1 Modbus Connection

1.1 Modbus configuration

The table below summarizes the Modbus configuration details;

Modbus configuration	
Protocol	Modbus RTU
Default slave address	0x01 (settable with LabVision or by dll)
Supported Modbus commands	Read Holding registers (0x03) Write single holding register (0x06)
Baud rate	9600bps
Data Length	8
Parity	None
Stop Bits	2
Physical layer	RS485 (two wire + optional GND)

The default setting for the Modbus (dependent) address is 1. The address setting resides in the e2prom of the interface and can be changed if required. This can be done LabVision, via the Argus link connection.

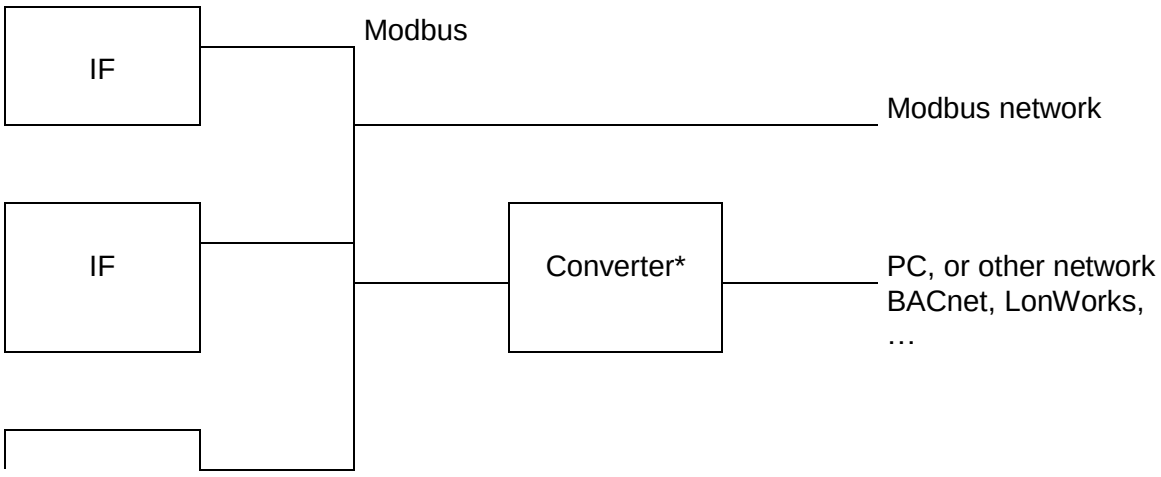
Multiple holding registers can be read (up to all of the available registers for the device), writing of holding registers is limited to one register at a time.

1.2 Modbus Functionality

The basic modbus functionality gives control over the devices connected by their modbus interface. The control includes building management systems, remote displays, PLC control.

On installation all Argus devices must be set at a unique modbus address. To connect to networks other than modbus, bus converters can be connected to the system. The optional bus converter can then scans these addresses for active devices, and map them on the network it needs to convert to.

1.2.1 System overview (example)



xx

* Optional

1.3 Modbus holding registers

Modbus communicates using words (the contents of 16bit holding registers).
The data that is offered is organized as a list of bytes.

Depending on the type of Modbus software used, the holding register addressing range starts either at 0x0000 or at 0x0001. If your Modbus software starts addressing from 0x0000 you can use the holding register addresses shown in the table above. If your Modbus software addressing range starts at 0x0001 then add 1 to the holding register addresses listed in the table above. This is also true for the various test tools available for Modbus.

1.3.1 Control register

A special control register is implement to secure certain modbus actions / commands.
To activate these actions / commands, first the control register must be written.

This must be done only when initiating a write command to a holding register.
Do not send this command when no write enable is needed to prevent holding registers from being corrupted.

Holding register		Access		Parameter name	Automatic Conversion	Range
		R	W			
99	0063	X	X	**Control register**		Bit0: Write enable .. Bit14: Controller Reset

When no Modbus communication (reading or writing) is sensed for more than 4,0 Seconds the *control register* bits will be reset. The bits will also be reset when undefined bits (i.e. other than bits 0 and 14) are set.

1.3.1.1 Write enable

The 'Write enable' register controls the reading and writing of the holding registers.
'Write enable' = 0: the data in the holding register is read only.
'Write enable' = 1: the data in the holding register can be written.

Writing of parameters with a different value is limited to 10.000 times.
All (CH,DHW) set points and parameters are for preset only,
they can be changed with an average of 2 changes per day.
Not to be used for dynamic temperature control!

1.3.1.2 Controller reset

A controller may be reset (only) when it is in error. Only Lock out errors can be reset. When the controller is in error, it can be reset by setting bit 14 to the control holding register (0x0063) of the Modbus interface. The Interface board then sends a reset command to the controller over the Argus Link bus. Once it has done this, it resets the reset bit of the Control holding register.

1.3.2 Controller Type

For easier handling of holding registers, the data format can be changed on the modbus interface. This means that all unit conversion is done in the modbus interface (for both reading and writing data).

Holding register		Access		Parameter name	Automatic Conversion	Range
		R	W			
97	0061	X		**Main Control Group Number**	V	0000 – 10000

The group number will identify the Main Control Group number which identifies specific system settings.

1.3.3 Modbus Version

For easier handling of holding registers, the data format can be changed on the modbus interface. This means that all unit conversion is done in the modbus interface (for both reading and writing data).

Holding register		Access		Parameter name	Automatic Conversion	Range
		R	W			
98	0062	X		**Modbus Version**		12

On readout the value can be displayed with the unit set in this holding register without conversion other than decimal point correction. So 12 is 1.2.

1.3.4 Modbus Units

For easier handling of holding registers, the data format can be changed on the modbus interface. This means that all unit conversion is done in the modbus interface (for both reading and writing data).

Holding register		Access		Parameter name	Automatic Conversion	Range
		R	W			
100	0064	X	X	**Modbus Units**		Bit0: °C / °F Bit1: bar / psi

To change the units, first enable writing in the control register, and then set the appropriate configuration bits in the *Modbus Units* register.

To enable decimals on readout, values are multiplied before they are stored in the holding register. They must be divided on readout to obtain the original value.

- Temperatures: resolution xxx.xx factor 100 Unit as set in Unit register
- Voltages: resolution xx.x factor 10 Unit as set in Unit register

On readout the value can be displayed with the unit set in this holding register without conversion other than decimal point correction.

1.3.5 Device type

In a complete bus system a lot of different devices can be connected. All these devices supply different data in their holding registers. To make an universal format for equal devices a device type is defined:

Device type	Function
1	Managing Boiler / Stand-alone Boiler (with build in controller)
2	Dependent Boiler
3	Trio Managing Boiler / Single Trio (with build in controller)
4	Trio Dependent Boiler (with build in controller)
5	…
6	…

When reading this *Device Type* register, the fixed format can be found.

NOTE: In some systems the format is defined by the address of the device.

Holding register		Access		Parameter name	Automatic Conversion	Range
		R	W			
101	0065	X		Device type		1 = Managing or Stand-alone Boiler 2 = Dependent Boiler 3 = Trio Managing or Single Trio 4 = Trio Dependent

1.4 Pre-defined devices

1.4.1 General notes

For all devices, empty or not available holding registers return 0.
When it is not implemented requests can be ignored by the Modbus device.

Holding registers below 99 are reserved for legacy devices, and are optional.
The functionality of these registers is not changed / influenced by this specification.

1.4.2 3 - Trio

Managing Boiler						
Holding register		Access		Parameter name	Automatic Conversion	Range
		R	W			
100	0064	X	X	**Modbus Units**		Bit0: °C / °F Bit1: bar / psi
101	0065	X		Device type		3 = Managing / Stand-alone Boiler
102	0066	X		State		See state table
103	0067	X		Status		See status table
104	0068	X		Error Code		See error list
105	0069	X		Warning Code		See warning list
106	006A	X	X	**Boiler CH setpoint**	V	Depending on units °C / °F
107	006B	X	X	**Boiler DHW setpoint**	V	Depending on units °C / °F
108	006C	X	X	**Boiler operation**		0..x
109	006D	X	X	**DHW type**		0..x
110	006E	X	X	**CH mode**		0..x
111	006F	X	X	**DHW mode**		0..x
112	0070	X		Supply temperature	V	Depending on units °C / °F
113	0071	X		Return temperature	V	Depending on units °C / °F
114	0072	X		DHW temperature	V	Depending on units °C / °F

115	0073	X		Flue gas temperature	V	Depending on units °C / °F
116	0074	X		Heat exchanger temperature	V	Depending on units °C / °F
117	0075	X		Firing Rate	V	0..100%
118	0076	X		Min Firing Rate	V	0..100%
119	0077	X		Flame current	V	0..x uA
120	0078	X		Water pressure	V	Depending on units 0..x bar/psi
121	0079	X		Analog in	V	0..10,0V
122	007A	X		Analog out	V	0..10,0V
123	007B	X		Information: (optionally implemented)		Bit0: On/Off - Flame Signal Bit1: Ok/Nok - Water level Bit2: Ok/Nok - Low gas pressure Bit3: Ok/Nok - High gas pressure Bit4: On/Off - Air pressure Bit5: Ok/Nok - Blocked flue Bit6: On/Off - Air damper Bit7: ..
124	007C	X		CH pump	V	0/100 or 0..100%
125	007D	X		DHW pump	V	0/100 or 0..100%
126	007E	X		Ignition count OK		0..65536, resolution 16
127	007F	X		Ignition count Failed		0..65536, resolution 1
128	0080	X		Flame count Failed		0..65536, resolution 1
129	0081	X		Burner High hours / CH Hours		0..65536 hours
130	0082	X		Burner Med hours / DHW Hours		0..65536 hours
131	0083	X		Burner Low hours		0..65536 hours
	..			Reserved		
150	0096	X		Dependent State		See state table
151	0097	X		Dependent Status		See status table
152	0096	X		Dependent Error Number		See error list
153	0096	X		Dependent Firing Rate	V	0..100%
	..			Reserved		
199	00C7			reserved		

Controller (managing)						
Holding register		Access		Parameter name	Automatic Conversion	Range
		R	W			
200	00C8	X		Controller State		See controller state table
201	00C9	X		Controller Status		See controller status table
202	00CA	X		Controller Error Code		See controller error list
203	00CB	X		Controller Warning Code		See controller warning list
204	00CC	X	X	**Controller CH setpoint**	V	Depending on units °C / °F
205	00CD	X	X	**Controller DHW setpoint**	V	Depending on units °C / °F
206	00CE	X	X	**High Outdoor Air temperature**	V	Depending on units °C / °F
207	00CF	X	X	**Minimum outdoor air setpoint**	V	Depending on units °C / °F
208	00D0	X	X	**Low outdoor air temperature**	V	Depending on units °C / °F
209	00D1	X	X	**Maximum Outdoor air setpoint**	V	Depending on units °C / °F
210	00D2	X	X	**Outdoor air shutdown temperature**	V	Depending on units °C / °F
211	00D3	X	X	**Night Setback**		Depending on units °C / °F
212	00D4	X		Header temperature	V	Depending on units °C / °F
213	00D5	X		Outside temperature	V	Depending on units °C / °F
214	00D6	X		Cascade Firing Rate	V	0..100%
215	00D7	X		Min Firing Rate	V	0..100%
216	00D8	X		System pump	V	0/100 or 0..100%
	..			reserved		
299	012B			reserved		

1.4.3 2 - Dependent boiler

Dependent Boiler					
Holding register	Access		Parameter name	Automatic Conversion	Range
	R	W			

100	0064	X	X	**Modbus Units**		Bit0: °C / °F Bit1: bar / psi
101	0065	X		Device type		2 = Dependent Boiler
102	0066	X		State		See state table
103	0067	X		Status		See status table
104	0068	X		Error Code		See error list
105	0069	X		Warning Code		See warning list
106	006A	X	X	**Boiler CH setpoint**	V	Depending on units °C / °F
107	006B	X	X	**Boiler DHW setpoint**	V	Depending on units °C / °F
108	006C	X	X	**Boiler operation**		0..x
109	006D	X	X	**DHW type**		0..x
110	006E	X	X	**CH mode**		0..x
111	006F	X	X	**DHW mode**		0..x
112	0070	X		Supply temperature	V	Depending on units °C / °F
113	0071	X		Return temperature	V	Depending on units °C / °F
114	0072	X		DHW temperature	V	Depending on units °C / °F
115	0073	X		Flue gas temperature	V	Depending on units °C / °F
116	0074	X		Heat exchanger temperature	V	Depending on units °C / °F
117	0075	X		Firing Rate	V	0..100%
118	0076	X		Min Firing Rate		0..100%
119	0077	X		Flame current	V	0..x uA
120	0078	X		Water pressure	V	Depending on units 0..x bar/psi
121	0079	X		Analog in	V	0..10,0V
122	007A	X		Analog out	V	0..10,0V
123	007B	X		Information: (optionally implemented)		Bit0: On/Off - Flame Signal Bit1: Ok/Nok - Water level Bit2: Ok/Nok - Low gas pressure Bit3: Ok/Nok - High gas pressure Bit4: On/Off - Air pressure Bit5: Ok/Nok - Blocked flue Bit6: On/Off - Air damper Bit7: ..
124	007C	X		CH pump	V	0/100 or 0..100%
125	007D	X		DHW pump	V	0/100 or 0..100%
126	007E	X		Ignition count OK		0..65536, resolution 16
127	007F	X		Ignition count Failed		0..65536, resolution 1
128	0080	X		Flame count Failed		0..65536, resolution 1
129	0081	X		Burner High hours / CH hours		0..65536 hours
130	0082	X		Burner Med hours / DHW hours		0..65536 hours
131	0083	X		Burner Low hours		0..65536 hours
	..			reserved		
199	00C7			reserved		

1.5 Custom devices

1.5.1 186 - Heat Recovery Unit Basic

Heat recovery Unit Basic						
Holding register		**Access**		**Parameter name**	**Conversion**	**Range**
		R	**W**			
100	0064	X		**Modbus Units**		Bit0: °C / °F Bit1: bar / psi
101	0065	X		Device type		reserved
102	0066	X	X	State		Stop, Run
103	0067	X	X	Status		Operation Modes fan, heat, cool, auto, VOD
104	0068	X		Error Code		See error list
105	0069	X		Warning Code		reserved
106	006A	X	X	Master is Modbus		No/Yes
107	006B	X	X	Fan speed Exhaust	V	Off, Low, Med, High

108	006C	X	X	Fan speed Supply	V	Off, Low, Med, High
109	006D	X	X	Setpoint	V	xxx.xx, Depending on units °C / °F
110	006E	X		Indoor sensor	V	xxx.xx, Depending on units °C / °F
111	006F	X		Outdoor sensor	V	xxx.xx, Depending on units °C / °F
112	0070	X		Bypass Valve (relay)		0..100%
113	0071	X	X	Filter time		x10 minutes
114	0072	X	X	Set clock with on time		
115	0073	X	X	Block 1 or 2		
116	0074	X	X	Day 1-7		
117	0075	X	X	On time in hours	V	00 – 23 hours
118	0076	X	X	On time in minutes	V	00 – 59 minutes
119	0077	X	X	Off time in hours	V	00 – 23 hours
120	0078	X	X	Off time in minutes	V	00 – 59 minutes
	..			reserved		
199	00C7			reserved		