



# FIC•FRIO

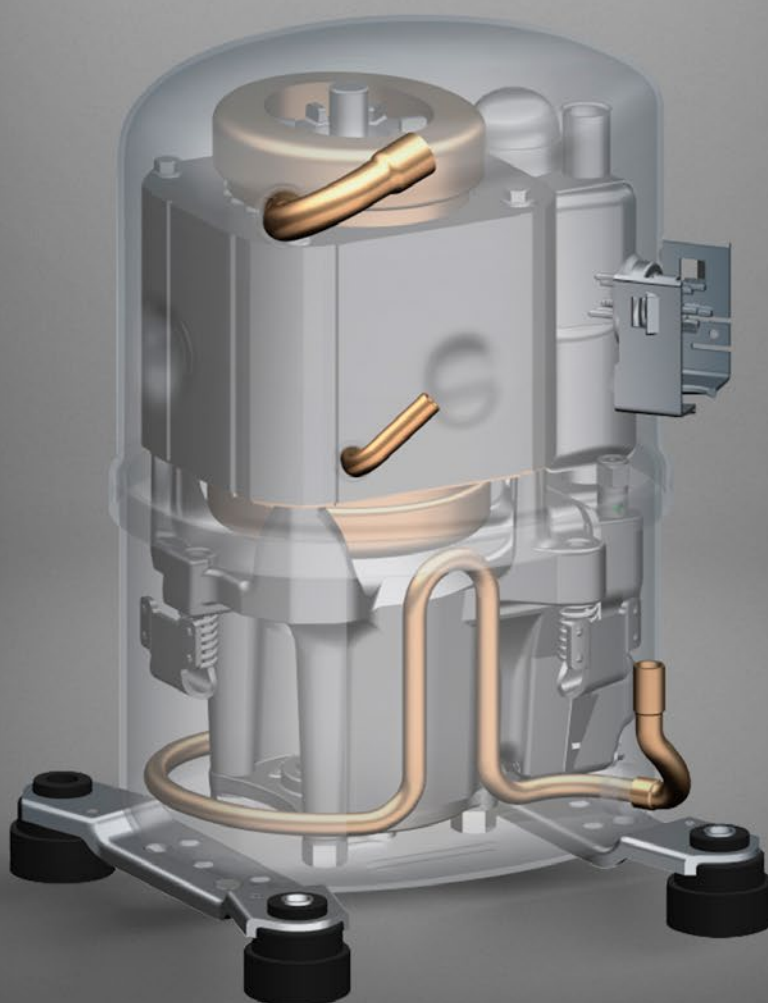


SECOND HALF OF 2019  
YEAR 28 • NO. 109 AND 110

## AW: ROBUST AND EFFICIENT

*Tecumseh compressors and condensing units designed to meet the most strict demands of the commercial refrigeration segment*

PAGES 6 AND 7



**PROFESSIONAL ETHICS**  
PAGES 4 AND 5

**E-COMMERCE**  
PAGE 8

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PAGE 12

**INFINEE**  
PAGE 18

# TECHNOLOGY AND SUSTAINABILITY

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*Tecumseh*

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# THE ART OF GATHERING

The end of the year has come. Time for family meetings, for togetherness, for being with the family and for contemplation. It is also the time to plan the next goals and strategies for future challenges.

Within this context, Tecumseh recalls and celebrates the various gatherings it sponsored in 2019, especially those presented in this edition of the **Fic Frio**: international topics – the Argus Project (American) and Infinee (French) – that now reach the Brazilian public; the Brazilian topics that are conveyed to English and Spanish speakers; the constant search and exploration of new technologies, which improve themselves and improve our products; the meetings of the people that help to develop this magazine; our target public, which drives us to look for better and better cooling solutions; and much more. After all, "life is the art of gathering, although there are so many mismatches in life," said the writer, singer and composer Vinicius de Moraes, in the song Samba da Benção.

Among those many gatherings, some were particularly special and you will explore them on the following pages with our students, readers and clients. The Tecumseh Corporate University (UCT) ends 2019 with ten classes already trained in the Tecumseh Refrigeration Specialist course, which attracted a diverse audience with a common goal, ie., the professional updating. This encounter with knowledge goes beyond the theoretical and practical content of the classes, it also implies the exchange of professional and personal experiences.

The relationship with our readers was also strengthened. Throughout the latest editions of the magazine, our readership sent suggestions on topics to be addressed in the **Fic Frio**. We could see this participation more closely and the desire to learn more, and you can check out the result in the topic Reader's Digest.

We also met the first buyer of Tecumseh's E-commerce during the 21st edition of Febrava, which took place in September in São Paulo. This moment showed how much we have grown since the launch of the Tecumseh Store and strengthened the will that our products reach more and more people in the country.

Finally, our last special gathering of 2019 is this magazine that now reaches you. Have a good read!

## IT IS WORTH CHECKING OUT

### READER'S DIGEST

The reader Ricardo Panesi suggested a topic and we wrote an article about it

### PAGES 10 AND 11

*Energy efficiency in refrigeration systems.*



Personal archive



# PROFESSIONAL ETHICS

*Permeating the human relationships in the professional field, ethical behavior is essential for individual and collective performance in the corporate world*

**T**o live in groups, man needs to find ways to make this coexistence harmonious and respectful. To this end, each era established behavior patterns consistent with the cultural values of each town and region.

A better understanding of these behavioral habits is the goal of ethics, which is part of the philosophy responsible for investigating the principles that motivate, distort, discipline or guide human behavior. Depending on the theoretical approach, ethics can also be understood as the ideal that guides human action.

Ethics, therefore, is pervasive in human relationships, even in the professional sphere – that is the matter of choice of the Professor Carlos Goldenberg, from the School of Engineering of the University of São Paulo (USP), in São Carlos. Electrical Engineer and Master in Electrical Engineering, he studies ethics in Engineering and teaches the subjects "Ethics and Social Responsibility in Engineering" and "The Engineer as an Ethical Agent."

In this context, Carlos Goldenberg explains the concept of ethics he adopts and its importance for the professional training in various specialties.

### **What is the definition of ethics and what is its importance and impact on today's society?**

I treat ethics as a set of four different ethic types, but that usually coexist simultaneously in our daily lives.

Every time I refer to ethics, in fact, I am dealing with professional ethics, which is the combination of individual (personal), organizational (corporate), social and artificial intelligence ethics. In this context, the definition I adopt is that ethics is a continuous reflection on knowledge and behavior and objective action in the sense of doing genuine good. It is also to believe that the exchange of experiences is much better than just the experience itself.

The importance and impact of ethics in society are increasingly growing and more sophisticated, especially when it comes to communication between people and corporations.

### **Knowing that ethics as a professional skill arose with the first corporate universities, what is the relationship between the concept and the institution? How did that happen and how does it keep happening?**

The contact between the corporate and the academic world has provided a gigantic ethical maturity for both realities, and we are still experiencing a great development of this coexistence. Corporate universities emerged around 1951, at the Stanford University in the United States, and soon expanded throughout the world.

This model of corporate education arose from the need to qualify employees in a way linked to business strategies, thus seeking to achieve better results for the institution.

An organization that fosters the continuing education of its employees is much better regarded on the market.

### **How is ethics present in corporate environments? What makes it unique for companies?**

In the corporate world, ethics is closely associated with the organizational culture and, as Socrates defended it, it is necessary for each organization to know itself and, based on this perception, improve itself.

In this respect, it is important to highlight two aspects: change does not necessarily mean improvement; and self-knowledge is only completely possible with the collaboration of agents outside the corporation, as with an individual when they refer to a doctor or therapist, which immediately stresses out the importance of a good ethical rela-



*Carlos Goldenberg, Professor of Engineering at the University of São Paulo (USP), in São Carlos*

tionship in the daily work, both inside and outside the work environment.

### **What are the main characteristics of ethical behavior? How can this bring advantages to the professional on the labor market?**

The answer is always unique, it depends on each individual and / or corporation and their work environment. However, I observe that ethical maturation goes through three evolutionary stages: that of pure ethics, which consists of being respectful and compliant with the laws; that of differential ethics, that is, to be fair and clearly establish the things that are and are not practiced; and that of perennial ethics, which is a good reputation over time.

### **How is ethics important for the engineering and refrigeration sectors? What would be the Ethics Engineering?**

In an increasingly transparent world, those professionals who do not have a good and obvious professional ethic will not have a pleasant or long life. After all, nobody wants to have a person of bad character by their side, except, of course, in the criminal world.

I believe that the natural evolution of human beings and their social and professional groups is also bringing to Engineering the responsibility of building a morally worthy and better world. This is allowing to diminish the distance between the technical / technological development and the moral development of Humanity.



**Performance:**  
it is the most  
efficient  
compressor in  
its category

**Robustness:**  
designed  
to meet the  
most strict  
demands of  
the commercial  
refrigeration  
segment

Images: Tecumseh Archive

# AW FAMILY

*Attentive to the needs of commercial applications on the market, Tecumseh develops products that stand out in robustness and cooling capacity*

**T**he commercial compressors and condensing units of the AW Family arrive on the market bringing high technology, increased energy efficiency, low noise and less weight than previous generations, thus meeting the needs of commercial market applications.

The compressors can operate with R-22, R-404A and R-134a refrigerants fluids and the main applications of the AW family are in cold rooms, refrigerated counters, milk cooling tanks and ice cream machines.

The AW compressor is available in two versions, with tube or valve, and the second option offers greater ease of installation and maintenance of cooling systems.



Inclined suction  
tube version

Version with  
rotalock valve

It's worth highlighting that the AW compressors are already available in Black-Units condensing units with microchannel or finned condenser.



### AW COMPRESSORS TECHNICAL INFORMATION

APPLICATION LBP (FROZEN)					60Hz
Fluid refrigerant	Model	Cooling capacity		Efficiency (W/W)	EER Btu/Wh
		W	Btu/h		
R-404A	AWS2495Z	1272	4337	1,12	3,82
	AWS2512Z	1846	6296	1,15	3,92

Evaporation temperature: -35 °C. Condensation temperature: 40 °C.  
Subcooling: 0 K. Gas return temperature: 20 °C

APPLICATION M/HBP (REFRIGERATED)					60Hz
Fluid refrigerant	Model	Cooling capacity		Efficiency (W/W)	EER Btu/Wh
		W	Btu/h		
R-22	AWS4522E	3370	11503	2,13	7,3
	AWS4532E	4443	15163	2,12	7,23
	AWS4538E	5745	19607	2,09	7,13
	AWS4542E	7091	24200	2,37	8,09
R-404A	AWS4522Z	3149	10738	1,91	6,51
	AWS4524Z	3599	12273	1,97	6,71
	AWS4532Z	4562	15557	2,07	7,06
	AWS4538Z	5712	19479	2,03	6,92
	AWS4544Z	6560	22369	1,95	6,64
R-134a	AWS4518Y	2415	8235	1,89	6,46
	AWS4525Y	3491	11906	2,15	7,32

Evaporation temperature: -10 °C. Condensation temperature: 45 °C.  
Subcooling: 0 K. Gas return temperature: 20 °C

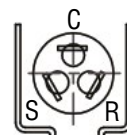
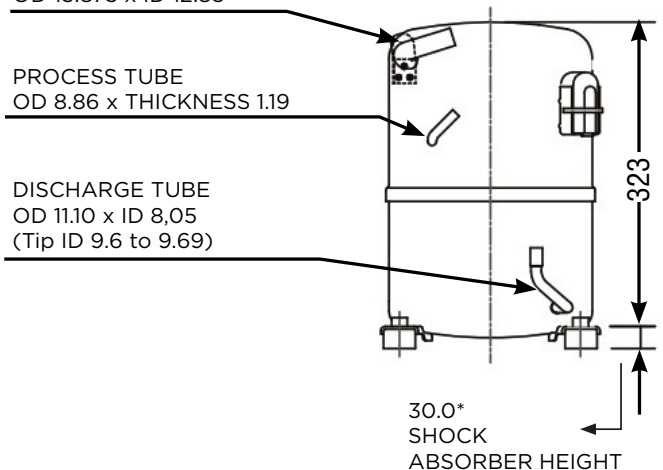
### SPECIFICATIONS

Application	LBP - M/HBP Frozen - Refrigerated
Fluid refrigerant	R-404A, R-22, R-134a
Cooling capacity	1200 - 5500 W 4100 - 18780 Btu/h
Connections	Rotalock tubes or valves
Oil	Polyolester (POE)
Fastening	190,5 x 190,5 mm
Engine type	CSR

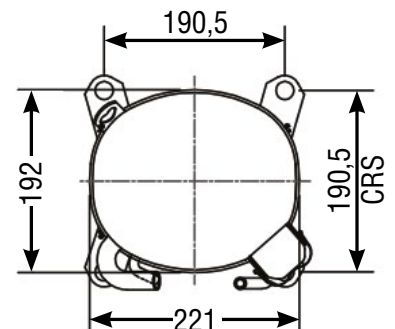
SUCTION TUBE  
OD 15.875 x ID 12.83

PROCESS TUBE  
OD 8.86 x THICKNESS 1.19

DISCHARGE TUBE  
OD 11.10 x ID 8,05  
(Tip ID 9.6 to 9.69)



POSITION OF  
THE TERMINALS  
\*OPTION 38mm



To replace compressors quickly and effectively, refer to the FOR YOU TO GATHER section of this edition, on page 19: reference table of AWS Tecumseh x compressors from other manufacturers.

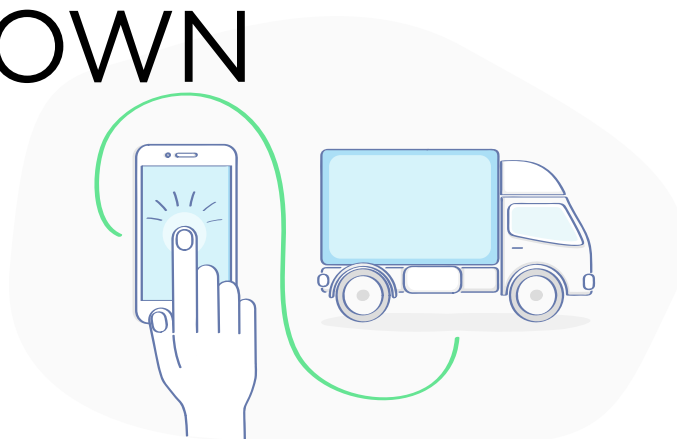
To learn more about the equivalences of Tecumseh's FH x AW compressors, please access the FOR YOU TO GATHER section on **Fic Frio's** No. 107 issue by clicking on the QR code on the right.





# E-COMMERCE: BREAKING DOWN BORDERS

*The importance and competitive edge of digital consumption spaces for large companies*



In September 2019, Tecumseh took part in another edition of the International Refrigeration, Air Conditioning, Ventilation, Heating and Air Treatment Fair (Febrava), held in São Paulo.

In the 21st edition of the event, in addition to sharing and improving knowledge, accompanying innovations and trends and showcasing its main products, technologies and launches, Tecumseh also met the first buyer of its e-commerce, Daniel Moroni Rocha.

Rocha is a microentrepreneur and technician in refrigeration and air conditioning at Sulfrio, located in Novo Hamburgo (RS), a company specialized in solutions for exhibition and storage of refrigerated products. The first product he bought at the Tecumseh Store was a Tecumseh Europe compressor, set up in an Italian compressed air dryer. "I called Tecumseh and they informed me that they had the compressor in stock, but that no other traditional supplier had it because it was a low-selling product and that they were working on an alternative, which was e-commerce. They put the compressor on the website and that was the only product there. I finished the purchase and everything went well," he says.

Before e-commerce became popular, Rocha used to make purchases by going directly to the store or buying over the phone, which was time-consuming and more costly. "In recent years, I have intensified Internet shopping, mainly because it is a very diversified environment, more than the traditional market, in which I have the autonomy to decide what and where to buy. Prices are also usually fairer than in physical stores. So, if I

have time to wait for the material, I opt for online purchase," he explains.

In increasingly technological societies, digital spaces for consumption are becoming more and more important and necessary. "A few years ago, we started thinking about selling our products online. In addition to being physically available in more than one hundred distributors throughout Brazil, Tecumseh's e-commerce proposal is to increase the availability of its products on the Brazilian market, since there are no borders in the digital world," says the Marketing and Institutional Relations Director of Tecumseh do Brasil, Homero Busnello.

The Tecumseh Store intends to keep growing, always offering quality services to its customers. "The competitive edge of the Tecumseh E-commerce that I like the most is the availability of the complete line of equipment, with compressors that are difficult to find on the market. I have already made other purchases and I consider it an excellent alternative", Rocha completes.



**Daniel Rocha, first e-commerce client, with Homero Busnello, Marketing and Institutional Relations Director, at Febrava 2019**

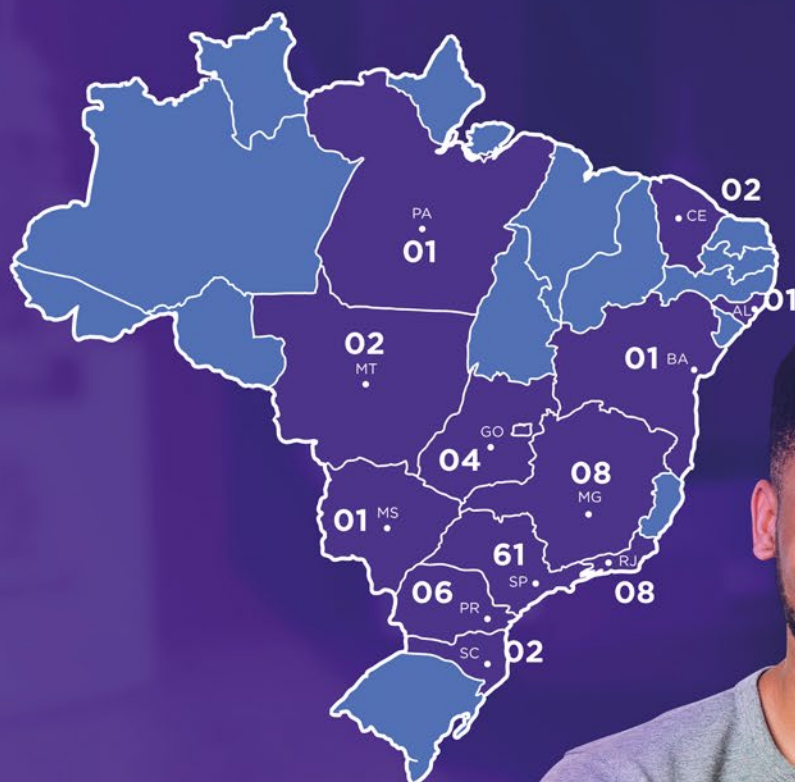


# TRAINING AND **PROFESSIONALS** APPRECIATION

AS OF THE START OF THE TECUMSEH CORPORATE UNIVERSITY (UCT) IN 2017, **10 CLASSES HAVE ALREADY GRADUATED** IN THE TECUMSEH REFRIGERATION SPECIALISTS COURSE.

AN ENVIRONMENT WHERE TECHNOLOGY MEETS KNOWLEDGE.

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**98**  
STUDENTS



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## READER'S DIGEST

By Mário Berti,  
Application engineer at Tecumseh do Brasil



# ENERGY EFFICIENCY

*Several factors are required for a product to make the best use out of energy*

In past editions of **Fic Frio**, the readers were invited to take part in the magazine staff meeting. The suggestion of Ricardo Panesi, professor in Mechanical Engineering, Production and Technology courses at the Federal Institute of São Paulo (IFSP), with the topic **“How has the refrigeration industry acted so that an equipment has a larger or smaller COP?”** was chosen.

The Coefficient of Performance (COP) is related to the energy efficiency of a refrige-

ration unit. Regular reader of the magazine, Panesi has already worked in companies in the refrigeration area and considers that the topic is important not only for these establishments, but also for his professional activity as a professor in refrigeration and air conditioning laboratories. “This is an important issue that must always be addressed and is directly related to my profession, as I can provide the students with what is relevant when learning about the main cooling issues,” he explains.



## COP: far beyond the compressor

The topic “energy efficiency in refrigeration” is related to **the joint action of all system components**, in addition to involving fiscal, economic and political issues.

The **compressor** is one of the main components responsible for providing efficiency. For this reason, currently, the industry trend is to use inverter compressors, which have better energy efficiency than conventional induction engines and allow speed variation.

Several techniques and technologies can also be used in other system components to promote structural improvements. For products intended for conservation or refrigeration, both domestic and commercial, the insulation of the **cabinet**, for example, is important for a better performance. The thickness, the type of material used and the quality in the injection process or sealing of joints are critical factors. A technology that is still being introduced in the domestic refrigeration industry is vacuum panels, which are much more efficient than the traditional polyurethane foam (PU) padding. And for commercial products with glass doors, those with low emissivity (Low-e) and triple glass doors are good options.

The cabinet control system is also crucial and can be improved with electronic measurements, such as the “ECO” mode present in commercial controllers, in which the set point is altered for a higher temperature when the product is not in use – condition which is detected by the controller through the door opening sensor. This resource has also been used in domestic refrigerators. In addition to that, the method and control of the **defrosting** cycle are also important, because when it is improperly configured it can raise the internal temperature of the cabinet or make the system run with a lot of ice on the evaporator, thus decreasing its efficiency.

High-end refrigerators are no longer defrosted at fixed times – some cabinet variables are monitored, until the moment in which it is really necessary to do so is ascertained. Another technique used for commercial frozen products is hot gas defrosting, which has better energy efficiency than electric resistance defrosting.

To optimize the use of energy, the **fan motors** that make the internal movement of the

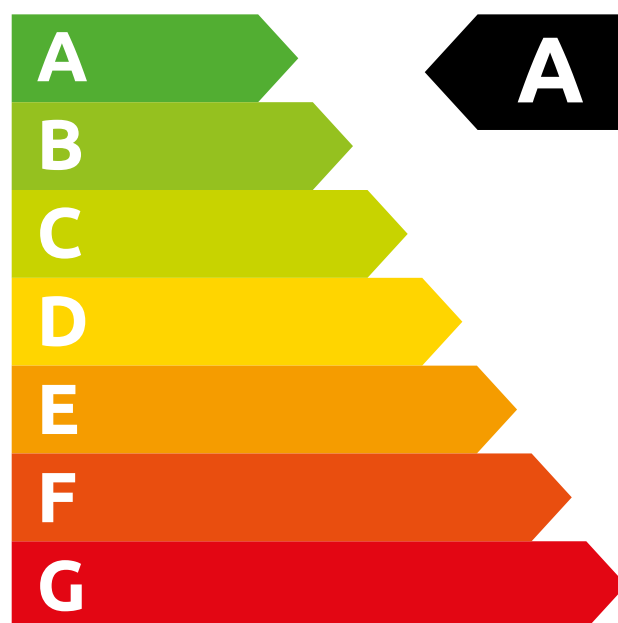
air are being replaced by electronic motors in the condenser. Some finite element software programs also help improve the duct design and air distribution through the refrigerator or display.

Two other items that play a fundamental role in the equipment efficiency are the **condenser** and the **evaporator**. Currently, there are several fin topologies, tubes with internal grooves, microchannel exchangers, among others.

The **expansion device** also plays an important role in system efficiency. Equipment or installations with a thermostatic expansion valve yield higher efficiencies than systems with a capillary tube. And another evolution in that sense is the electronic expansion valves.

For air conditioners, in addition to all these components, there are also several lines of research to improve the thermal insulation of environments, such as insulating materials, paints and films with thermal properties that are under development.

In order for all these improvements to be made, there is an increase in the price of the product. In this scenario, the requirements of regulatory and governmental agencies, such as the National Institute of Metrology, Quality and Technology (Inmetro), are in force. The use of demanding efficiency indices and product labeling are the main motivations for the industry to keep innovating, as well as the legislation that establishes minimum efficiency indices for each product category.





# ARGUS PROJECT

*Tecumseh condensing unit stands out for energy efficiency and meets the needs of both small and large customers*

In 2018, the North American Tecumseh team was challenged to design a new product that would deliver significant improvements in energy efficiency, which would later be known as Argus.

The directive was given and challenged the team, but meet an important set of requirements, like multi refrigerant, exceed 2020 Department of Energy (DOE) requirements, improve safety and serviceability for maintenance, address specific product improvement opportunities in microchannel, manufacturing and improve overall performance and durability.

After analyzing competitors and contacting customers for feedback and suggestions for improvements, the product began to be developed. Tecumseh North America Condensing Units and Systems General Manager Kevin Wilson explained that after the conceptual stages were reached, product validation also passed through the end customers. "Some customers were present at the presentation of the Argus prototype and contributed with their opinions - 15 of these suggestions were incorporated into the final project."

The result is Argus, a low and medium temperature condensing unit with both indoor and outdoor configurations. Focusing on the 1/2 to 6 HP capacity range, Tecumseh Argus is optimized around HFO-blend refrigerants and exceeds the DOE's AWEF requirement by up to 15%. Ideal for walk-in coolers and freezers, Tecumseh Argus provides restaurants, grocery stores and convenience stores unmatched performance and configurability which keeps produce and other products at optimum freshness. In addition, corrosion protection features an innovative liquid collection tray, advancing the evaporation system.

Argus offers differentiated added value for all customers, distributors, installers and manufacturers, says Tecumseh North America Director of Product Management and Technical Support, Kit Fransen. "To achieve even higher quality, Tecumseh has partnered with LU-VE, an Italian company rec-

ognized for its durable products. Thus, Argus brings specially designed tubes for high performance: tubocoil, to meet new refrigerants, and turbofin, in a unique design that avoids ice formation. "

The Tecumseh Argus condensing unit platform offers all customers something of value, which is different than what we've seen from our marketplace in the past. Besides that, Tecumseh partnered with LU-VE unit coolers bring engineering innovation that delivers superior performance jet streamer, tubocoil and turbofin.

Kit Fransen, Director Product Management & Customer Support North America States, says "the key needs for end-users, distributors, OEMs and contractors throughout the entire product lifecycle were carefully reviewed and we designed the platform based on agreed upon themes: sustainability, serviceability, and flexibility".

In the next years, Tecumseh is excited to deliver more value added products and systems like Tecumseh Argus - improving efficiencies, designing for low GWP refrigerants, and designing for the important regional needs to offer effective and efficient solutions to customers across the globe.

In July 2019, Argus received the Dealer Design Silver Award for silver product design placement for distributors, and Tecumseh was recognized by the industry as a leader in design by the renowned company ACRH News Dealers (USA).

## ARGUS BENEFITS



**Flexibility:** A variety of sizes and refrigeration capacities in three simple packages;



**Serviceability:** Simple layout that offers easy access to internal components and innovations like latches, LED light and QR-code that allows access to electrical diagrams through a mobile phone;



**Sustainability:** improved efficiency and use of low GWP fluid refrigerant.

By Antonio Silva,

Products and technical services intern at Tecumseh do Brasil

# SHUTTING OFF THE REFRIGERATOR

*Find out what measures really help save energy and which ones are not efficient*

**T**he idea that turning off the refrigerator at night results in energy savings is common in the imaginary of Brazilians. Recently, this was made evident on the Internet, with the episode of the French chef Erick Jacquin, amazed to discover that a restaurant owner turned off the restaurant's refrigerator during the night, in a reality show on restaurant consulting.

According to the National Electric Energy Agency (Aneel), refrigerators are one of the heavy energy consumer home appliances. For a large chunk of the population, the refrigerators became the great villains of the electricity bill. Therefore, the idea to turn off the device for some periods – during the night, for example, when the device “would not be used”.

**However, with this practice, the value of the electricity bill can actually increase.** That is because refrigerators take approximately 10 hours to defrost completely and are designed to operate at a certain temperature. When they are turned off for a prolonged period, the internal temperature rises and, when it is turned on again, the compressor will have to work harder to reach the ideal temperature again. This increase in the workload will cause the compressor to consume the energy it has saved during the night, or maybe more.

In addition, turning off the refrigerator can impair the preservation of foods that require constant cooling. Therefore, turning off the refrigerator is only feasible if it is not used for days in a row with no food inside.

## HARMFUL PRACTICES FOR ENERGY SAVINGS

- **To dry clothes on the back of the refrigerator:** in addition to the risk of electric shock, this practice increases the temperature of the system, which makes the compressor overwork to offset the additional heat, thus consuming more energy;
- **To store hot food:** this will also require more effort from the refrigerator, as it will have to lower the temperature of the food;
- **Refrigerator too full:** the excess of products damages the air circulation, which requires more work by the compressor and the possibility that some food do not refrigerate.

## PRACTICES THAT HELP IN ENERGY SAVINGS

- **Ventilated area:** leaving the appliance in a ventilated place helps to disperse heat, relieving the work of the compressor and reducing energy consumption;
- **Gasket:** keeping the refrigerator's seals in good condition prevents the internal temperature from rising, which makes the temperature variation smaller;
- **Defrost regularly:** the accumulation of ice sheets affects cooling, compressor performance and energy savings;
- **Thermostat:** adjusting the thermostat according to the station prevents the compressor from working more than necessary and prevents food loss caused by temperature variation.

**References:** G1, Jornal Correio and Tips of your account.

# Cross Reference

# SEMI-HERMETIC

# COMPRESSORS

## LBP Semi-Hermetic Compressors

TECUMSEH					BITZER					COPELAND					DORIN					GEA (BOCK)				
Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)
B	SH2-1.5-10BY	2	11,86	6,60	CE1	2FES-2Y	2	11,45	6,36	-	-	-	-	-	H1	H200CS	2	11,86	5,30	HG12P	HG12P/110-4	2	11,28	6,36
D	SH2-002-13DY	2	15,78	8,50	CE2	2DES-2Y	2	16,08	9,00	DL	(D) LF-20X	2	15,48	5,40	H1	H280SB	2	15,88	7,20	HG22e	HG22e/160-4	2	16,44	7,68
	SH2-002-15DY	2	18,43	10,10	-	-	-	-	-		(D) LJ-20X	2	17,40	6,72	H2	H300CS	2	19,13	9,00	-	-	-	-	-
	SH2-003-16DY	2	19,68	11,90	CE2	2CES-3Y	2	19,44	10,92		-	-	-	-	-	-	-	-	-	HG22e	HG22e/190-4	2	19,80	9,60
Q	SH2-004-20QY	4	23,72	12,10	CE3	4FES-3Y	4	21,72	11,40	-	-	-	-	-	H35	H401CS	4	23,15	12,60	HG34e	HG34e/215-4	2	22,56	9,72
	SH2-005-28QY	4	33,62	16,80		4DES-5Y	4	32,16	17,40	2D	(D)2DB-50X	2	33,60	13,80		H551CS	4	32,80	15,50		HG34e/315-4	2	32,76	14,64
	SH2-007-36QY	4	43,03	23,30	-	-	-	-	-	-	-	-	-	-		H751CS	4	45,67	20,00	-	-	-	-	-
S	SH2-008-42SY	4	49,58	24,36	CE4	4TES-9Y	4	49,56	23,88	3D	(D)3DC-75X	3	45,60	16,80	H41	H851CS	4	51,37	12,10	HG44e	HG44e/475-4	2	49,56	22,80
	SH2-010-52SY	4	61,80	29,40		4PES-12Y	4	58,20	27,24		(D)3DS-100X	3	59,88	23,40		H1001CS	4	58,58	26,40		HG44e/565-4	2	59,04	26,40
	SH2-015-56SY	4	67,20	36,84		4NES-14Y	4	67,44	31,92	4D	(D)4DA-100X	4	67,20	25,20		H1501CS	4	68,24	30,00		HG44e/665-4	2	69,24	31,20
V	SH2-015-71VY	4	84,92	38,60	BE5	4HE-18Y	4	88,44	44,04	4M	4ML-15X	4	85,68	42,48	H5	H2000CS	4	91,00	45,60	HG5	HG5/830-4	2	86,64	42,00
	SH2-020-84VY	4	100,57	55,40		4GE-23Y	4	101,52	52,68		4MM-20X	4	93,84	46,80		H2500CS	4	102,01	54,00		HG5/945-4	2	98,64	50,40

V / Z series compressors • Suction and discharge valves • POE oil load • Total protection with PTC sensors + Kriwan INT69 electronic module • Gum coating for vibration (4x)

• Discharge temperature sensor • INT250 Oil differential pressure switch

A / B / D / Q / S series compressors • Suction and discharge valves • POE oil load • Total protection with PTC sensors + Kriwan INT69 electronic module • Gum coating for vibration (4x)





## M/HBP Semi-Hermetic Compressors

TECUMSEH					BITZER					COPELAND					DORIN					GEA (BOCK)				
Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)	Series	Model	Cilinders	Displac. (m³/h)	MRA (400V)
A	SH4-1.5-8AY	2	11,02	5,80	CE1	2GES-2Y	2	9,10	6,00	DK	(D) KL-15X	2	8,88	4,08	H1	H150CS	2	9,25	4,10	HG12P	HG12P/90-4	2	9,60	5,88
B	SH4-1.5-9BY	2	12,90	7,10	-	-	-	-	-	DK	(D)KSL-20X	2	10,92	5,64	H1	H200CC	2	10,16	7,20	-	-	-	-	-
D	SH4-004-18DY	2	21,52	15,0	CE3	4FES-5Y	4	21,72	12,96	DL	(D) LL-40X	2	21,84	11,40	H2	H380CC	2	21,04	11,30	-	-	-	-	-
Q	SH4-005-24QY	4	28,32	16,6	CE3	4EES-6Y	4	27,24	16,32	2D	(D)2DL-75X	2	28,20	15,60	H35	H551CC	4	27,76	15,50	HG34e	HG34e/255-4S	1	26,52	14,64
	SH4-005-25QY	4	29,63	15,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SH4-007-33QY	4	39,19	24,0	CE3	4CES-9Y	4	39,00	24,24	3D	(D)3DA-75X	3	38,64	21,00	H35	H751CC	4	38,26	20,00	HG34e	HG34e/380-4S	1	39,72	21,60
S	SH4-012-42SY	4	49,58	26,88	CE4	4TES-12Y	4	49,56	30,12	3D	(D)3DC-100X	3	45,60	24,60	H41	H1001CC	4	51,37	30,00	HG44e	HG44e/475-4 S	1		27,60
	SH4-015-52SY	4	61,80	38,88		4PES-15Y	4	58,20	33,84		(D)3DS-150X	3	59,88	34,80		H1501CC	4	58,58	40,80		HG44e/565-4 S	1		31,20
	SH4-020-56SY	4	67,20	46,08		4NES-20Y	4	67,44	39,84	4D	(D)4DA-200X	4	67,20	39,00		H2002CC	4	68,24	45,60		HG44e/665-4 S	1		36,00
V	SH4-025-71VY	4	84,92	52,20	BE5	4HE-25Y	4	88,44	52,80	4M	4MH-25X	4	85,68	49,92	H5	H2500CC	4	91,00	57,60	HG5	HG5/830-4 S	1	86,64	50,40
	SH4-030-84VY	4	100,57	59,00		4GE-30Y	4	101,52	61,44		4MI-30X	4	93,84	55,20		H3000CC	4	102,01	67,20		HG5/945-4 S	1	98,64	58,80
Z	SH4-035-106ZY	6	127,39	72,24	BE6	6HE-35Y	6	132,60	77,28	-	-	-	-	-	H6	H3500CC	6	136,49	72,00	HG6	HG6/1240-4 S	1	129,12	90,00
	SH4-040-126ZY	6	150,86	86,28		6GE-40Y	6	152,16	88,68	6M	6MI-40X	6	144,60	85,68		H4000CC	6	153,02	86,40		HG6/1410-4 S	1	146,88	91,20

RCR - SH - 001 - 08/17

**V / Z series compressors** • Suction and discharge valves • POE oil load • Total protection with PTC sensors + Kriwan INT69 electronic module • Gum coating for vibration (4x)  
 • Discharge temperature sensor • INT250 Oil differential pressure switch  
**A / B / D / Q / S series compressors** • Suction and discharge valves • POE oil load • Total protection with PTC sensors + Kriwan INT69 electronic module • Gum coating for vibration (4x)

# MICROCHANNEL CONDENSING UNIT

*Case study comparing lab test and in the field activity shows the performance of Tecumseh's microchannel condenser*

**T**he Tecumseh condensing units started receiving microchannel capacitors in 2017, which has made them even more efficient than the conventional finned condensers, thus consuming less electrical energy, using less fluid refrigerant and presenting a great thermal transfer capacity.

In order to achieve high performance and economy, several tests have been carried out, such as those for performance, efficiency and service life.

As the microchannel condensers are manufactured entirely in aluminum, there is a possibility that galvanic corrosion could cause the system to leak and consequently break the condenser unit – learn more about on Fic Frio's 102nd edition. In this regard, one of the main test carried out is the

Salt Spray, which simulates a situation of salt corrosion, exposing the condenser to a solution of water and salt (NaCl).

## **Aquarium of Ubatuba receives a microchannel condenser**

In 2012, Tecumseh developed a refrigeration project for the Penguinarium of the Ecological Park in São Carlos, which secured reduced energy consumption and a reliable temperature control. The uniqueness of this proposal lies on the equipment's remote monitoring of temperature, voltage and current with IoT technology from a Tecumseh module.

The management board of the Aquarium of Ubatuba, on the coast of the São Paulo state, learned the development of this refrigeration solution through the Fic Frio magazine (edition No. 80) and got in touch with Tecumseh to propose the development of a refrigeration project for their penguinarium, which is home to six Magellanic penguins, a species native to Argentina and Chile





whose ideal climatic condition is 20°C.

In February 2018, Tecumseh sent a **condenser unit with a microchannel condenser to the climate control of the Penguinarium** – learn more on **Fic Frio's** No. 103 issue.

This alliance that combines high performance, energy and sustainability for the Penguinarium's climate control was also an excellent opportunity for Tecumseh to test his new condensing unit out of lab in a coastal region, under the influence of the coastal climate, which plays a major role regarding the corrosion of the microchannel condenser. Another advantage was the possibility to carry out and periodically monitor preventive maintenance of the system, evaluating the results.

### Tests comparison

The Salt Spray test carried out in a microchannel condenser unit in the Tecumseh chemical lab took 2,610 hours. In the Aquarium of Ubatuba, it took 17,664 hours and, even so, it presented better results. In addition to this time discrepancy, the lab test proved itself much more aggressive than the one in the field, because the pieces were tested individually and without the black spray protective paint, which is a special paint that creates a protective layer against corrosion, promoting a longer durability. Whereas the field test included the complete condensing unit, with all the items and accessories analyzed together, so that it was also possible to observe other potential corrosion points.

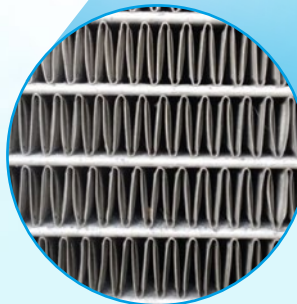
Therefore, the results have been positive. The images below allow the comparison of the microchannel condensers: the Salt Spray and the field test.



**Salt Spray test in the Tecumseh lab in Brazil**



**Application in the Aquarium of Ubatuba Penguinarium**







# INFINEE

*Using natural refrigerants, the French minichiller is a complete refrigeration solution and a safety highlight*

**R**efrigeration systems with high added value have been increasingly released to the market, such as the French condenser and evaporator minichiller **Tecumseh Infinee**.

Developed to offer efficiency and safety, it uses R-290 propane as the fluid refrigerant. Despite being flammable, the natural fluid has a GWP greater than three, which allows to maintain a cooling system similar to the native projects with HFC, achieving high efficiency – under full load conditions, propane will provide efficiency gains from 10 to 15%; and under partial load conditions the real benefit of this dynamic unit with electronic controls is achieved.

Infinee strives for safety. For this reason, the unit is composed and divided into three different parts: one dedicated to the hydraulic system; another for the refrigeration system; the third comprises all electrical components. Therefore, in case of leakage, it is possible to limit the propane propagation risk – even in the condenser, the fans push the air against the heat exchangers to avoid the contact of the fluid with the engines and, in addition, the filter drier was placed on the front of the fans to ease maintenance.

Still on **safety**, the cooling phase is achieved through a secondary loop composed of a mixture of water and glycol. In this way, no flammable fluid is present on the inside of the building – propane is used on the outside. Besides, the condenser unit is tested with a refrigerant load in the factory, so the customer has no contact with the propane circuit.

To provide the best **energy efficiency**, the key components of the unit are dynamically controlled, allowing the equipment adaptation to different conditions at the same time. The complete hydraulic module also guarantees a simplification of electrical installations, network controls and the hydraulic loop is



provided with filter, insulating valves, liquid tanks and pressure sensors and controlled by an inverter pump.

Another particularity is the quick plug & play assembly system, which is pre-set at the Tecumseh factory. The client only needs to specify the parameters in the controller and the unit can now be used.

Designed and equipped with electronic fans, heat exchangers, consumption reducers with PID controllers, safety levers and electronic expansion valve, it is commanded and controlled by inverter technology. By providing 30 kW (102 kBtu / h) in cooling capacity, it is **best in the category** and is especially suitable whenever it is necessary to maintain precise control of the room temperature and humidity, such as wineries for the conservation of items and cold rooms for floriculture.



# Tecumseh

Cooling for a Better Tomorrow™

## TECUMSEH'S CROSS REFERENCE FRACTIONAL COMPRESSORS 60HZ

Market Compressors			TECUMSEH Compressors	Application range	Cooling capacity (Btu/h) (ASHRAE32 L/MBP ) (ASHRAE46 M/HBP)			Commercial Reference (HP)
Fluid refrigerant (Application)	Embraco	Elgin			LBP (-23,3 °C)	MBP (-6,7 °C)	HBP (+7,2 °C)	
R-134a/ BLEND (LBP L/MBP)	Application range	Cooling capacity	THB1330Y	LBP	335	-	-	1/10
	(Btu/h) (ASHRAE32 L/MBP) (ASHRAE46 M/HBP)	CommercialRefer- ence	THG1340Y	LBP	425	-	-	1/8
	(HP)	ENL55/ENLE 55	THG1352Y	LBP	525	-	-	1/6
	Fluid refrigerant	ECP0065	THG1358Y	LBP	600	-	-	1/5
	(Application)	Embraco	Elgin			LBP	-	1/4
	(-23,3 °C)	MBP	TCW410Y	L/MBP	1060	2550	-	1/3
	(-6,7 °C)	HBP	TCW413Y	L/MBP	1170	2755	-	1/3+
R-134a/ BLEND (MBP M/HBP)	(+7,2 °C)		AEW415Y	L/MBP	1480	3335	-	1/2
	-	-	AZ0340YS	M/HBP	-	400	754	1/12
		ENL20	AZ0345YS	M/HBP	-	470	886	1/10
	EMIS20HHR	ENL30	AZ0360YS	M/HBP	-	625	1178	1/8
	EMIS30HHR	ENL40	AZ0387YS	M/HBP	-	870	1640	1/6
	EM55HHR	TCM0013	AZ0411YS	M/HBP	-	1175	2215	1/5
	EM65HHR	-	AZ0413YS	M/HBP	-	1330	2507	1/4
	FF8.5HBX/NEK6170Z	TCM0020/ECP0085	AE4430Y	M/HBP	-	1824	3400	1/4
	FF110HBX/NEU6210Z	TCM0039/ECP0115	AE4440Y	M/HBP	-	2334	4350	1/3
	FFI12HBX/NEU6212Z	ECP0130	AE4450Y	M/HBP	-	3150	5500	1/2
	NT6212Z/NEU6214Z/NT6215Z	TCM0035	AE4460Y	M/HBP	-	3660	6350	1/2
	NT6215Z/NEU6214Z	TCM0040	TYA4466Y	M/HBP	-	3634	6900	1/2+
	NT6217Z	TCM0050	TYA4475Y	M/HBP	-	4214	8000	3/4
	NT6220Z	TCM0062	TYA4489Y	M/HBP	-	4951	9400	1
R-404A (LBP)	NEK2134GK/NEU2140GK/ FFK2134GK	TCB4020	AE2420Z	LBP	2050	-	-	1/2
	NEK2150GK/NEU2155GK	-	AE2425Z	LBP	2650	-	-	3/4
	NEK2168GK/NEU2168GK	TEB4030	AE2430Z	LBP	3000	-	-	1
	NT2180GK/NEU2178GK	TCB4040	TYA2431Z	LBP	3150	-	-	1
	NJ2192GK	TCB4046	TYA2438Z	LBP	3810	-	-	1 1/4
R-404A (M/HBP)	NT6220Z	TCB4046	TYA2446Z	LBP	4775	-	-	1 1/2
	NEK6210GK/NEU6215GK	TCM4033	AE4450Z	M/HBP	-	3430	5700	1/2
	NE9213GK	TCM4037	AE4460Z	M/HBP	-	4000	6750	1/2
	NT6217GK/NT6220GK	TCM4047	AE4470Z	M/HBP	-	4730	7900	3/4
	NT6222GK	TCM4064	TYA9457Z	M/HBP	-	5780	10390	1
	NTU6232GK/NJ9226GK	TCM4072	TYA9468Z	M/HBP	-	6900	12402	1 1/3
R-22 (M/HBP)	NTU6234GK	TCM4080	TYA9483Z	M/HBP	-	8300	14500	1 1/2
	-	TCM2015	AE4430E	M/HBP	-	1750	3200	1/3
	NE6210E	TCM2020	AE4440E	M/HBP	-	2280	4100	1/3
	-	TCM2030	AE4456E	M/HBP	-	3375	5850	1/2
	NE9213E	TCM2040	AE4470E	M/HBP	-	4530	7500	3/4
	NJ6220Z	TCM2050	TYA9455E	M/HBP	-	5000	9960	1
	NJ6226Z	TCM2062	TYA9467E	M/HBP	-	6000	12000	1/5
R-600a (LBP)	EGAS80CLP/EMYE70CLP	-	TA1380M	LBP	800	-	-	1/4
R-290 (LBP)	FFU160UAX	-	AE2430U	LBP	2800	-	-	3/4

### Conditions of Application ASHRAE 32 (L / MBP)

Condensation temperature: 54.4°C  
Gas return temperature: 32.2°C  
Liquid temperature: 32.2°C  
Room temperature: 32.2°C

### Conditions of Application ASHRAE 46 (M / HBP)

Condensation temperature: 54.4°C  
Gas return temperature: 35°C  
Liquid temperature: 46.1°C  
Room temperature: 35°C



# Tecumseh

Cooling for a Better Tomorrow™

## TECUMSEH'S CROSS REFERENCE COMMERCIAL COMPRESSORS (L'UNITE) 60HZ

Fluid refrigerant (Application)	Market Compressors		Tecumseh (L'Unite) Compressors	Application range	Cooling capacity (Btu/h) EN12900		Commercial reference (HP)
	Danfoss (Maneurop)	Emerson (Copeland)			LBP (-25°C)	M/HBP (-5°C)	
R-404A**/ R-448A/ R-449A/ R-452A (LBP)	-	CF04K6E	T / CAJ2446Z	LBP	4853	-	1 1/2
	-	CS14K6	T / CAJ2464Z	LBP	5696	-	1 1/2
	NTZ048 / NTZ068	CS14K6 / CS20K6	T / FH2480Z / AWS2495 **	LBP	8837	-	2
	NTZ068	CS20K6 / CS27K6	T / FH2511Z / AWS2512 **	LBP	13429	-	3
	NTZ108	CF12K6E / CS33K6E	TAG2516Z / TAGP2516Z *	LBP	16787	-	4
	NTZ136	-	TAG2522Z / TAGP2522Z *	LBP	23459	-	5
	-	-	TAG2525Z	LBP	23581	-	6
R-134a (M/HBP)	MTZ018	-	TYA4489Y / CAJ4492Y	M/HBP	-	5255	1
	MTZ022	CS10K6E	T / CAJ4511Y	M/HBP	-	7152	1
R-22 (M/HBP)	-	-	TYA9467E / CAJ9513T	M/HBP	-	8160	1 1/3
	MT018	-	TYA9474E / T / CAJ4517E / T	M/HBP	-	9329	1 1/2
	MT019	CR18K6 / CR20K6 / CR24K6	AJ5519E / TAJ4519T	M/HBP	-	12465	1 3/4
	MT022 / MT028	CR24K6	T / FH4524F / AWS4522E **	M/HBP	-	13828	2
	MT028 / MT032 / MT036	CR32K6	T / FH4531F / AWS4532E **	M/HBP	-	19400	2 1/2
	MT036 / MT040	CR37K6	FH5540E / TFH4540F / AWS4538E **	M/HBP	-	24679	3
	MT044 / MT045 / MT050	CR53KQ	TAG4546T / TAGP4546T * / AWS4542E **	M/HBP	-	25767	3 1/2
	MT056 / MT057 / MT064	CR62KQ	AG5553E / TAG4553T / TAGP4553T *	M/HBP	-	30306	4
	MT056 / MT057 / MT064	CR62KQ	AG5561E / TAG4561T / TAGP4561T *	M/HBP	-	34809	5
	MT056 / MT064 / MT065 / MT072	-	AGA5568E / TAG4568T / TAGP4568T *	M/HBP	-	39333	5 1/2
	MT065	-	TAG4573T / TAGP4573T *	M/HBP	-	42325	6
	MT072 / MT073 / MT080	-	TAG4581T	M/HBP	-	45429	6
R-404A**/ R-448A/ R-449A/ R-452A (M/HBP)	-	-	CAJ9513Z	M/HBP	-	8041	1 1/3
	MTZ018	-	CAJ4517Z	M/HBP	-	9780	1 1/2
	MTZ019	CS10K6E	CAJ4519Z	M/HBP	-	12925	1 3/4
	MTZ022	CS12K6E	T / FH4524Z / AWS4522Z **	M/HBP	-	13322	2
	MTZ028 / MTZ032	CS14K6E	T / FH4531Z / AWS4532Z **	M/HBP	-	17206	2 1/2
	MTZ036 / MTZ040	CS20K6E	T / FH4540Z / AWS4538Z **	M/HBP	-	21447	3
	MTZ044 / MTZ045	CS24K6E	TAG4546Z / AWS4542Z **	M/HBP	-	25719	3 1/2
	MTZ050	-	TAG4553Z / TAGP4553Z *	M/HBP	-	29540	4
	MTZ056 / MTZ057 / MTZ064	CS27K6E	TAG4561Z / TAGP4561Z *	M/HBP	-	34165	5
	MTZ056 / MTZ064 / MTZ065 / MTZ072	-	TAG4568Z / TAGP4568Z *	M/HBP	-	40000	5 1/2
	MTZ065	-	TAG4573Z / TAGP4573Z *	M/HBP	-	42653	6
	MTZ072 / MTZ073 / MTZ080	-	TAG4581Z / TAGP4581Z *	M/HBP	-	45912	6

\* Models with the letter "P" after the family are used for applications in conjunction with the connection for oil equalization.

\*\* The use of the R-452A fluid is not authorized.

\*\*\* Performance data using the R-404A fluid refrigerant.

### Conditions of Application EN12900 (LBP)

Gas return temperature: 20°C

Liquid temperature: 39.6°C

Condensation temperature (LBP): 40°C

### Conditions of Application EN12900 (M / HBP)

Gas return temperature: 20°C

Liquid temperature: 49.7°C

Condensation temperature (M / HP): 50°C