

## EMA Completa - Energy management

The EMA Completa computer controls a boiler room system with 1 boiler for CO<sub>2</sub> and heat production, 1 storage tank and 1 or 2 extra boilers/heat exchangers for heat production only.

By normal heat production the boiler temperature is controlled by its own controller at a fixed setpoint

EMA Completa also controls a frequency controlled ring main pump depending on heat demand and differential pressure.

EMA Completa can control a main valve for the temperature control on the ring main. EMA Completa can control 2 ring mains

EMA Completa does not control the boiler shunt pumps.

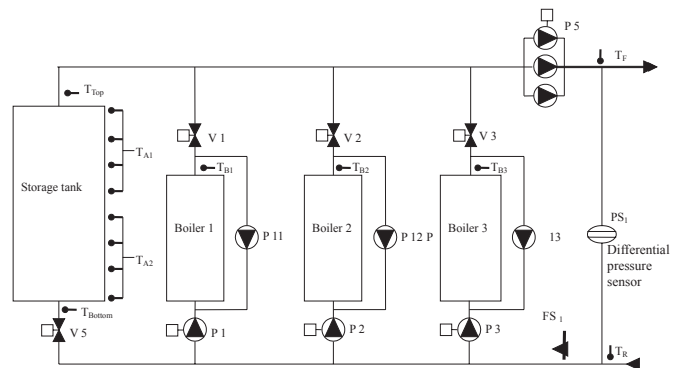


Figure 1 Principle drawing



### CO<sub>2</sub> production

The CO<sub>2</sub> production starts when a CO<sub>2</sub> demand is detected on the ARC-net or on an external input.

Boiler 1 will start and the hot water will be stored in the storage tank. When the tank is full boiler 1 will stop.

### Heat production

The heat production will start when a heat demand is detected on the ARC-net or on an external input.

If the storage tank is not empty and not in a buffer mode 1 or 2 (see storage tank), it will be discharged before the boilers are started. When the heat production is started the boilers will start in a preset sequence. The staging of the boilers is depending on the actual power delivered on the ring main.

### Boiler failure

If the ring main temperature drops below a setpoint, caused by a boiler failure, the staging will increase until the temperature is back above the setpoint.

### CO<sub>2</sub> + heat production

By both CO<sub>2</sub> and heat production boiler 1 and the selected stage/boiler will operate in parallel.

### Boiler 1 control

Boiler 1 can be used for CO<sub>2</sub> production and heat production

## CO2 production

When a CO2 demand is detected, the EMA Completa gives a signal to the boiler for running in CO2 mode, and a signal (0-5/10 V) for wanted fire rate.

The wanted fire rate can be changed depending on the charge % of the storage tank.

The boiler pump speed is controlled to keep the boiler at a fixed temperature, normally a little lower than the boilers own setpoint.

## Heat production

The boiler is turned ON depending on the needed boiler stage and the sequence for starting the boilers.

The boiler runs on its own setpoint. By heat production the boiler temperature is controlled by its own controller at a fixed setpoint

The boiler pump speed is controlled at a ratio to the ring main pump speed.

The ratio is controlled to keep the charge in the storage tank at a wanted %.

## CO2 + heat production

By both CO2 and heat production boiler 1 will operate in heat production mode as long as the fire rate is higher or close to the wanted fire rate by CO2 production.

## Boiler 2+3

Boiler 2 and 3 can be either boilers or heat exchangers. EMA Completa does not control the boiler temperature.

The boilers are turned ON depending on the needed boiler stage and the sequence for starting the boilers.

The boiler runs on its own setpoint.

The boiler pump speed is controlled at a ratio to the ring main pump speed.

The ratio is controlled to keep the charge in the storage tank at a wanted %.

## Heat exchangers

If one or both "boilers" are heat exchangers, the primary valves on the heat exchangers can be controlled to keep the outputs at a fixed temperature.

## Ring main

EMA Completa can control 2 ring mains and can control a main valve for controlling the temperature on the ring main.

When a heat demand is detected, the ring main pump is started and controlled to keep a constant pressure difference flow-return.

## Storage tank

The storage tank is used to store the excess heat production while producing CO2 with boiler 1, or used as a buffer to deliver energy at a wanted time.

Charging the storage tank for buffering will be performed in a selected boiler stage.

## Buffer mode

When using the storage tank as a buffer, the control has following modes:

- 0 The tank must be empty before starting any boiler by heat demand
- 1 The tank is being charged for buffering and kept at wanted charge %
- 2 The tank will be discharged to wanted charge %

The modes are absolute time controlled.

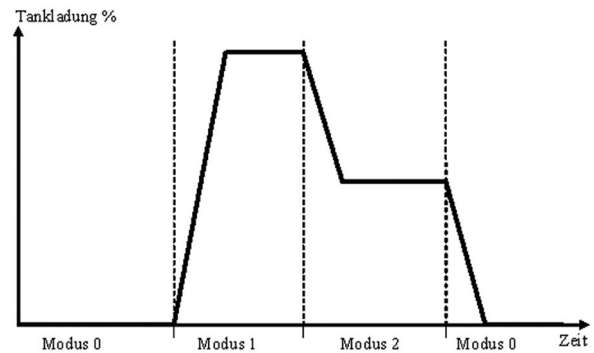


Figure 1 Storage tank buffer modes

## Technical specifications:

CO2 boilers:	1
Other boilers:	2 (can be heat exchangers)
Storage tanks:	1
Ring main pumps:	2

Frequency controlled pumps on all boilers

Motor controlled valves on all boilers

Frequency controlled pump on ring main

Analog/digital pressure difference sensor on ring main, or 2 absolute analog pressure sensors.

## Requirements:

Flow and return temperature sensors on ring main

Flow temperature sensors on all boilers

8+2/16+2 temperature sensors on storage tank

## Option

Motor controlled valve on storage tank

Water flow sensor on ring main

Return flow temperature sensor on boiler 1

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