

# newsTRAC

NEWSLETTER FOR TECHNICIANS IN REFRIGERATION AND AIR CONDITIONING (RAC) SERVICING SECTOR

ISSUE VII

FEBRUARY 2026

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# Finding Invisible Refrigerant Leaks: Electronic Leak Detectors for Safer, Greener Cooling

By Shaurya Anand, Associate Fellow,  
The Energy and Resources Institute (TERI)

Refrigerant leakage is one of the most persistent and costly problems facing the air conditioning and refrigeration sector today. Every time a system slowly loses refrigerant, it escapes directly into the air, adding to global warming because many refrigerants are hundreds to thousands of times more potent than carbon dioxide. Leaks also make systems work harder, increasing electricity use, raising customer bills, and adding more load to power plants. For technicians, this means that finding and fixing leaks early is no longer just a technical skill; it is part of climate action and professional responsibility.

## Role of Digital Technology in Modern Servicing

Across industries, digitalization is transforming how assets are monitored, maintained, and optimized. Refrigeration and air-conditioning (RAC) servicing is also shifting away from purely manual inspection toward sensor-based, electronic diagnostic tools that improve accuracy, safety, and efficiency.

Traditional leak-detection methods such as soap solution testing are time consuming and often fail to identify micro-leaks that still cause performance degradation and long-term emissions. Electronic refrigerant leak detectors bridge this gap by providing fast, sensitive, and repeatable detection of refrigerant presence in air, even at very low concentrations. These tools are especially important as the sector transitions toward low-global warming potential (GWP) refrigerants, including mildly flammable A2L refrigerants and hydrocarbons such as R-290, where early leak detection is critical for both safety and environmental protection.

By enabling early identification of leaks, electronic leak detectors support proper refrigerant recovery, reduced emissions, improved system reliability, and longer equipment life

## What Is a Digital Leak Detector?

An electronic refrigerant leak detector is a handheld servicing tool that senses small amounts of refrigerant present in the air and alerts the technician through audible alarms (beeps), visual indicators such as LEDs, and in some models numerical or bar-type displays indicating relative leak intensity.

Unlike soap bubbles, it can detect leaks that are too small to see but still large enough to cause performance loss, repeat callbacks, and long-term climate damage.

Modern electronic leak detectors are compact, battery-powered tools designed for routine field use across a wide range of cooling applications. They are commonly used in residential air-conditioning systems, commercial AC installations, and cold rooms. Modern digital detectors have multiple benefits. The key benefits are explained in Figure 1.

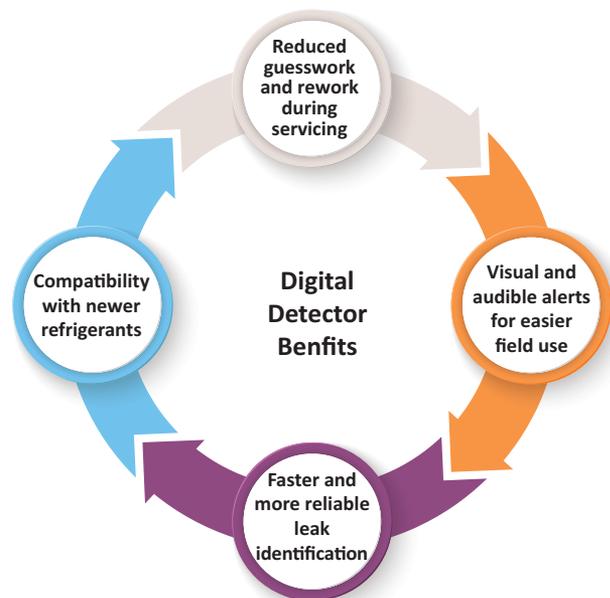


Figure 1 Key Benefits of Modern Digital Sensors in RAC Servicing

## How Digital Refrigerant Leak Detectors Work?

Digital leak detectors rely on specialized sensor technologies that respond to the presence of refrigerant molecules or gas flow characteristics. Understanding sensor types helps technicians select the right tool for each application.

### Common Detection Technologies

#### Infrared (IR) detection

Infrared detectors identify refrigerants based on how specific gases absorb infrared light. This method is highly selective and reliable, making it suitable for most heating, ventilation, and air conditioning (HVAC) and refrigeration applications.

#### Heated Diode Sensors

These sensors respond to changes in temperature caused by refrigerant gases passing over a heated element. They are sensitive and effective for detecting small leaks in compact systems.

#### Ultrasonic Detection

Ultrasonic detectors listen for high-frequency sound generated when pressurized gas escapes through a leak. These are particularly useful in noisy environments or large systems where airflow is high.

#### Multi-sensor Digital Detectors

Advanced devices combine multiple sensor types with digital signal processing to improve reliability and reduce false alarms.

To select the right digital leak detector, it is important for technicians to understand how different sensor technologies work and where each is best applied. Digital leak detectors use various sensing principles to detect refrigerant gases with different levels of

sensitivity, accuracy, and selectivity. Table 1 summarizes the commonly used sensor technologies in refrigerant leak detection, highlighting their working principles, suitable applications, and key practical considerations for servicing work.

### From Installation to Preventive Servicing

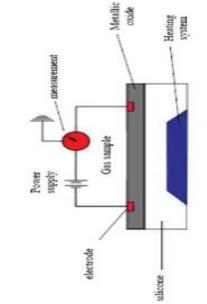
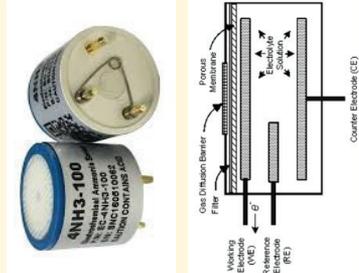
Leak detection should not be limited to breakdown servicing alone. One of the most critical stages for identifying and preventing refrigerant leaks is during installation and commissioning, when joints, brazed connections, valves, and service ports are first pressurized. Undetected installation defects at this stage can lead to continuous refrigerant loss, reduced system performance, and repeated service call-backs over the equipment's operating life.

After commissioning, routine preventive servicing plays an equally important role. Over time, factors such as vibration, thermal cycling, moisture ingress, and corrosion can weaken joints and tubing, particularly in outdoor units and in coastal or industrial environments. Regular leak inspections using electronic leak detectors help technicians identify micro-leaks and early signs of deterioration before they develop into major failures.

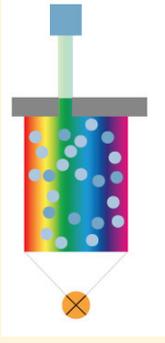
Table 2 summarizes the role of electronic leak detection at different stages of the cooling system lifecycle, highlighting how early and preventive checks reduce failures, refrigerant loss, and environmental impact.

By aligning leak-detection practices with each stage of the system lifecycle, technicians can improve reliability, reduce energy and refrigerant losses, and support safer, more climate-responsible cooling. As cooling systems evolve towards smart, connected, and energy-efficient designs, precision diagnostic tools will remain central to modern servicing practices.

**Table 1** Common sensor technologies used in digital refrigerant leak detection and their servicing applications

Sensor technology	Detection principle (simple and technical)	Refrigerants /gases detected	Key advantages	Limitations and care	Typical applications	Schematic diagram /tool image
Semiconductor (heated diode/MOS)	Uses a heated metal oxide surface. When refrigerant gas contacts the sensor, a chemical reaction changes electrical resistance, which is measured as a leak signal.	HFCs, HCFCs, HFOs	Economical, widely available, simple to use, long service life (~5 years)	Sensitive to humidity, temperature changes, solvents, hydrocarbons, and exhaust gases; requires periodic calibration	Routine field servicing, split ACs, and small refrigeration systems	 <p>Figure showing heated sensor tip near joint with gas flow and resistance change</p>
Electrochemical sensor	Works like a small battery. The target gas reacts at the working electrode, generating an electrical current proportional to gas concentration.	Primarily ammonia (NH <sub>3</sub> )*; other toxic gases	Very high accuracy at low ppm levels, fast response, highly selective, minimal cross-sensitivity	Limited to specific gases, requires calibration, sensor life ~3-5 years	Cold storage, food processing, industrial refrigeration using NH <sub>3</sub>	 <p>The sensor consists of a working electrode, a counter electrode, and an electrolyte. Electrochemical sensors work like batteries.</p>

\* Note: Industrial refrigeration systems such as cold storage and food-processing facilities use ammonia (NH<sub>3</sub>). Not typically used in residential or commercial air-conditioning systems.

Sensor technology	Detection principle (simple and technical)	Refrigerants /gases detected	Key advantages	Limitations and care	Typical applications	Schematic diagram /tool image
Infrared (IR) sensor	Emits infrared light through an air sample. Refrigerant gases absorb specific wavelengths, reducing light intensity, which is measured by the sensor.	HFCs, HCFCs, HFOs, NH <sub>3</sub> , hydrocarbons (R-290), CO <sub>2</sub>	High sensitivity and accuracy, very low cross-sensitivity, stable readings, long life (5-7 years), fast response	Higher cost compared to basic sensors	Professional servicing, preventative maintenance, modern low-GWP systems	 <p>Schematic showing IR source, gas chamber, absorption sensor, digital display</p>
Ultrasonic detection <sup>#</sup>	Detects high-frequency sound produced when pressurised gas escapes through a leak, independent of gas type	Any pressurized refrigerant gas	Works in windy or ventilated areas, independent of refrigerant type, useful in noisy environments	Less effective for very small leaks or low-pressure systems	Large systems, cold storage, industrial installations	
Multi-sensor digital detectors	Combines two or more sensor technologies with audio-visual alerts and digital processing for improved accuracy	Depends on sensor combination	Higher reliability, reduced false alarms, technician-friendly interface	Higher cost, requires basic user training	Professional servicing, preventative maintenance	

<sup>#</sup> Mr Cartool , Ultrasonic Leak Detector Product Manual

**Table 2** Role of electronic leak detection in servicing

System stage	What happens at this stage?	Common leak risks	Role of electronic leak detectors	Why it matters?
<b>Installation and commissioning</b>	System is installed and pressurized for the first time; joints, brazed connections, valves, and service ports are tested	Poor brazing, loose joints, faulty valves, improper tightening	Confirms leak-free installation before handover	Prevents early refrigerant loss, repeat call-backs, and poor system performance
<b>Early operation (post-commissioning)</b>	System starts regular operation under varying load and weather conditions	Vibration, thermal expansion and contraction	Detects early micro-leaks that develop after start-up	Avoids gradual efficiency loss and customer complaints
<b>Routine preventive servicing</b>	Periodic inspection during scheduled maintenance	Corrosion, ageing joints, mechanical wear	Identifies small leaks before they become major failures	Reduces refrigerant consumption and improves system reliability

# Safe handling of R-290 Refrigerant

Sneha Kashyap, Associate Fellow,  
The Energy and Resources Institute (TERI)

R-290, commonly known as propane, can be used as a hydrocarbon refrigerant alternative for traditional hydrochlorofluorocarbons (HCFCs)/hydrofluorocarbons (HFCs) in low or medium temperature applications such as domestic and commercial refrigerators, freezers, heat pumps, commercial ACs, etc.<sup>1</sup>

R-290 can't be used as a retrofit refrigerant. It is intended only for new systems that are specifically designed and certified for R-290 use.<sup>2</sup> Owing to its extremely low environmental impact, R-290 is being adopted as a low global warming potential (GWP) replacement for refrigerants such as R-22, R-404A, R32 and R410A in residential applications and R-134a in selected applications.

Unlike propane used for domestic cooking purposes, refrigeration-grade R-290 is not odourised. Domestic LPG is deliberately odourised to enable quick leak detection, but refrigeration-grade propane has no added odorant. As a result, leaks cannot be easily detected by smell,<sup>3</sup> making adherence to proper safety procedures and leak-detection practices critical. Figure 2 illustrates the range of cooling applications where hydrocarbon refrigerants such as R-290 are being deployed.

## Characteristics

The A3 safety classification indicates low toxicity but high flammability, which necessitates strict safety controls during installation, servicing, and disposal.

Formula	C <sub>3</sub> H <sub>8</sub>
Molecular weight (g/mol)	44.1
Boiling temperature °F (°C)	-43.8 (-42.1)
Critical temperature °F (°C)	206.1 (96.7)
Critical pressure, PSI, (bar)	616.5 (42.5)
Global warming potential	3
Ozone depletion potential	0
ASHRAE safety group	A3

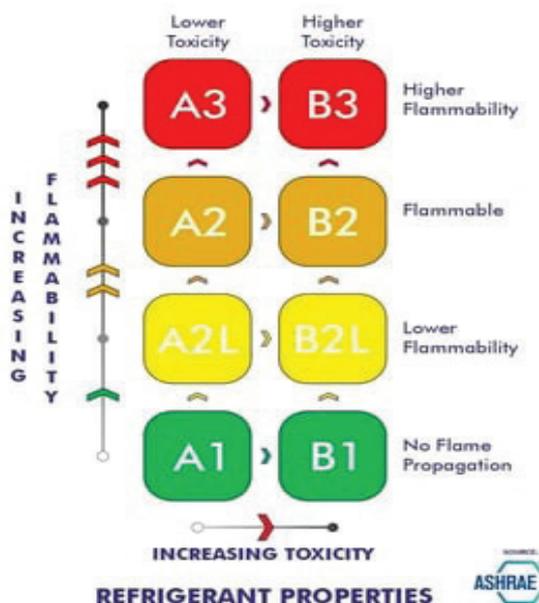


Figure 2 Application of R-290<sup>4</sup>

<sup>1</sup> <https://www.superradiatorcoils.com/blog/r-290-pros-cons-comparisons-r22-r134a-r404a#:~:text=R%2D290%2C%20commonly%20known%20as,lengthy%20history%20as%20a%20refrigerant.>

<sup>2</sup> Guide for the Use of R-290 Refrigerant in Copeland Refrigeration

<sup>3</sup> Technical data sheet-R290-Gas Service

<sup>4</sup> <https://www.agas.com/au/products-services/refrigerants/r290/>

Safe handling depends on the use of appropriate tools, adequate ventilation, and trained personnel.

## Tools and Equipment

Only tools and equipment specifically designed and certified for flammable (A3) refrigerants shall be used. The detailed requirements for tools, along with fundamentals of refrigerant safety and recovery and reclamation procedures, were discussed in the Sixth edition of *newsTRAC* issue. A brief overview of essential tools is provided below. Essential tools include:

- Spark-proof/explosion-proof hand tools (non-ferrous materials preferred)
- Hydrocarbon-compatible recovery machines rated for A3 refrigerants
- Vacuum pumps suitable for flammable refrigerants
- Electronic leak detectors for hydrocarbons
- Charging scales, hoses, and manifolds approved for use with R-290

Use of standard HFC tools or uncertified equipment is strictly prohibited due to ignition risk.

## Safe-handling Methods

- Ensure good ventilation at all times to prevent gas accumulation.
- Remove all ignition sources before starting work (open flames, sparks, hot surfaces, smoking).
- Work only on systems specifically designed for R-290.
- Allow handling and servicing only by trained and certified technicians.

## Charging and Servicing

- Always charge by weight, using calibrated charging scales.
- Never exceed the manufacturer-specified refrigerant charge limit.
- Fully evacuate the system before charging.
- Conduct leak testing after servicing using recommended hydrocarbon leak detectors suitable for flammable refrigerants. Always consult your organization’s servicing protocols and the equipment manufacturer’s service manual before undertaking charging or servicing activities.
- Never rely on smell to detect leaks—refrigeration-grade R-290 is not odourised.

When handled correctly, R-290 is a safe, efficient, and environmentally friendly refrigerant. Failure to follow

proper tools, procedures, and safety practices can lead to fire, explosion, or serious injury.

## Do’s and Don’ts for Handling R-290

Do’s	Don’ts
<ul style="list-style-type: none"> <li>▪ Do ensure the work area is well ventilated.</li> <li>▪ Do use spark-proof and hydrocarbon-rated tools only.</li> <li>▪ Do wear appropriate personal protective equipment (PPE) such as safety gloves, goggles, and anti-static clothing.</li> <li>▪ Do use approved electronic leak detectors or soap solution for leak testing.</li> <li>▪ Do follow manufacturer instructions and applicable safety standards (such as IEC and ISO standards).</li> <li>▪ Do ensure only trained and certified technicians handle R-290 systems.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Do not use R-290 as a drop-in or retrofit refrigerant.</li> <li>▪ Do not smoke, weld, or use open flames near R-290 systems.</li> <li>▪ Do not use standard electrical tools that may generate sparks.</li> <li>▪ Do not rely on smell to detect leaks.</li> <li>▪ Do not overcharge the system.</li> <li>▪ Do not store cylinders near heat sources or in confined, unventilated spaces.</li> </ul>

R-290 represents the future of climate-responsible refrigeration. But its safe deployment depends on disciplined servicing, standards-compliant tools, and precise leak detection. Electronic hydrocarbon leak detectors convert invisible risks into visible warnings, enabling technicians to protect lives, property, and the environment. As the cooling sector transitions towards the next generation of refrigerants, the future of servicing will be defined by advanced detection technologies, stricter safety protocols, and a highly skilled technician workforce. The safety does not begin at repair; it begins with detection.

# Keeping Your Leak Detector Reliable: Servicing and Maintenance of Digital Refrigerant Leak Detectors

Digital refrigerant leak detectors have become indispensable in modern refrigeration and air-conditioning (RAC) servicing. They allow technicians to find micro-leaks quickly, reduce refrigerant emissions, improve energy efficiency, and ensure safe handling of refrigerants.

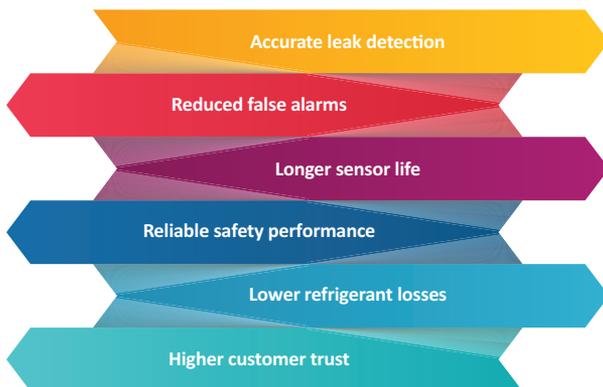
But like any precision instrument, a leak detector is only as reliable as its maintenance. Poorly maintained detectors lead to false alarms, missed leaks, repeated service calls, and in the case of flammable refrigerants, serious safety risks.

Proper servicing and care of leak detectors should not be ignored as it is essential for professional, climate-responsible and safe servicing.

## Why Maintenance Matters?

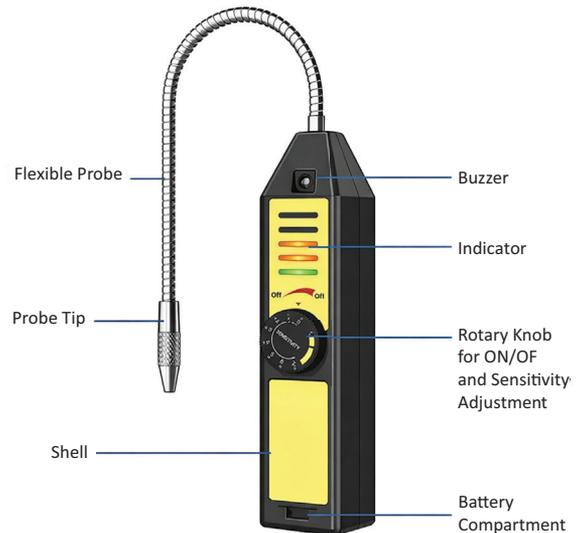
Inside every digital leak detector is a sensitive sensor element operating at controlled temperature and electrical conditions. Dust, oil vapour, moisture, solvent fumes, and battery fluctuations can all affect sensor stability. Over time, sensors may drift, lose sensitivity, or produce false signals if not maintained correctly.

## Regular Maintenance Ensures



## Parts of Digital Refrigerant Leak Detector

A typical handheld digital refrigerant leak detector consists of a flexible probe and probe tip for air sampling, a sensor chamber, signal-processing electronics, visual indicators, an audio alarm, sensitivity controls, and a battery compartment. These components work together to sense refrigerant molecules in ambient air and convert them into visual and audible leak indications. Figure 3 depicts a schematic diagram of the main components of a typical commercial handheld digital refrigerant leak detector.



**Figure 3** Schematic diagram of a typical handheld digital refrigerant leak detector showing key components<sup>5</sup>

## Warm-up Before Testing

Product manuals for modern handheld digital refrigerant leak detectors specify that sensing elements require a short warm-up period after power-on to reach stable operating temperature before accurate leak detection

<sup>5</sup> Adapted from : <https://www.optimumindia.in/product/refrigerant-leak-detector-model-wjl-6000s/>

begins. This warm-up phase allows the heated sensor and internal circuits to stabilize, ensuring reliable response to refrigerant gas.

In field practice, technicians typically allow approximately 30–60 seconds of warm-up time before commencing leak testing, consistent with manufacturer recommended sensor stabilisation procedures.

## Baseline Zeroing for Accurate Detection

Many contemporary leak detector product manuals describe an ‘ambient reset’ or ‘baseline zeroing’ function. This function sets the surrounding background refrigerant concentration as a reference point, ensuring that normal ambient vapours are ignored and only elevated concentrations near actual leak sources trigger alarms. Without baseline zeroing, background contamination may be misinterpreted as a refrigerant leak, reducing confidence in detection results and increasing false positives.

## Keeping the Sensor Tip Clean

During routine use, the sensor probe is exposed to compressor oil vapour, dust, moisture, and cleaning agents. Contamination on the probe tip can affect sensor sensitivity and stability. Best practice includes keeping the protective cap on when not in use, avoiding direct contact with the sensor tip, preventing exposure to solvents, and gently removing dust using clean dry airflow.

## Battery Care and Power Stability

Leak detectors rely on stable battery voltage to maintain sensor heating and signal processing. Weak batteries can lead to slow response, unstable readings, and reduced detection accuracy. Best practice includes replacing batteries proactively, avoiding mixing old and new batteries, and removing batteries during long-term storage.

## Avoiding False Alarms

Certain ambient vapours such as solvents, paints, and cleaning chemicals can trigger sensors if baseline zeroing is not performed or environmental conditions change. Re-zeroing the detector in fresh air before testing reduces the likelihood of false alarms and ensures reliable leak detection.

## Calibration and Sensor Life

Most semiconductor and infrared sensors have defined service lives, typically ranging from two to seven years, depending on their type, usage and environment.<sup>6,7</sup> Regular calibration checks and adherence to manufacturer-recommended replacement intervals help maintain consistent sensitivity and accuracy.

## Do’s and Don’ts for Detector Maintenance

Do’s	Don’ts
<ul style="list-style-type: none"> <li>▪ Allow warm-up before use</li> <li>▪ Perform baseline zeroing in clean air</li> <li>▪ Keep sensor probe capped when idle</li> <li>▪ Replace batteries proactively</li> <li>▪ Store in clean, dry conditions</li> <li>▪ Use detectors rated for flammable refrigerants where required</li> </ul>	<ul style="list-style-type: none"> <li>▪ Do not expose sensors to solvents or moisture</li> <li>▪ Do not touch the sensor tip</li> <li>▪ Do not operate with weak/old batteries</li> <li>▪ Do not skip warm-up or zeroing procedures</li> <li>▪ Do not use non-rated detectors on flammable refrigerants</li> </ul>

## Conclusion

Digital refrigerant leak detectors are frontline instruments of modern heating, ventilation, and air-conditioning and refrigeration (HVAC&R) servicing. Yet their effectiveness depends not only on sensor technology but also on the care given by the technician using them. Regular warm-up, zeroing, cleaning, battery management, and calibration transform a simple handheld device into a reliable guardian of safety, efficiency, and environmental responsibility.

<sup>6</sup> <https://www.reed instruments.com/pdfs/cache/www.reed instruments.com/c-380/manual/c-380-manual.pdf>  
<sup>7</sup> <https://samon.com/wp-content/uploads/2024/09/Product-Guide-2025-v3.pdf>

# RAC Technicians Training Calendar (February-April 2026)

**Theme:** Good service practices during installation and repair of room air conditioners with HFC-32, HCFC-22 and flammable refrigerants

## February 2026 – RAC Technicians Training Calendar

S. No.	Location	Training dates	Training partner	Contact details	Training centre address
1	Mumbai, Maharashtra	Day 1 Wednesday, 25 February 2026 Day 2 Thursday, 26 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd Ashok Complex, H No. 218, Shop No. 1, 1st Floor, Lahoti Comp, Opposite Dandekar Company, Above Punjab National Bank, Kalyan Road, Bhiwandi, Mumbai – 421302, Maharashtra
2	Bhubaneswar, Odisha	Day 1 Wednesday, 25 February 2026 Day 2 Thursday, 26 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Pratisruti Infotech Pvt. Ltd Plot No. 438, Lingipur, Bhubaneswar – 751002, Odisha
3	Telangana	Day 1 Wednesday, 25 February 2026 Day 2 Thursday, 26 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	13-255/1, 1st floor Rosery Convent School Chandra Nagar, Medchal Telangana – 501401
4	Telangana	Day 1 Wednesday, 25 February 2026 Day 2 Thursday, 26 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	13-255/1, 1st floor Rosery Convent School Chandra Nagar, Medchal Telangana- 501401
5	Lucknow, Uttar Pradesh	Day 1 Wednesday, 25 February 2026 Day 2 Thursday, 26 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Grey Sim Learnings Foundation 1st Floor, Situated at C-20, J Road, Mahanagar Extension, Lucknow – 226006, Uttar Pradesh
6	Lucknow, Uttar Pradesh	Day 1 Friday, 27 February 2026 Day 2 Saturday, 28 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Grey Sim Learnings Foundation 1st Floor, Situated at C-20, J Road, Mahanagar Extension, Lucknow – 226006, Uttar Pradesh

S. No.	Location	Training dates	Training partner	Contact details	Training centre address
7	Howrah, West Bengal	Day 1 Friday, 27 February 2026 Day 2 Saturday, 28 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Ramakriahna Mission Janasiksha Mandir, 313 GT Road, Belurmath, Howrah – 711202, West Bengal
8	Lucknow, Uttar Pradesh	Day 1 Friday, 27 February 2026 Day 2 Saturday, 28 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Grey Sim Learnings Foundation 1st Floor, Situated at C-20, J Road, Mahanagar Extension, Lucknow – 226006, Uttar Pradesh
9	Mumbai, Maharashtra	Day 1 Friday, 27 February 2026 Day 2 Saturday, 28 February 2026	Funfirst Global Skillers Pvt. Ltd	Ms. Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Private Limited, C 119, Kailas Vaibhav, Kailas Industrial Complex, Vikhroli West, Mumbai – 400079, Maharashtra
10	Ajmer, Rajasthan	Day 1 Saturday, 28 February 2026 Day 2 Sunday, 1 February 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@tmie2e.com	Hotel Ambassador Mali Mohalla, Ashok Marg, Ajmer – 305001, Rajasthan

## March 2026 – RAC Technicians Training Calendar

S. No.	Location	Training date	Training partner	Contact details	Training centre address
1	Lucknow, Uttar Pradesh	Day 1 Sunday, 1 March 2026 Day 2 Monday, 2 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Grey Sim Learnings Foundation 1st Floor, Situated at C-20, J Road, Mahanagar Extension, Lucknow – 226006, Uttar Pradesh
2	Mumbai, Maharashtra	Day 1 Sunday, 01 March 2026 Day 2 Monday, 2 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd, C 119, Kailas Vaibhav, Kailas Industrial Complex, Vikhroli West, Mumbai – 400079, Maharashtra
3	Telangana	Day 1 Sunday, 1 March 2026 Day 2 Monday, 2 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	13-255/1, 1st floor Rosery Convent School Chandra Nagar, Medchal, Telangana – 501401

S. No.	Location	Training date	Training partner	Contact details	Training centre address
4	Ahmedabad, Gujarat	Day 1 Monday, 2 March 2026 Day 2 Tuesday, 3 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	1st floor 212/213/A, Tata Nagar Society, Megahni Nagar Road, Opposite Civil Hospital Staff Quarters, Ahmedabad, Gujarat – 380016
5	Telangana	Day 1 Tuesday, 3 March 2026 Day 2 Wednesday, 4 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	13-255/1, 1st floor Rosery Convent School, Chandra Nagar, Medchal Telangana – 501401
6	Lucknow, Uttar Pradesh	Day 1 Tuesday, 3 March 2026 Day 2 Wednesday, 4 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Grey Sim Learnings Foundation 1st Floor, Situated at C-20, J Road, Mahanagar Extension, Lucknow – 226006, Uttar Pradesh
7	Ahmedabad, Gujarat	Day 1 Wednesday, 4 March 2026 Day 2 Thursday, 5 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	1st floor 212/213/A, Tata Nagar Society, Megahni Nagar Road, Opposite Civil Hospital Staff Quarters, Ahmedabad – 380016, Gujarat
8	Pune, Maharashtra	Day 1 Wednesday, 4 March 2026 Day 2 Thursday, 5 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd No. D/3, Renuka Complex, Jangali Maharaj Road, Above Canara Bank, Shivajinagar, Pune – 411004, Maharashtra
9	Telangana	Day 1 Thursday, 5 March 2026 Day 2 Friday, 6 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	13-255/1, 1st floor Rosery Convent School Chandra Nagar, Medchal, Telangana – 501401

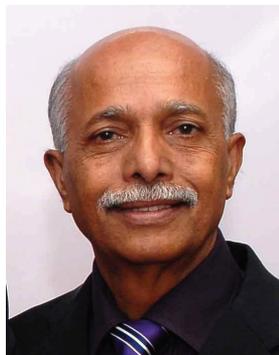
S. No.	Location	Training date	Training partner	Contact details	Training centre address
10	Raipur, Chhattisgarh	Day 1 Thursday, 5 March 2026 Day 2 Friday, 6 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd  2nd Floor, Shyam Square New Pandri Road, Near LIC Office, Block-B, Raipur - 492001, Chhattisgarh
11	Ahmedabad, Gujarat	Day 1 Friday, 6 March 2026 Day-2 Saturday, 7 March 2026	Funfirst Global Skillers Pvt. Ltd.	Ms Ulka Patel   9833981768   upatel@funfirst.in	1st floor 212/213/A, Tata Nagar Society, Megahni Nagar Road, Opposite Civil Hospital  Staff Quarters, Ahmedabad - 380016, Gujarat
12	Pune, Maharashtra	Day 1 Friday, 6 March 2026 Day 2 Saturday, 7 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd  No. D/3, Renuka Complex, Jangali Maharaj Road, Above Canara Bank, Shivajinagar - 411004, Pune, Maharashtra
13	Jaipur, Rajasthan	Day 1 Saturday, 7 March 2026 Day 2 Sunday, 8 March 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@tmie2e.com	Jagrati Ananta Express Daga Path  Hans Vihar RIICO Industrial Area, Mansarovar, Near Galaxy Cinema Hall, Jaipur - 302020, Rajasthan
14	Bengaluru, Karnataka	Day 1 Saturday, 7 March 2026 Day 2 Sunday, 8 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	28 52/3, Bannerghatta Road, Doresanipalya,  Anthappa Layout, Phase 4, Bilekahalli, Bengaluru - 560076, Karnataka
15	Raipur, Chhattisgarh	Day 1 Saturday, 7 March 2026 Day 2 Sunday, 8 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd  2nd Floor, Shyam Square, New Pandri Road, Near LIC Office, Block-B, Raipur - 492001, Chhattisgarh

S. No.	Location	Training date	Training partner	Contact details	Training centre address
16	Delhi	Day 1 Monday, 9 March 2026 Day 2 Tuesday, 10 March 2026	Centre for Research and Industrial Staff Performance (CRISP)	Mr. Vijay Saxena   Mobile: 9425029865   Email: vijay@crispindia.com Mr Mukesh Sharma   Mobile: 9782044467	ITI Nizamuddin, Opposite Nizamuddin Dargah, Delhi -110013
17	Mumbai, Maharashtra	Day 1 Monday, 9 March 2026 Day 2 Tuesday, 10 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd Ashok Complex, H. No. 218, Shop No. 1, 1st Floor, Lahoti Comp, Opposite Dandekar Company, Above Punjab National Bank, Kalyan Road, Bhiwandi, Mumbai - 421302, Maharashtra
18	Raipur, Chhattisgarh	Day 1 Monday, 9 March 2026 Day 2 Tuesday, 10 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd 2nd Floor, Shyam Square, New Pandri Road, Near LIC Office, Block-B, Raipur - 492001, Chhattisgarh
19	Bengaluru, Karnataka	Day 1 Wednesday, 11 March 2026 Day 2 Thursday, 12 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	28 52/3, Bannerghatta Road, Doresanipalya, Anthappa Layout, Phase 4, Bilekahalli, Bengaluru - 560076, Karnataka
20	Mumbai, Maharashtra	Day 1 Wednesday, 11 March 2026 Day 2 Thursday, 12 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Private Limited, C 119, Kailas Vaibhav, Kailas Industrial Complex, Vikhroli West, Mumbai - 400079, Maharashtra
21	Delhi	Day 1 Thursday, 12 March 2026 Day 2 Friday, 13 March 2026	Centre for Research and Industrial Staff Performance (CRISP)	Mr Vijay Saxena   9425029865   vijay@crispindia.com Mr Mukesh Sharma   Mobile: 9782044467	ITI Nizamuddin, Opposite Nizamuddin Dargah, Delhi -110013

S. No.	Location	Training date	Training partner	Contact details	Training centre address
22	Ajmer , Rajasthan	Day 1 Friday, 13 March 2026 Day 2 Saturday, 14 March 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Ambassador, Mali Mohalla, Ashok Marg, Ajmer –305001, Rajasthan
23	Hubli, Karnataka	Day 1 Friday, 13 March 2026 Day 2 Saturday, 14 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	3rd Floor Shrinath, Complex Neelgin Road New Cotton Market, Near Traffic Police Station, Hubli – 580029, Karnataka
24	Raipur, Chhattisgarh	Day 1 Friday, 13 March 2026 Day 2 Saturday, 14 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	Funfirst Global Skillers Pvt. Ltd 2nd Floor, Shyam Square New Pandri Road, Near LIC, Block-B, Raipur – 492001, Chhattisgarh
25	Ajmer, Rajasthan	Day 1 Sunday, 15 March 2026 Day 2 Monday, 16 March 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Ambassador, Mali Mohalla, Ashok Marg , Ajmer –305001, Rajasthan
26	Ajmer, Rajasthan	Day 1 Sunday, 15 March 2026 Day 2 Monday, 16 March 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan  8005532526   trainings.rj@ tmie2e.com	Hotel Ambassador, Mali Mohalla, Ashok Marg, Ajmer –305001, Rajasthan
27	Hubli, Karnataka	Day 1 Sunday, 15 March 2026 Day 2 Monday, 16 March 2026	Funfirst Global Skillers Pvt. Ltd	Ms Ulka Patel   9833981768   upatel@funfirst.in	3rd Floor Shrinath, Complex Neelgin Road, New Cotton Market, ear Traffic Police Station, Hubli – 580029, Karnataka
28	Alwar, Rajasthan	Day 1 Friday, 27 March 2026 Day 2 Saturday, 28 March 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Aravali Madhuvan Bank Colony, Near Railway Station, Alwar – 301001, Rajasthan
29	Alwar, Rajasthan	Day 1 Sunday, 29 March 2026 Day 2 Monday, 30 March 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Aravali Madhuvan Bank Colony, Near Railway Station, Alwar – 301001, Rajasthan

## April 2026 – RAC Technicians Training Calendar

S. No.	Location	Training date	Training partner	Contact details	Training centre address
1	Jaipur, Rajasthan	Day 1 Saturday, 4 April 2026 Day 2 Sunday, 5 April 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Jagrati Ananta Express Daga Path Hans Vihar, RIICO Industrial Area Mansarovar, Near Galaxy Cinema Hall, Jaipur – 302020, Rajasthan
2	Sikar, Rajasthan	Day 1 Thursday, 9 April 2026 Day 2 Friday, 10 April 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Eros, Sakpura Mohlla, Railway Station Road, Sikar – 332001, Rajasthan
3	Sikar, Rajasthan	Day 1 Saturday, 11 April 2026 Day 2 Sunday, 12 April 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Eros, Sakpura Mohlla, Railway Station Road, Sikar – 332001, Rajasthan
4	Alwar, Rajasthan	Day 1 Friday, 17 April 2026 Day 2 Saturday, 18 April 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Aravali Madhuvan Bank Colony, Near Railway Station, Alwar – 301001, Rajasthan
5	Alwar, Rajasthan	Day 1 Sunday, 19 April 2026 Day 2 Monday, 20 April 2026	TMI e2E Academy Pvt. Ltd	Mr Vijay Chauhan   8005532526   trainings.rj@ tmie2e.com	Hotel Aravali Madhuvan Bank Colony, Near Railway Station, Alwar – 301001, Rajasthan



**Experience**

Mr Mathew has over five decades of experience in the refrigeration and air-conditioning (RAC) sector.



**From the field:**

**Mr Mathew has over five decades of experience in the refrigeration and air-conditioning (RAC) sector, beginning his career in 1970 as an instructor at a technical institute in Pune and later working across various industrial and marine establishments. After gaining international experience in marine and factory maintenance in the UAE, he returned to India in 1989 to establish Max Cooling Systems, specializing in air-conditioning and refrigeration solutions for cars, buses, reefers, and off-road vehicles.**



**Could you briefly describe the nature of servicing work carried out by RAC technicians at your centre?**

Ans: Our technicians handle installation, servicing, maintenance, and repair of a wide range of refrigeration and air-conditioning systems, covering domestic, commercial, and industrial applications. Our work spans micro air-conditioning systems for EV battery cooling to large industrial chillers, as well as ultra-low temperature deep freezers operating at -85°C. Notably, we have also retrofitted So-Low ultra-low temperature freezers with Suva 95, an environmentally friendly refrigerant, and served as the service franchisee for these specialized systems.



**Which refrigerants are commonly handled during servicing, and what safety practices are followed, especially for flammable refrigerants?**

Ans: Our technicians handle a range of refrigerants including R22, R134a, R290, R600a, R32 ammonia, and HC blends. We have also worked on So-Low ultra-low temperature freezers imported from the USA, which operate on a cascade refrigeration system consisting of two independent refrigeration circuits. In these systems, the primary unit cools the condenser of the secondary unit to achieve temperatures of -85°C, originally using R13 and R23 refrigerants. These freezers were retrofitted with Suva 95 (a blend of trifluoromethane and hexafluoroethane).



**What professional training or certifications do your technicians undergo before field servicing?**

Ans: Our technicians undergo in-house training covering air-conditioning and refrigeration fundamentals, evacuation, recovery and recycling practices, use of modern diagnostic tools, and safe handling of refrigerants before undertaking field servicing.



**What are the most common challenges technicians face during RAC servicing and maintenance work?**

Ans: One of the key challenges is the lack of formal technical training among many technicians, as skills are often acquired through workshop experience. This sometimes results in gaps in understanding of refrigerants, system diagnostics, and effective repair practices.



**How important are proper tools, equipment, and standard servicing procedures in ensuring quality service?**

Ans: Proper tools and adherence to standard servicing procedures are essential for quality service. The use of gauge manifolds, multimeters, clamp meters, vacuum gauges, and appropriate hand tools is critical for accurate diagnostics, safe operations, and reliable system performance.



**From your experience, what types of training programmes are most needed for RAC technicians to keep up with new refrigerants, tools, and technologies?**

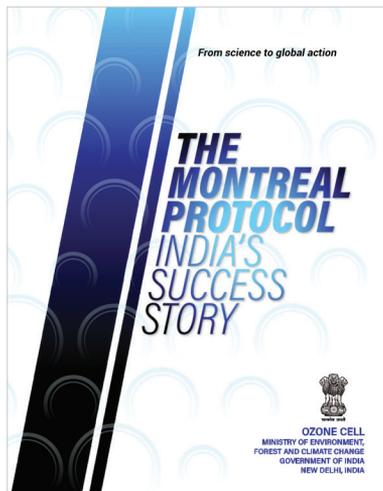
Ans: Training programmes should focus on fundamentals of air-conditioning and refrigeration, working principles of system components, safe handling of new and low-GWP refrigerants, use of advanced diagnostic tools, and emerging technologies in the RAC sector.



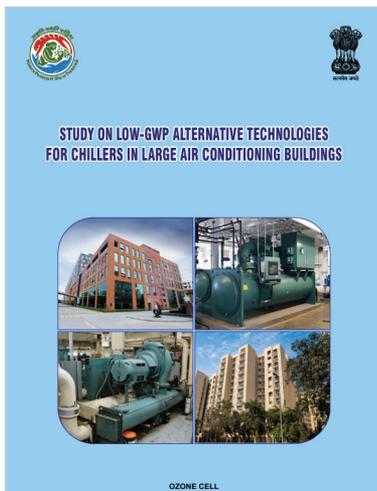
**What message would you like to share with young professionals entering the RAC servicing field?**

Ans: Young professionals should continuously upgrade their knowledge and skills by participating in certified training programmes and workshops conducted by recognized agencies, to build strong technical foundations and ensure long-term career growth in the RAC sector.

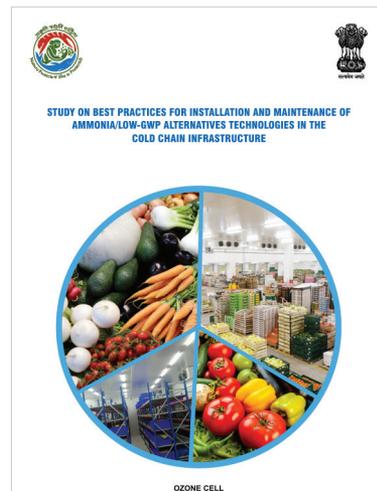
**The Ozone Cell, Ministry of Environment, Forest and Climate Change (MoEF&CC), released important publications and awareness materials on the occasion of World Ozone Day 2025.**



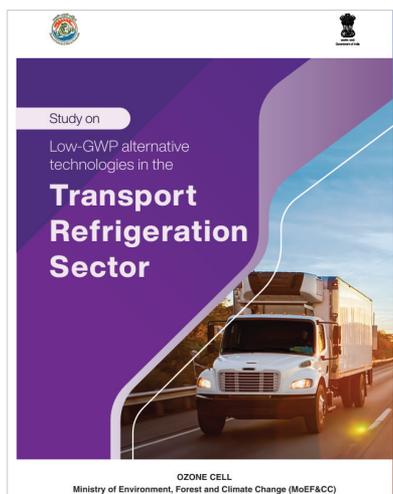
**27th edition of 'The Montreal Protocol: India's Success Story'**



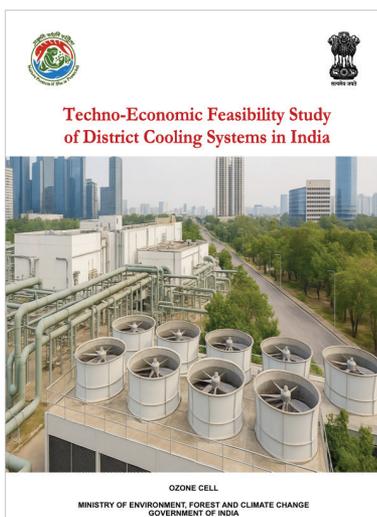
**Study on Low-GWP Alternative Technologies for Chillers in Large Air-Conditioning Buildings**



**Study on Best Practices for Installation and Maintenance of Ammonia / Low-GWP Alternatives in Cold Chain Infrastructure**



**Study on Low-GWP Technologies in the Transport Refrigeration Sector**



**Study on Techno-Economic Feasibility of District Cooling Systems (DCS) in India**

**For detailed reports and downloads, please visit:**

**Ozone Cell Resource Portal**

**<https://ozonecell.nic.in/home-page/resource-informations/>**



# GOOD SERVICE PRACTICES FOR ROOM AIR-CONDITIONERS



**RECOVERY OF REFRIGERANT FROM SYSTEM FOR REUSE IN THE SAME SYSTEM**



**REPAIR/REPLACE DEFECTIVE PARTS WITH OEM PARTS**



**PROPER BRAZING &/OR FLARING**



**CLEANING/ POLISHING AND FLUSHING WITH OXYGEN FREE DRY NITROGEN**



**LEAK/ PRESSURE TESTING WITH OXYGEN FREE DRY NITROGEN**



**EVACUATION AND VACUUM HOLDING**



**SEALING PROCESS TUBE/CLOSING VALVES**



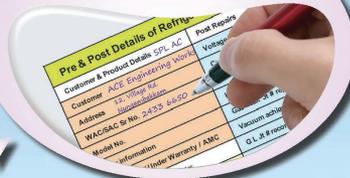
**REFRIGERANT CHARGING BY WEIGHT**



**CHECK FOR PROPER OPERATION AND FINAL LEAK CHECK**



**RECORD DETAILS OF WORK DONE**



Committed to  
**Quality Service**  
Committed to  
**The Environment**

Boiling Point of Water °C	Vapor Pressure in Microns
100	7,59,968
50	92,456
30	31,750
10	8,641
0	4,572
-10	1,722
-23.35	500

Our aim  
**500 microns**



**SAFETY ALWAYS**



HPMP (HCFC PHASE-OUT MANAGEMENT PLAN): SERVICING SECTOR

A Project of the Ozone Cell, Ministry of Environment & Forests (MoEF), Government of India in co-operation with the Government of Germany represented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and United Nations Environment Programme (UNEP)



[www.ozoncell.nic.in](http://www.ozoncell.nic.in)

## Ready Reference for Good Servicing Practices Videos



**Basic tools  
overview**



**Evacuation of  
Air Conditioner**



**Flaring**



**Leak  
Detection**



**Refrigerant  
Charging**

**Want to learn and  
explore more about good  
servicing practices, scan  
here:**



Ministry of Environment,  
Forest & Climate Change  
Government of India

### For further information

Ozone Cell, Ministry of Environment,  
Forest and Climate Change

1st Floor, 9 Institutional Area, Lodhi Road,  
New Delhi -110003

**Phone No.:** 011-24642176

**Fax:** 011-24642175

**Website:** <http://ozonecell.nic.in/>

**Email:** [pmucfc-mef@nic.in](mailto:pmucfc-mef@nic.in)

**twitter:** <https://twitter.com/OMoefcc>

**YouTube:** [https://www.youtube.com/  
channel/UC82wIRSvgzUEzOys5SZWrpgg](https://www.youtube.com/channel/UC82wIRSvgzUEzOys5SZWrpgg)



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