

Marco Buoni



Ing. Marco Buoni, a European expert in refrigeration and air conditioning, has been the Vice President of AREA (Air conditioning and Refrigeration European Association) since 2010. AREA voices the interests of 20 national associations from 17 European countries, representing more than 13,000 companies, which employ some 110,000 people. Buoni is also an expert in capacity building in refrigeration and air conditioning, leading the training activities related to certification and best practices. He is highly active as the Technical Director of Centro Studi Galileo in the organisation of training and conferences in refrigeration technologies worldwide. Every year he leads over 300 training courses for up to 3000 participants.

Certification schemes and standards

UNIDO, Vienna Talks 14 June 2017

Marco Buoni

VicePresident, AREA

Air Conditioning & Refrigeration European contractors' Association (www.area-eur.be)

Secretary General Italian Association of Refrigeration Technician, ATF

(www.associazioneATF.org)

Director Centro Studi Galileo (www.centrogalileo.it)

Agenda

1. Gaps following the increase in use of Alternative Refrigerants
 - a) Actual training and certification on traditional refrigerants
 - b) Actual and future training and certifications on alternative refrigerants
2. Available trainings and certification in EU
3. International cooperation in capacity buildings
4. Real Alternatives project



In Pills: To prevent refrigerant emissions and increase safety → Training and certification



The Refrigeration, Air Conditioning and Heat Pumps systems containing fluorinated refrigerants in EU should have:

- Logbook
- Periodical inspections
- Installation, repair only by certified craftsmen
- Right equipment (also suitable for alternative refrigerants)

Mandatory Certification to handle refrigerants

Before 842/2006
Now 517/2014



REGULATION (EC) 2067/2015 (or EN 13133 becoming ISO)

MINIMUM COMPETENCE OF PERSONNEL

T = THEORETICAL P = PRACTICAL

CATEGORIES

DUTIES AND KNOWLEDGE		I	II	III	IV
1	Basic thermodynamics	T	T		T
2	Environmental impact of refrigerants and corresponding environmental regulations	T	T	T	T
3	Checks before putting in operation, after a long period of non-use, after maintenance or repair intervention, or during operation	P	P		
4	Checks for leakage	T/P	T/P		T/P
5	Environment-friendly handling of the system and refrigerant during installation, maintenance, servicing or recovery	P	P	P	
6	Component: installation, putting into operation and maintenance of reciprocating, screw and scroll compressors, single and two-stage	P	P		
7	Component: installation, putting into operation and maintenance of air cooled and water cooled condensers	P			
8	Component: installation, putting into operation and maintenance of air cooled and water cooled evaporators	P			
9	Component: installation, putting into operation and servicing of Thermostatic Expansion Valves (TEV) and other components	P			
10	Piping: building a leak tight piping system in a refrigeration installation	P	P		
11	Information on relevant technologies to replace or to reduce the use of fluorinated greenhouse gases and their safe handling	T	T	T	T

Fgas Certification the numbers

(data June 2016)

UK

- 40,021 individuals hold certificates
- 7123 UK companies are registered

Germany

- 45.000 Personnel certified in Germany
- 3.500 Companies certified in Germany

Italy

- 56300 Personnel certified in Italy
- 23500 Companies certified in Italy

- Average cost for preparation to the certification and the assessment is 600 Euro in EU
- Craftsmen are happy to be certified as they have a recognition of their important job. Certification can be spent by craftsmen as a proper professional qualification, which is mutual recognized in all 28 European Countries

! Fgas Certified
Technicians in EU:
nearly 500.000 !

Registration and monitoring



In EU, We estimate around
500.000 technicians competent and certified
in the 28 EU Members States
for handling refrigerants, mainly HFCs

Netherlands and other
countries in EU started
certification also for
alternative refrigerants

Training is not
Certification

Building Engineering Services Certificate of Achievement

THIS IS TO CERTIFY THAT

Marco Buoni

HAS BEEN SUCCESSFULLY ASSESSED IN

Category

Expiry Date

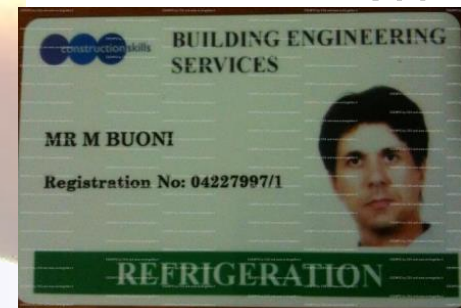
Safe Handling Refrigerants (A11-F Gas Cat1) 19/07/16

Issued on: 12 August 2011

Registration No: 04227997

Construction Skills - The Skills Partnership - Skills for Life - Skills for Success

Chief Executive Construction Skills



Standards, Legislations and Projects in EU



- **EN13313 Refrigerating systems and heat pumps. Competence of personnel**
- CE 2015/2067 (*competence*)
- Real Alternatives EU project
- RDL Refrigeration Driving Licence



- Under Revision, soon ISO Internationally Recognized
- This European Standard defines the activities related to refrigerating circuits and the associated competence profiles and establishes procedures for assessing the competence of persons who carry out these activities.

These standards,
legislations, projects are All
linked together
(and with EN378)





Table 2: Analysis of training in climate-friendly alternative refrigerants to fluorinated greenhouse gases

	Ammonia	CO ₂	Hydrocarbons: small hermetic systems	Hydrocarbons: larger systems (split systems, chillers)	HFOs
Training available in country (% of Member States)	71%	52%	48%	35%	20%
Proportion of certified fluorinated gas personnel trained in alternative refrigerants	2.3%	2.2%	0.7%	0.05%	0%

In EU:
Report of EU commission presented at
Consultation Forum 1st December

Contractors' training with low GWP refrigerants: mind the gap!

Kigali Amendment includes measures in favour of a decreased use of HFCs in RACHP equipment. Such measures would, in turn, result in an increased use of alternatives, namely low GWP (global warming potential) refrigerants, and in particular the so-called “natural refrigerants” (CO₂, hydrocarbons and ammonia). Mindful of the key role played by contractors in the safe, efficient and reliable functioning of equipment working with natural refrigerants, AREA sought an overview of the availability and level of training in the EU.



➔ Solution could be starting from the F-Gas certification of personnel adding modules for natural refrigerants

Recommendations of AREA: Minimum Requirements for alternative refrigerants HC – NH₃– CO₂– HFO



COMPETENCE OF SERVICE TECHNICIANS Assessment: P Practical T Theoretical	HC	NH ₃	CO ₂	HFO A2L
BASIC THERMODYNAMICS AND PHYSICS	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i>
<ul style="list-style-type: none"> Properties : temperature, pressure, density, thermal capacity.. Differences between Low GWP refrigerants and HFCs 				
GOOD PRACTICE	<i>P</i>	<i>P</i>	<i>P</i>	<i>P</i>
<ul style="list-style-type: none"> Identify typical application State and identify the commonly used refrigerants designation 				
HEALTH AND SAFETY REQUIREMENTS	<i>P</i>	<i>P</i>	<i>P</i>	<i>P</i>
<ul style="list-style-type: none"> Safe system shutdown and isolation Extinguish a fire, First aid care treatment 				
REGULATIONS AND STANDARDS	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i>
<ul style="list-style-type: none"> Knowledge of International and National Regulations standards Storage of the refrigerant 				



Details in AREA Guidance
www.area-eur.be

AREA guidelines



- Low GWP Refrigerants

Guidance on minimum requirements for contractors in Servicing Sector Training & Certification

Used by several
EU Member
States for
implementing
national
legislations and
recommendations



The Voice of European Air-Conditioning, Refrigeration and Heat Pumps Contractors

Low GWP Refrigerants

Guidance on minimum requirements for
contractors' training & certification

November 2014
rev. 2 added training facilities list

DISCLAIMER AREA does not assume liability for any statements made in this paper or any actions taken by its readers or users, which may cause unintended damage or injury as a result of any recommendations or inferences made within this paper. Please always refer to manufacturers' manuals and instructions. Although all statements and information contained herein are believed to be accurate and reliable, they are presented without guarantee or warranty of any kind, expressed or implied. This paper makes only general recommendations on the use of Low GWP refrigerants which do not compensate for individual guidance and instructions. National laws and guidelines must be consulted and adhered to under all circumstances.

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Example: training for Hydrocarbons



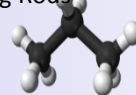
Course details

- Thermodynamic characteristic of Hydrocarbons as refrigerant - p/h diagram
- Specific components for Hydrocarbons
- Electronic components suitable for flammable refrigerants
- Refrigeration and Air conditioning applications with HC
- Recovery or Venting Hydrocarbons
- Vacuum-Charging procedures
- Leak testing
- Mechanical/compression joint connections – avoid brazing
- Flammability and safety issues, first aid
- Conversion HCFC – HFC systems into HC
- National and European regulations and standards
- Transport and storage requirements
- Logbook



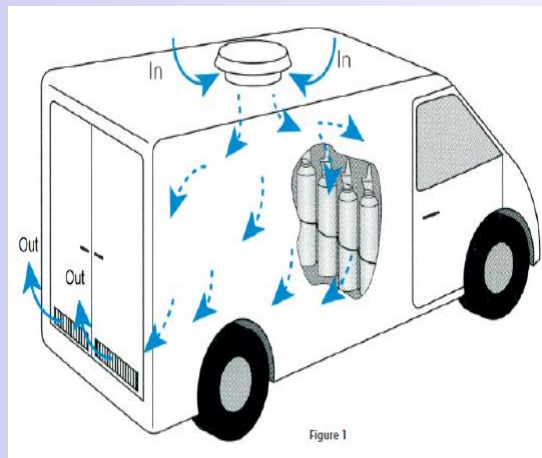
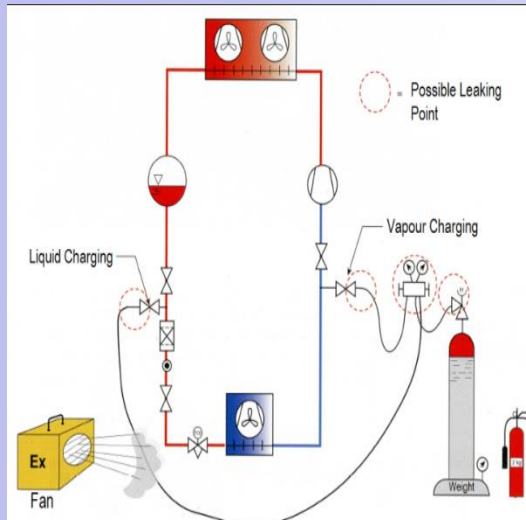
Necessary equipment and components (minimum)

- Test Rig equipped with Pressure Gauges, sight glasses in key points, service valves for connections, temperature well - thermowell (Domestic/Commercial refrigerator or small packaged portable air conditioning unit)
- Mechanical/compression joint tool and connectors
- Nitrogen Regulator - Cylinder of High Purity Nitrogen
- Electronic Weighing Platform
- Hydrocarbon Cylinder
- Electronic or analogue Vacuum gauge
- Manifold set - Hoses with ball valves
- Vacuum Pumps and Hose
- Electronic Leak Detector (suit HC)
- Proprietary Leak Spray
- Temperature meter
- Ammeter
- Tools, Pipe Cutters, Pipe Deburring Tool, Pipework Expanders, Hacksaws, Brazing Rods
- Flaring Tool
- Personal protective equipment



AREA guidelines

- Equipment for handling refrigerants with lower (A2L) and higher (A3) flammability



*Example of Figure from the guideline:
Possible sources for leakage and safety
equipment used when filling
flammable refrigerant*



The Voice of European Air-Conditioning, Refrigeration and Heat Pumps Contractors

**EQUIPMENT FOR REFRIGERANTS
WITH LOWER (A2L) AND
HIGHER (A3) FLAMMABILITY**

Version 1.0 – April 2016

AREA (www.area-eur.be) is the European organisation of air-conditioning, refrigeration and heat pumps contractors. Established in 1988, AREA voices the interests of 21 national members from 19 European countries, representing more than 9,000 companies across Europe (mainly small to medium sized enterprises), employing some 125,000 people and with an annual turnover approaching € 20 billion.

**! Translated already in
8 languages, including
arabic !**

 **EN 378**

Equipment and tools

Equipment and tools of the certified personnel to be supplied by his employer		RC
Manifold		X
Vacuum Gauge or Vacuum Meter		X
Temperature meter		X
Portable leak detector		X
Refrigerant weight Scale		X
Vacuum pump		X
Recovery set		X
Nitrogen pressure regulator		X
Recycling cylinder		X



Figure 4 Recovery cylinder, how to label it



Figure 7 Leak detector



Figure 5 Vacuum pump



Figure 8 Scale



Figure 9 Vacuum Gauge



Figure 6 Refrigerant recovery machine



Figure 10 Pressure Manifold



Figure 11 Temperature Meter



Project 1: Training and Equipment with UNIDO

The following projects with UNIDO have been successful:

- Eritrea – training and certification
- Gambia – Equipment on CO2 and Hydrocarbons and certification of technicians
- Saudi Arabia – Certification of technicians handling refrigerant in split units
- Tunisia – Training, equipment on alternative refrigerants and certification

Many more training and certification has been organized with UNEP and UNDP in Turkey, Montenegro, Rwanda, Benin, Iraq and next month Chinese technicians will come to CSG Headquarter

Gambia



Benin



Rwanda



Project 2: AREA – UNEP Project

Universal Training Kit for Future Alternatives – U TkitAR

- **Full package of material for each module:**
- Pre-Assessment test – Post training assessment
- Venue requirements for training Venue equipment as Computer, projector, WhiteBoard, Microphone, Number of seats, spaces, chair. Requirments
- Teacher minimum qualification
- Checklists and Procedures to start and hold a training course
- Minimum Equipment: Test Rig equipped with Pressure Gauges, sight glasses in key points, service valves for connections, temperature well - thermowell (Domestic/Commercial refrigerator or small packaged portable air conditioning unit) · Mechanical/compression joint tool and connectors · Nitrogen Regulator - Cylinder of High Purity Nitrogen · Electronic Weighing Platform · Hydrocarbon Cylinder · Electronic or analogue Vacuum gauge · Manifold set - Hoses with ball valves · Vacuum Pumps and Hose · Electronic Leak Detector (suit HC) · Proprietary Leak Spray · Temperature meter · Ammeter · Tools, Pipe Cutters, Pipe Deburring Tool, Pipework Expanders, Hacksaws, Brazing Rods · Flaring Tool · Personal protective equipment
- Text book, manuals, tables, charts, Syllabus
- Powerpoint Presentations



Project 3: CSG – Bahrain Project

Details:

1. **Design Certification Scheme for Personnel (Service Technicians RSS)**
2. **Training requirements before examination for personnel working in the field - training and assessment should be separate and independent**
 - a. Pre-training assessment, post training assessment before certification
 - b. 2 days training (16 hours), for orientation programme for preparing the assessment for service technicians (with experience)
 - c. 5 days (40 hours) training for increasing and levelling the competences for service technicians (daytime and evening courses)
 - d. Syllabus, Material, Lecturer Notes, Powerpoint. (Support economic good practice).
 - e. List of support material, Lecturer guideline, venue requirements and equipment...
3. **Designing certification scheme for Companies**
4. **Supporting Services**
 - a. Train the trainer sessions under created training scheme
 - b. Certify the Assessors session
 - c. Certification Affiliation for international regulation for mutual recognition





NATIONAL CERTIFICATION SCHEMES FOR REFRIGERATION AND AIR CONDITIONING SERVICE TECHNICIANS

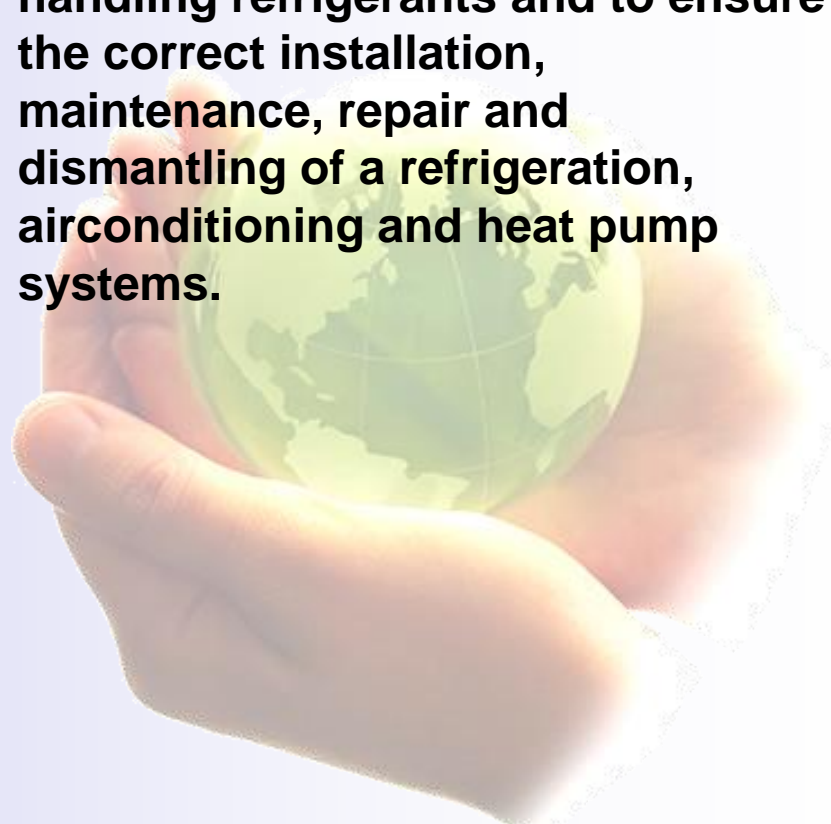
Examples of Strategies
and Requirements for their
Establishment and Operation



UNITED NATIONS ENVIRONMENT PROGRAMME



Certification
is the best practical method to
verify the competence of personnel
handling refrigerants and to ensure
the correct installation,
maintenance, repair and
dismantling of a refrigeration,
airconditioning and heat pump
systems.



New learning for alternative refrigerants in new equipment – Used by the Industry safety, efficiency, reliability and containment



For Life Project



REAL Alternatives

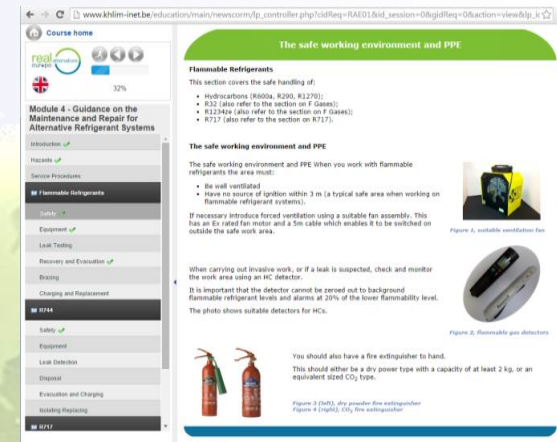
www.realalternatives.eu



“REAL Alternatives for LIFE” is a new and extended project to update existing content, develop new materials on applying safety standards and introduce a range of practical exercises and assessments. It will also include train the trainer events and study days held across Europe.

Will Reach 220,000 technicians

in thirteen working languages and include fifteen partner organisations based in UK, France, Germany, Italy, Belgium, Poland, Czech Republic, Slovakia, Spain, Romania, Denmark, Portugal, and Turkey.



**Free – E-learning usable from
Smartphone, Tablet, Desktop etc...**



Conclusions

- In Kigali–Rwanda has been decided the future of a HFCs phase down worldwide under the Protocol of Montreal
- Train the trainers sessions could help to move to higher competence, in particular for future alternative refrigerants, but also already now for traditional refrigerants
- Certification is the only way to check the level of competence.
Training is not certification
- Could be a solution to succeed in the new goals of shifting to alternative refrigerants worldwide
- To preserve our water, our climate and our environment we should move to new refrigerants but we should do it with competence.





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