



Austrian survey on the frequency, location, and detection of leaks in heat pump and cooling systems up to 50 kW nominal capacity

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MOTIVATION


- F-Gas and REACH regulations → natural, but flammable refrigerants
 - IEA HPT Project 64 “Safety measures for flammable refrigerants” contributes to a safe use of flammable refrigerants by
 - Increasing understanding of risks
 - Maintaining risks at acceptable levels
 - One focus: Collection and analysis of field-based data to assess the current state of safety practices
- **Austrian team conducted practice-oriented online survey** with experts from
- Manufacturers
 - Distributors
 - Installers
 - Refrigeration services companies

CONTENTS

- Approach
- Results and Discussion
- Summary and conclusions

ACKNOWLEDGEMENTS

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 Federal Ministry
Innovation, Mobility
and Infrastructure
Republic of Austria

 **IEA Research Cooperation**
Part of open4innovation

 **FFG**
Promoting Innovation.

APPROACH



APPROACH

- Online survey from Oct. 2024 to March 2025
- Focus on:
 - Heat pumps, cooling/air conditioning units up to approx. 50 kW nominal output
 - Primarily for residential buildings, only in Austria
 - Period of last 3 years
- 4 tailored questionnaires with up to 8 standardized questions for:

Persons from	Feedback from
Manufacturers / Sales Companies	48
Installers	23
Service / refrigeration technicians	42

QUESTIONS

- Single-choice, multiple-choice, rating scale, 1 open-ended

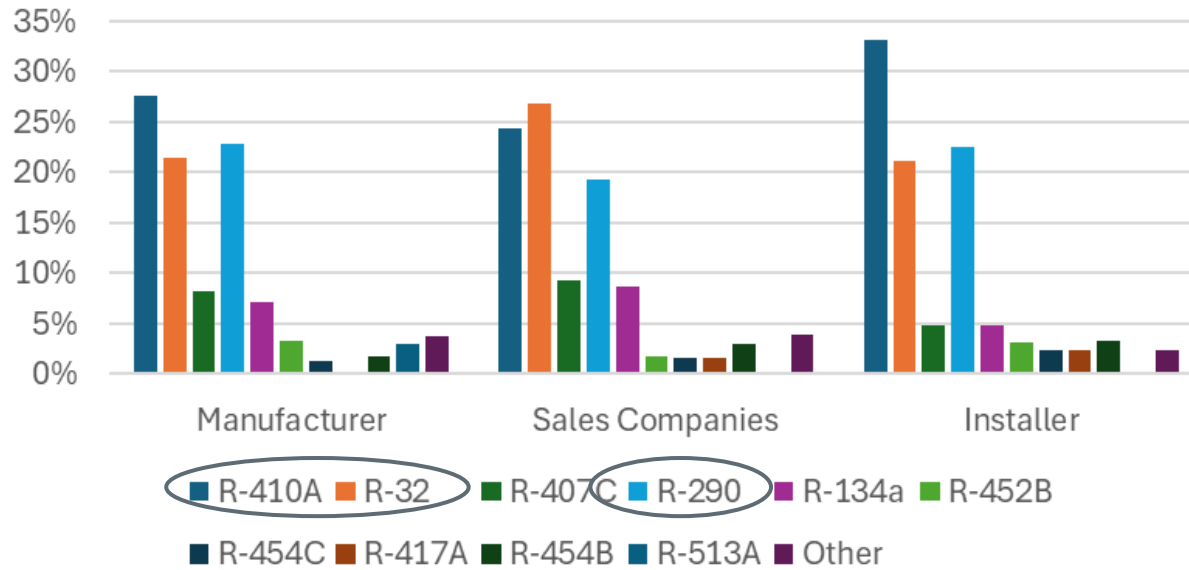
	Question	Manufacturers / Sales companies	Service technicians	Installers
1	Company Information	X		
2	Refrigerants used in sold units	X		X
3	Service Structure	X		X
4	Triggers of Troubleshooting	X	X	X
5	Occurrence of Leaks	X	X	X
6	Leak location	X	X	
7	Leak location - Comment	X	X	
8	Leak testing and leakage detection	X	X	

RESULTS AND DISCUSSION



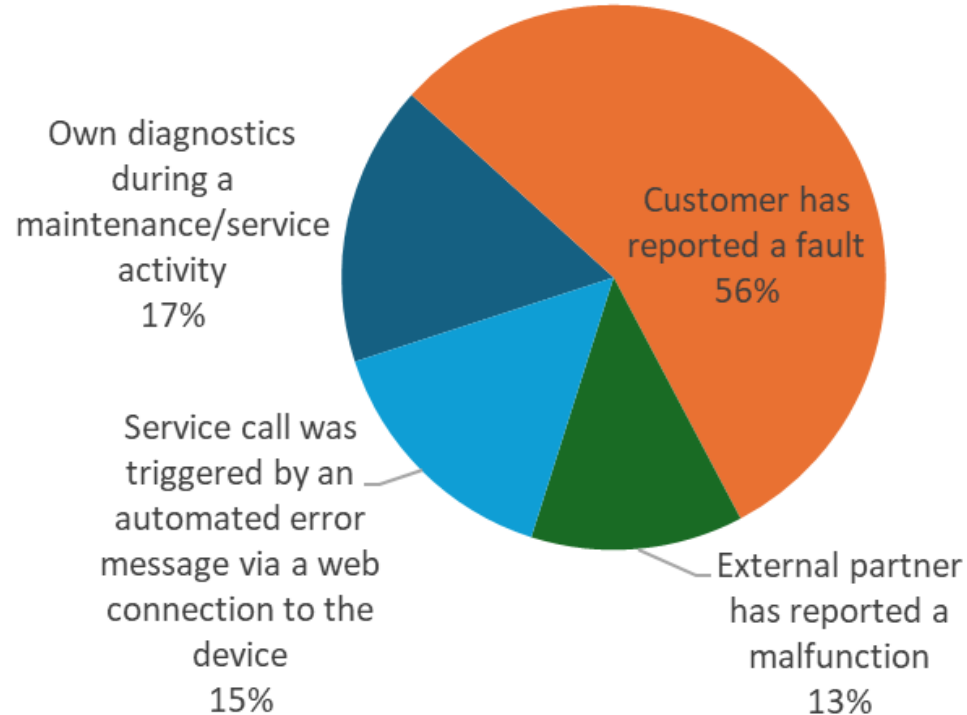
REFRIGERANTS USED IN SOLD UNITS

Refrigerant distribution per group (question 2, 71 answers)



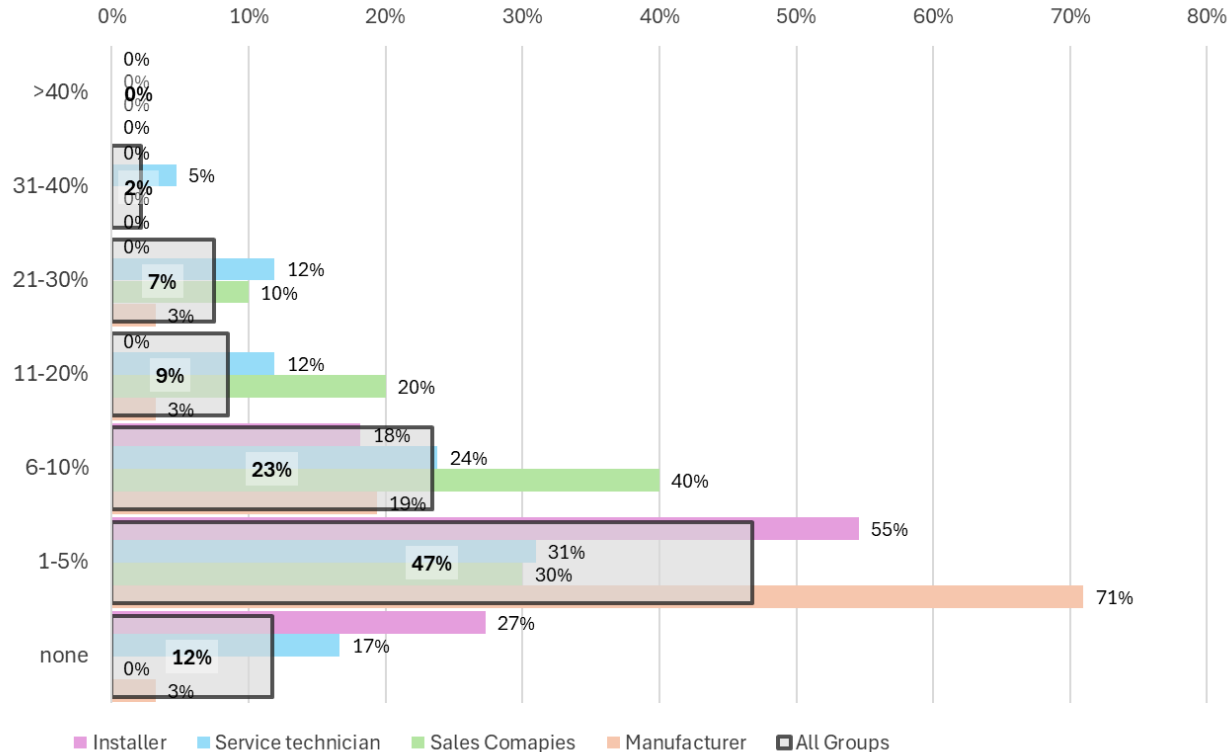
TRIGGERS OF TROUBLESHOOTING

Distribution of the triggering options for troubleshooting operations across all groups (question 4, 94 answers)



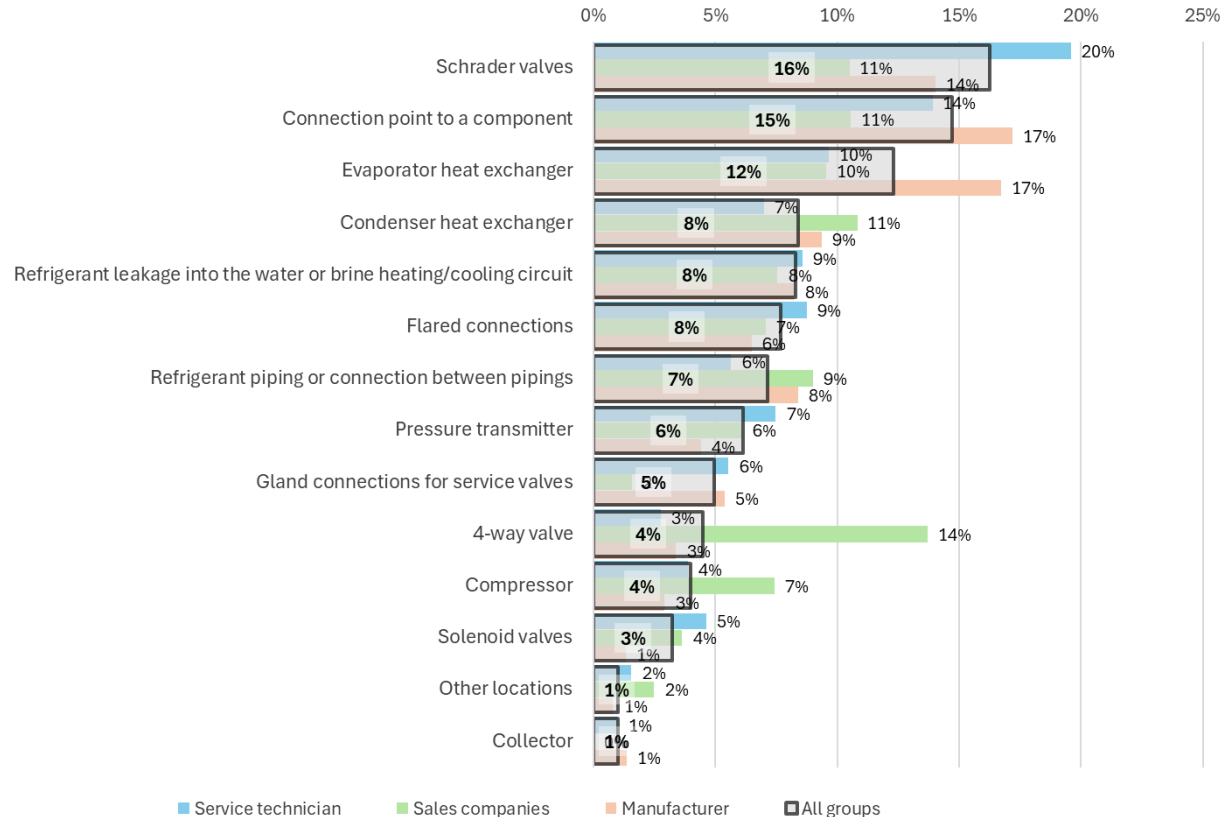
OCCURRENCE OF LEAKS

Leaks during malfunctions (question 5, 94 answers)



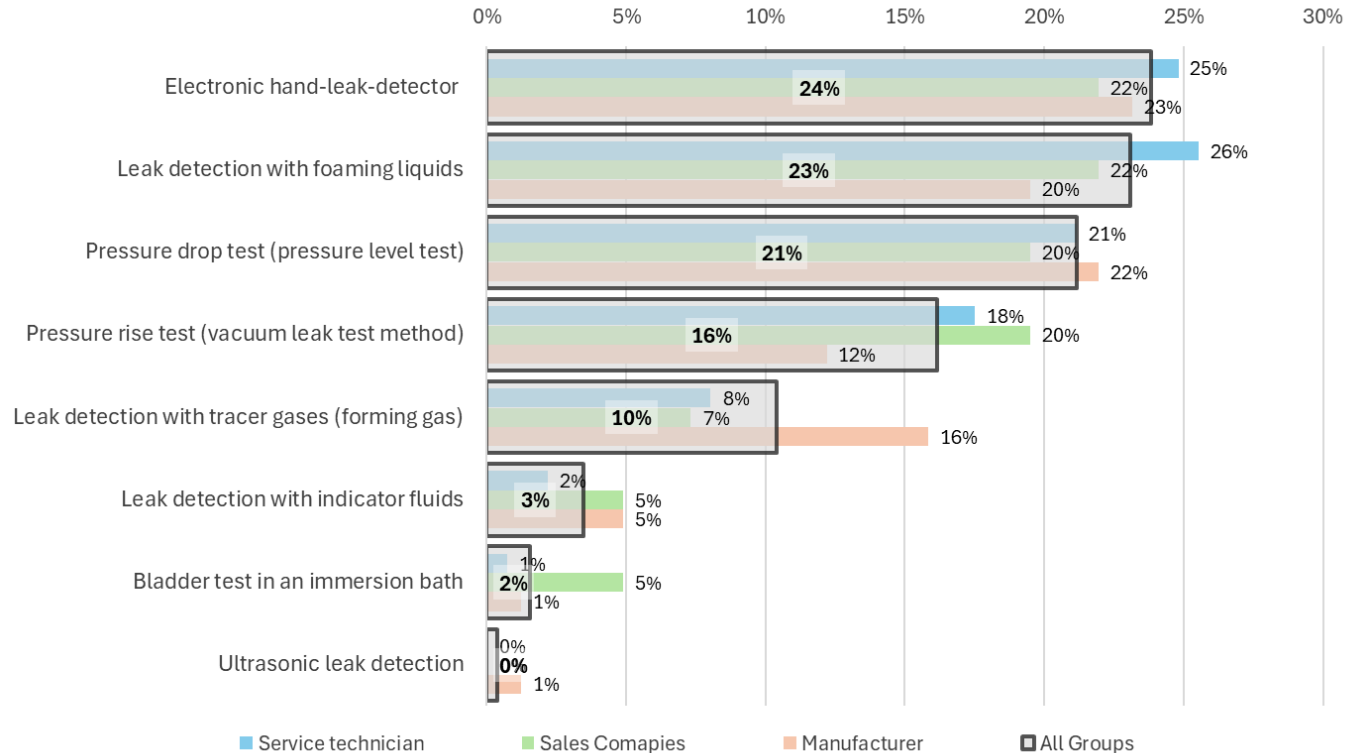
LEAK LOCATION

Local allocation of leaks to all groups (question 6, 83 answers)



LEAK TESTING AND LEAKAGE DETECTION

Methods of leak testing and leakage detection (question 8, 83 answers)



SUMMARY AND CONCLUSIONS



SUMMARY

- The divergence between existing sales and new product portfolios is important for safety-related planning → **Different refrigerant qualifications are required at the same time**
- As end customers are the most common starting point → **Safety briefings also for end customers**
- Notably, 47% of respondents reported that refrigerant circuit leaks occurred in only 1–5% of all service incidents → **Events are relatively rare, but present**
- Most common leak locations: Schrader valves, connection points to components, and evaporator heat exchangers → **Design improvements, assembly/quality requirements and training content should be prioritised towards these areas**
- Preferred methods for leak testing & detection highlight the → **Need for robust, field-ready standard methods for leak testing & detection**

CONCLUSIONS

- Even though results cannot be directly transferred to other countries, they still give valuable insights into the frequency and typical causes of system failures
- Findings can help guide the development of technical standards, product design, training programs, and service procedures and ultimately reducing environmental risks and enhancing operational safety
- See <https://heatpumpingtechnologies.org/project64/> for further outcomes of **IEA HPT Project 64 “Safety measures for flammable refrigerants”**

QUESTIONS?



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