

Training ClimaECO, 2020

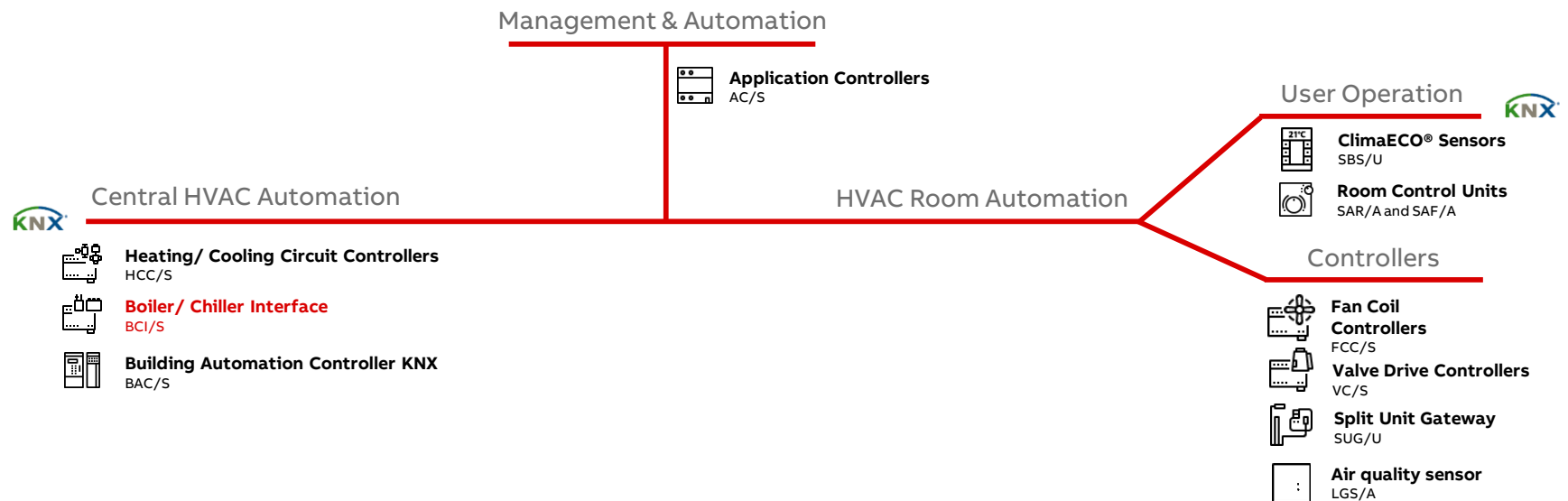
Boiler/Chiller Interface BCI/S 1.1.1

ClimaECO

Thorsten Reibel, Competence Center Europe

Boiler/Chiller Interface BCI/S 1.1.1

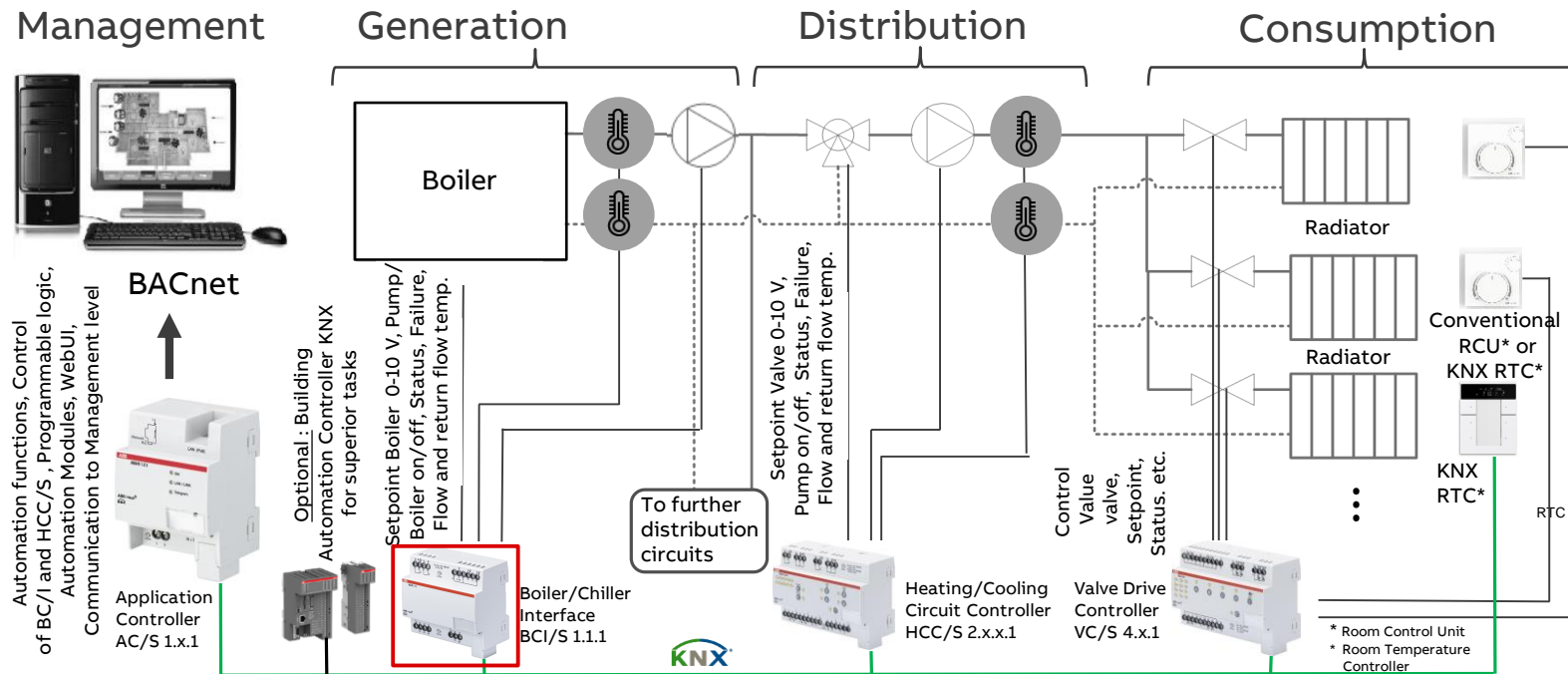
Overview ClimaECO: New Products



A holistic HVAC Building Automation System, over 30 new devices

Boiler/Chiller Interface BCI/S 1.1.1

Overview ClimaECO: ABB i-bus® KNX HVAC Solutions



Boiler/Chiller Interface BCI/S 1.1.1

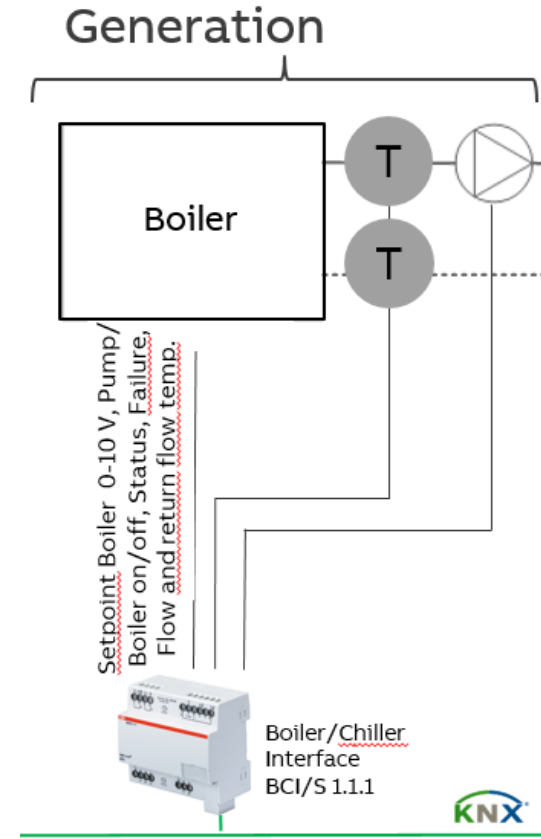
Introduction

Why Boiler/Chiller Interface BCI/S 1.1.1 in a Heating/Cooling System?

In a heating/cooling system hot/cold water has to be generated with the right amount and temperature to be distributed to various circuits/units in a building.

A boiler or chiller produces the tempered water but has to be controlled depending on the demand of the total heating/cooling system

→ For a holistic approach Boiler Chiller Interface BCI/S 1.1.1 from ABB based on KNX



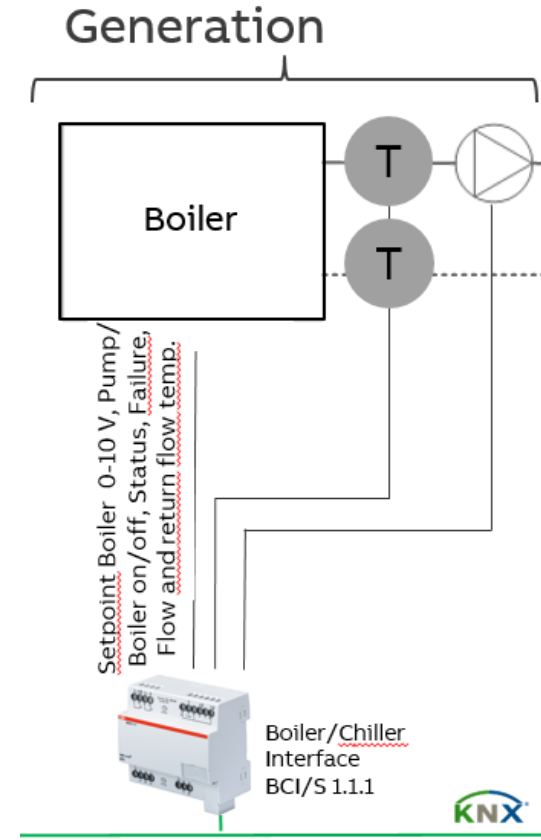
Boiler/Chiller Interface BCI/S 1.1.1

Introduction

How does the Boiler/Chiller Interface function in a Heating/Cooling System?

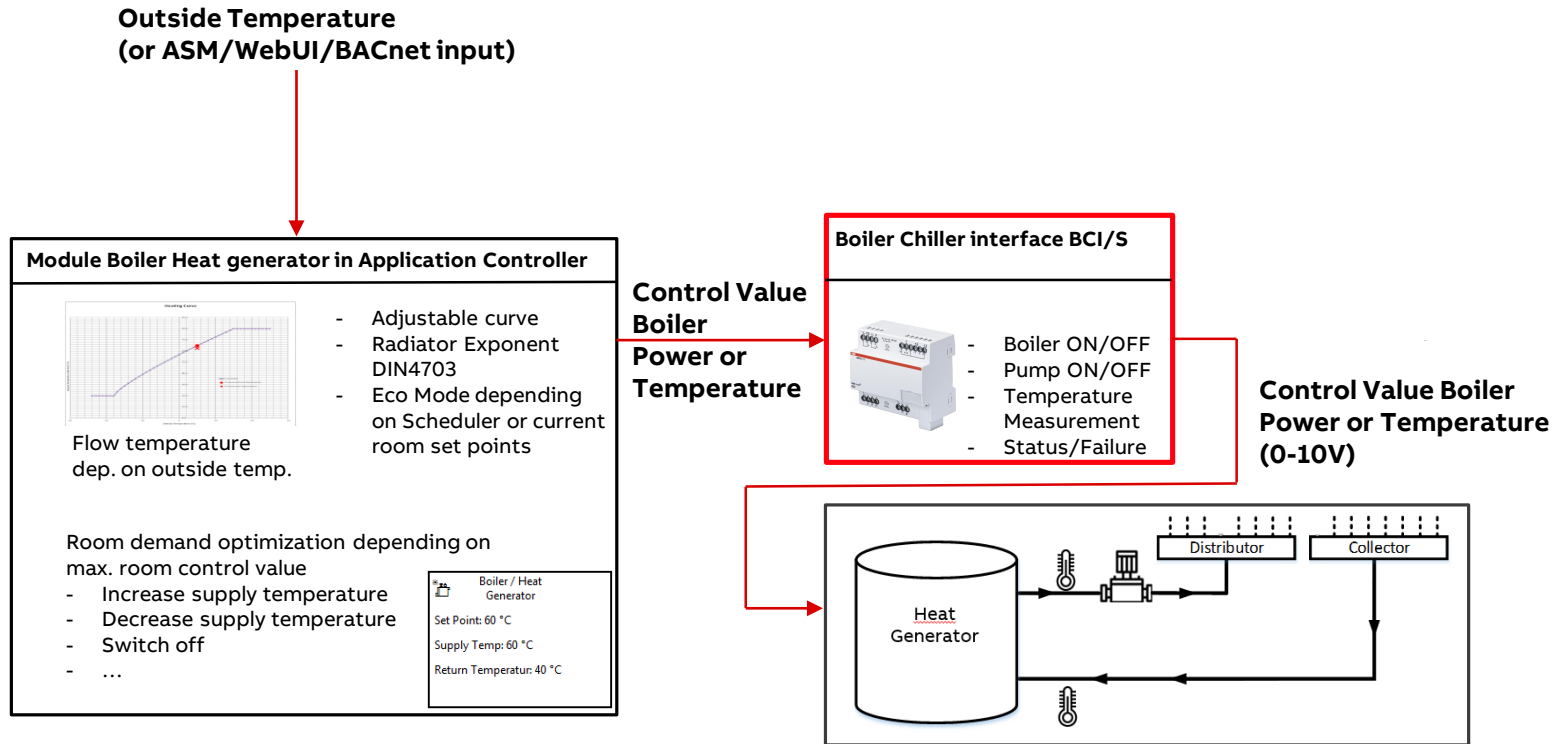
A boiler or chiller offers typically 0-10V interface in order to control the water temperature or power

- Standard solution on the market:
 - Connection of outdoor temperature sensor, Boiler temperature to be adjusted depending on outside temperature
 - Connection of indoor temperature sensor in a reference room
 - Both solutions do not consider the real Heat/Cool demand of the complete system



Boiler/Chiller Interface BCI/S 1.1.1

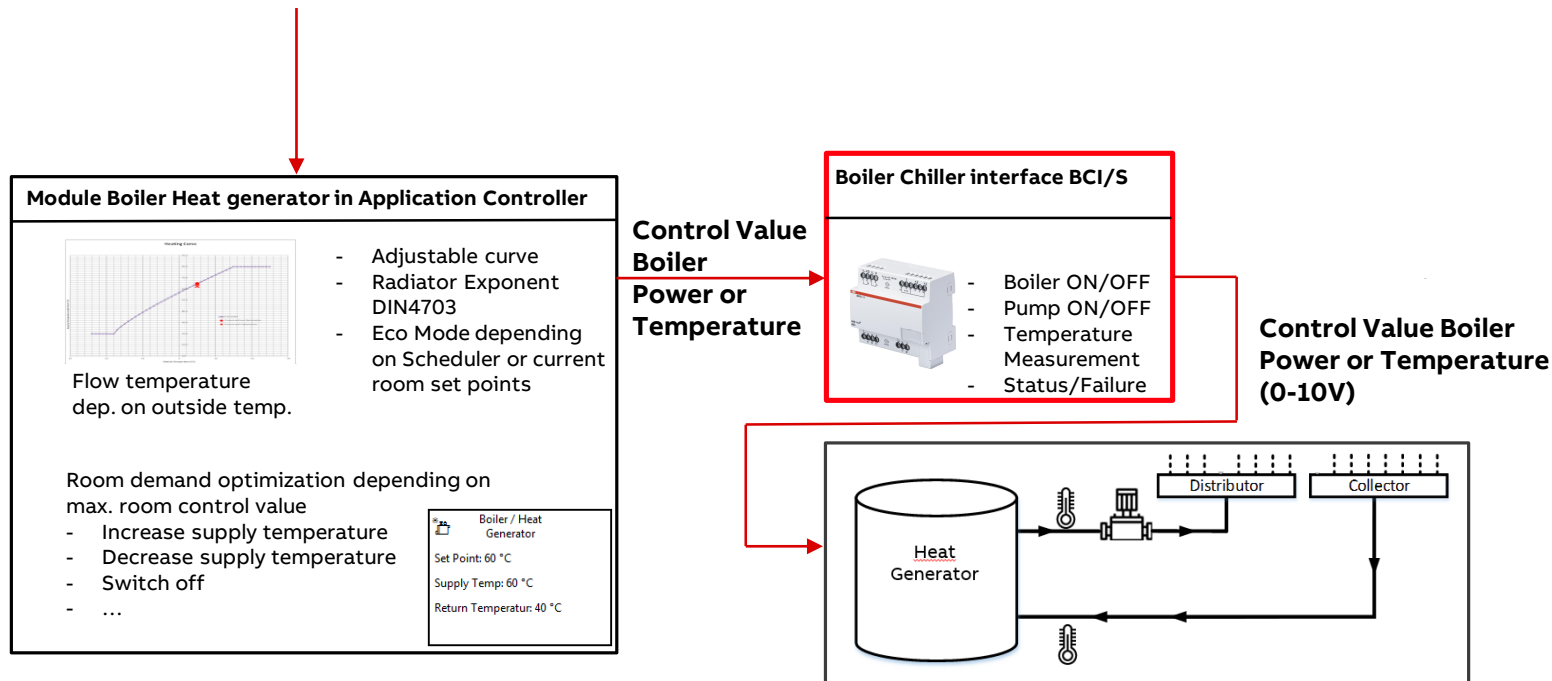
Function in Context with Heating (Boiler Control **without** Heating Circuit Control by HCC/S)



Boiler/Chiller Interface BCI/S 1.1.1

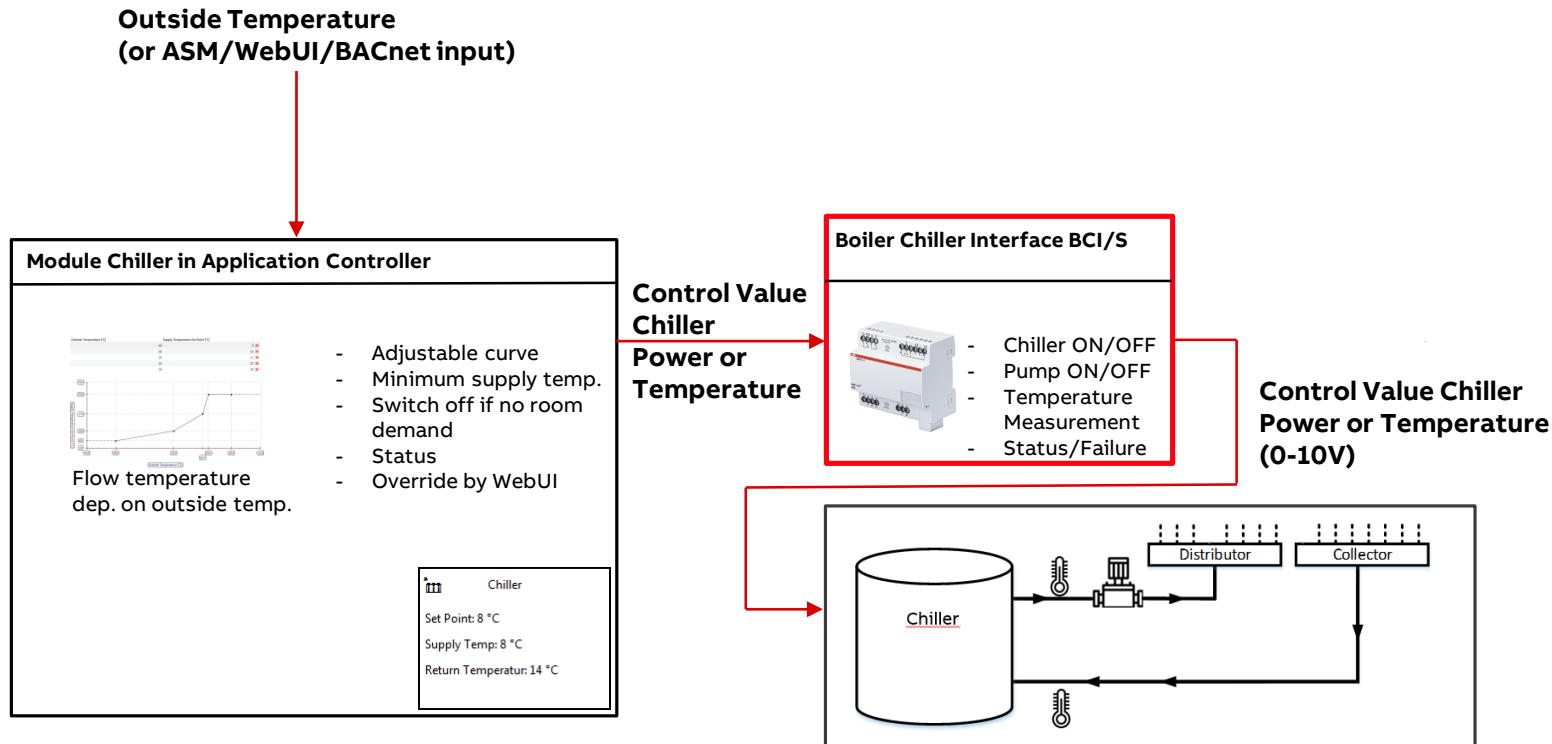
Function in Context with Heating (Boiler Control **with** Heating Circuit Control by HCC/S)

ASM Input: Maximum Control Value
from the actuators in the rooms



Boiler/Chiller Interface BCI/S 1.1.1

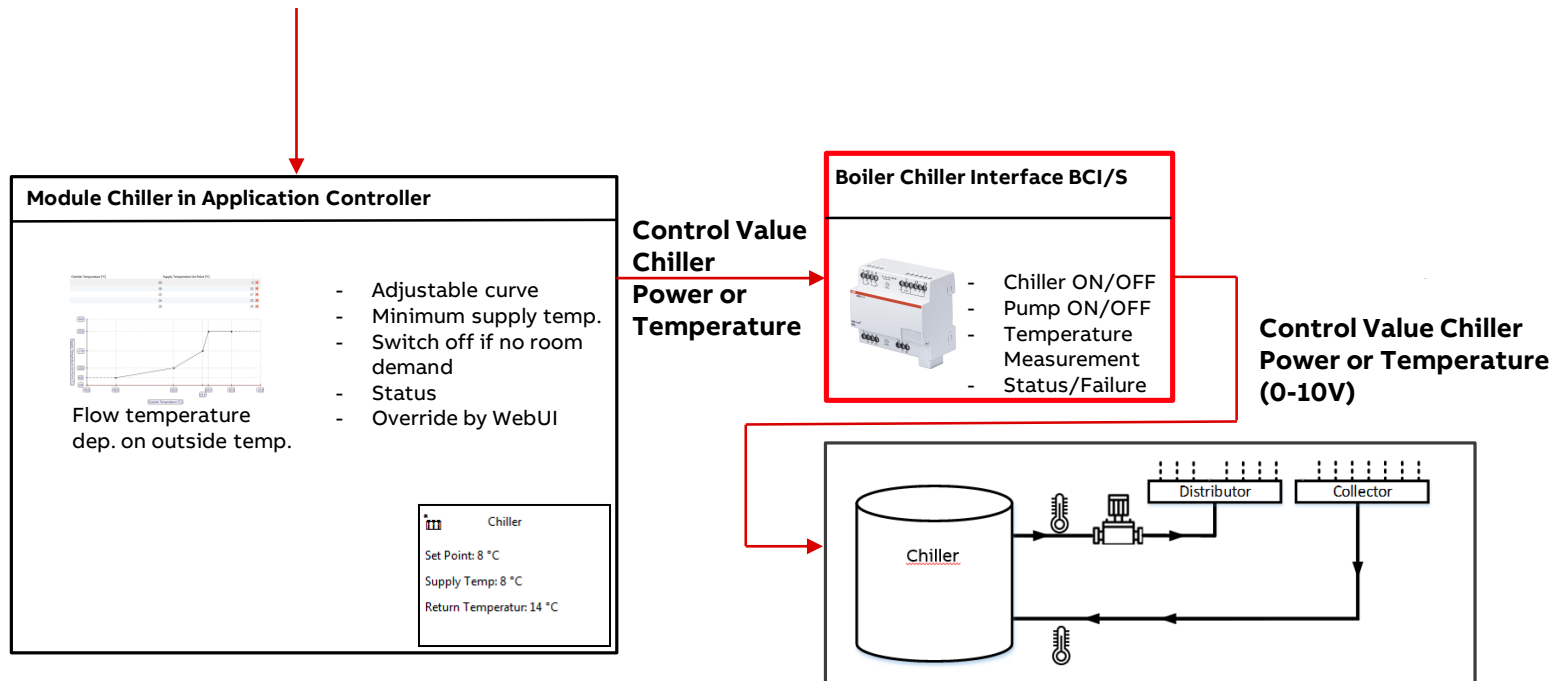
Function in context with Cooling (Chiller Control **without** Cooling Circuit Control by HCC/S)



Boiler/Chiller Interface BCI/S 1.1.1

Function in context with Cooling (Chiller Control **with** Cooling Circuit Control by HCC/S)

ASM Input: Minimum Control Value
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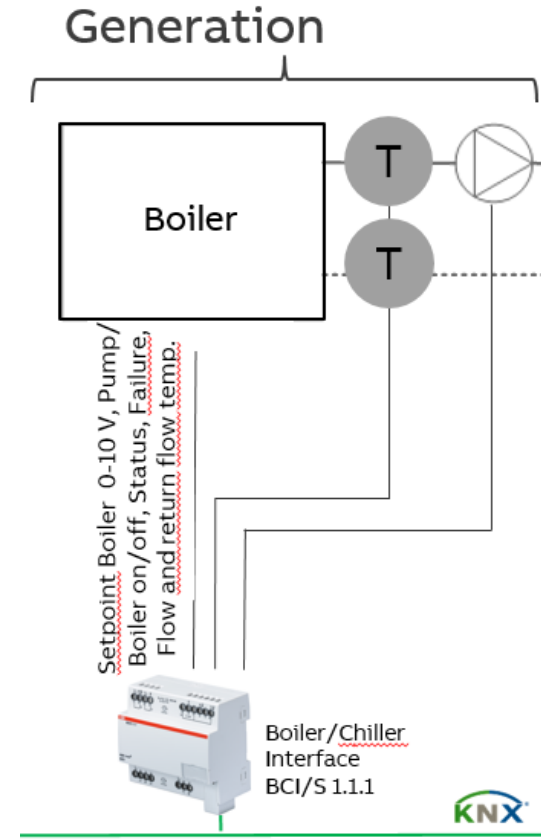


Boiler/Chiller Interface BCI/S 1.1.1

Introduction

How does the Boiler/Chiller Interface function in a Heating/Cooling System?

- The BCI, supported by the Application Controller AC/S, is able to control the temperature/power of the boiler/chiller depending on the real demand
- Beside the provision of 0-10V for boiler/chiller temperature BC/I controls the pump (depending on actuating value to the boiler), transmits status information and temperature values
- The main intelligence (especially to provide the right control value) is located in the Application Controller AC/S (ASM's Boiler Heat generator and Chiller)
 - It means, no controller inside Boiler/Chiller interface



Boiler/Chiller Interface BCI/S 1.1.1

Introduction

Motivation – Features

- Control of a Boiler/Chiller and pump **NEW**
- Expansion of ABB i-bus KNX to the Automation level
- Expansion of ABB i-bus KNX to the Generation level
- Necessary for for a holistic approach of a HVAC solution completly with ABB i-bus KNX (Automation- and Generation level)
- Control of necessary water temperature (set point) in the boiler/chiller via 0-10V
- Turn on/off of boiler/chiller
- Turn on/off of pump of the main heating/cooling circuit
- Measurement of flow- and return flow temperature



Boiler/Chiller Interface BCI/S 1.1.1

Introduction

Motivation – Features

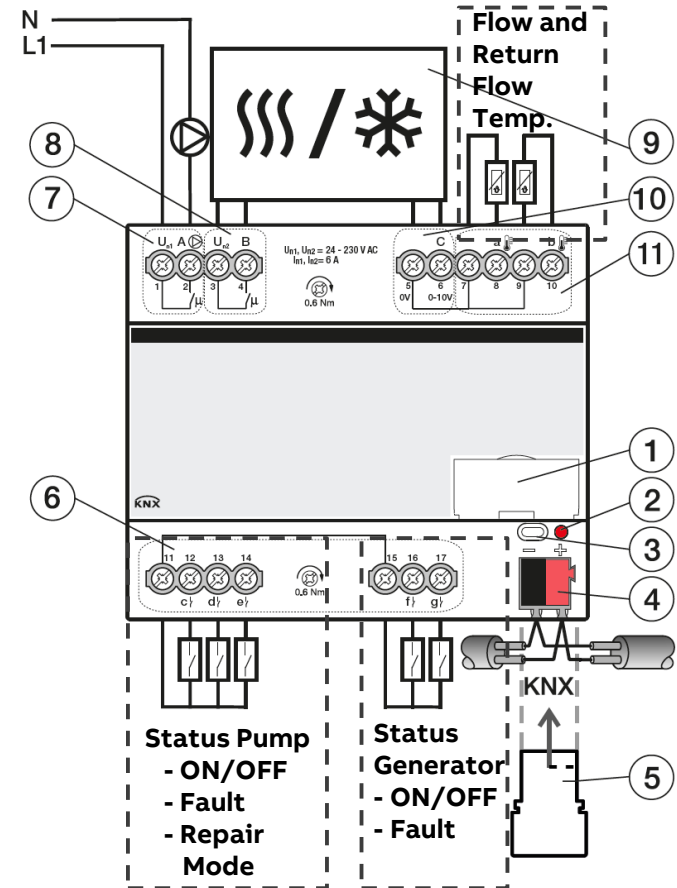
- 0-10 V output for setpoint boiler/chiller
- 2 switch outputs for boiler/chiller and pump
- Binary inputs for status or other functions
 - 2 binary inputs failure, status boiler/chiller
 - 3 binary inputs failure, status, repair switch pump
 - 2 analogue inputs for flow- and return flow temperature
- One device without manual operation
- → I/O device for boilers and chillers with dedicated functions for it's purpose
- No controller inside, it's an interface, therefore no interference with the internal safety mechanism of the boiler or chiller unit.
- ABB i-bus tool support



Boiler/Chiller Interface BCI/S 1.1.1

Connection Terminals

1. Label carrier
2. KNX programming button
3. KNX programming LED (red)
4. KNX connection
5. Cover cap
6. Binary inputs (c, d, e, f, g)
7. Relay output A (Pump)
8. Relay output B (Boiler/Chiller)
9. Boiler (Heat Generator)/Chiller
10. Analog Output C
(Set point transfer to Boiler/Chiller)
11. Temperature input (a, b)



Boiler/Chiller Interface BCI/S 1.1.1

Product range

BCI/S 1.1.1 – Functional Overview

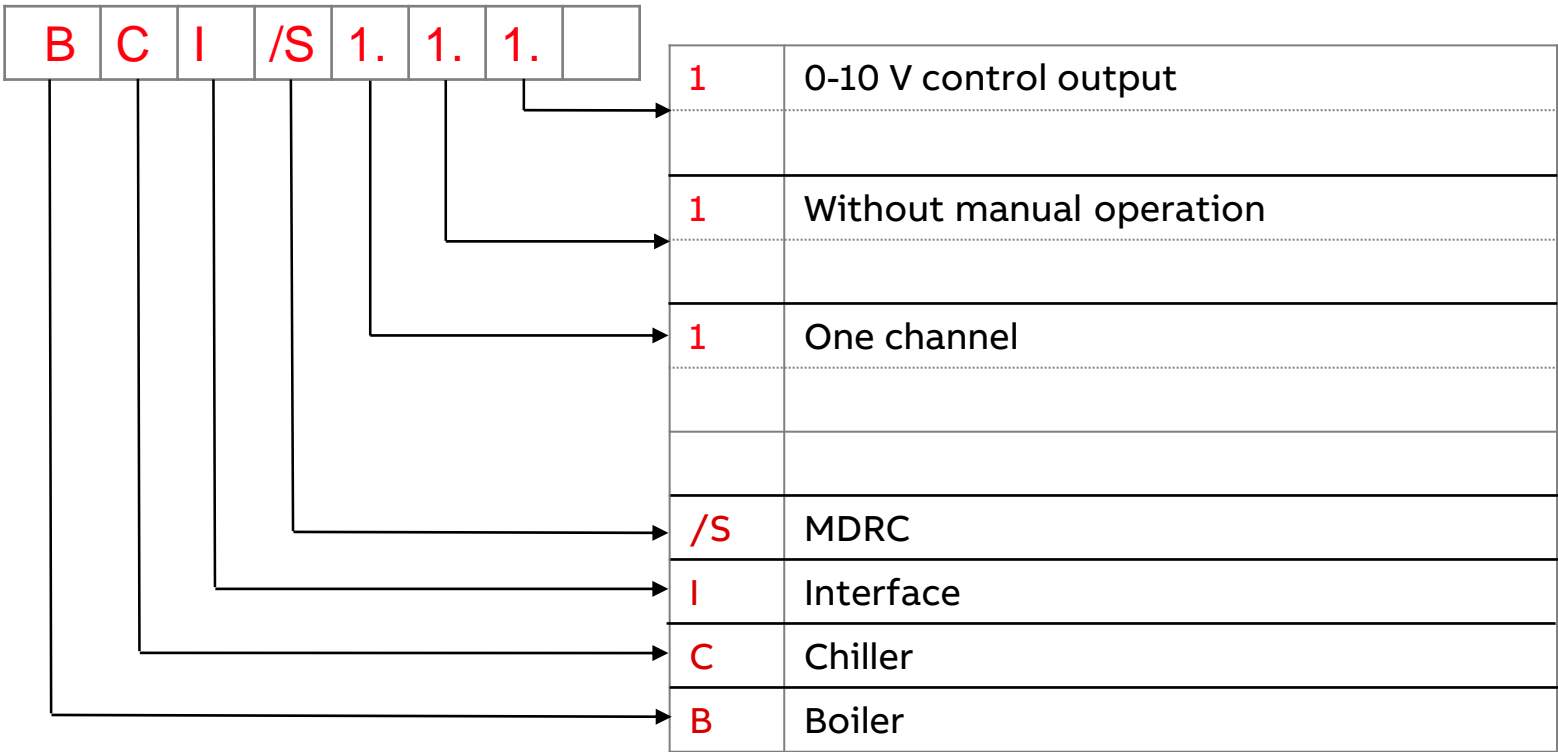
Function/Device	BCI/S 1.1.1
Number of channels	1
Interface to Boiler/Chiller	0-10V and Relay (5A)
Inputs for sensors (total)	5
Inputs for temperature measurement	2
Inputs for pump status	3
Inputs for Boiler/Chiller status	2
Pump output	1 (5A)
Module width	6



Boiler/Chiller Interface BCI/S 1.1.1

Product range

BCI/S 1.1.1 – Type Description



Boiler/Chiller Interface BCI/S 1.1.1

Commercial aspects

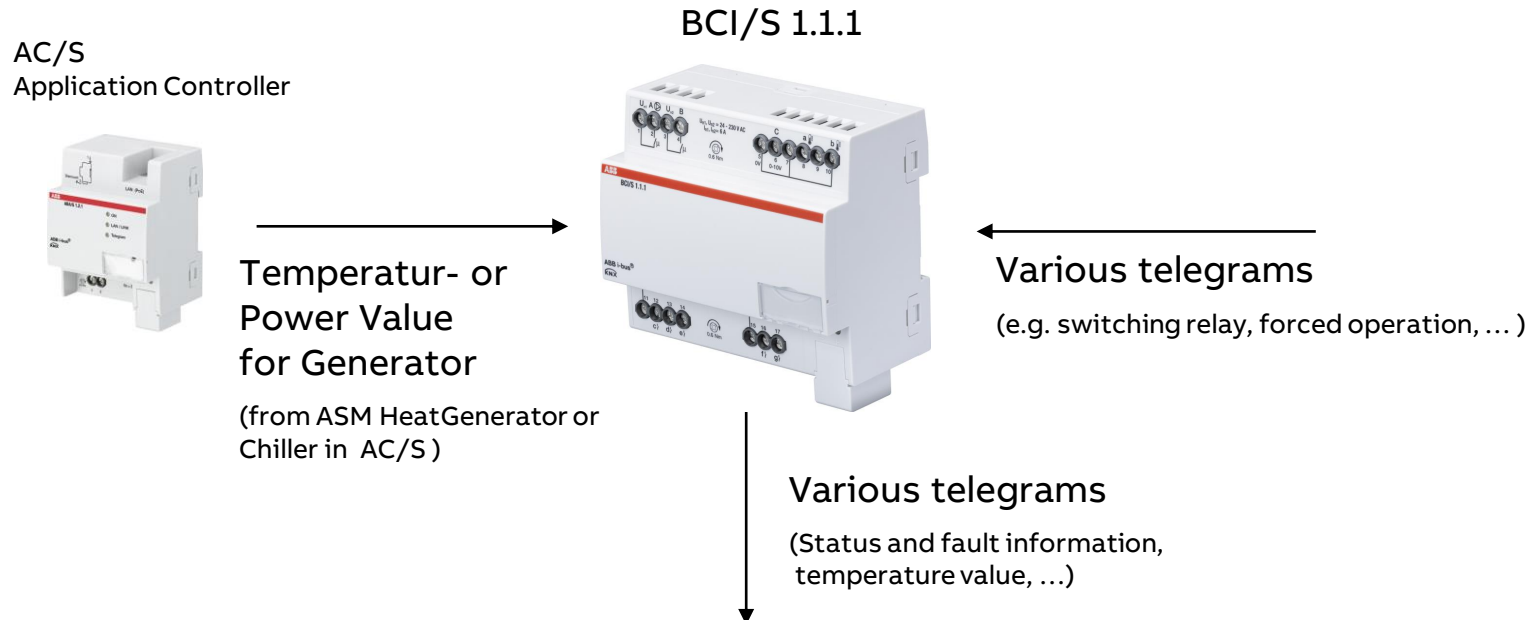
- Ident No. 2CDG 110 222 R0011



Boiler/Chiller Interface BCI/S 1.1.1

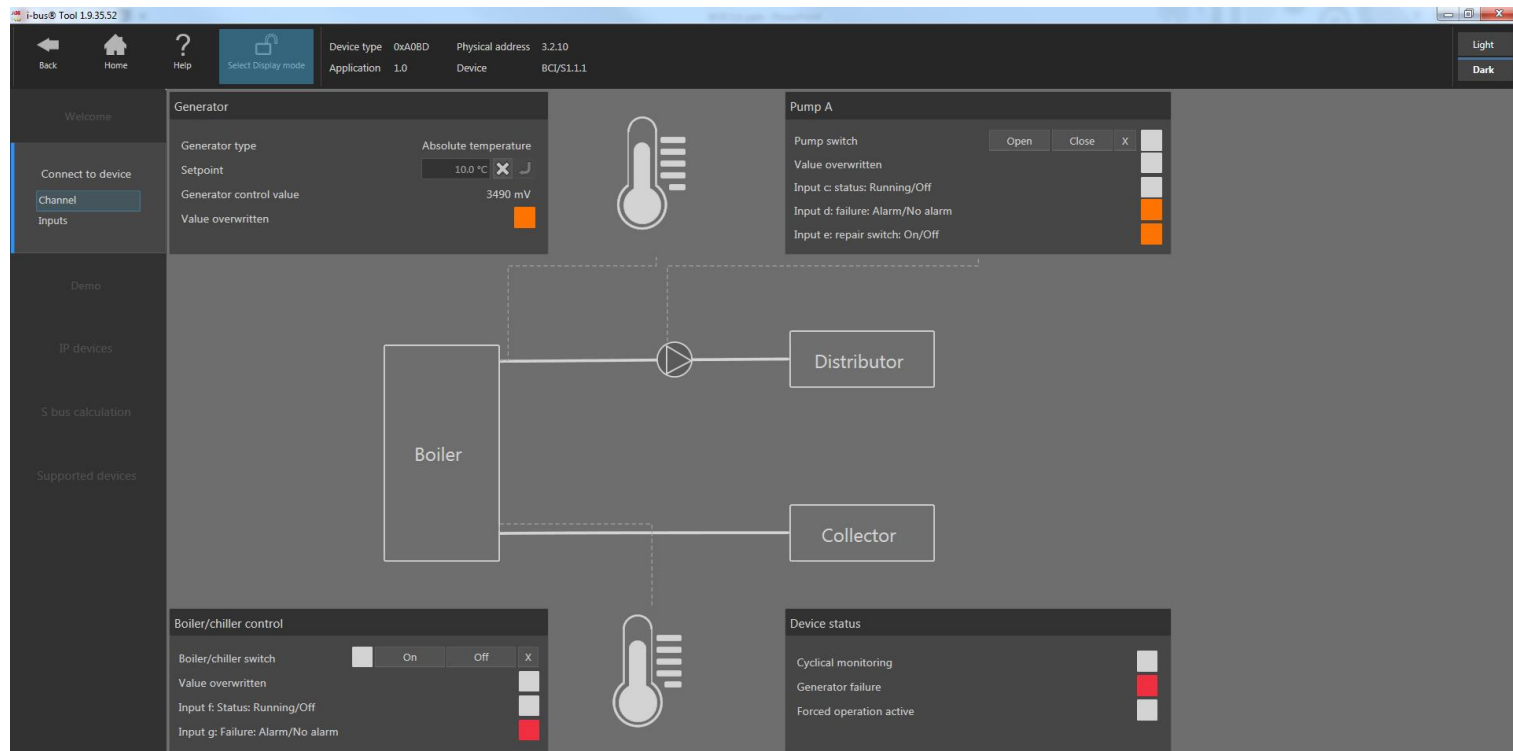
Application example

BCI/S linked in KNX with ...



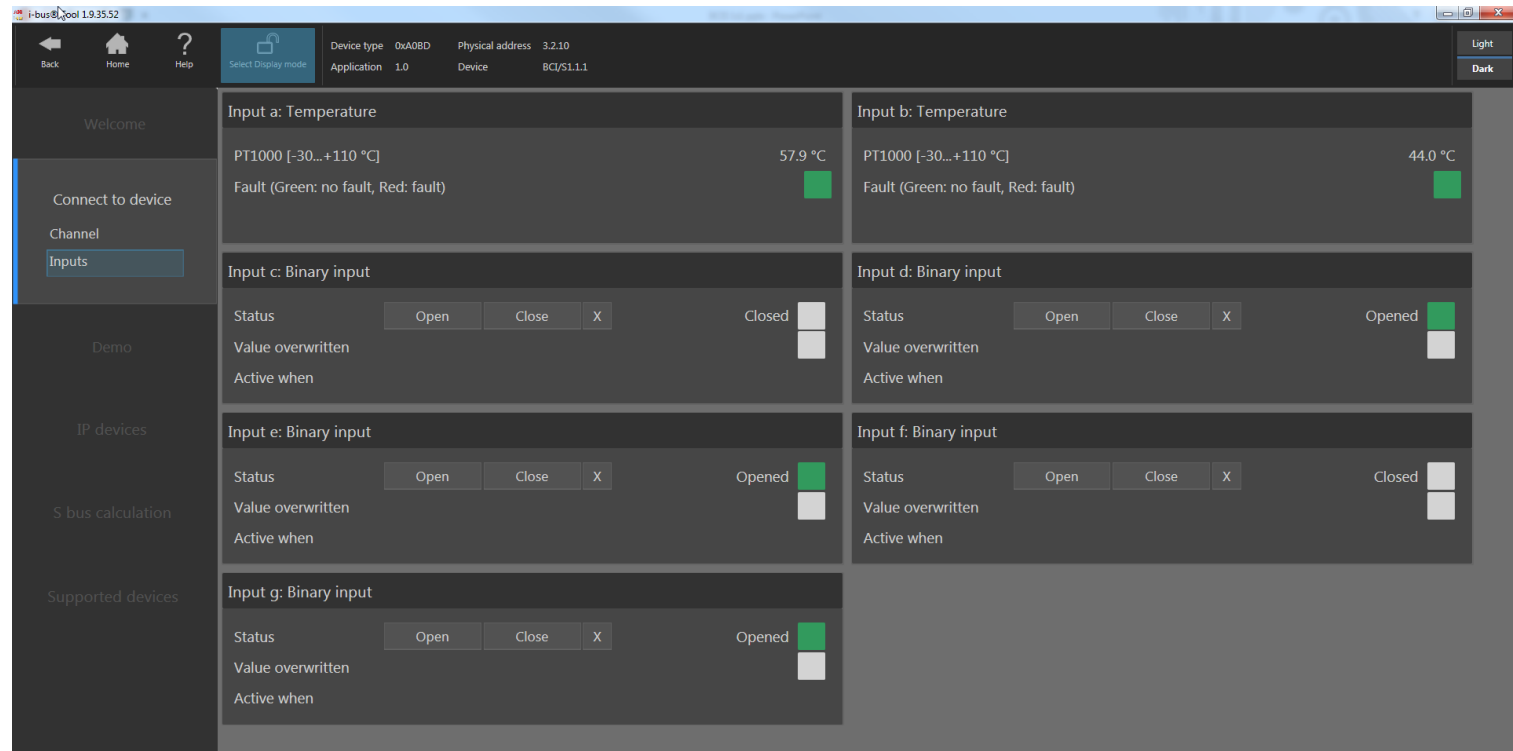
Boiler/Chiller Interface BCI/S 1.1.1

ABB i-bus tool



Boiler/Chiller Interface BCI/S 1.1.1

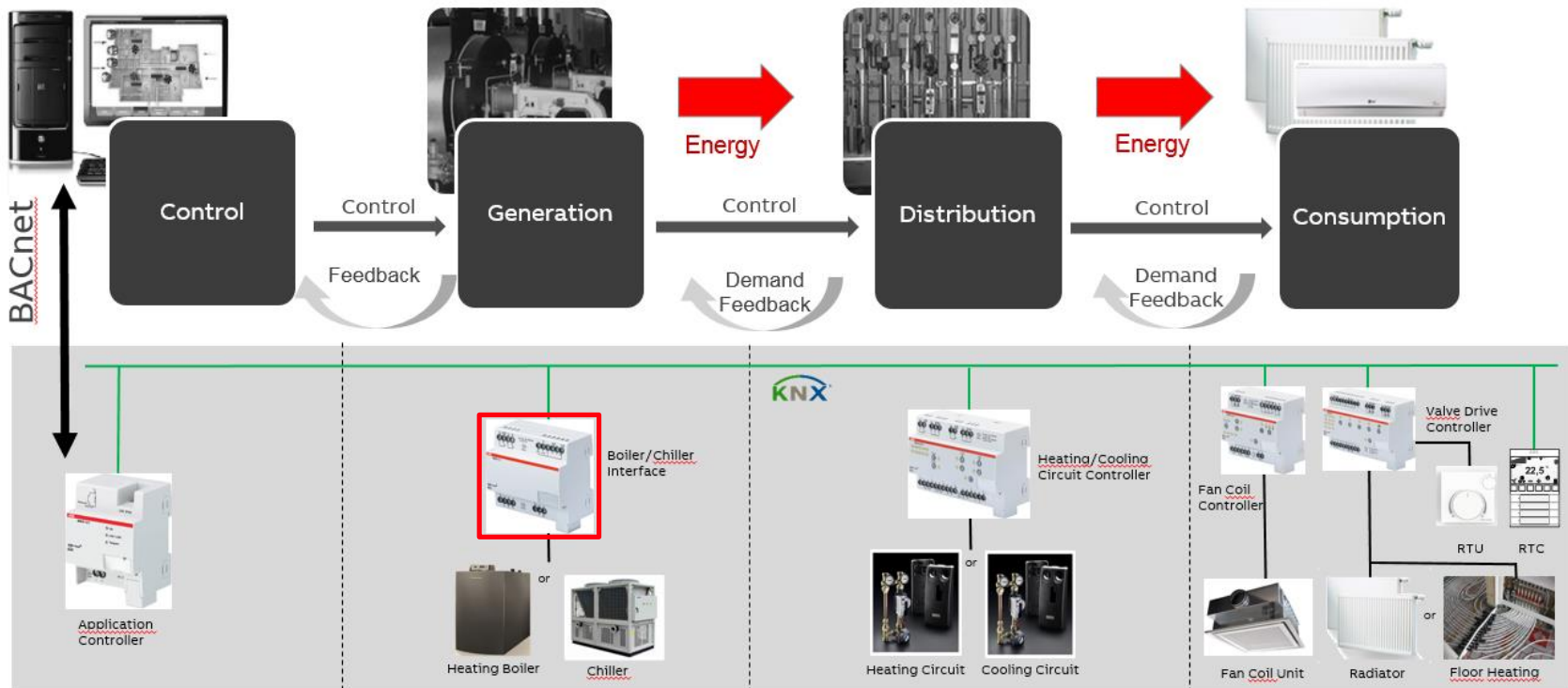
ABB i-bus tool



Boiler/Chiller Interface BCI/S 1.1.1

Application example

BCI/S 1.1.1 integrated in ClimaECO



Boiler/Chiller Interface BCI/S 1.1.1

Support

Technical documents

www.abb.com/KNX

→ Product category

→ Heating, Ventilation, Air Conditioning

→ BCI/S

- Product Manual
- Technical datasheet
- Installation and operating instructions
- Specification Text
- ETS Application
- Application Note
- CE declaration of conformity
- . . .

ABB PRODUCT-DETAILS GLOBAL SITE

Detailed information for: BCI/S1.1.1


This page contains technical data sheet, documents library and links to offering related to this product. If you require any other information, please contact us using form located at the bottom of the page. [Print...](#) [Print to Pdf...](#)

[Data Sheet](#) [Downloads](#)

BCI/S1.1.1

General Information

Extended Product Type:	BCI/S1.1.1
Product ID:	2CDG110222R0011
EAN:	4016779011655
Catalog Description:	BCI/S1.1.1 Boiler/Chiller Interface,1f
Long Description:	As interface between the KNX system and a heat generator or chiller. Via an analog output (0...10V) the set point or set point adjustment temperature can be transmitted to the heat generator/chiller. The set point itself is received via KNX. Via two binary inputs the device can monitor the status of the heat generator/chiller (via potential free contacts) and send it on the KNX bus. A relay output (5A) is included to switch or enable/disable the heat generator/chiller. With an additional relay output (5A) the pump of the heat generator/chiller can be switched on and off. Via 3 binary inputs it is possible to monitor the status of the pump (via potential free contacts) and integrate these feedback into the control of the pump. The device supports the ABB i-bus Tool for advanced diagnosis and improved commissioning.



Show all (23)

- Brochure (2)
- CAD outline drawing (2)
- Declaration of conformity (1)
- Manual (1)
- Movie (4)
- Operating instruction (1)
- Presentation (8)

Summary: No summary available
Presentation - English - 2018-11-30 - 1,93 MB [PDF](#)

Webinar (.PPT) [EN] ClimaECO - Building Automation Controller BAC/S
Summary: No summary available
Presentation - English - 2018-11-30 - 38,96 MB - [For approved users only](#) [PPTX](#)

ETS Application (.knxprod) [XX] BCI/S 1.1.1
Summary: Version 1.0
Software - German, English, Spanish, French, Italian, Dutch, Polish - 2018-11-13 - [KNXPROD](#)

CE & RoHS Declaration of Conformity (.PDF) [XX] BCI/S 1.1.1
Summary: No summary available
Declaration of conformity - German, English, Spanish, French, Italian, Dutch, Polish - 2018-11-12 - 0,10 MB [PDF](#)

Boiler/Chiller Interface BCI/S 1.1.1

Which answer is correct?

Question 1

What is the purpose of a Boiler/Chiller Interface BCI/S 1.1.1?

A

Control of Heater

B

Control of heating or cooling circuits

C

Control of Boiler or Chiller

Boiler/Chiller Interface BCI/S 1.1.1

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- ☐ B Control of heating or cooling circuits
- ☒ C Control of Boiler or Chiller

Boiler/Chiller Interface BCI/S 1.1.1

Which answer is correct?

Question 2

What is the right statement?

- A** Boiler/Chiller control is necessary to provide the right water temperature to the main circuit
- B** An external controller is required for using BCI/S
- C** Some Boiler or Chiller expect a power value as setpoint

Boiler/Chiller Interface BCI/S 1.1.1

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Boiler/Chiller Interface BCI/S 1.1.1

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Question 3

What is true? BCI/S allows to switch directly ...

A

... a pump

B

... a boiler or chiller

C

... a fan

Boiler/Chiller Interface BCI/S 1.1.1

Which answer is correct?

Question 3

What is true? BCI/S allows to switch directly ...

A ... a pump

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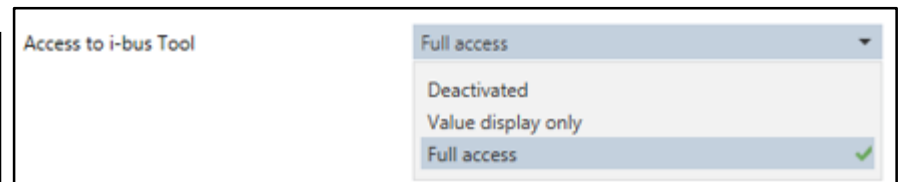
Boiler/Chiller Interface BCI/S 1.1.1

ETS

Access i-bus tool

Three options to handle the i-bus tool access

- Deactivated:
 - No operation, no indication
- Display only:
 - No operation, full indication
- Full access:
 - Full operation and indication



Higher security and user friendliness

Boiler/Chiller Interface BCI/S 1.1.1

ETS

Forced operation

1 bit or 2 bit telegram

Allows to set control value and pump on or off

3.2.10 BCI/S1.1.1 boiler/chiller interface,MDRC > Application > Monitoring and safety

General	Caution!
Application	Its is important to note the parameter settings in the 'Generator signal' parameter window. They influence the parameters in this window.
Device function	
Monitoring and safety	
Pump	
Pump	

Use forced operation	Forced operation, 1 bit; 1 active
Relay output	On
Generator state	<input checked="" type="radio"/> Switching on <input type="radio"/> Switch off
Setpoint generator signal	50 °C
Pump status	Switch on pump

Channel 1 - Common	Forced operation 1-bit	1 bit
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Individual control

Boiler/Chiller Interface BCI/S 1.1.1

ETS

Cyclic monitoring

Setpoint temperature can be monitored concerning reception of signal

Fixed value can be set in case of malfunction to guarantee safe operation

Monitoring and safety	
— Pump	Cyclical monitoring <input type="radio"/> Deactivated <input checked="" type="radio"/> Activated
Pump	Monitor receipt of setpoint temperature group object <input type="radio"/> Deactivated <input checked="" type="radio"/> Activated
— Generator activation	Time interval for cyclical monitoring 00:05:00 hh:mm:ss
	Setpoint temperature on exceeding the monitoring time 50 °C

Safe Operation

Boiler/Chiller Interface BCI/S 1.1.1

ETS

Pump

Run-on time: period the pump is still running after off command

External pump control via group object with reset time

Status information to be connected either to the input of BCI/S or sent as telegram to BCI/S

- Status pump on/off
- Pump failure
- Pump repair mode detection (pump manually turned off)

Availability of status information depending on pump type

3.2.10 BCI/S1.1.1 boiler/chiller interface,MDRC > Pump > Pump

General	Automatically switch on pump when generator is in activation range <input type="radio"/> No <input checked="" type="radio"/> Yes
+ Application	Run-on time 00:00:05 hh:mm:ss
– Pump	Activate manual pump overdrive via group object <input type="radio"/> No <input checked="" type="radio"/> Yes
Pump	Return from manual pump control to automatic mode <input type="radio"/> Via group object <input checked="" type="radio"/> Via group object or automatic
– Generator activation	Reset time 00:05:00 hh:mm:ss
Generator signal	Monitor pump status <input checked="" type="radio"/> Deactivated <input type="radio"/> Via physical device input
Generator relay	Monitor pump error Via physical device input
– Inputs	Note: Configuration in parameter window 'd: Binary input'
a: Supply temperature	Monitor pump repair switch Via physical device input
b: Return temperature	Note: Configuration in parameter window 'e: Binary input'
c: Binary input	Send status value After a change or request

Boiler/Chiller Interface BCI/S 1.1.1

ETS

Inputs

7 inputs

- Input a: analogue, fixed for flow temperature, necessary as actual value for control
- Input b: analogue, fixed for return flow temperature, for information only
- Input c: binary, for pump status detection or free input
- Input d: binary, for pump failure detection or free input
- Input c: binary, for pump repair mode detection or free input
- Input d: binary, for generator status detection or free input
- Input e: binary, for generator failure detection or free input

3.2.10 BCI/S1.1.1 boiler/chiller interface.MDRC > Inputs > a: Supply temperature

General	Use temperature input	<input type="radio"/> Deactivated <input checked="" type="radio"/> Activated
+ Application	Temperature sensor type	PT1000 [-30...+110°C]
+ Pump	Temperature offset	0 °C
+ Generator activation	Cable error compensation	None
- Inputs	Filter	Inactive
a: Supply temperature	Send temperature value	After a change
b: Return temperature	Value is sent from a change of	1 °C
c: Binary input		
d: Binary input		
e: Binary input		
f: Binary input		
g: Binary input		

Boiler/Chiller Interface BCI/S 1.1.1

ETS

Inputs

Analogue inputs for temperature (Flow- and Return flow, Channel A and B)

- PT1000, PT100, NTC, KTY, NI 1000
- Temperature offset
- Line fault compensation
- Filter: average value from measuring period 30, 60, 120 s

Use temperature input	<input type="radio"/> Deactivated <input checked="" type="radio"/> Activated
Temperature sensor type	PT1000 [-30...+110°C]
Temperature offset	0 C
Cable error compensation	Via cable resistance
Cable resistance (total of fwd and rtn conductors)	500 mohms
Filter	High (floating mean value over 120 seconds)
Send temperature value	After a change
Value is sent from a change of	1 C

Boiler/Chiller Interface BCI/S 1.1.1

ETS

Generator relay

2 possible functions

- Generator control (on/off)
- Simple switching contact, e.g. for light

Basic functions of switching output

- Normally closed/open
- Status

Application: turn off of boiler/chiller when no hot/chilled water is required, e.g. summer (boiler) and winter (chiller)

3.2.10 BCI/S1.1.1 boiler/chiller interface,MDRC > Generator activation > Generator relay

General	Output is	<input type="radio"/> Deactivated <input checked="" type="radio"/> Activated
+ Application	Output reaction	<input type="radio"/> Normally closed <input checked="" type="radio"/> Normally open
+ Pump	Object value Relay status	<input checked="" type="radio"/> 1 = closed; 0 = open <input type="radio"/> 0 = closed; 1 = open
– Generator activation	Send status values	After a change or request ▼
Generator signal		
Generator relay		

Boiler/Chiller Interface BCI/S 1.1.1

ETS

Generator signal

Generator represents Boiler or Chiller

- Generator type: absolute temperature, temperature offset, power output related to 0-10V signal
- Min/Max output voltage – failure: Voltage range which indicates the generator a breakdown of the device that sets the setpoint
- Min/Max output voltage for generator off → valid control range
- 0-10 V Signal inversion, e.g for chiller
- Lower and upper temperature limit
- Usage of relay for generator on/off and generator overdrive via group object

3.2.10 BCI/S1.1.1 boiler/chiller interface,MDRC > Generator activation > Generator signal

General	Type of generator activation	Absolute temperature
+ Application	Caution! The following voltage ranges must not overlap.	
+ Pump	Minimum output voltage - failure	0 V
- Generator activation	Maximum output voltage - failure	2 V
Generator signal	Min. output voltage for generator Off	2.1 V
Generator relay	Max. output voltage for generator Off	5 V
+ Inputs	Min. voltage for generator activation	
	Maximum voltage for generator activation	10 V
	Signal output (voltage to temperature/ power)	<input checked="" type="radio"/> Normal <input type="radio"/> Inverted
	Lower temperature limit for generator activation	25 °C
	Upper temperature limit for generator activation	60 °C
	Use of relay output for generator activation	<input type="radio"/> No <input checked="" type="radio"/> Yes
	Monitor generator status	<input checked="" type="radio"/> Deactivated <input type="radio"/> Via physical device input
	Monitor generator error	Via physical device input
	Note: Configuration in parameter window 'g: Binary input'	
	Activate generator overdrive via group object	<input type="radio"/> No <input checked="" type="radio"/> Yes
	Return from manual generator override	<input type="radio"/> Via group object <input checked="" type="radio"/> Via group object or automatic
	Reset time	00:05:00 hh:mm:ss
	Send status values	After a change or request

Boiler/Chiller Interface BCI/S 1.1.1

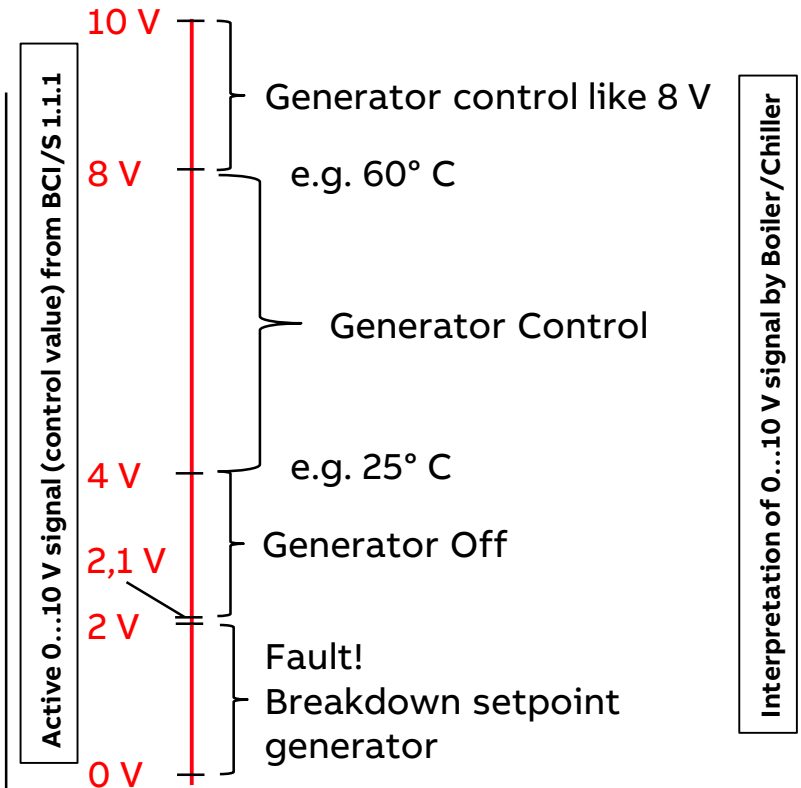
ETS

Generator signal

Interpretation of 0-10 V Generator signal by Boiler/Chiller

Depending on generator type following values can be adjusted (example values):

- **0 V:** Min. output voltage failure
- **2 V:** Max. output voltage failure
- **2.1 V:** Min. output voltage for generator off (2 V + 0.1 V)
- **4 V:** Max. output voltage for generator off
Min. voltage for generator activation
 - In case of calculated value between 2.1 V and 4 V fixed mean value is active from BCI/S → $(2.1 + 4) : 2 = 3.05 \text{ V}$
- **8 V:** Max. voltage for generator control



Boiler/Chiller Interface BCI/S 1.1.1

Which answer is correct?

Question 1

What can be done with ABB i-bus Tool together with BCI/S?

- A** Usage as a 24/7 visualisation
- B** Changing the setpoint of the chiller
- C** Detection of pump failure (Main pump)

Boiler/Chiller Interface BCI/S 1.1.1

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- ☒ B Changing the setpoint of the chiller
- ☐ C Detection of pump failure (Main pump)

Boiler/Chiller Interface BCI/S 1.1.1

Which answer is correct?

Question 2

BCI/S can control the main pump. Which feature is directly available in this regard?

- A** Follow up time: period the pump is still running after off command
- B** Overtemperature of the pump motor
- C** Pump can be connected directly or controlled via KNX telegram

Boiler/Chiller Interface BCI/S 1.1.1

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BCI/S can control the main pump. Which feature is directly available in this regard?

- ☒ **A** Follow up time: period the pump is still running after off command
- ☐ **B** Overtemperature of the pump motor
- ☐ **C** Pump can be switched directly or controlled via KNX telegram

Heating Cooling Circuit Controller HCC/S 2.x.x.1

Which answer is correct?

Question 3

Inputs of BCI/S are made for ...

- A** ... connecting any binary signals
- B** ... connecting temperature sensor of flow temperature
- C** ... connecting fault signal from the Boiler/Chiller

Heating Cooling Circuit Controller HCC/S 2.x.x.1

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