



*Your service center for information and technical support on the new set of EPB standards*

## **European certification of HVAC: energy certification of experts (CEN-CE scheme)**



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**ENERGY EFFICIENT RENOVATION OF EXISTING BUILDINGS**

**Novembro 3rd 2022, Lisbon, Ordem dos Engenheiros**



# Content and structure

- 1) **CEN-CE context**
- 2) **CEN-CE training content and facilities**
- 3) **CEN-CE scheme**
- 4) **CEN-CE roll-out**
- 5) **CEN-CE unique value**



# About EPB Center

<https://epb.center/>

- **Founding parties**

**Initiated** by **REHVA / ISSO** (Dutch HVAC), facilitated by **EU Commission**

## Mission and services

**Service Center** for **information, support, training** on **EPB standards**

- provide **interested parties** with **technical support**
- further **develop** and **improve** this set of EPB standards.

*EPB Center is provides specific services  
requested by individual or clusters of stakeholders*

More information on  
the set of EPB standards:

[www.epb.center](http://www.epb.center)

Contact: [info@epb.center](mailto:info@epb.center)





# 1) CEN-CE context

**CEN-CE: CEN standards Certified Experts**

*EU-wide training / qualification / certification scheme based on EPB standards*



**H2020 – Project to increase Construction skills of professionals**

- CEN-CE should be run as a **self-funded business case**;
- CEN-CE **scheme to be used in cooperation with existing providers**

**CEN-CE partners: Scientific, technical, professional, training background**



**CSTB**  
France



**ENBEE**  
Slovakia



**REHVA**  
Belgium



**FSB**  
Croatia



**SLR**  
Italy

# Why CEN-CE?

## help matching the new challenges



- **Nearly zero** energy buildings (new buildings after 31 December 2020)
- Buildings are no longer energy consumers but energy producers (e.g., PV)
- **EU ambition: CO<sub>2</sub> neutral in 2050 (EU Green Deal),**
- Evaluation of HVAC systems must be related to **real performance**
- **Change of HVAC systems: from fossil fuels to renewables, more storage, interacting of systems, sensible to boundary conditions (Heat pumps)**



**New challenges request qualified workforce, increased skills**  
**CEN-CE added EU value:** based on CEN ISO standards  
**Common approach facilitates exchange (know-how /tools)**  
**and recognition of experts**



# 2 ) The CEN-CE training content Overview of the whole set of the EPB standards

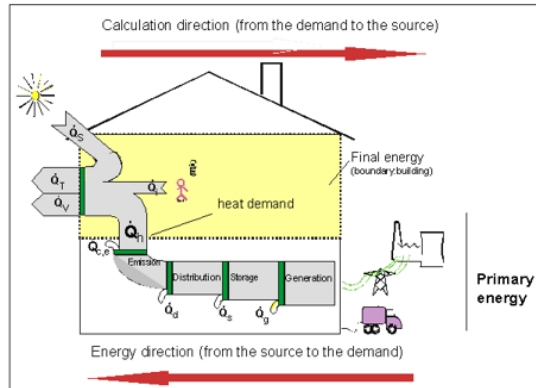
## Overview of the modular structure

Table 2 – Position of this standard, within the modular structure of the set of EPB standards

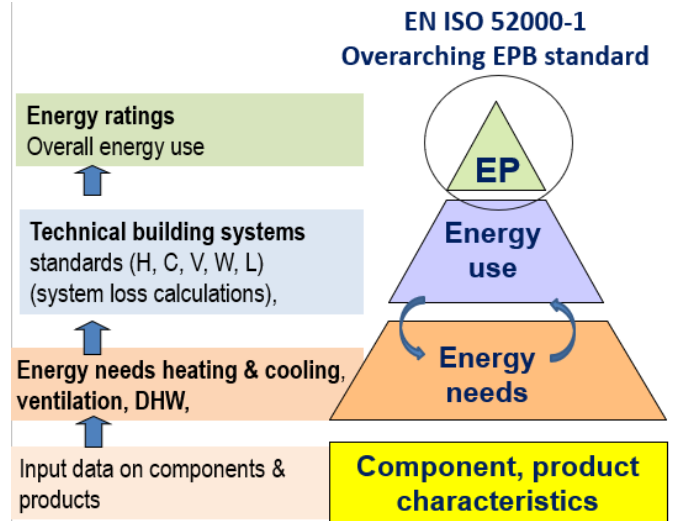
Overarching		Building (as such)		Technical Building Systems											
EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	General	1	General	1	General	M3	M4	M5	M6	M7	M8	M9	M10	M11	
2	Common terms and definitions (symbols, units and abbreviations)	2	Building Energy Needs	2	Needs										
3	Applications	3	(Free) Indoor Climate without Systems	3	Maximum Load and										
4	Ways to Express Energy Performance	4	Ways to Express Energy Performance	4											
5	Building Functions and Building Performance	5	Heat Transfer by Transmission	5											
6	Building Occupancy and Operating Conditions	6	Heat Transfer by Infiltration and Ventilation	6											
7	Aggregation of Energy Services and Energy Carriers	7	Internal Heat Gains	7											
8	Building Performance	8	Solar Heat Gains	8											
					B-2	Heat pumps	15316-4-2		15316-4-2						
					B-3	Thermal solar Photovoltaics	15316-4-3		15316-4-3					15316-4-3	
					B-4	On-site cogeneration	15316-4-4		15316-4-4					15316-4-4	
					B-5	Direct heating and cooling	15316-4-5	15316-4-5						15316-4-5	
					B-6	Direct electrical heater	15316-4-6		15316-4-6					15316-4-6	
					B-7	Wind turbines								15316-4-7	
					B-8	Radiant heating/cooling	15316-4-8								
					B-9	Load dispatching and operating conditions									
9	Calculated Energy Performance	9	Building Dynamics (Detailed model)	9											
10	Measured Energy Performance	10	Measured Energy Performance	10	Measured Energy Performance	15378-3			15378-3						
11	Inspection	11	Inspection	11	Inspection	15378-1			15378-1						
12	Ways to Express Indoor Comfort	12		12	IMC										
13	Internal Environment Conditions														
14	Economic Calculation	14													



## Principle of the energy calculation “From losses to primary energy”



## Structure “from products to “system”



# 3) CEN-CE training and scheme

EU-wide training / qualification based on CEN standards

**CEN-CE starts with standards related to Heating and DHW**

➤ **Training** topics per standard:

- PPT (fundamentals, main topics of the standard);
- Handbook (resuming the calculation procedures);
- Excel sheet (to evaluate impact of different parameters).



➤ **Qualification / certification scheme** for CEN-CE experts

- Pre-requisites to enter the training;
- Exams;
- List of experts.



# CEN-CE training parts: Fundamentals

## Background information related to each standard

### INDEX



1. Introduction
2. Fundamentals/Physics
3. Input data
4. Calculation method
5. Output data
6. Example




**CEN-CE** EN 15316-4-2 Heat Pumps  
Vladimir SOLDÓ, Iva BERTOVIĆ 13/10/2020 3

CEN EPB Standards Certified Experts

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018

### Fundamentals

#### Basic heat pumps types

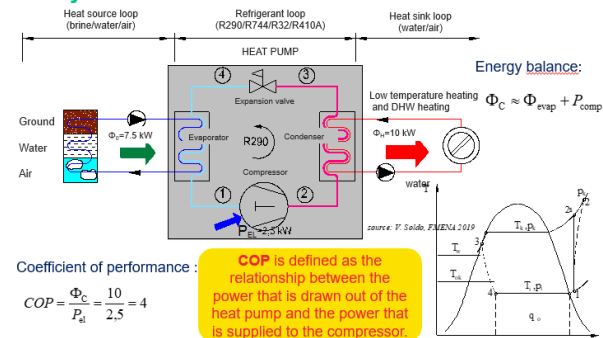
<p>Standard operating outside temperature up to -7 °C (for EVI system up to -15 °C). Main issue: defrosting of the evaporator.</p>  <p><b>Air source HP</b></p>	<p>Very stable heat source. Ground source temperature in the range of 10 to 15 °C. Main issue: vertical drilling of boreholes.</p>  <p><b>Ground source HP</b></p>	<p>Ground water temperature in the range of 10 to 14 °C. The most efficiency heat pump. Main issue: very strict regulation for water intake, water capacity</p>  <p><b>Water source HP</b></p>
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### Physics



**CEN-CE** EN 15316-4-2 Heat Pumps  
Vladimir SOLDÓ, Iva BERTOVIĆ 13/10/2020 7

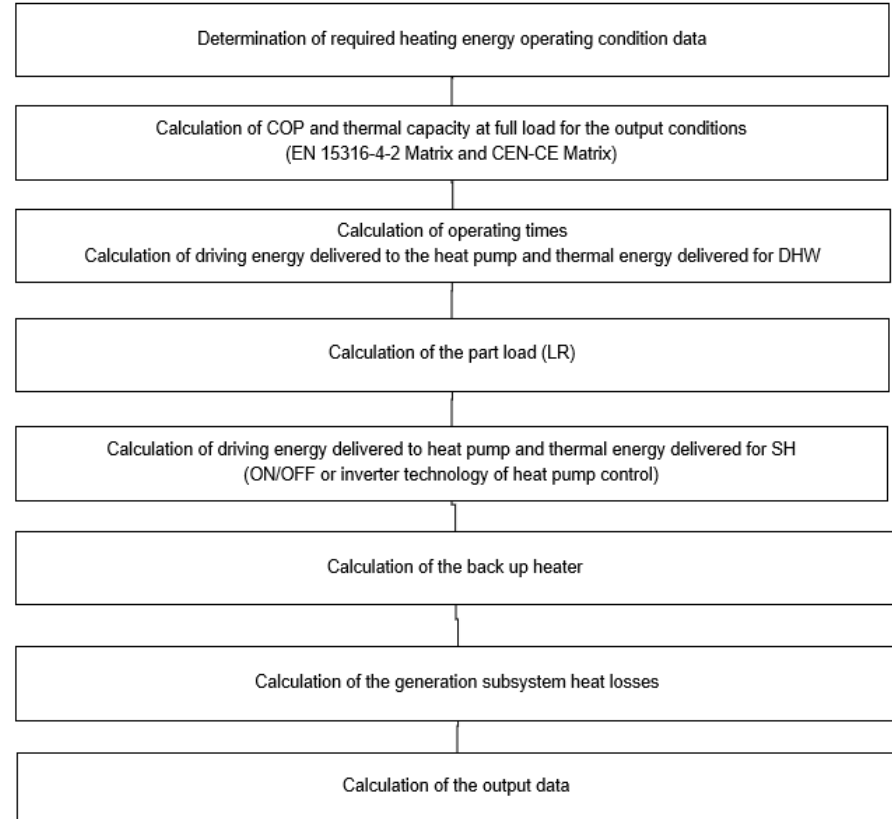
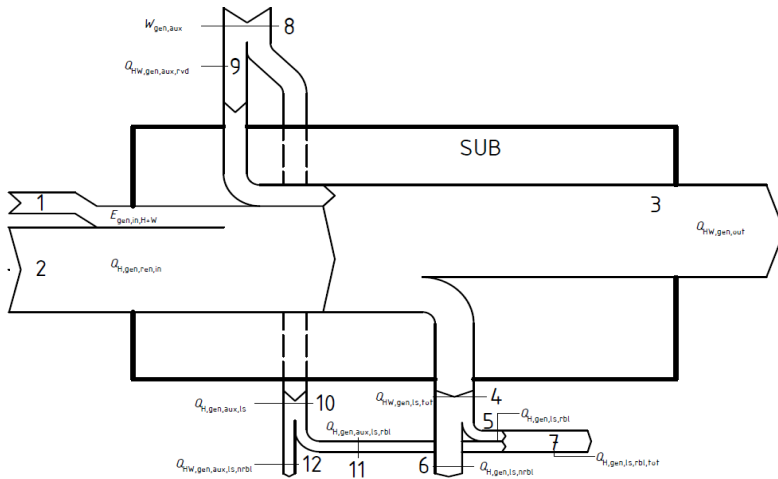
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# CEN-CE training parts: Explaining the standard energy flows and related calculation flow chart

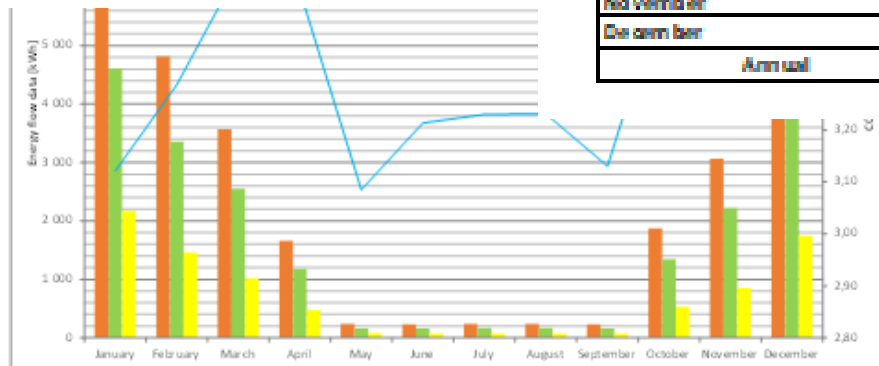


# CEN-CE training parts: Using the standard CEN-CE spread sheets for parameter analysis

## HEAT PUMP DESCRIPTION DATA

Heat pump type	HP_TYPE	HP_TYPE_AIR_WATER
Type of end energy use (services)	HP_USE	HP_USE_HLW
Heat pump fuel	HP_FUEL	HP_FUEL_EL
CE marking	HP_CE	HP_CE_YES
Heat pump location	HP_LOC	HP_LOC_BOIL
Heat pump techno type	HP_TECH	HP_TECH_ONOFF
Heat pump back up	HP_BU	HP_BU_NO
Back-up fuel	HP_FUEL_BU	HP_FUEL_BU_NO
Inertia of the distribution system	TAU_OUT_EM_TYPE	TAU_OUT_EM_TYPE_L
Heat pump technical data		
Standard used	EN 15210:2017	
COP and thermal capacity/ratio calculation method	th	Phi_Pn
Thermal capacity at standard rating conditions at full load	COP <sub>gen,Phi,th,sn</sub>	COP <sub>gen,Phi,th,sn</sub>
COP at standard rating conditions at full load	COP <sub>gen,Phi,th,sn</sub>	COP <sub>gen,Phi,th,sn</sub>
Inlet temperature at standard rating conditions at full load	theta <sub>gen,Phi,in</sub>	theta <sub>gen,Phi,in</sub>
Outlet temperature at standard rating conditions at full load	theta <sub>gen,Phi,out</sub>	theta <sub>gen,Phi,out</sub>
Temperature operating limit	theta <sub>op</sub>	theta <sub>op</sub>
Bivalent temperature	theta <sub>biv</sub>	theta <sub>biv</sub>
System design data		
Power of auxiliary (pumps)	P <sub>aux,op</sub>	P <sub>gen,aux</sub>
Part of the electrical power to operate the heat pump (heat pump control)	f <sub>gen,aux</sub>	f <sub>gen,aux</sub>
Minimum value of part load ratio at minimum continuous operation (inverter technology)	LR <sub>cont,op</sub>	LR <sub>cont,min</sub>

Month	N <sub>day</sub>	Q <sub>gen,heat,pump</sub> kWh	E <sub>gen,heat,pump</sub> kWh	E <sub>gen,electricity</sub> kWh	Q <sub>gen,space,heating</sub> kWh	W <sub>gen,space,heating</sub> kWh	COP <sub>gen,space,heating</sub>
January	31	6773	2170	0	4603	175	3,13
February	28	4819	1466	0	3353	118	3,29
March	31	3567	1017	0	2550	79	3,51
April	30	1658	478	0	1180	36	3,47
May	31	339	77	0	161	6	3,09
June	30	331	73	0	158	5	3,21
July	31	339	74	0	165	5	3,23
August	31	339	74	0	165	5	3,23
September	30	331	74	0	157	5	3,13
October	31	1875	535	0	1340	40	3,50
November	30	3067	850	0	2217	66	3,61
December	31	5740	1749	0	3991	141	3,20
<b>Annual</b>		<b>38677</b>	<b>8635</b>	<b>0</b>	<b>30041</b>	<b>681</b>	<b>3,22</b>



# CEN-CE training outcomes

## CERTIFICATE

- after passing **exam**
- **all** standards will be **listed**, only **passed** ones will be **highlighted** (as driving license)



A		A1	
B		B1	
C		C1	
D		D1	
BE			
CE		C1E	
DE		D1E	

<b>EN 15316-1 - General</b>		<input checked="" type="checkbox"/>
<b>Heat load</b> EN 12831- 1	<input checked="" type="checkbox"/>	<b>Emission &amp; controls</b> EN 15316-2
<b>DHW needs</b> EN 12831- 3	<input checked="" type="checkbox"/>	<b>Distribution</b> EN 15316-3
<b>Meas. performance</b> EN 15378-3	<input type="checkbox"/>	<b>Gen – Boiler</b> EN 15316-4-1
<b>System design</b> EN 12828	<input checked="" type="checkbox"/>	<b>Gen – Heat pump</b> EN 15316-4-2
<b>Installation &amp; comm</b> EN 14336	<input type="checkbox"/>	<b>Gen – solar</b> EN 15316-4-3
<b>Instructions</b> EN 12170 / 1	<input type="checkbox"/>	<b>Gen – Cogen</b> EN 15316-4-4
<b>Economics</b> EN 15459	<input checked="" type="checkbox"/>	<b>Storage</b> EN 15316-5

# CEN-CE training facilities

## CEN-CE training platform – online (LMS)

- one-page presentation of the topic,
- commented input / output list of data
- **didactics for trainers**
- **questions and answers for exam**

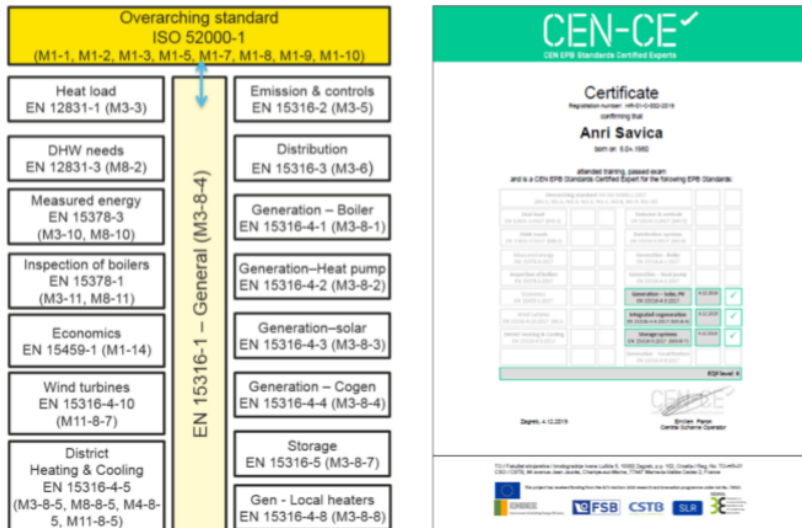


Figure 1. List of standards for CEN-CE training an example of CEN-CE certificate.

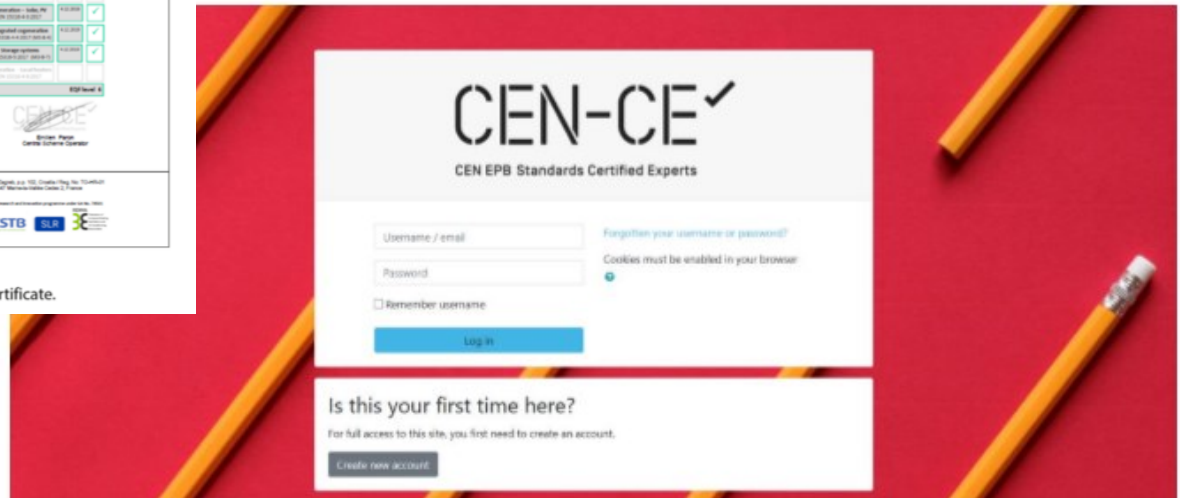


Figure 2: Opening page of the CEN-CE learning and certification platform

# 3) CEN-CE roll-out

## Operational /organizational design

EU Central Scheme Operator  
(EPB Center)

MS National Training scheme operator  
(e.g. OdE)

**Implementation in practice  
of Operational /organizational design**  
Qualification / certification  
of experts (EU / MS e.g. ADENE)

**1. Application**  
(criteria, initial  
competence:  
education,  
experience)

**2. Training**  
(competence,  
knowledge)

**3. Verification**  
(pass exam)

**4. Certification**  
(recognition,  
public list) of  
experts




# Example: CEN-CE scheme **commercial** roll-out in Romania

<https://lms.cen-ce.eu/>

CEN-CE Learning Management System English (en) Q You are not logged in. (Log in)

<b>Overarching standard</b> EN ISO 52000-1:2017			0	✓	
<b>General part</b> EN 15316-1: 2017			0	✓	
<b>Heat load</b> EN 12831-1:2017	1	✓	<b>Generation - Boiler</b> EN 15316-4-1:2017	4	✓
<b>DHW needs</b> EN 12831-3:2017	1	✓	<b>Generation – Heat pump</b> EN 15316-4-2:2017	4	✓
<b>Emission &amp; controls</b> EN 15316-2:2017	2	✓	<b>Generation – Solar, PV</b> EN 15316-4-3:2017	4	✓
<b>Distribution systems</b> EN 15316-3:2017	3	✓	<b>Integrated cogeneration</b> EN 15316-4-4:2017	4	✓
<b>Economics</b> EN 15459-1:2017	5	✓	<b>Storage systems</b> EN 15316-5:2017	4	✓
<b>Measured energy</b> EN 15378-3:2017	6	✓	<b>District Heating &amp; Cooling</b> EN 15316-4-5:2017	4	✓
<b>Inspection heating &amp; DHW</b> EN 15378-1:2017	6	✓	<b>Generation - Local heaters</b> EN 15316-4-8:2017	4	✓
			<b>Wind turbines</b> EN 15316-4-10:2017	4	✓



# CEN-CE implementation in Romania

## ➤ Step 1 Train-the-Trainer programme with CEN-CE Master Trainers

Via CEN-CE LMS & WebEx events,

CEN-CE Certified Trainers (displayed on CEN-CE website)

## ➤ Step 2 Licencing agreement between EPB Center (CEN-CE CSO) & AIIR (CEN-CE National Training Operator - NTO)

## ➤ Step 3 Training & certification by NTO (national) and CSO (EU)

- Translation in national language & adding national context (NTO)
- Exam via CEN-CE LMS by National TO to European CSO
- CEN-CE Certified Expert displayed on CEN-CE website



# 5) CEN-CE Unique Value per stakeholder

« common » based on Standards

« complete » training structure  
from « fundamental » to « calculation »



**Industry**



- **Fair consideration** of products in EP calculation (**level playing field**)
- common **EU databases**
- **Common EU market**

**Education institutions**



- EU-wide acknowledged calculation method

**Certification / accreditation schemes**



- Accreditation of experts for mandatory **and** voluntary certification,
- **quality** of energy audits

**Professionals**



**New skills, know-how, recognition** of competence and quality at **EU level**

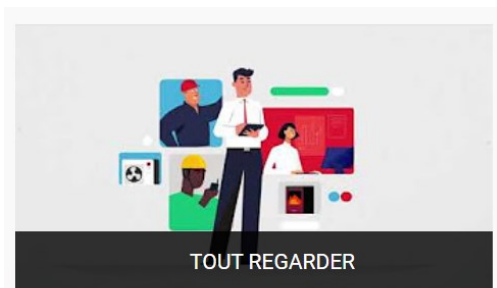






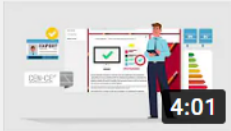
# Visual & quick overview (subtitles in all EU languages)

- 2 pitch videos (for experts and industrials)
- 1 LMS (Learning Management System) video

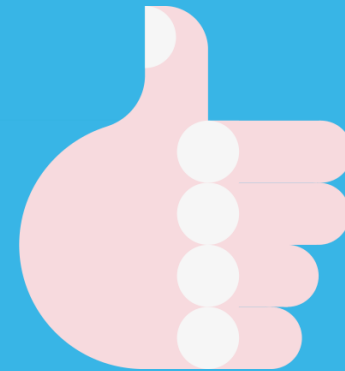
<https://youtube.com/playlist?list=PL8h4qO6ICZGA0of0bojCJgrGCqa4mWex>



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1		CEN-CE scheme for building technology manufacturers REHVA HVAC 2:15
2		CEN-CE scheme for building technology designers and installers REHVA HVAC 2:16
3		CEN-CE scheme's Learning Management System REHVA HVAC 4:01

# THANK YOU!



## CEN-CE ✓

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