

LAB^{TQ}- MARCOGAZ Workshop

mCHPs Importance of experimental evaluation and intercomparison tests

**Brussels
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Ecodesign and prEN 50465

Ecodesign Documents describe measurement procedures based on existing standards and evaluation methods. For mCHP appliances the standard concerned is (amongst others) prEN 50465

Some ambiguities and risks of non-equivalence are already identified and to be presented here

Experimental testing of mCHPs appliances will bring further ones to light

Advantage of Intercomparison:

Different labs are approaching their tasks from different perspectives, thereby uncovering ambiguities and hidden parameters.

Former intercomparison tests taught us that even tiny differences in settings or operation can cause significant differences in the outcome.

prEN 50465 states

7.6 overall Efficiency

The tests shall be performed for condensing appliances at the water temperature regime of 50 °C/30 °C and for non-condensing at 80 °C/60 °C at nominal heat output (100 % CHP + 100 % _Sup).

The test at (100 % CHP + 0 % _Sup) shall be performed with the flow rate

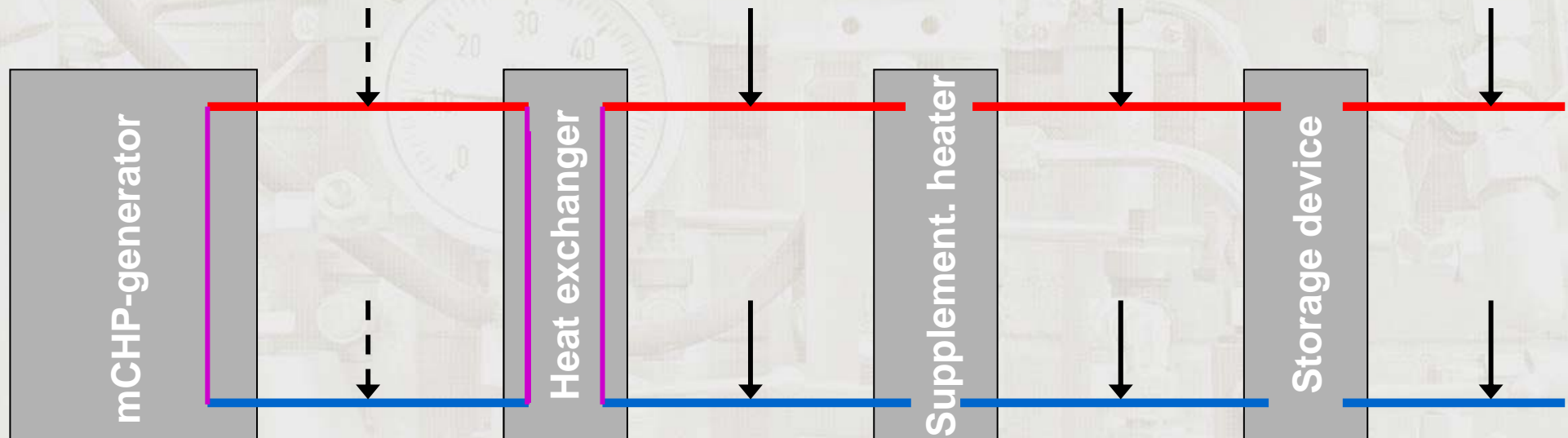
- maintained at the same flow rate and the same return temperature as during the tests at nominal heat output, or
- if the appliance is equipped with an integrated variable speed pump, adjusted according to the manufacturer's instructions, or
- adjusted to a value which allows a difference between flow and return water temperature of a minimum of 6 K.

Do we get the same results under all circumstances?

Overall efficiency measurement Location of test points thermal output

For mCHPs: different concepts of systems and various alternatives of moduling

Particular configuration of an appliance with four modules



Different test points — different thermal outputs
Flow - and return temperature measurement points
clearly defined for all kinds of appliances falling under the scope?
Defined measure points accessible?

Thermal Store vs. product label/ package label

working document Energy labelling Space and Kombi Heater states

...**product label** ... for **stand-alone heaters**...

...**storage tank** ... may be included in the **package**

prEN 50465 states

3.3.2 Definition of mCHP appliance

Appliance... ...comprising as relevant:

- Primary heat and power generator
- Supplementary heat generator
- Flue ducts
- Thermal store**

Maybe interpreted differently

Range rated appliances

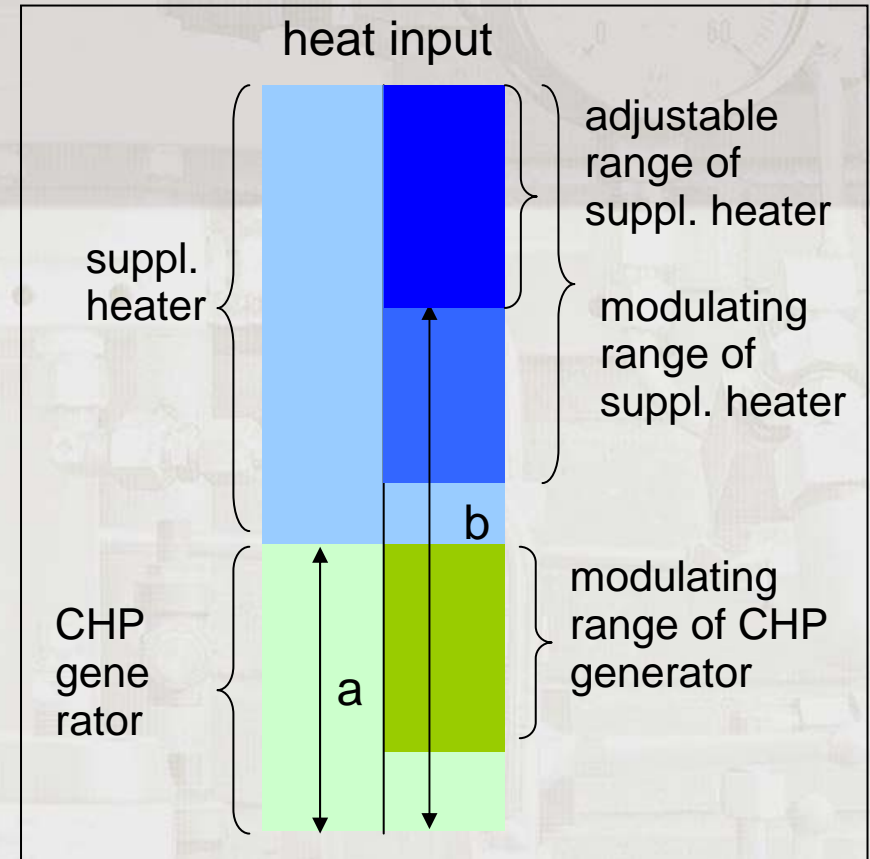
EN 50465 states:

3.7.4

*range rated mCHP appliances operate at a nominal heat input between the maximum and **minimum adjustable** heat input.*

7.6 overall efficiency

...For range rated units the 100% represents the arithmetic mean of the maximum and minimum heat input for the specific unit of the mCHP appliance...



What is **minimum adjustable heat input**?

If supplementary heater can be switched off completely as an adjustment, the minimum adjustable heat input is “a”. Or is it “b”?

Standby- losses Boiler standard for mCHPs

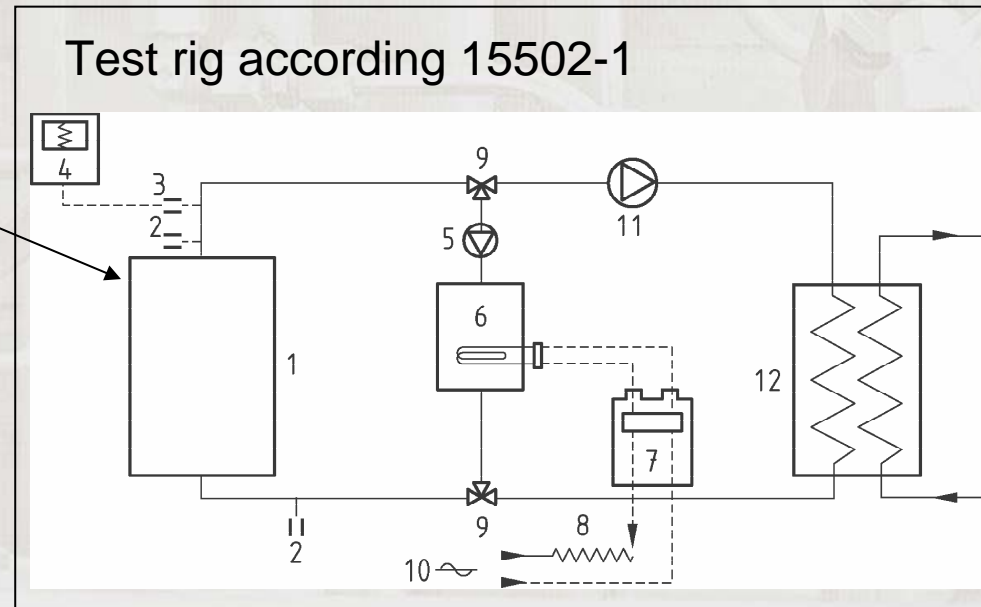
Working document testing calculation Space and Kombi heaters :

*standby heat losses and auxiliary electrical consumption in standby mode
are measured according EN 15502-1 for boilers.*

boiler in EN 15502-1

Which parts of the mCHP correspond to the item „boiler“?

- mCHP generator only?
- plus supplementary heater if any?



various interpretation possibilities depending on the various modules
Different approaches — different values for standby heat losses

Standby- losses

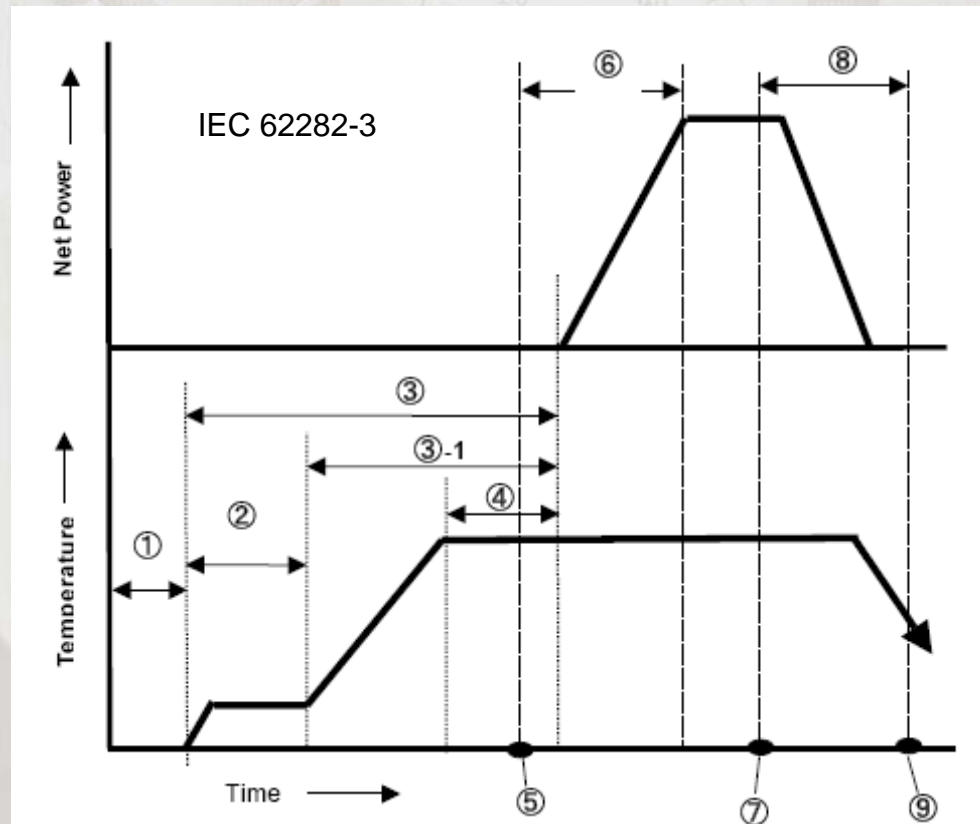
Definition of standby mode

3.1.9.4 stand-by (EN 15502-1)

operating mode without heat demand. The system **immediately** starts up in the required mode however, when there is a heat demand.

Ecodesign working document

condition wherethe cogeneration space heater is connected to the mains power source, depends on energy input from the mains power source to work as intended



What is the **definition of standby mode** for mCHP-appliances?

for e.g. SOFC mCHP appliances

→ huge differences in electrical consumption with respect to the mode.

Working document testing calculation Space and Kombi heaters:
Emissions of nitrogen oxide NO_x is measured according EN 15502-1 for boilers

- problem of **adapting a boiler standard to a mCHP**,
perhaps adaptation will be different for different labs

example:

an on/off mCHP generator + modulating supplementary

heater

should be measured according on/off boilers or

modulating boilers?

- problem of **range rated** appliance:
different interpretations of range rated will lead to different NO_x values.

Intercomparison tests - Why?

Primary Goal:

Comparability of measurements and evaluations through **reproducible test conditions** without **open or undefined parameters** for current and future concepts of systems and variations of design

LabTQ's experience is intercomparison tests are the appropriate tool to identify ambiguities and hidden parameters.

**Thank you
for your kind attention**

