how to upload the parameters into the controller and Application Designer is to be found in Operating Instructions BA069S/04/en, whereby the SFC162 does not have to be switched to visitor mode. The upload function is available from Version 2.05.xx upwards.

This tutorial tells you how to parametrize offline with Application Designer.

5.1 TMT162 temperature transmitter

Full details of how to parametrize the TMT162 temperature transmitter are to be found Operating Instructions BA224REN.

5.1.1 Transducer Block

Table 5-1 shows the parameters that must be set in the TMT162 TEMP_1 transducer block

Parameter	Function	Temperature TT100
MODE_BLOCK/TARGET	Normal operating mode of block	Auto
PRIMARY_VALUE_TYPE	Calculation method for primary process value <ul style="list-style-type: none"> ■ Process temperature SV1 or SV2 ■ Average 0.5 (SV1 + SV2) with/without redundancy ■ Differential (SV1 - SV2) ■ Conditional (SV1 or SV2), (SV2 if SV1 >T) 	Sensor Value 1
SENSOR_TYPE	Type of sensor connected to the transmitter <ul style="list-style-type: none"> ■ All types of standardized temperature sensors 	Pt 100 IEC 751
SENSOR_CONNECTION	Way in which the sensor is connected <ul style="list-style-type: none"> ■ 4-wire (if two sensors are connected only one can be 4-wire) ■ 3-wire ■ 2-wire 	2-wire

Tab. 5-1: Basic parameters for TMT162 transducer block

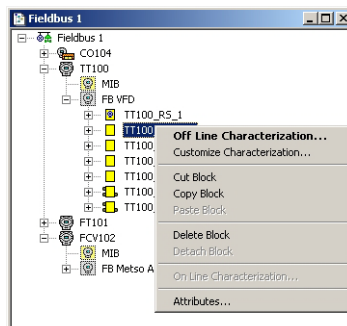
Order of parameters

Some block parameters have a write check based on the value of others parameters. It is therefore important to set the parameters in the order shown in Table 5-1 (the same order in which they are displayed in the **Off Line Characterization** dialog.

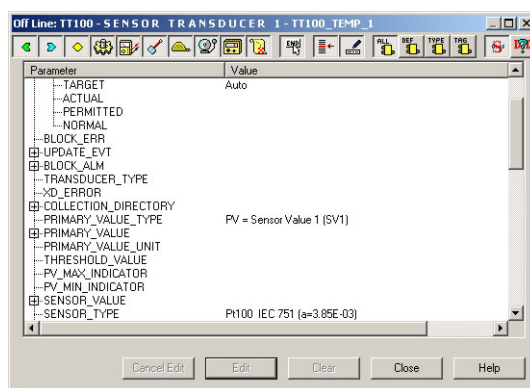
After parametrization of the block, the parameters will appear in the FOUNDATION Fieldbus tree. If you find a parameter in the wrong position, it can be move by dragging and dropping to the correct one.

5.1.2 Parameter the transducer block

- 1 In the Fieldbus network workspace, expand the TT100 tree until the function blocks are visible
 - Right click on the **TT100-TEMP-1** block and select **Off Line Characterization...**
(for some revisions the block is named TT100-BLK-1)



- 2 The **Off Line Characterization** dialog opens
 - Expand the **Mode Block** parameter tree



- 3 The Mode Block **Target** must be set to **Auto**. If this is not the case
 - Double-click on the "Value space" next to the **Target** parameter
 - Select **"Auto"** from the drop-down menu
 - Press **End Edit** to register your change
- 4 Now set the following parameters to the values in Table 5-1:
 - PRIMARY_VALUE_TYPE = PV = Sensor value 1 (SV1)
 - SENSOR_TYPE = Pt 100 IEC (a=3.85 E-03)
 - SENSOR_CONNECTION = 2-wire
- 5 Press **Close** to quit the Characterization dialog
- 6 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.5
- 7 Open **Project File**, then press **Save Entire Configuration**, to save the project.

5.2 Promass 83F flow transmitter

Full details of how to parametrize the Promass 83F flow transmitter are to be found Operating Instructions BA065DEN.

5.2.1 Transducer Block

In the tutorial, we have selected Channel 1 in the FT101-AI-2 block, which means that the transducer block must be configured to deliver mass flow in the selected units (t/h). The parameters used correspond to those in the Gas Flow Quick Setup in Chapter 6.3 of the Operating Instructions. Table 5-1 shows the parameters that must be set in the Promass 83F transducer block

Parameter	Function	Flow FT101
MODE_BLOCK/TARGET	Normal operating mode of block	Auto
SYSTEM_UNIT_MASS_FLOW	Engineering unit of the mass flow measurement ■ Select from drop-down menu	t/h
LOW_FLOW_CUT_OFF_ASSIGN	Assigns the low-flow cut-off function to a particular measurement ■ Select from drop-down menu	Off
EPD_EMPTY_PIPE_DETECTION	Enables or disables Empty Pipe Detection function	Off

Tab. 5-2: Basic parameters for Promass 83F transducer block

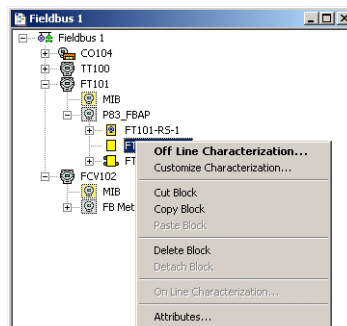
Order of parameters

Some block parameters have a write check based on the value of others parameters. It is therefore important to set the parameters in the order shown in Table 5-2 (the same order in which they are displayed in the **Off Line Characterization** dialog.

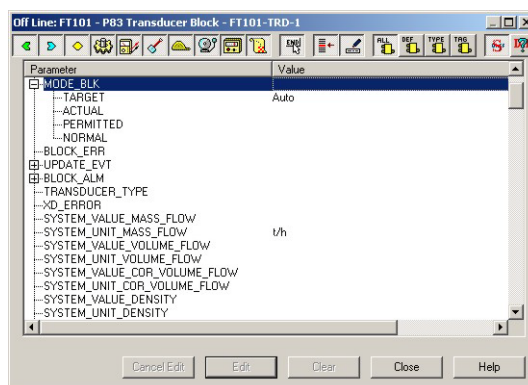
After parametrization of the block, the parameters will appear in the FOUNDATION Fieldbus tree. If you find a parameter in the wrong position, it can be move by dragging and dropping to the correct one.

5.2.2 Parameter the transducer block

- 1 In the Fieldbus network workspace, expand the FT101 tree until the function blocks are visible
 - Right click on the **FT101-TRD-1** block and select **Off Line Characterization...**
(for some revisions the block is named FT101-BLK-1)



- 2 The **Off Line Characterization** dialog opens
 - Expand the **Mode Block** parameter tree



- 3 The Mode Block **Target** must be set to **Auto**. If this is not the case
 - Double-click on the "Value space" next to the **Target** parameter
 - Select **"Auto"** from the drop-down menu
 - Press **End Edit** to register your change
- 4 Now set the following parameters to the values in Table 5-2:
 - SYSTEM_UNIT_MASS_FLOW = t/h
 - LOW_FLOW_CUT_OFF_ASSIGN = Off
 - EPD_EMPTY_PIPE_DETECTION = Off
- 5 Press **Close** to quit the Characterization dialog
- 6 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.5
- 7 Open **Project File**, then press **Save Entire Configuration**, to save the project.

5.3 Metso ND9103FN positioner

Full details of how to parametrize the Metso ND9103FN valve positioner are to be found in the ND900F User Guide which can be downloaded from www.metso.com.

5.3.1 Transducer Block

In the tutorial, you have probably only the valve positioner, but not the valve itself. In real life, the positioner must be told what it is driving and certain assembly information must always be entered into the transducer block. The for a rotary valve parameters are included in Table 5-3. For instructions on how all other parameters can be used, see the User Guide.

Parameter	Function	Positioner FCV102
MODE_BLOCK/TARGET	Normal operating mode of block	Auto
VALVE_TYPE	Type of valve the positioner is actuating ■ Select from drop-down menu	Rotary
FINAL_VALUE_RATE_DN	Maximum travel rate in closing direction ■ 0 = parameter not in use	0
FINAL_VALUE_RATE_UP	Maximum travel rate in opening direction ■ 0 = parameter no in use	0
POSITIONER_FAIL_ACTION	Action of position on loss of electrical power or reception of an output signal with a bad status ■ Select from drop-down menu	Close
POS_SENSOR_ROT	Relationship between valve action and position sensor rotation ■ Select from drop-down menu	Standard: Clockwise to close
DEAD_ANGLE_COMP	Dead angle for segment and rotary valves	0
ACT_TYPE	Type of positioner action ■ Select from drop-down menu	Double-acting actuator
PERFORMANCE_LEVEL	Target performance level of valve position control Select from drop-down menu	Optimum
CHAR_TYPE	Type of linearization ■ Select from drop-down menu	No characterization

Tab. 5-3: Basic parameters for Promass 83F transducer block

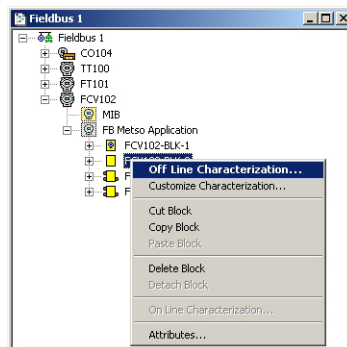
Order of parameters

Some block parameters have a write check based on the value of others parameters. It is therefore important to set the parameters in the order shown in Table 5-3 (the same order in which they are displayed in the **Off Line Characterization** dialog).

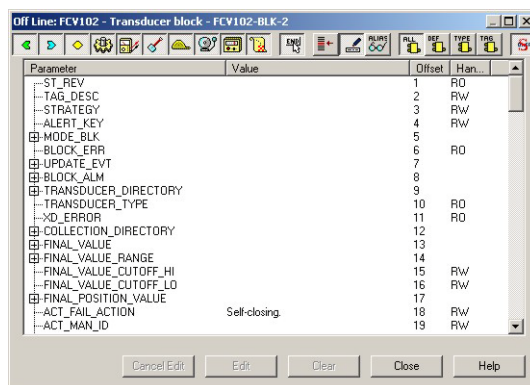
After parametrization of the block, the parameters will appear in the FOUNDATION Fieldbus tree. If you find a parameter in the wrong position, it can be move by dragging and dropping to the correct one.

5.3.2 Parameter the transducer block

- 1 In the Fieldbus network workspace, expand the FCV102 tree until the function blocks are visible
 - Right click on the **FCV102-BLK-2** block and select **Off Line Characterization...**



- 2 The **Off Line Characterization** dialog opens
 - Expand the **Mode Block** parameter tree



- 3 The Mode Block **Target** must be set to **Auto**. If this is not the case
 - Double-click on the "Value space" next to the **Target** parameter
 - Select **"Auto"** from the drop-down menu
 - Press **End Edit** to register your change
- 4 Now set the following parameters to the values in Table 5-3:
 - VALVE_TYPE = Rotary
 - POSITIONER_FAIL_ACTION = Close
 - ACT_TYPE = Double-acting actuator
- 5 Press **Close** to quit the Characterization dialog
- 6 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.5
- 7 Open **Project File**, then press **Save Entire Configuration**, to save the project.

6 Go On-line

6.1 Connect to the Field Controller

In order to download the project, the host computer and Field Controllers must be allocated IP addresses in the same address range. It is possible to do this on the workbench before installation or after the Field Controller and other components have been physically installed in the Fieldbus network (subnet).



Warning

- The use of IP addresses is strictly controlled. Usually your system administrator will be authorised to allocate unique addresses. Assigning an unauthorised address to a Field Controller may result in conflicts within your system and the failure of the associated devices!



Note!

- The tools that setup the network use Ethernet services that may be blocked by Windows Firewall. Normally the firewall will be unblocked for the tools during installation, but it might be necessary to stop the firewall should they not function properly. If you are not sure how to stop the firewall, consult your system administrator.

Before starting, check the following:

- **Internet Protocol TCP/IP** is installed on your computer
- You have administration rights for your computer
- You have an set of IP addresses that have been authorized by your IT department
- Any proxy server for your Internet Browser is disabled

The procedures described in this chapter are for Windows XP. For other Windows systems consult your system administrator.



Note!

- When the Field Controllers are physically connected together with the Host computer via Ethernet, HSE Network Setup will see them irrespective of the IP address domain to which they belong

6.1.1 Set the IP address of the host computer

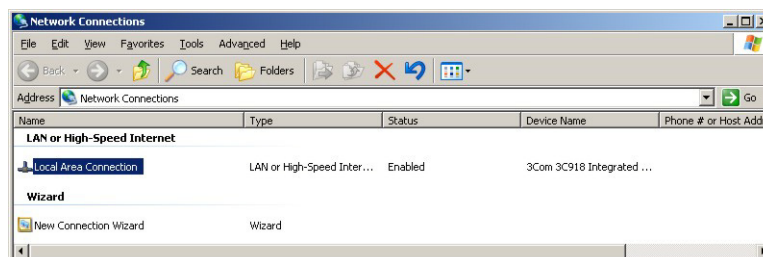
SFC162 Field Controllers are delivered with the default IP address:

- 192.168.164.100

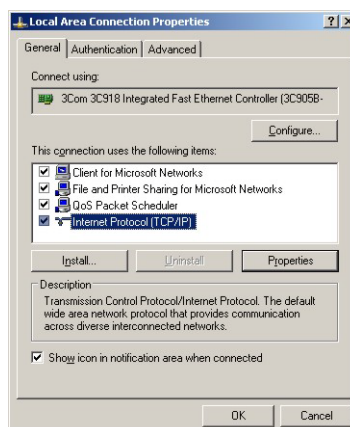
In order that the host computer can communicate with the Field Controller Web Server, it must be allocated an IP address in the same address domain, e.g. 192.168.164.200. If you are not sure how to do this, consult your network administrator.

Procedure

- 1 Right-click **Start =>Settings =>Control Panel =>Network Connections**

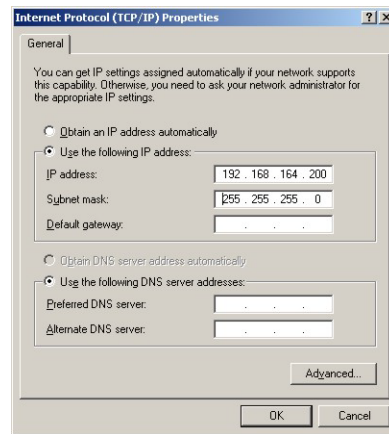


- 2 Right-click **Local Area Connection => Properties**



- 3 Using the left mouse button, double-click **Internet Protocol (TCP/IP)** or click once, then click **Properties**.
- 4 Note the original values of IP address and Subnet Mask of the computer to restore them if necessary at end of the operation.

- 5 Change the IP address and the Subnet Mask of the host computer to those required by the application. In the example, an address in the same subnet as the Field Controller.
 - IP Address 192.168.164.XXX and network mask (Subnet Mask) 255.255.255.0.
 - Do not use the address 192.168.164.100, as these are reserved as default addresses for Field Controller SFC162



- 6 Click on the **OK** button to complete the procedure, close the other dialogs with **OK** and **Close**.

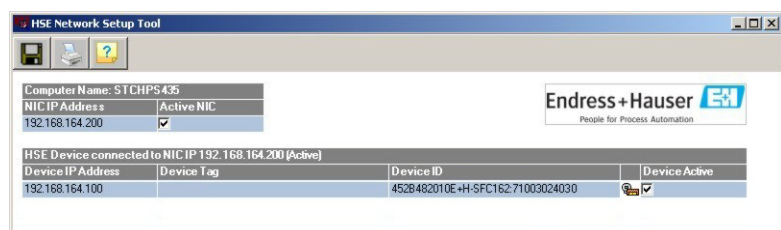
6.1.2 Set the Field Controller IP address

Note!



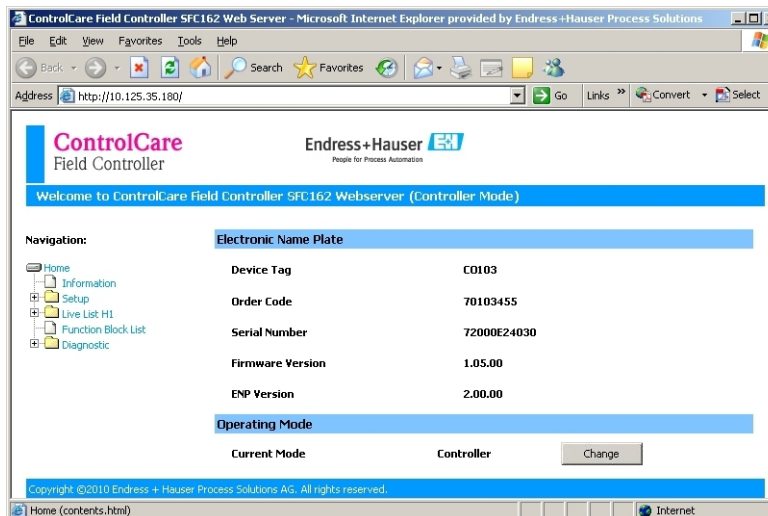
- It is recommended that Field Controllers of the same type are introduced one by one to the network.

- 1 Call HSE Network Setup:
Programs =>Endress+Hauser=>ControlCare=>Tools=>HSE Network Setup
- 2 HSE Network Setup is launched and searches for Field Controllers in the Ethernet network.



- All Field Controllers in the network appear, irrespective of their IP domain.
If this is not the case:
 - Check that the proxy server of your Internet Browser is switched off
 - Check that the windows firewall is not blocking the program (switch off)
 - Check all cables and switches
 - If you find two or more Field Controllers with the same IP address, disconnect all but one from the network
- 3 If your computer has more than one NIC card, select the one you want to use for communication with the Field Controllers by ticking "Active NIC" and Press .

- 4 Right-click on the Field Controller, the address of which is to be changed:
the Field Controller Web Server opens



- The Web Server will only open if the host computer and the Field Controller have IP addresses in the same IP domain.
- 5 Expand the **Setup** node and click **Network**
 - Enter User Name "pcps" and Password "pcps" to open the **Network Configuration** dialog

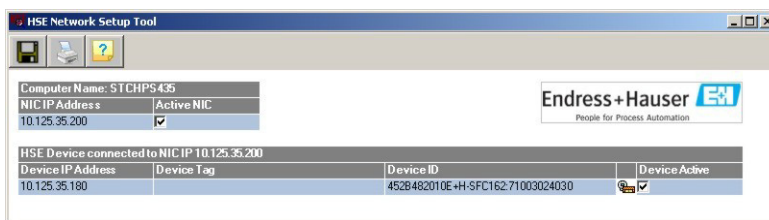
Network Configuration	
DHCP:	<input type="checkbox"/> Enabled
IP address:	<input type="text" value="10.125.35.180"/>
Netmask:	<input type="text" value="255.255.255.0"/>
MAC address:	<input type="text" value="00:07:05:43:00:C5"/>
Default gateway:	<input type="text" value="10.125.35.1"/>
<input type="button" value="Update"/>	


- Enter the required IP address, in our example 10.125.35.180
 - Enter a netmask, normally 255.255.255.0
 - If required, enter a default gateway, usually address xxx.xxx.xxx.1 in the selected domain
- 6 Press **Update** to change the IP address
 - You are now asked to restart the Field Controller
 - Select the **Restart** node

Firmware restart options	
Choose one restart option and press restart bottom:	
<input type="button" value="No additional options"/> <input type="button" value="Restart"/>	
<div style="border: 1px solid black; padding: 2px;"> No additional options Factory init Hold Disable web server </div>	

- Select "**No additional options**" from the drop-down menu and press **Restart**
- Close the Web Browser
- The Field Controller disappears from HSE Network Setup and reappears with the new IP address

- 7 Now set the address of the host computer to the same domain as the Field Controllers, see Chapter 6.1.1 – in our example 10.125.35.200
 - Restart **HSE Network Setup**



- Tick the Field Controller, so that it appears in the HSE Live List associated with the computer's active NIC card.
- Press  to save the configuration.
- You are now ready to download the project

Note!

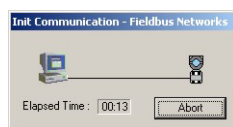
- If you have more than one Field Controller on the network, Repeat Steps 4 to 6 for all other Field Controllers, introducing them one by one to the network.

6.2 Create a live list

6.2.1 Create the HSE live list

Once the Computer and Field Controller are able to communicate with each other, the connection to the network can be checked by creating a live list.

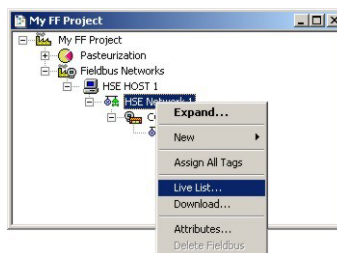
- 1 Press the **On-Line** button  in the menu toolbar
 - The project goes on on-line



- Red crosses appear against the Field Controller in the Project workspace and against the Field Controller and devices in the Fieldbus network workspace



- 2 In the Project workspace, right click on **HSE Network** and select **Live List**



- A live list is generated of the devices on the HSE network

HSE Live List - HSE Network 1							
Device Tag	Device Class	Device Address	Device Id	Manufacture Id	Type Id	Dev. Rev.	DD Rev.
HSE HOST 1	Host	10.125.35.200	0000000001:FF-HSE HOST:0000000001				
71003024030	Bridge	10.125.35.180	452B482010E+H-SFC162:71003024030	452B48 (Endress+Hauser GmbH)	2010 (SFC162)	03	04

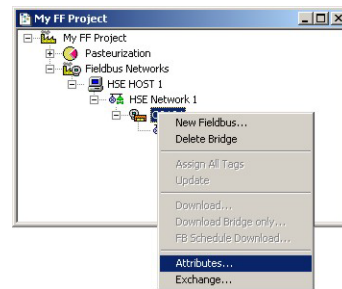
Note!



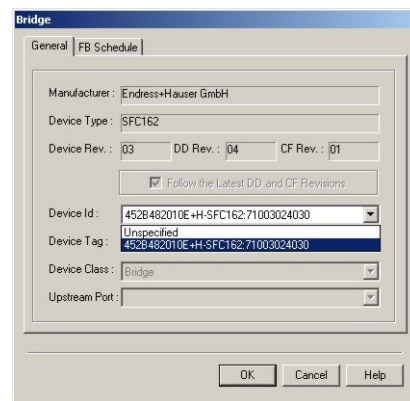
- It may take sometime to generate the live list
 - The devices found first go grey
 - Their profiles (all important device-specific data) including IP address are read
 - On successful completion of profile reading, the devices are shown in full black

6.2.2 Assign the HSE Device IDs

- 1 In the Project workspace, right click on the **Field Controller** (CO104) and select **Attributes...**



- 2 The **Attributes** dialog opens
 - Open the drop-down menu of the **Device ID** and select the Field Controller associated with the displayed TAG (in our case CO104) – the serial number is on the front panel
 - Do this even though the correct ID is already displayed – the program expects it!



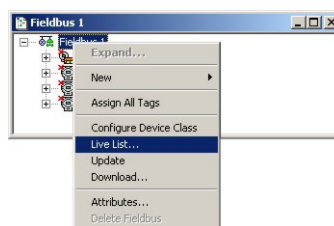
- Confirm your choice with **OK**
 - If Application Designer detects a mismatch in version, this is logged at the bottom of the page (for remedy, see Chapter 7.2)
- 3 In the HSE Live list, the Controller Icon goes grey, then reappears with the correct tag

Device Tag	Device Class	Device Address	Device Id	Manufacture Id	Type Id	Dev. Rev.	DD Rev.
HSE HOST 1	Host	10.125.35.200	0000000001:FF-HSE HOST:0000000001				
CO104	Bridge	10.125.35.180	452B482010E+H-SFC162-71003024030	452B48 (Endress+Hauser GmbH)	2010 (SFC162)	03	04

- 4 If several SFC162s were in use, Steps 1 and 4 would be repeated for all.
- 5 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.10
 - Open **Project File**, then press **Save Entire Configuration**, to save the project.

6.2.3 Create the FOUNDATION Fieldbus live list

- 1 In the Fieldbus network workspace, right-click on **Fieldbus 1** and select the option **Live List**

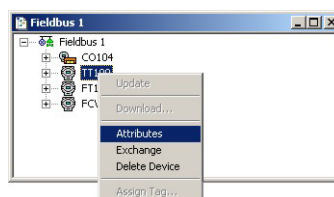


- 2 The Fieldbus live list is created
 - Check that devices in the project appear in the live list. If not, check connections etc.

Device Tag	Device Class	Device Address	Device Id	Manufacture Id	Type Id	Dev. Rev.	DD Rev.
E+H TMT162_8200SF04223	Basic	34 (0x22)	452B4810CC-8200SF04223	452B48 (Endress+Hauser GmbH)	10CC (TMT162)	01	01
Metro 10P000_055001030	Basic	26 (0x1A)	000E052328ND-90000550010300	E05 (Metro Automation)	2328 (METSO FBK ...)	03	01
71003024030	Bridge	16 (0x10)	452B482010E4H-5FC162-71003024030	452B48 (Endress+Hauser GmbH)	2010 (5FC162)	03	04
E+H PROMASS_83_CC87878...	Basic	25 (0x19)	452B481051-CC878787654	452B48 (Endress+Hauser GmbH)	1051 (Promass83)	03	01

6.2.4 Assign the Fieldbus Device IDs

- 1 In the fieldbus workspace, right click on **TT100** and select **Attributes...**



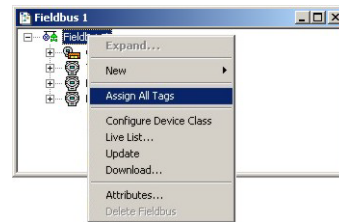
- 2 The **Attributes** dialog opens
 - Open the drop-down menu of the **Device ID** and select the device ID associated with the displayed TAG (in our case TT100) - the serial number is on the nameplate!

 A screenshot of the 'Device Attributes' dialog box. It contains fields for Manufacturer (Endress+Hauser GmbH), Device Type (TMT162), Device Rev. (01), DD Rev. (02), CF Rev. (01), and a checkbox for 'Follow the Latest DD and CF Revisions'. The Device ID dropdown is open, showing 'Unspecified' and a list of device IDs including '452B481051-CC878787654' and '000E052328ND-90000550010300'. The Device Class is set to '452B4810CC-8200SF04223'.

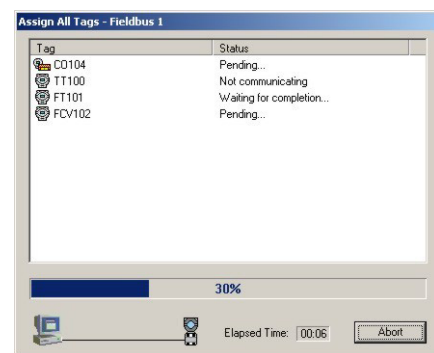
- Confirm your choice with **OK**
 - After a period of time, the red cross disappears from the device in the Fieldbus network
 - If Application Designer detects a mismatch in version, this is logged at the bottom of the page (for remedy, see Chapter 7.2)
- 3 Repeat the process for the rest of the devices in the Fieldbus network (FT101, FCV102)
 - After a period of time, the red cross disappears from the device in the Fieldbus network
 - 4 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.10
 - Open **Project File**, then press **Save Entire Configuration**, to save the project.

6.2.5 Assign All Tags

- 1 In the Fieldbus workspace, right-click on the Fieldbus node at the top of the tree and select **Assign All Tags**



- 2 The Assign All Tags dialog appears with the list of device and a progress bar



- On completion, the message "Profile reading done" stands next to the Field Controller and "Tag has been confirmed" next to the devices
 - If there are any failures in tag assignment these are logged with reasons at the bottom of the screen.
- 3 As the assignment proceeds, the Field Controller transmits the change to the device
 - The device goes grey in the live list
 - The Field Controller initiates a new network scan
 - After about 1 - 2 minutes, the device goes black and appears with the new tag
 - 4 At the end of the process the live list looks like this

Device Tag	Device Class	Device Address	Device Id	Manufacture Id	Type Id	Dev. Rev.	DD Rev.
FT101	Basic	25 (0x19)	452B481051-CC878787654	452B48 (Endress+Hauser GmbH)	1051 (Promass83)	03	01
FCV102	Basic	26 (0x1A)	000E052328ND9000050010330	E05 (Metso Automation)	2328 (METSO FBK ...)	03	01
CO104	Bridge	16 (0x10)	452B482010E+H-SFC162:71003024030	452B48 (Endress+Hauser GmbH)	2010 (SFC162)	03	04
TT100	Basic	27 (0x1B)	452B4810CC-82005F04223	452B48 (Endress+Hauser GmbH)	10CC (TMT162)	01	01

- The "bright" dot next to the SFC162 Field Controller indicates that it is the ACTIVE LAS of this segment

6.3 Download the project



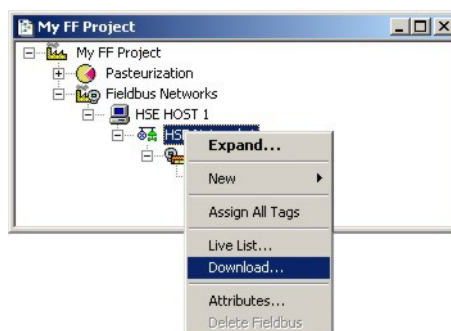
Note!

- The procedure below describes the initial download for the entire HSE network.
- Partial downloads can be made later from lower leaves, when changes are confined to this level
- Incremental downloads can be made to a running project by checking the boxes **Incremental Download** and **Compare Parameters**: Unaffected Local I/Os will hold their last values.

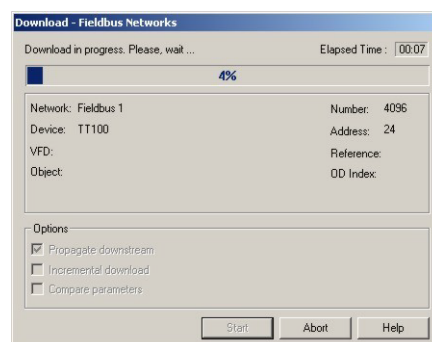
6.3.1 Download

When the devices in the Fieldbus live list correspond to those configured in the project, the download can begin.

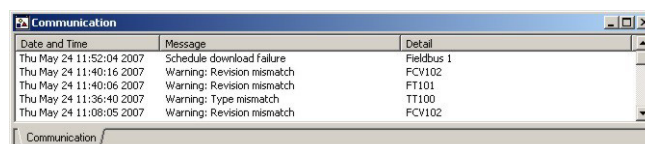
- 1 In the Project workspace right-click on **HSE Network** and select **Download**



- 2 The **Download dialog** appears



- Press **Start** to start the download
- A log at the bottom of the screen allows you to identify and non-critical download problems



- 3 The download will be interrupted if the project encounters a critical problem, e.g.
 - The Project tags are not up-to-date => Chapter 3.10
 - The Device IDs have not been assigned correctly => Chapter 6.2.2, Chapter 6.2.4
 - The Device Tags have not been assigned => Chapter 6.2.5
- 4 When the download is successfully completed, the dialog is closed, and you are ready to test the control strategy

6.3.2 Configure device class

In our project the Field Controller acts as the Link Active Scheduler by default. The FOUNDATION fieldbus protocol allows other devices to take over this role should the Field Controller fail. This ensures that any control loop not involving function blocks in the controller will continue to function in this event. A device can be setup to be a backup LAS by using the Configure Device Class function. This function is only effective when the device is online.

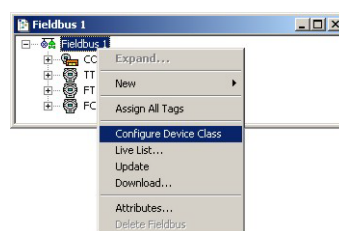


Note!

- If you are offline, the process finishes at Step 2. The change is registered in the project but is not downloaded with it. The procedure must then be repeated with the device online, otherwise a mismatch when you try to download.

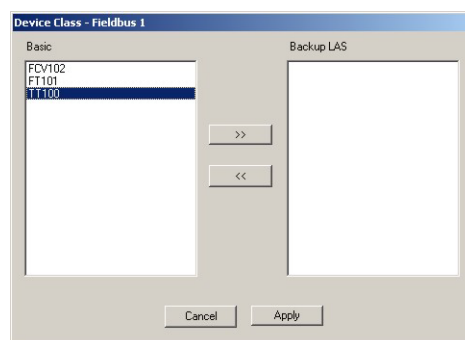
Procedure

- 1 In the Fieldbus window, right click on the Fieldbus node to open the context menu



- Select the menu **Configure Device Class**

- 2 The **Device Class** dialog opens



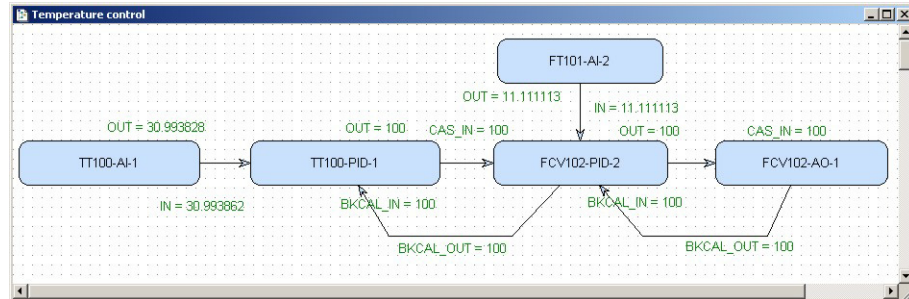
- Select the device(s) you want as backup LAS (usually one with few FB links, in our case TT100)
- Press >> to transfer the device to the righthand pane (if the device does not support LAS functionality, an error message appears)
- Press **Apply** to confirm the choice and close the dialog.

- 3 When online, the **Change Device Class** dialog appears and shows the download progress
- 4 On completion the TT100 device appears in the live list with a dot indicating backup LAS functionality

FF H1 Live List - Fieldbus 1 (CO104 Port 1)							
Device Tag	Device Class	Device Address	Device Id	Manufacture Id	Type Id	Dev. Rev.	DD Rev.
FT101	Basic	25 (0x19)	452B481051-CC878787654	452B48 (Endress+Hauser GmbH)	1051 (Promass83)	03	01
FCV102	Basic	26 (0x1A)	000E052328A090000550010330	E05 (Metso Automation)	2328 (METSO FBK ...)	03	01
CO104	Bridge	16 (0x10)	452B482010E+H-5FC162.71003024030	452B48 (Endress+Hauser GmbH)	2010 (SFC162)	03	04
TT100	Link Master	27 (0x1B)	452B4810CC-82005F04223	452B48 (Endress+Hauser GmbH)	10CC (TMT162)	01	01

6.4 Check the control strategy

- 1 Click in the Control Strategy workspace (Temperature control) and press the button  in the menu toolbar – the control strategy goes "on-line"



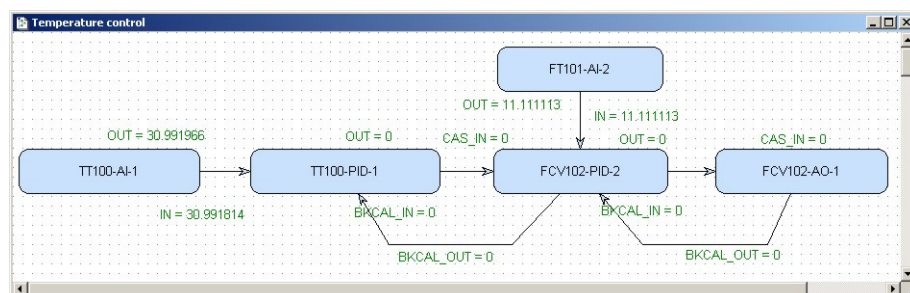
- Values appear in green when the status is good
 - Values appear in red if the status is bad – at this stage this is an indication of a Fieldbus configuration, a strategy configuration or a device parametrization error
- 2 Check that the loop is working by changing the Setpoint parameter in the temperature PID TT100
- Double-click on the **Temperature PID block** TT100-PID-1, the **On-line Characterization** dialog appears
 - Press the **All** icon to reveal all parameters
 - Open the **SP** leaf and double-click in the space next to **Value**
 - Enter a new SP value – for $T > SP$, set $SP < T$ or vice versa
 - Click **End Edit** to set the parameter
 - Press **Close** to store the value (if you are prompted – answer with **Yes**)

Off Line: TT100 - PID Control - TT100-PID-1

Parameter	Value	Offset	Hardware (HW)
MODE_BLK	5		
BLOCK_ERR	6		RO
PV	7		
SP	8		
STATUS	.1		RW
VALUE	20	.2	RW
OUT	9		
PV_SCALE	10		
OUT_SCALE	11		
CONTROL_OPTS	Bypass Enable	13	RW
IN	15		
BYPASS	Off	17	RW
CAS_IN	18		
GAIN	1.5	23	RW
RESET	0.1	24	RW
RATE	0.5	26	RW
BKCAL_OUT	31		
SHED_OPT	NormalShed_NormalReturn	34	RW

Buttons: Cancel Edit, End Edit, Clear, Close, Help

- 3 Now check that the control loop has responded properly



6.5 Modify the project



Note!

- It is essential that any change in the project, in particular to device settings, is registered in Application Designer, as this serves as a back-up in the event that the Field Controller battery becomes empty. This is assured, provided the procedures described in this Chapter are followed.



6.5.1 On-line characterization

Once the project is on-line you may want to change parameters to e.g. tune the control-loop or eliminate configuration errors. With the exception of the **SP** parameter, the function block must be put out of service before the parameter is changed:

- 1 In the Control strategy workspace double-click on the function block you want to modify, or in the Fieldbus network or Control module workspace, right-click on the function block and select **On Line Characterization**
- 2 The function block **On Line Characterization** dialog appears:
 - Press the **All** icon to reveal all parameters
 - Open the **Mode** leaf and double-click in the space next to **Target**
 - Set the Target to **OOS** (Out of Service)
 - Click **End Edit** to set the parameter
- 3 Change the parameters you wish to modify
 - If appropriate, open the parameter leaf and double-click in the space next to the parameter you require
 - Enter the new parameter or select it from the drop-down menu
 - Click **End Edit** to set the parameter
 - Repeat the procedure for all the parameters you wish to modify
- 4 Put the function block back into standard operating mode
 - Open the **Mode** leaf and double-click in the space next to **Target**
 - Set the Target back to the original value (**Auto** (Automatic) or **Cas** (Cascade))
 - Click **End Edit** to set the parameter
 - Check that the **Mode** really changes to the Target Mode (failure to do so indicates a configuration error)
 - Press **Close** to store the values (if you are prompted - answer with **Yes**)
- 5 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.10
 - Open **Project File**, then press **Save Entire Configuration**, to save the project.
- 6 Put the Control strategy back "on-line" to check the results of your modification, Chapter 6.4.

6.5.2 Off-line characterization

You may prefer to change parameters off-line, e.g. when modifying the control strategy or adding new functions to the project.

- 1 If you are on-line, press the **Off-line** button  in the menu toolbar alternatively, in the FOUNDATION Fieldbus network or Control module workspace, right-click on the function block and select **Off-line Characterization**
 - The function block **Off-line Characterization** dialog appears
- 2 Change the parameters you wish to modify
 - If appropriate, open the parameter leaf and double-click in the space next to the parameter you require
 - Enter the new parameter or select it from the drop-down menu
 - Click **End Edit** to set the parameter
 - Repeat the procedure for all the parameters you wish to modify
 - Press **Close** to store the values
- 3 Click on the **Project View** workspace and **Export Tags...**, see Chapter 3.10
 - Open **Project File**, then press **Save Entire Configuration**, to save the project.
- 4 Press the **On-line** button  in the menu toolbar to go on-line again
- 5 Download the modified project
 - In the Project workspace right-click on **Fieldbus Network** and select **Download**
 - Follow the procedure in Chapter 6.3
- 6 Put the Control strategy back "on-line" to check the results of your modification, Chapter 6.4.

6.5.3 Handheld, FieldCare or local interface


If device parameters are changed with a handheld, FieldCare or at a local interface, e.g. display, the changes must be uploaded to the Field Controller and Application Designer. The upload function is available from Version 2.05.xx upwards. Depending upon the tool and the task this can be done for the entire fieldbus or for individual devices.

- 1 Open Application Designer and go online
- 2 Right click on the **Fieldbus1** node in the fieldbus pane and select **Upload...**
 - Answer the confirmation dialog with **Yes**
- 3 When the upload is complete, click on the plant node and select **Export Tags**
- 4 Now check the transducer blocks to see whether the upload was successful
 - Open the **Online Characterization** block to view the parameters
 - Put the control strategy on line to check that it is working
- 5 Open **Project File**, then press **Save Entire Configuration**, to save the project.


6.6 Packing and unpacking the project

In order to install the project at the customer's site, the project can be packed and unpacked. It is important to remember, especially if you have not been using the actual project devices to test your project, that the instruments on site may have newer (or even older) DD/CFF files than the ones you use. The latest DD/CFF files must then be uploaded to the project and corresponding corrections must be made to configuration, before it is downloaded to the SFC162 Field Controller, see Chapter 7.2.

6.6.1 Pack the project

- 1 Select **Project File => Pack Project...**
 - The **Pack Project** dialog appears
 - Browse to the folder where the files will be created
You can create a folder with the Make New Folder button 
 - Enter the name of the project
 - Press **Save** to save the packed project
 - Press **OK** to close the successful packing message dialog

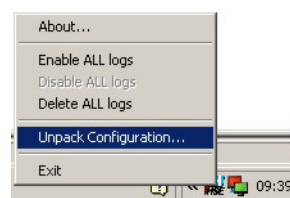
6.6.2 Unpack the project

- 1 Select **Project File => Unpack Project...**
 - In the **Unpack Project** dialog
 - Browse to the folder where the packed project is located
 - Click on the name of the project
 - Press **Open** to save the packed project
- 2 In the **Browse for Folder** dialog:
 - Browse to the folder where the project is to be installed
You can create a folder with the Make New Folder button 
 - Press **OK** to start unpacking
 - Press **OK** to acknowledge the successful unpacking of the project

6.6.3 Unpack the OPC data base only

For some applications it may be necessary to update the OPC data base of a SCADA program that has no provision for importing new DDs etc.. This can be done in Application Designer, which allows the separate unpacking of the OPC data base.

- 1 Go online, then right-click on the **HSE OPC Server** icon in the system tray



- 2 Select **Unpack Configuration...**
 - Unpack the OPC data base to the folder required according to the Steps 1 and 2 in Chapter 6.6.2 above

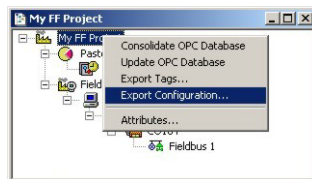
6.7 Export the configuration

For documentation purposes, the project configuration can be exported to an existing ODBC file data source, e.g. Oracle, a machine database, e.g. Excel to provide a record of the current status of the project or to an XML sheet for viewing with a browser.

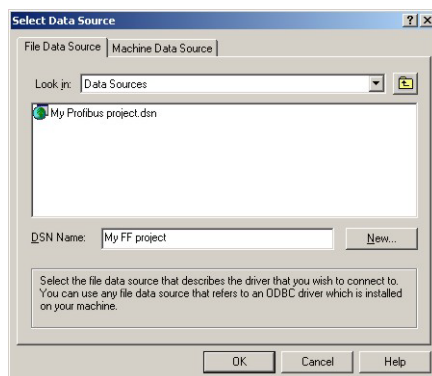
6.7.1 File data source folder

The file data source must have been created before the export.

- 1 In the Project window, right-click on the Project icon and select **Export Configuration**:



- 2 The **Select Data Source** dialog box appears
- 3 In the **File Data Source** folder, select the source that describes the driver that you wish to connect to. You can use any file data source that refers to an ODBC driver which is installed on your machine.
 - Use the **New...** button and **Look In** dropdown menu to browse or
 - Click the data source icon to select the driver:



- Press **OK** to make the connection

6.7.2 Machine data source folder

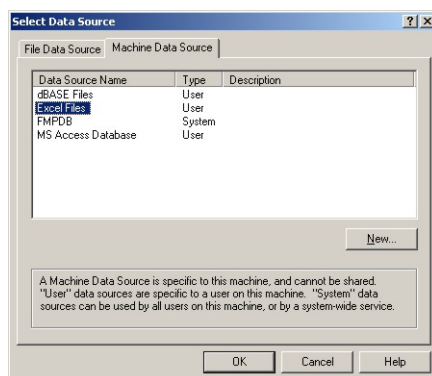
The **Machine Data Source** is specific to the machine, and cannot be shared. "User" data sources are specific to a user on the machine; "System" data sources can be used by all users on the machine, or by a system-wide service. The Machine Data Source must have been created before export.

Procedure

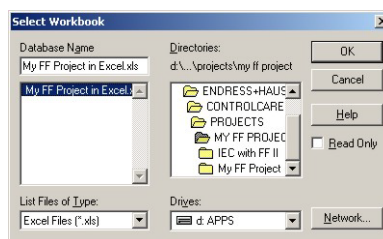
- 1 In the Project window, right-click on the Project icon and select **Export Configuration**:



- 2 The **Select Data Source** dialog box appears
 - Click on the **Machine Data Source** tab to open the folder
 - Double-click the data source name to select the machine, e.g. Excel:



- 3 The **Select Workbook** dialog box will appear:
 - Select the folder where the data file is and double-click the workbook icon.

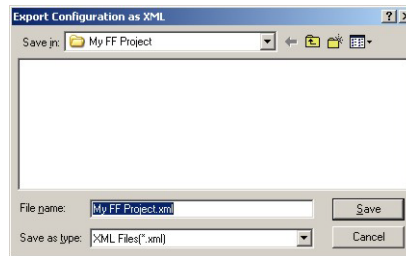


- Your project configuration will be exported to the workbook file.
 - A message box appears on completion – press OK
- 4 Open the Excel file to check the result:

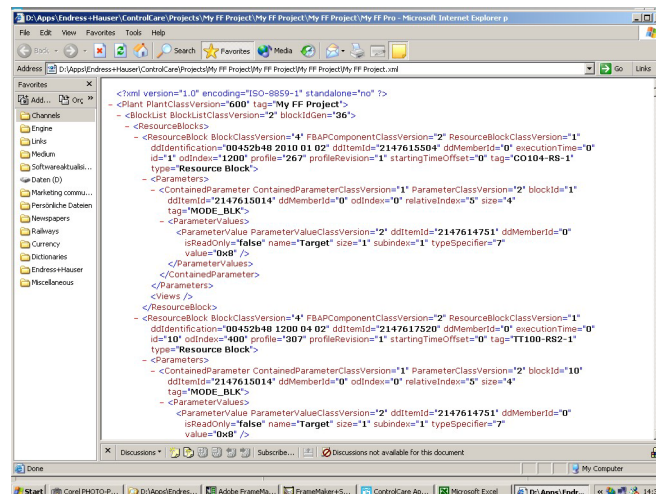
	A	B	C	D	E	F	G	H	I	J	K
1	BlockTag	BlockType	Manufacturer	DeviceType	DeviceRevision	DDRevision	StartingTimeOffset	ExecutionTime	ControlModuleTag	DeviceTag	VFDNumber
2	FT101-AI-2	Analog Input	Endress+Hauser GmbH	Promass83	03	01	0	20	Temperature control	FT101	2
3	FCV102-AQ-1	Analog Output	Metso Automation	METSO FBK Interface	03	01	0	20	Temperature control	FCV102	2
4	FCV102-PID-2	PID Control	Metso Automation	METSO FBK Interface	03	01	0	25	Temperature control	FCV102	2
5	TT100_AI_1	Analog Input	Endress+Hauser GmbH	TMT162	01	02	0	25	Temperature control	TT100	2
6	TT100_PID_1	PID Control	Endress+Hauser GmbH	TMT162	01	02	0	50	Temperature control	TT100	2

6.7.3 XML file

- 1 Click in the Project workspace and select **Project File => Export => Configuration as XML**
 - The **Export Configuration as XML** dialog appears




- 2 Enter a **File Name** and **Save In** location, then press **Save**
 - The project is saved as an XML file at the selected location





6.8 Close Application Designer

When you have completed your session, close Application Designer

- 1 If you are on-line, press the **Off-line** button  in the menu toolbar
- 2 If you have made any modifications while you were on line, you will be prompted to store them
 - If appropriate answer with **Yes**
- 3 Close the project by clicking on **Project File => Close**
- 4 Exit Application Designer by clicking on **Project File => Exit**
- 5 The Field Controller continues to operate with the project configured according to the last download/on-line correction
 - If you switch off the Field Controller, the project remains stored in its memory (provided the battery DIP switch is on, see BA021S/04/en: Field Controller, Hardware Installation)
 - It is initialized and re-executed as soon as the Field Controller is switched on again

6.8.1 Reconnecting

Provided your computer is operating in the same IP address domain as the Field Controller, you can reconnect at any time.

- 1 Start up Application Designer and select the Project you require
- 2 Press the **On-line** button  in the menu toolbar
- 3 Expand the various workplaces as required
- 4 Click in the **Control Strategy** workspace and press the button  in the menu toolbar – the control strategy goes "on-line" with the last configuration that was downloaded.

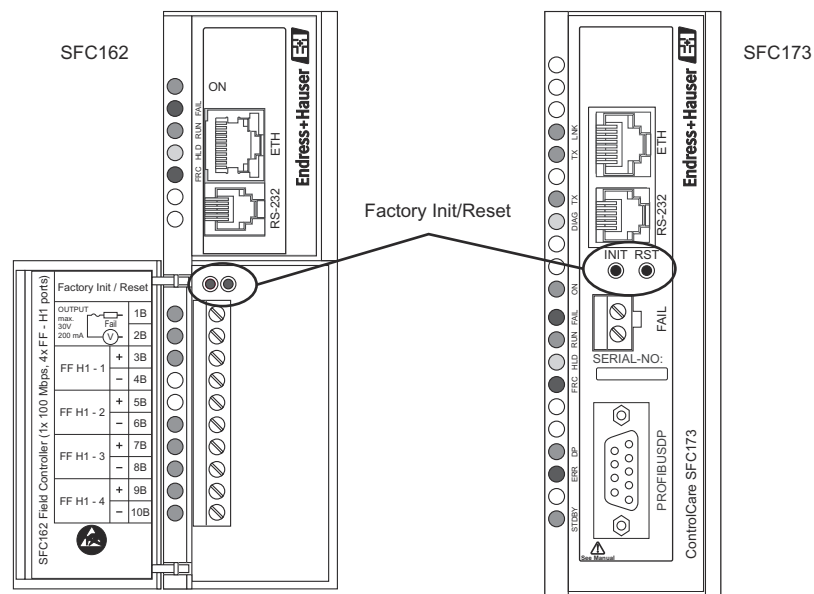
7 Trouble-Shooting

7.1 Factory initialisation and reset



Warning!

- Do not use the pushbuttons located in the Field Controller unless you are certain that you want to reset the system.



Two pushbuttons located in the SFC162 module (and SFC173 module), see Fig 7.1, allow the system to be initialised and reset. The function and effect of the buttons is described in the table below.

- To "click " the pushbuttons use a pointed instrument (e.g. a ballpoint pen).
- Other functions of the two buttons are to be found Chapter 7 of the Operating Instructions BA035S/04/en, Field Controller: Commissioning and Configuration..

Function	Effect	Procedure
Reset	Resets system: the last configured IP Address is retained	<ul style="list-style-type: none">■ Click the right pushbutton - the system resets (takes several seconds)■ If no IP Address is found, a new one is assigned automatically■ Verify that the RUN and ETH LNK LEDs are lit.
Factory Init	Deletes application, the last configured IP Address is retained	<ul style="list-style-type: none">■ Keeping the left pushbutton pressed, click the right pushbutton■ Check that the FORCE LED flashes once a second.■ Release the left push button. The system resets, see above.

7.2 Exchanging devices

It may be that during Device ID assignment, see Chapters 6.2.2 and 6.2.4, Application Designer detects a revision mismatch. If this occurs, the device revision must be changed in the project and the project downloaded as described below.

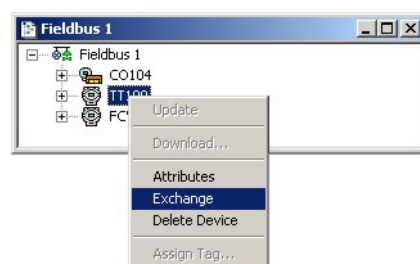
Note!



- For exchange of controllers, see Chapter 7.3, Updating the Firmware, in BA035S/04/en
- The process also applies to exchange of devices of the same type but different device revision
- In the case of devices from different manufacturers, manually check the incompatibilities (press **NO** at Step 3). Additional adjustments to the strategy may also be required.
- Device revisions not supported by Application Designer can be downloaded from www.fieldbus.org and integrated using the Import Device Support function

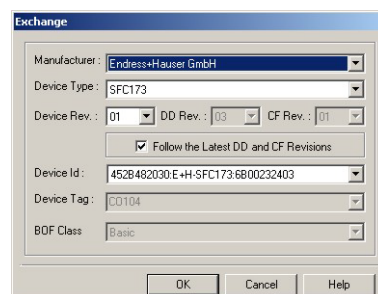
Procedure

- 1 Open the project in Application Designer and select the device to be updated, here SFC162



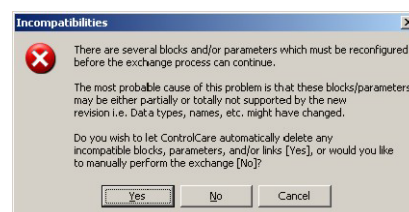
- Right-click on the node and select **Exchange...**

- 2 The **Exchange** dialog for the device appears



- Open the **Device Rev** menu and select the correct revision
- Press **OK** to confirm the change and close the dialog.

- 3 The **Incompatibilities** dialog may now appear



- Press **OK** to automatically update all links
- Close the successful exchange dialog by pressing **OK**.

- 4 Export the tags, press  to go on-line and download the project as described in Chapter 6.3.

7.3 Trouble-shooting tables

7.3.1 Field Controller

	Problem	Remedy
1	HSE Network Setup/FC Tools does not find any Field Controller	<ul style="list-style-type: none"> ■ Disable the Windows firewall (normally a message appears ask whether you should unblock the program) ■ Disable the proxy server for your Internet browser ■ Check that you are using the correct Ethernet cables, see ETH LINK below ■ Check that all ethernet switches are powered up ■ Check that the network adapter is on and OK: Execute a PING command to its own IP, via DOS PROMPT. ■ Check if the Ethernet connection is OK: Execute a PING command to the Field Controller.
2	Field Controller appears intermittently in FC Tools	Host and Field Controller are in different subnets. <ul style="list-style-type: none"> ■ Normal behaviour, but for firmware download both host and Field Controller must be in the same subnet
3	HSE Network Setup/FC Tools does not show all the Field Controllers that are in the network	There is probably an IP address conflict in the network. <ul style="list-style-type: none"> ■ Disconnect all the Field Controllers except one from the from the sub-network ■ If necessary, change its IP address ■ Now reconnect the other Field Controllers one after the other, if necessary changing their IP addresses
4	Field Controller Web Server does not open	No Ethernet connection <ul style="list-style-type: none"> ■ Disable the Windows firewall ■ Disable the proxy server for your Internet browse ■ Wrong subnet IP address Host and Field Controller must be in same subnet ■ Wrong subnet mask Host and Field Controller must have same subnet mask
5	Firmware begins to execute but after a certain time it stops	It might be a configuration problem. <ul style="list-style-type: none"> ■ Use the Factory Init procedure and configure the Field Controller again. ■ If the problem persists, see the relevant chapter in Operating Instructions BA035S/04/en, Field Controller, Commissioning and Configuration
6	HOLD LED remains lit	If the HOLD LED remains lit after the Field Controller has been turned on, the firmware may be invalid. <ul style="list-style-type: none"> ■ Update the firmware, see the relevant chapter in Operating Instructions BA035S/04/en, Field Controller, Commissioning and Configuration
7	ETH LNK LED does not light	Check if the cable is connected correctly, or that the cable is not damaged. Check the specification of the cables: <ul style="list-style-type: none"> ■ SFC954 - Cable Standard. To be used in a network between the Field Controller and a Switch/Hub. (preferred configuration) ■ SFC955 - Crossed Cable (Cross). To be used point to point between a PC and the Field Controller (some PCs/laptops may have problems with crossed cable)
8	FRC LED is flashing (Force)	Field Controller is powered up for the first time <ul style="list-style-type: none"> ■ Battery is not switched on (see BA021S/04/en, p50) Field Controller is in reset mode <ul style="list-style-type: none"> ■ Complete the RESET procedure Field Controller is in normal operation <ul style="list-style-type: none"> ■ Battery is flat: <ul style="list-style-type: none"> – No problem if controller remains powered up – If power is switched off, the project will be lost and must be downloaded again from Application Designer on repowering

7.3.2 Application Designer

	Problem	Remedy
1	Field Controller does not appear in HSE live list	No connection to Field Controller <ul style="list-style-type: none"> See Remedies for Items 1, 2 and 4, Chapter 7.3.1 Field Controller is on HOLD, set it to RUN mode IP address is not configured correctly, use PING to check
2	Field Controller appears but always stays grey in HSE Live List	No connection to Field Controller <ul style="list-style-type: none"> Check that host and Field Controller are in same subnet
3	Red cross appears on the Field Controller	No communication with Field Controller <ul style="list-style-type: none"> No Ethernet connection with Field Controller, check connection, IP address etc, see above No Device ID set in the Field Controller (Attributes)
4	Red cross appears on Fieldbus/Profibus	No communication with fieldbus/Profibus <ul style="list-style-type: none"> No communication with Field Controller, see above Fieldbus/Profibus not connected to controller
5	Red cross appears on field device	No communication with fieldbus device <ul style="list-style-type: none"> No communication with Field Controller, see above No communication with fieldbus, see above No Device ID set (Attributes) Tag not assigned (Assign Tag)
6	A device does not appear in the live list	Communication error <ul style="list-style-type: none"> The device is not powered up The project has been updated but no download has been made yet
7	Configuration will not download	You have either a communication problem or the configuration is not complete <ul style="list-style-type: none"> Check that you are on-line - press the On-line button Check that your computer is in the same address subnet Check that you have assigned the Field Controller tag Check that you have exported all tags OPC server Check that the parameters are in the recommended order Check that the OPC server is running (look for icon in bottom line) Try "Update" from the Field Controller node and download again
9	Parameter appears red in the on-line control strategy	The parameter has a bad status <ul style="list-style-type: none"> Check that the Block Mode is Auto (or Cas) Check that the block has been correctly configured Check that the device is still live (live list) Check that the device address is the same as that you have in your configuration (live list) Check that the parameter has been correctly configured Check that the tags were exported (Export Tags)
10	FB links do not work	Project not downloaded correctly, e.g. partial download when bridge has HSE links <ul style="list-style-type: none"> Repeat full download from the HSE Network node

For your notes

For your notes

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