

# Stream - The State Of The Art Semi-Hermetic Piston Technology



## Pioneering Technologies And Global Expertise

For more than 80 years we have been introducing pioneering technologies to the market, from the first semi-hermetic and hermetic compressor in the 1940s and 1950s, to the brand new and high efficiency semi-hermetic “Stream” and scroll compressors of today. With our strong investment in R&D and in product engineering combined with technically superior

products from our industry leading brands such as Copeland Scroll™ and DWM Copeland™, Alco Controls, Dixell and Vilter we provide continuous improvement and innovation. Completed by a global network with strong resources turning our experience and expertise into market driven solutions we are managing the challenges of today and tomorrow.

# 1986

Launch of **Discus®** technology in Europe

# 2008

Foundation of a high-tech production & **engineering centre** for semi-hermetic technology in Czech Republic

# 1957

Production of the **1<sup>st</sup> semi-hermetic Copeland®** compressor

# 1983

Production of the **1-millionth** semi-hermetic Copeland® compressor in Europe

# 2012

Production Launch of **Stream**

## Challenging Applications Require Superior Technologies

Staying abreast of the market's challenges Emerson continues to develop and improve its compressor technologies: scroll as well as semi-hermetic reciprocating. Especially in the commercial refrigeration segment where the spectrum of applications is a broad one with more customized system requirements a selection of both technologies is of utmost importance.

While scroll technology with developments such as vapor injection, digital modulation and compact design plays its strength in smaller retail businesses, the semi-hermetic reciprocating technology is the perfect fit for large scale commercial refrigeration.

For these applications the necessity to be easily serviced, repaired and the ability to implement capacity unloading mechanisms are of major importance. With the new Stream compressor range comprising innovations as digital modulation, multi refrigerant and CoreSense™ Diagnostics for advanced protection and preventive maintenance Emerson is at the forefront of semi-hermetic compressor technology.

The fact is whatever requirements and applications are requested, Emerson is able to offer the best solution and the best performance: with either semi-hermetic or scroll compressor technology.

### Features & Benefits

#### Scroll Technology

- Effective equipment costs
- High seasonal efficiency
- Simple digital continuous modulation
- Light and compact, ideal for condensing units, compact racks and distributed systems
- Reliability with ability to handle liquid slugging

#### Semi-Hermetic Technology

- Applications requiring individual compressor reparability
- Ideal for central machine room installations
- Perfect for large central refrigeration plant
- Product and design maturity
- Integrated electronics for advanced protection and diagnostics

# 2011

Sales of **90 million** scroll compressor worldwide

Sales of **11 million** semi-hermetic compressors worldwide

# 2011

# Stream Technology And Its 5 Key Benefits





## Diagnostics

CoreSense™ Diagnostics technology helps your refrigeration equipment last longer. This technology offers advanced compressor protection, diagnostics, communication and power consumption measurement.



## Efficiency

Its unique valve technology makes Stream 10% more efficient than any other compressor and therefore helps you reduce the carbon footprint and running cost of your installation.



## Multi Refrigerant

Its unique valve technology makes Stream a multi refrigerant compressor. One model suits all applications without any compromise on performance.



## Modulation

Digital technology or operation with inverter makes Stream the most flexible choice for continuous capacity modulation.



## Low Sound

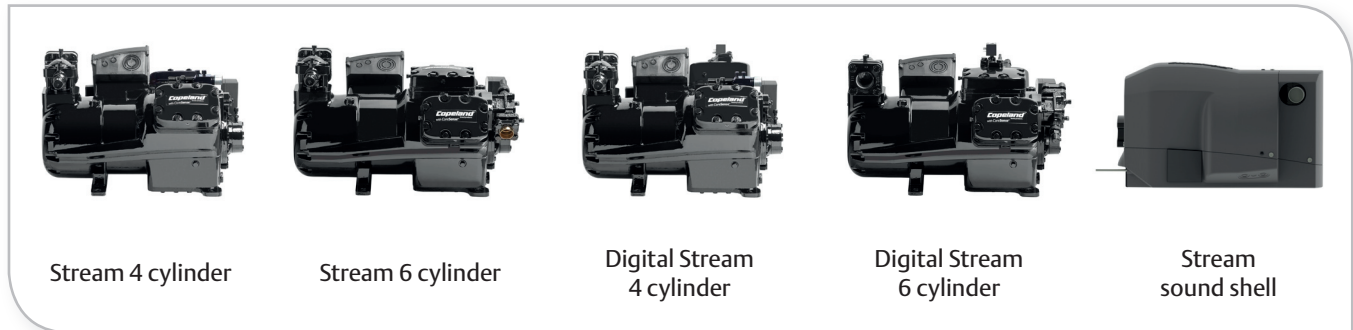
Sound shell technology makes Stream the quietest compressor on the market for sound critical applications.

# Stream - A Broad Family For The Perfect Application Fit

## Stream For HFC Refrigerants

Our Stream range provides best in class performance for today's commonly used HFCs and uprising low GWP refrigerants. The result? Significantly smaller cost of operation and reduced environmental impact compared to competing products.

The range comprises 4 and 6 cylinder models that are qualified for inverter applications as well as 4 and 6 cylinder digital models for continuous cooling capacity modulation. The compressors can be fitted with a dedicated sound shell for sound sensitive applications.



## Stream For R744 Refrigerant - Transcritical

The Stream series comprises three models of 4 cylinder compressors for R744-transcritical applications and is the ideal solution for R744 medium temperature cascade and booster systems.

It is characterized by a design pressure range of 135 bar. Refrigerant flow and heat transfer have been optimized for best performance. These models are released for operation with frequency inverters.



In combination with the R744-subcritical scroll for the low temperature refrigeration side, EmersonClimate Technologies offers the most energy efficient package available on the market today.

## CoreSense™ Diagnostics

All Stream models feature CoreSense™ Diagnostics offering advanced protection and diagnostics benefits for excellent system reliability, reduced service costs and increased equipment uptime.

With CoreSense technology, service engineers can now diagnose system-related problems faster or even before they occur to keep the refrigeration system in optimum condition over its entire lifetime.





## CoreSense™ Diagnostics - Your Finger On The Pulse

Recent trends show us that intelligent electronics are becoming more and more important when it comes to energy savings, cost optimization, increased system uptime and reduced lifecycle costs. The combination of an intelligent and user-friendly diagnostics tool in one technology is an ideal and unique solution.

Emerson Climate Technologies now offers this brand new and unique solution with its CoreSense™ Diagnostics for refrigeration as a standard to all Stream compressors.

### How it works

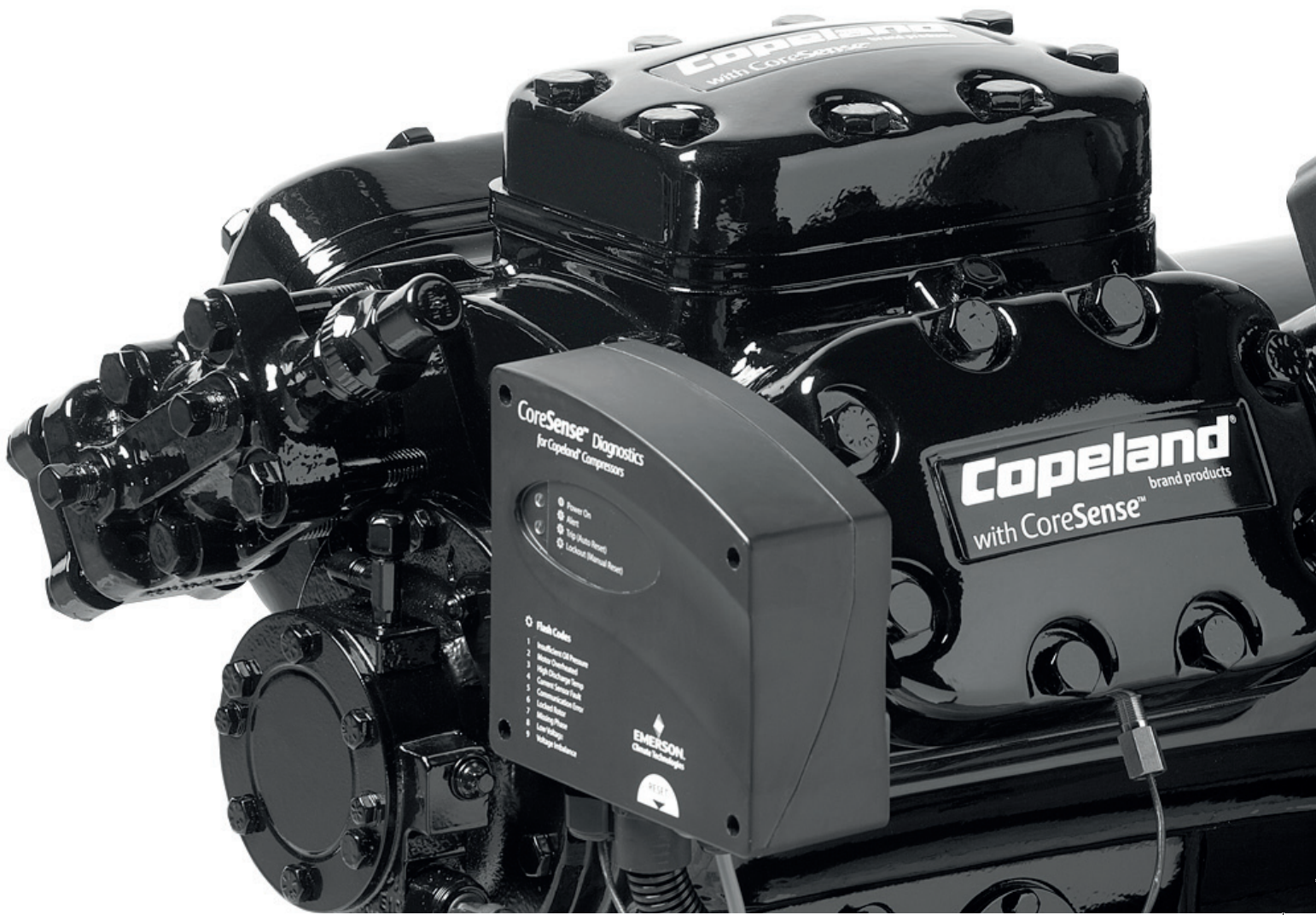
CoreSense technology with proprietary algorithms uses the compressor as a sensor to unlock the information inside the machine and provides value-

added features such as advanced motor protection, diagnostics, communication and verification.

### What It Means To You

Therewith it helps customers identify and address potential problems in a quick and efficient way thereby improving compressor performance and reliability.

The monitoring of the compressor power consumption and crankcase heater control are other value-added features of CoreSense.





## Intelligent CoreSense™ Diagnostics Add Value To Your System

### What It Means To You

#### Advanced Motor Protection

Using proprietary algorithms, CoreSense™ goes beyond conventional basic motor protection. It protects the compressor from severe damage-causing failures like locked rotor, single phasing and voltage imbalances. Furthermore CoreSense provides discharge temperature protection.

CoreSense not only protects the compressor from these critical failures but also displays, stores and communicates this information to the customer and to responsible service technicians, so that the problem can be quickly diagnosed to avoid system downtime and food loss.

#### Diagnostics

The diagnostics feature of CoreSense provides the compressor alarm history and running status information. EEPROM memory in the CoreSense module stores the complete failure history including asset information of the compressor (serial number and model number of the compressor). The customer can access the information directly on site using the pack controller display or CoreSense PC interface software. This software is either installed on the service laptop or on a remote computer with access via Modbus communication.

#### Communication

The communication feature of the CoreSense module provides access to information such as alarm history, operating parameters and the running status for a pack controller with open Modbus protocol.

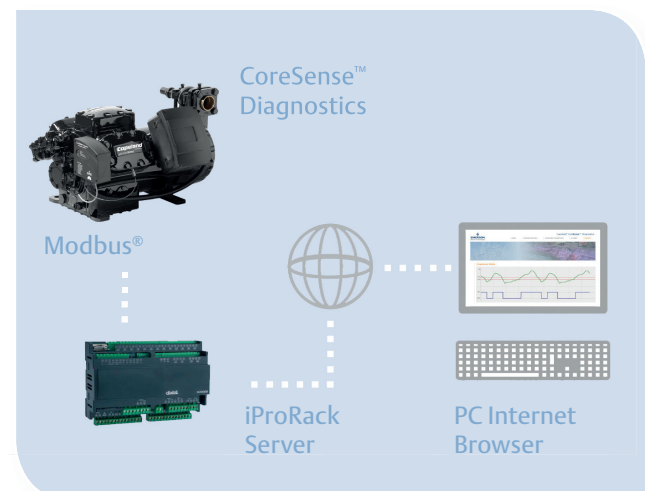
It enables remote reset capability and remote monitoring of the compressor information with no requirement of actually visiting the site. An easy-to-access and user-friendly Dixell web server interface for pack controller, Dixell iProRack, allows customers to read the CoreSense information remotely with a graphical interface.

In addition we offer a PC interface software for a direct service laptop connection to the CoreSense module. This enables access to CoreSense module information directly on site such as compressor operating information and alarm history.

The alarm history is stored in different ways:

- › 8-day history of alarms showing the number of occurrences per day
- › The most recent 10 alarms
- › Accumulated number of failures since the compressor was first put into operation
  - Compressor running status information
  - Number of compressor running hours, alignment starts, resets and type of resets
  - Number of compressor running hours without sufficient oil pressure

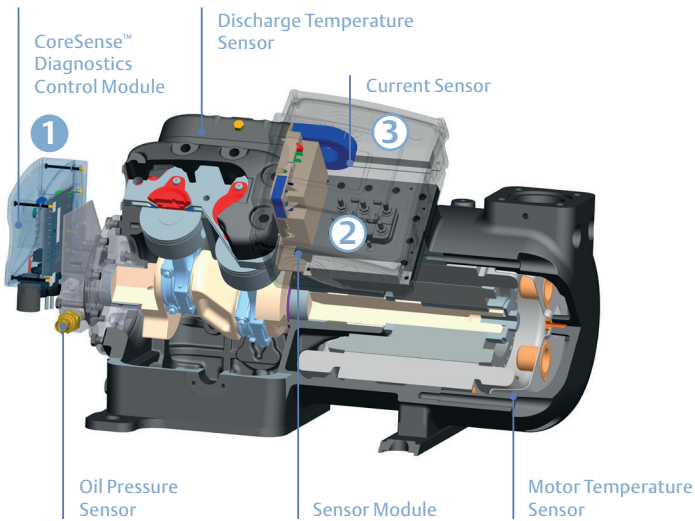
### CoreSense™ communication Example with Dixell iProRack





## How It Works

### CoreSense™ Architecture



#### 1 CoreSense™ Control Module

- › Motor overheat protection
- › Oil protection
- › High discharge temperature protection
- › Communication to pack controller via Modbus
- › Sensor module communications
- › Compressor proofing
- › EEPROM memory
- › Alarm history, operating history
- › Local and remote reset capability
- › Multi-color LEDs to indicate alarms

#### 2 Sensor Module Inside Terminal-Box

- › Reads and processes phase voltages by using voltage sensing leads and current sensor module
- › Supplies information to CoreSense™ control module
- › Acts as a slave to CoreSense control module
- › Sensor module offers the following features:
  - Locked rotor
  - Low voltage
  - Single phasing
  - Voltage imbalance
  - Crankcase heater control
  - Power consumption monitoring protection

#### 3 Current Sensor Inside Terminal-Box

- › Reads current values as an input for the sensor modules

## CoreSense™ Diagnostics Features

- › Basic Protection
  - Against motor overheat and insufficient oil protection
- › Advanced Motor Protection
  - Against single phasing, locked rotor, voltage imbalance and protection of discharge temperature and low-voltage
- › Diagnostics
  - Alarm history, compressor operating history, compressor running status information
- › Communication
  - From the CoreSense to a pack controller using open Modbus® protocol
- › Advanced features
  - Power consumption measurement (voltage, current; power factor measurement), remote reset capability, crankcase heater control

## What It Means To You

- › Improved compressor reliability and performance
- › Easy preventive maintenance using the diagnostics features
- › Avoidance of refrigeration system downtime and food loss
- › Reduced applied system costs
  - Factory installed devices: Oil protection sensor and the discharge temperature sensor are installed and connections are already made in the factory
  - Crankcase heater control is integrated in CoreSense
- › Remote access to the compressor data, running status and possibility to reset alarms without visiting the installation site
- › Multi-color LEDs on the module help to find any compressor issue quickly
- › Power consumption monitoring of the compressor to analyze the energy costs of the compressor



## More Efficient With Stream

Environmental impact and energy consumption is at the centre of every discussion relating to sustainable refrigeration. Retailers face important challenges as they strive to find the right balance between ecological and economical aspects. Therefore energy efficiency is always under scrutiny as it impacts both the carbon footprint and the costs relative to an installation.

Efficiency is at the forefront of new product designs at Emerson. The introduction of Discus® compressors in the past and the launch of Stream prove this.

### Stream With Discus® Valve Technology What It Means To You

Thanks to the unique Discus® valve technology, significant savings can be made using Stream compressors. It is the key difference between Stream and conventional reciprocating technologies available on the market. The valve technology is at the heart of the efficiency advantage of Stream.

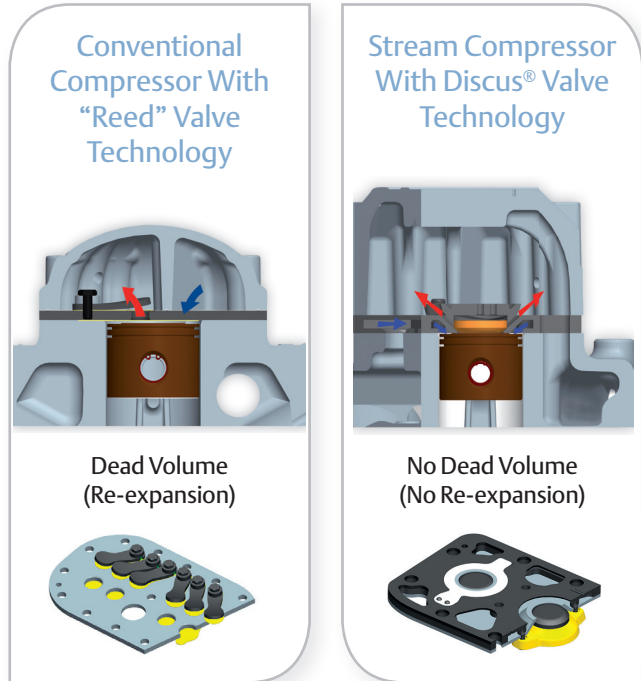


Figure 2: Key difference between conventional reed and Discus® valve technology

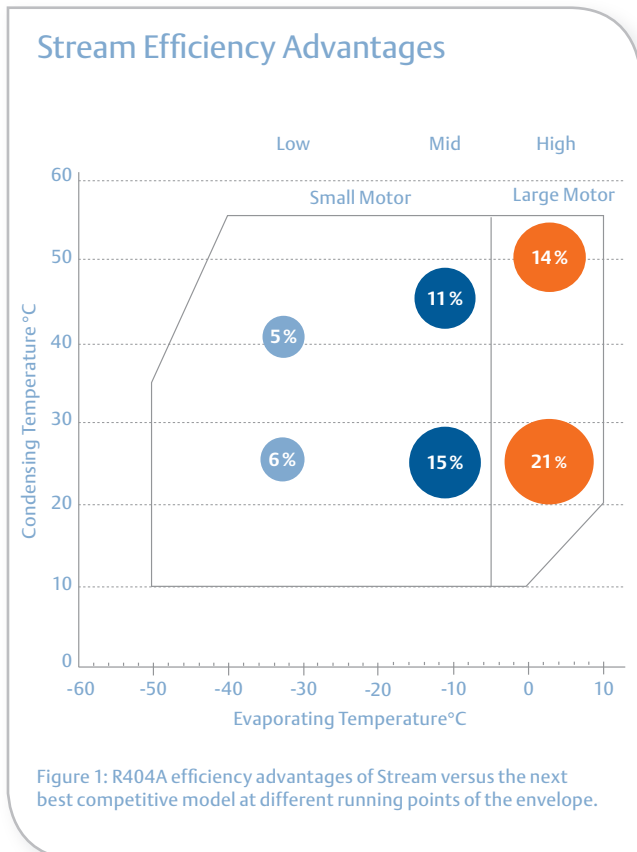


Figure 1: R404A efficiency advantages of Stream versus the next best competitive model at different running points of the envelope.

### How It Works

The unique valve technology allows gas to flow into the cylinders with minimum heat gain while suction cavities are designed to smoothly route the gas to minimize losses. This leads to a superior capacity and efficiency of the compressor compared to conventional reed type compressors, giving customers much more efficiency.

### Discus® Valve Technology

The Discus® technology takes its name from the conical discharge valve. When closed, the valve remains flush with the valve plate reducing the clearance volume to an absolute minimum when the piston is at the top of the cylinder (as shown in figure 2, right side). With a conventional machine, the reed suction valve prevents the piston coming close to the top of the cylinder causing additional “dead volume” in the discharge ports of the valve plate (figure 2, left side).

# Leveraging An Unequaled Technology To Make It Even Better

By leveraging and improving the Discus® valve technology, the new Stream features a series of design characteristics that make it even more efficient:

- Valve plate with large suction and discharge gas areas to minimize losses
- Optimized gas distribution in suction area
- Improved motor cooling with side body bow -for larger passageways
- Refrigeration optimized motor selection

## Our Selection Tool - Your Efficient Choice Of Compressor

Emerson selection software “Select” offers a number of dedicated tools to help OEMs, contractors and end-users select the best compressor technology in terms of energy efficiency. All the parameters of a refrigeration system can be defined to perform energy simulations and comparisons between several solutions.



### Simulation Study - Done With Selection Software Tool

Result of a compressor energy comparison analysis

#### Parameters :

- Stream versus next best comparable compressor
- Medium temperature pack application with 5 compressors
- Location of application: Brussels
- Refrigerant: R404A

#### Result :

- 15% Reduction of energy costs using Stream
- 50.700 kWh/year or 5000 €/year savings (0,1 €/kWh)

### Temperature Profile In Ambient Condition

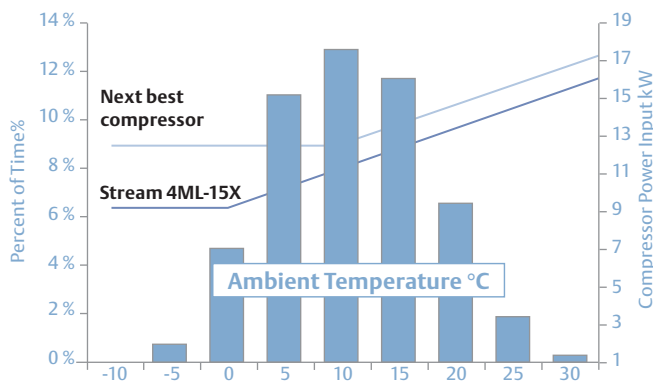


Figure 3: Temperature profile in Brussels and single compressor power input in function of ambient condition (Stream 4ML-15X with R404A).

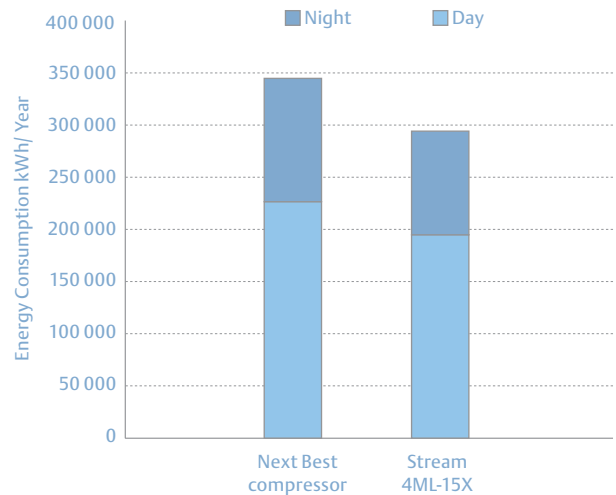


Figure 4: Comparison between Stream and next best compressor.



## One Compressor - Multiple Applications At Best Efficiency

Today's most commonly used refrigerant is R404A. Improving system architectures, changing compressor technology or moving to a refrigerant with a lower Global Warming Potential (GWP) can significantly improve the carbon footprint of an installation.

Moving from R404A to R134a is one of many ways to reduce the GWP (from 3922 to 1430). While this requires a compressor of bigger displacement for the same capacity, the GWP is reduced by 64% and the system's efficiency is improved.

A recent trend shows that compressor manufacturers "optimize" their valve plate design to the refrigerant it will be used with. This leads to a better efficiency but creates product complexity and proliferation for equipment manufacturers and wholesalers.

### Stream With Discus® Valve Technology What It Means To You

The Stream valve plate is designed to provide the best efficiency level whatever the refrigerant. In fact, the same Stream model provides an efficiency advantage of more than 10% over market level when using refrigerant R404A while still outperforming so called R134a dedicated compressors from other manufacturers (shown in figure 5). The benefits are:

- One model fits all refrigerants (universality)
- 50% less models to handle
- Easier logistics & lower stock levels
- Less variations of refrigeration equipment
- Compressors easier to service and replace

All Stream models are released with R404A, R134a, R407C and R22.

### How It Works

The discharge valves of a compressor generate two types of losses:

- The pressure drop through the valve: at equal opening and closing timing, the valve that opens the most generates the least pressure losses
- The re-expansion volume of compressed gas in the compression chamber – the larger the re-expansion volume, the larger the losses

With a reed design a compromise has to be found between these two losses: the larger the valve, the lower the pressure drop but the higher the re-expansion.

### Efficiency Comparison

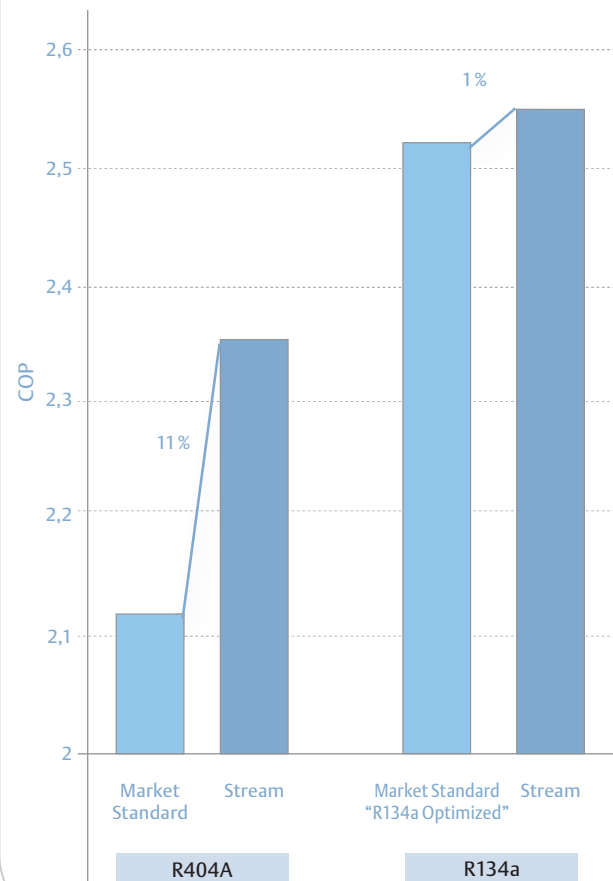


Figure 5: Example at condition -10°C/45°C/20°C SGRT: Stream 4ML-15X for R404A and R134a versus a standard compressor and "R134a Optimized" competitive models.

With Stream there is no need for a compressor design dedicated to each refrigerant. Multi-refrigerant valve technology offers the best compressor performance whichever the refrigerant.

A reed valve is sensitive to gas density and velocity through the valve so a compromise must be made for the given refrigerant and the condensing point. As a result a design optimization that targets an efficiency improvement at low condensing will create deterioration in high condensing.

With a Discus® valve technology, the larger the valve, the lower the pressure drop. As the valve is integrated in the valve plates there is no re-expansion volume. By designing the valve to the largest size allowed by the valve plate, the optimum is reached regardless of the refrigerant and operating condition. There is no compromise to make in Stream.

### Conventional Reed Valve Plate

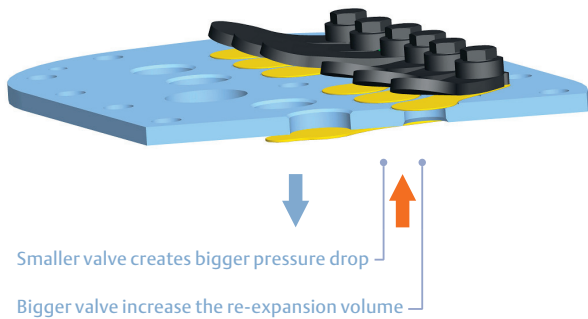


Figure 6: The reed valve type forces a design compromise between pressure drop and re-expansion volume making it impossible to achieve optimized efficiency for all refrigerant and operating points. A dedicated refrigerant design is necessary.

### Discus® Valve Technology

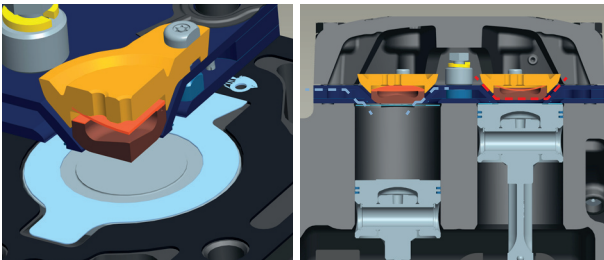


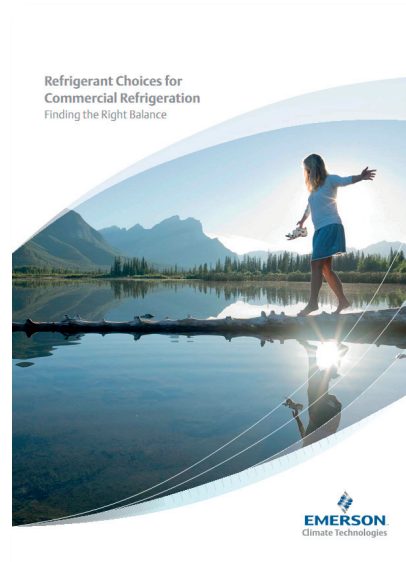
Figure 7: With the Stream design, a larger discharge passage will not increase re-expansion volume leading to the highest efficiency whatever the refrigerant and operating point. A dedicated refrigerant design is not necessary.

## Our Simulation Tool - Your Efficient Choice Of Refrigerant

Refrigerant choice, system architecture design and compressor technology are key factors that determine the environmental impact of an installation. Minimizing the impact on climate change through responsible energy use and reduced carbon footprint are key objectives at Emerson.

Emerson carried out a study to provide guidance to end users, consultants, contractors and installers in the complex decision-making process of specifying supermarket cooling systems. It focuses on the refrigerant while taking into account the system architecture and technologies that have an impact on energy consumption, the carbon footprint and investment costs. Supermarkets were chosen in this study as they offer the greatest potential to integrate the latest design principles in order to improve environmental performance.

The results of the study are summarized in our report «Refrigerant Choices for Commercial Refrigeration» available at [www.emersonclimate.eu](http://www.emersonclimate.eu).





## One Compressor - Two Modulation Options

There is a common goal shared by many in refrigeration: preserve and display food at safe temperatures and reasonable operating cost. Varying the capacity available to meet the load is the most significant way to achieve this objective. This ability leads to a more stable temperature in the refrigerated areas and does so at favourable power consumption since producing excess capacity is avoided.

### What It Means To You

All Stream compressors are released for applications using inverter technology. In addition, and in an effort to give technology options to the refrigeration industry, Emerson Climate Technologies introduces Digital technology. Digital technology is used worldwide on scroll compressors installed in many refrigeration applications and has proven to be the simplest and most reliable means of continuous capacity modulation. Digital is also now available on Stream semi-hermetic reciprocating compressors.

## Stream - The Choice Is Yours

### Frequency Modulation

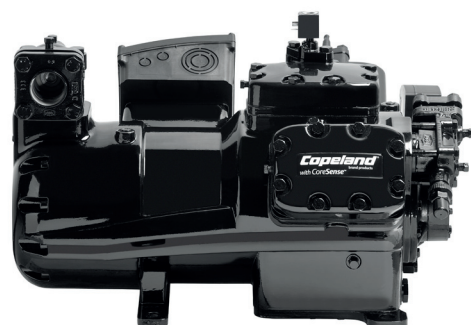
- › Dedicated refrigeration inverters from Control Techniques



Emerson Inverter

### Digital Capacity Modulation

- › 4 cylinder compressor: 50 to 100% modulation
- › 6 cylinder compressor: 33 to 100% or 67 to 100% modulation



# Digital Modulation

## How It Works

A high-cycle solenoid valve is fitted on the cylinder head of the compressors and actuates a piston that controls the flow of gas into the suction area of the Stream valve plate.

When cooling capacity is required and during the normal compression process, refrigerant flows through the valve plate, past the suction reed, and into the compression cylinders. While in the cylinders, the gas is compressed to a higher pressure before being discharged past the valve and into the head. This is known as the “loaded state”.

When less cooling capacity is required, by interrupting the refrigerant flow into the cylinders, there is no compression taking place. By controlling the time when actual compression is taking place, the capacity output of the Stream Digital compressor

can be adjusted. This new approach to capacity control is simple to integrate into equipment design and extremely reliable. The digital cylinder banks can be retrofitted to existing compressors.

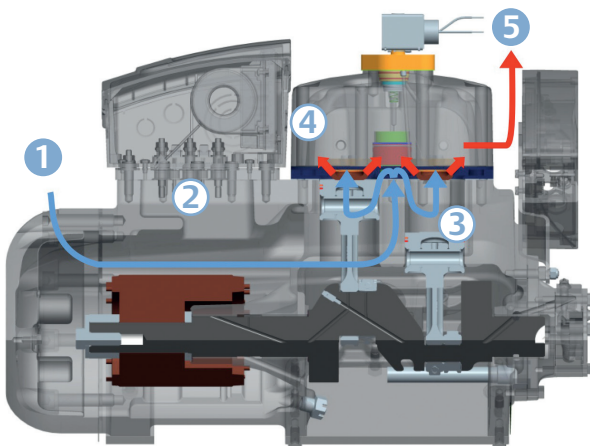
On a 4-cylinder compressor, one cylinder bank is fitted with a simple solenoid valve mechanism that actuates 2 pistons. These pistons block the gas from entering the compression area. When less cooling capacity is required, an interruption of the refrigerant flow into the cylinders stops the compression taking place. By controlling the opening and closing cycle time of these pistons via a panel mounted digital driver, the compressor capacity will modulate from 50 to 100%.

On a 6-cylinder compressor, one cylinder bank is fitted with a solenoid mechanism as described above while the other cylinder bank is fitted with a standard on/off capacity unloader. The result is a range of continuous capacity modulation from 33 to 100%.

### Loaded State

Refrigerant Flow:

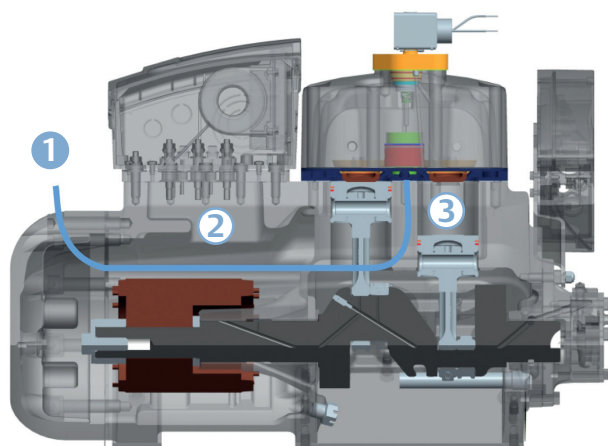
- 1 Refrigerant enters compressor
- 2 Passes through body
- 3 Into the valve plate
- 4 Compressed by pistons
- 5 Exits compressor



### Unloaded State

Refrigerant Flow:

- 1 Refrigerant enters compressor
- 2 Passes through body
- 3 Unloader mechanism blocks gas before entering the valve plate





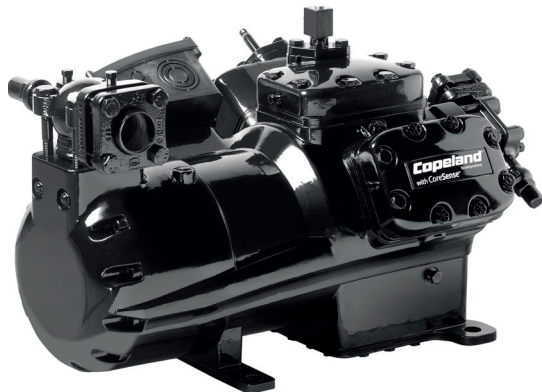
## Our Digital Technology - Your Benefits

The benefits of digital modulation are the same as capacity modulation by means of a frequency inverter, in terms of energy savings, precise evaporator air temperature and suction pressure control.

Apart from these benefits digital modulation offers significant additional advantages as described to the right.

### Features & Benefits

- ▶ No specific precautions are necessary with respect to oil return as Stream Digital runs at constant speed just like a standard compressor
- ▶ No vibrations or mechanical stress on system piping and compressor parts
- ▶ Reduced compressor cycling for longer contactor and compressor life
- ▶ Simple system and control architecture whatever the compressor size
- ▶ Eliminates over/under shooting of suction pressure leading to the ability to run the system at a higher set point
- ▶ Easy to integrate in existing equipment
- ▶ Increased uptime and reduced maintenance
- ▶ Possibility to easily retrofit existing installations with digital cylinder head kit

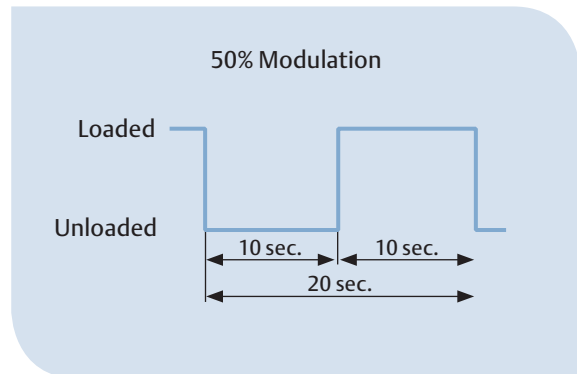


### Cycle Time

The compressor capacity is controlled by modulating the solenoid valve input over time.

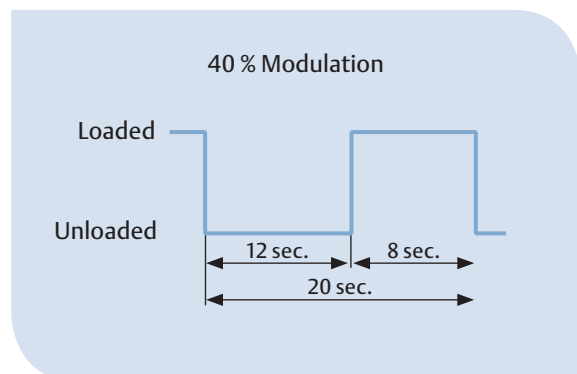
Example 1 :

- Cycle time: 20 sec
- Valve active/open: 10 sec
- Valve inactive/closed: 10 sec
- Resulting capacity: 50%



Example 2 :

- Cycle time: 20 sec
- Valve active/open: 12 sec
- Valve inactive/closed: 8 sec
- Resulting capacity: 40%





# Low Sound



## Noise Emissions - A Serious Concern

Environmental noise emissions have become a serious issue and this has led to a wide variety of contentious situations, particularly in the case of refrigeration applications. Indeed, kitchen equipment, compressor packs or condensing units are often the source of disturbing noise in urban areas.

### The Quietest Compressor On The Market With Sound Shell Technology

Stream is one of the quietest reciprocating compressors on the market: design efforts have led to sound reduction of up to 7 dBA compared to previous generation of compressors depending on models and application. Compressor quiet operation is not always sufficient for sound sensitive and urban application. As a result a new sound shell can be fitted on Stream compressors and provides an additional 15 dBA attenuation.

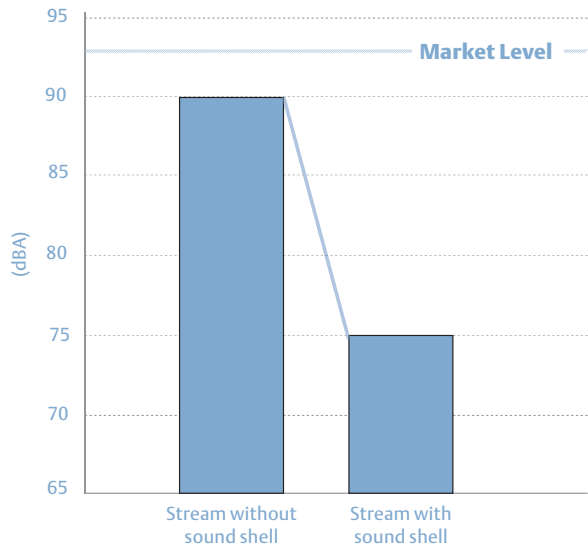
### Stream Sound Shell

#### How It Works

By leveraging the success of its scroll sound shell Emerson Climate Technologies developed the Stream sound shell. Emerson engineers designed a sound shell that fully encapsulates Stream to minimize any sound leaks.

The shell is made of 5 major parts that make it easy to assemble and fit refrigeration equipment. Snapped together parts allow quick access to key components of the compressor such as the oil control device if mounted, the oil service valve or the CoreSense™ Diagnostics reset button.

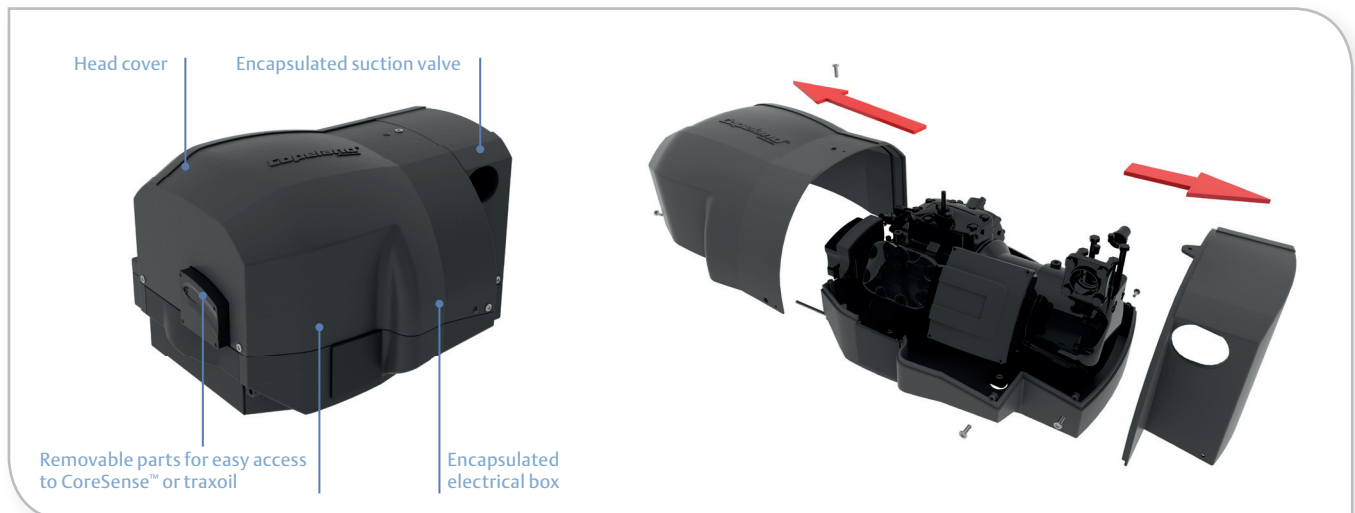
#### Noise Level



#### What It Means To You

Two shell versions are available: one for 4-cylinder and one for 6-cylinder compressors including digital models.

Groundbreaking design techniques and materials, derived from the automotive industry are used. Low pressure reaction injection molded parts allow up to 15 dBA sound attenuation and provide a significant improvement over conventional sound jackets that reduce compressor sound by just 3 to 6 dBA.

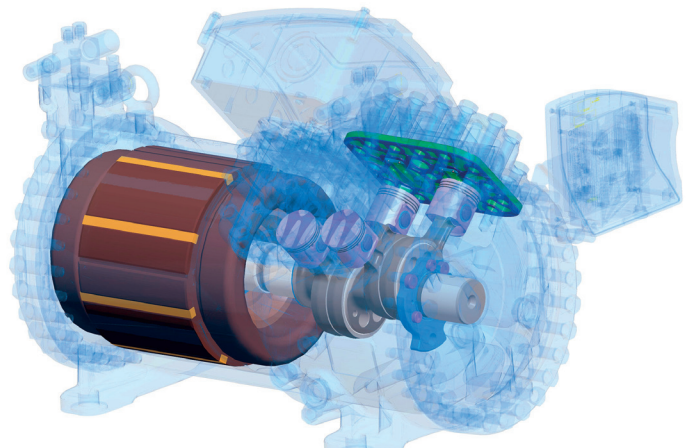


## Stream - R744

### Designed For Durability And Best-In-Class Performance

The Stream line of 4 cylinder R744 compressors is the ideal solution for R744 medium temperature cascade and booster systems. It is characterised by a design pressure of 135 bar. Refrigerant flow and heat transfer

have been optimized for best performance. All compressors are equipped with CoreSense™ technology and offer the possibility to diagnose system related problems faster or even before they occur.



#### Features & Benefits

##### Designed for flexibility in pack design and operation

- › Compact dimensions
- › Integrated high and low pressure relief valve
- › Discharge temperature protection
- › Service valve 360° rotation for ease of piping design
- › 2 sight glasses for mounting of oil management control and visual inspection
- › One additional sight glass for oil visual inspection at run time
- › One oil port for oil equalization in parallel system
- › Oil splasher system ensuring lubrication at constant and variable speed

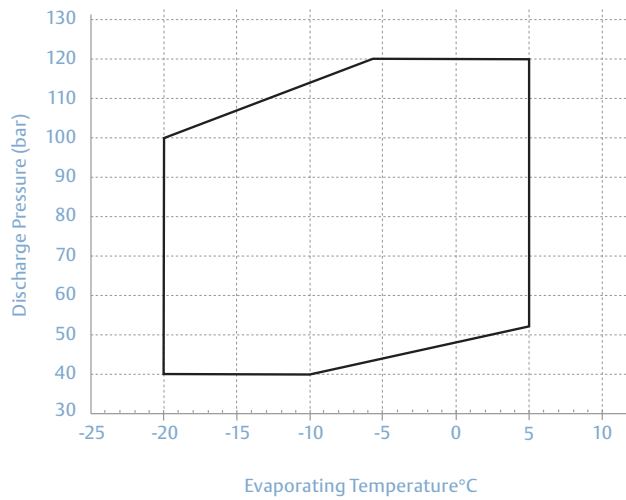
##### Designed for durability and performance in R744 applications

- › Low sound, low vibration and large discharge chamber to eliminate pulsation
- › High design pressures of 135 bar (high side) and 90 bar (low side)
- › Burst pressures in excess of safety factor 3
- › Cylinder head and discharge plenum design minimizing heat transfer to suction side
- › Stepless capacity modulation via inverter
- › Emerson CoreSense™ Diagnostics
- › Individual compressor power consumption monitoring

# Stream - R744

## Technical Specifications

### Operating Envelopes With R744

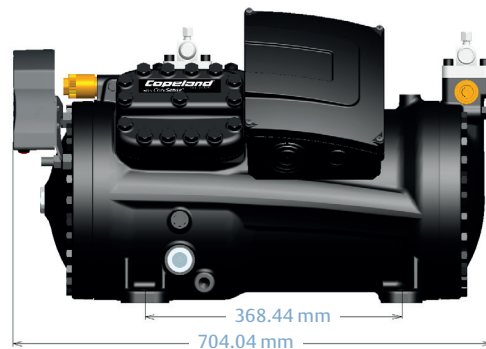
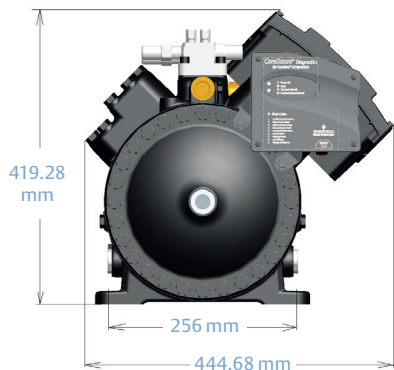


## Technical Overview

Model	Displacement (m <sup>3</sup> /h)	Cooling Capacity* (kw)	Pressure (high / low side)			Net Weight (kg)	Footprint (mm)	Motor	Footprint (A)
			Max. Operating (bar)	Design (bar)	Burst (bar)				
4MTL-10X	9,5	20	120 / 40	135 / 90	420 / 286	156	368 x 256	AWM 380-420/ 3/50Hz	24,8
4MTL-15X	12,5	26				157			31,1
4MTL-30X	17,9	38				160			45,4

\* Evaporating -10°C, gas cooler exit: 35°C / 90 bar, suction superheat 10 K, subcooling 0K

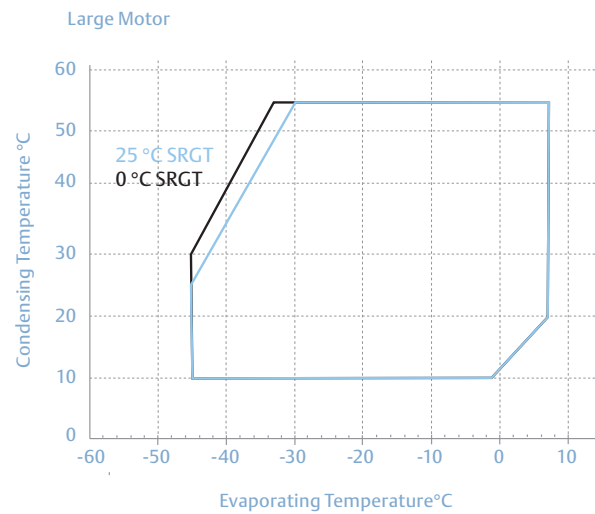
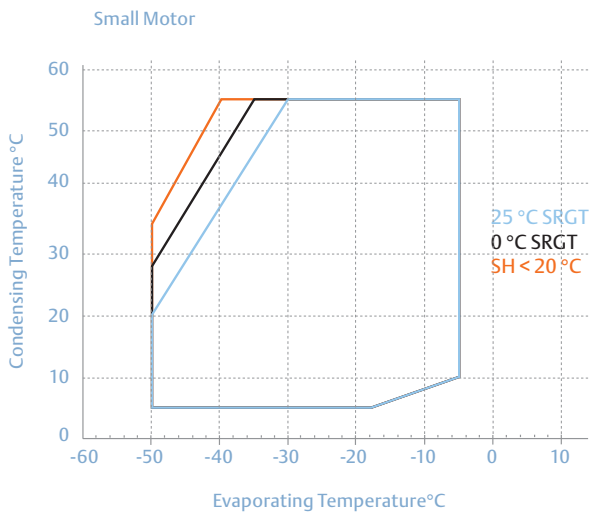
## Dimensions



All technical data is preliminary.

## Technical Specifications

### Operating Envelopes With R404A



For envelopes with R134a, R407C, R22 refer to Selection Software.

## Technical Overview

Model	Nominal Horsepower (hp)	Displacement (m <sup>3</sup> /h)	Medium Temperature				Low Temperature		Net Weight (kg)	Footprint (mm)
			Cooling Capacity		COP		Cooling Capacity ** (kW)	COP **		
			R404A *	R134a ***	R404A *	R134a ***				
4MF-13X	13	62	33,4	18,2	2,3	2,4	11,4	1,4	177	
4MA-22X	22	62	33,6	19,1	2,4	2,6	10,8	1,4	178	
4ML-15X	15	71	38,7	22,1	2,3	2,3	13,2	1,5	180	
4MH-25X	25	71	38,8	21,4	2,4	2,3	12,5	1,4	187	
4MM-20X	20	78	42,6	24,7	2,3	2,4	14,7	1,5	182	
4MI-30X	30	78	42,8	23,9	2,4	2,4	13,9	1,4	188	
4MT-22 X	22	88	47,8	27,7	2,3	2,4	16,5	1,5	183	
4MJ-33X	33	88	48,0	26,8	2,3	2,4	16,0	1,4	190	
4MU-25X	25	99	54,2	31,2	2,3	2,4	18,7	1,5	186	
4MK-35X	35	99	54,4	30,1	2,4	2,3	17,7	1,4	202	
6MM-30X	30	120	61,8	36,9	2,3	2,3	21,6	1,4	215	
6MI-40X	40	120	64,2	35,3	2,4	2,3	20,3	1,4	219	
6MT-35X	35	135	70,4	41,3	2,3	2,3	25,1	1,5	221	
6MJ-45X	45	135	72,4	40,4	2,3	2,4	23,6	1,4	223	
6MU-40X	40	153	79,8	46,3	2,3	2,3	28,4	1,4	225	
6MK-50X	50	153	82,1	45,3	2,3	2,3	26,6	1,4	230	

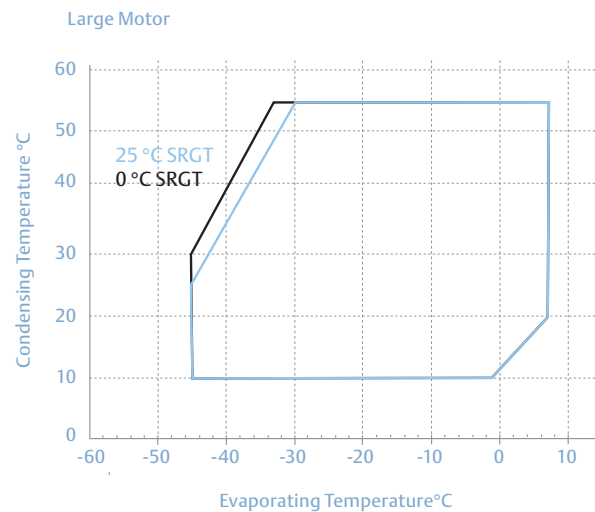
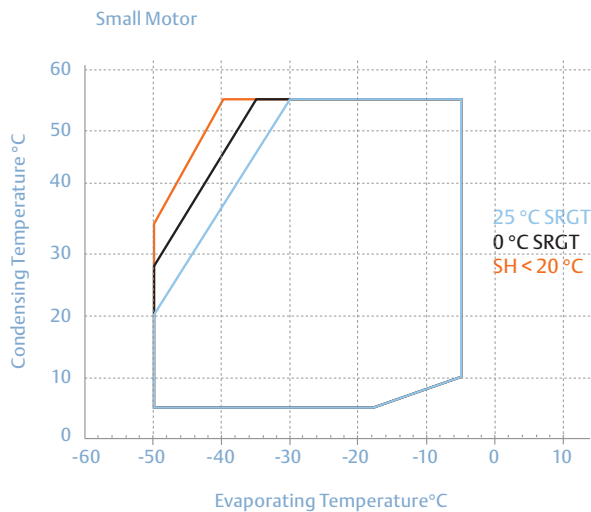
\* R404A evaporating -10°C, condensing 45°C, suction gas temperature 20°C, subcooling 0K  
 \*\* R404A evaporating -35°C, condensing 40°C, suction gas temperature 20°C, subcooling 0K  
 \*\*\* R134a evaporating -10°C, condensing 45°C, suction superheat 10K, subcooling 0K

All technical data is preliminary.

# Stream - HFC Digital

## Technical Specifications

### Operating Envelopes With R404A (100% Capacity Modulation)



For envelopes with R134a, R407C, R22 refer to Selection Software.

### Technical Overview (100% Capacity Modulation)

Model	Nominal Horsepower (hp)	Displacement (m <sup>3</sup> /h)	Medium Temperature				Low Temperature		Net Weight (kg)	Footprint (mm)
			Cooling Capacity		COP		Cooling Capacity ** (kW)	COP **		
			R404A *	R134a ***	R404A *	R134a ***				
4MFD-13X	13	62	33,4	18,2	2,3	2,4	11,4	1,4	177	381 x 305
4MAD-22X	22	62	33,6	19,1	2,4	2,6	10,8	1,4	178	
4MLD-15X	15	71	38,7	22,1	2,3	2,3	13,2	1,5	180	
4MHD-25X	25	71	38,8	21,4	2,4	2,3	12,5	1,4	187	
4MMD-20X	20	78	42,6	24,7	2,3	2,4	14,7	1,5	182	
4MID-30X	30	78	42,8	23,9	2,4	2,4	13,9	1,4	188	
4MTD-22X	22	88	47,8	27,7	2,3	2,4	16,5	1,5	183	
4MJD-33X	33	88	48,0	26,8	2,3	2,4	16,0	1,4	190	
4MUD-25X	25	99	54,2	31,2	2,3	2,4	18,7	1,5	186	
4MKD-35X	35	99	54,4	30,1	2,4	2,3	17,7	1,4	202	
6MMD-30X	30	120	61,8	36,9	2,3	2,3	21,6	1,4	215	
6MID-40X	40	120	64,2	35,3	2,4	2,3	20,3	1,4	219	
6MTD-35X	35	135	70,4	41,3	2,3	2,3	25,1	1,5	221	
6MJD-45X	45	135	72,4	40,4	2,3	2,4	23,6	1,4	223	
6MUD-40X	40	153	79,8	46,3	2,3	2,3	28,4	1,4	225	
6MKD-50X	50	153	82,1	45,3	2,3	2,3	26,6	1,4	230	

\* R404A evaporating -10°C, condensing 45°C, suction gas temperature 20°C, subcooling 0K

\*\* R404A evaporating -35°C, condensing 40°C, suction gas temperature 20°C, subcooling 0K

\*\*\* R134a evaporating -10°C, condensing 45°C, suction superheat 10K, subcooling 0K

All technical data is preliminary.

# Stream - Continuous Improvements In Detail

## Technical Highlights

Stream is a brand new compressor entirely redesigned to confer outstanding benefits to the refrigeration industry:

- ▶ Improved product range versus previous Discus® compressors
- ▶ Reduced overall dimensions allowing refrigeration equipment to remain compact
- ▶ Reduced compressor weight by up to 45 kg
- ▶ Wide operating envelope: one model fits all refrigeration applications, medium and low temperature
- ▶ Availability of 2 motor versions per displacement, the largest motor being the best selection for inverter applications
- ▶ No cooling fan required for low temperature (0°C suction gas return temperature) to keep applied costs low
- ▶ Extremely low condensing temperatures for increased system efficiency
- ▶ Protection and sensing devices pre-installed to reduce applied system cost
- ▶ Current sensor which enables power monitoring of individual compressors to stay on top of energy costs
- ▶ Integrated compressor status LEDs for local communication via color and flash codes
- ▶ Remote communication via Modbus® for faster service

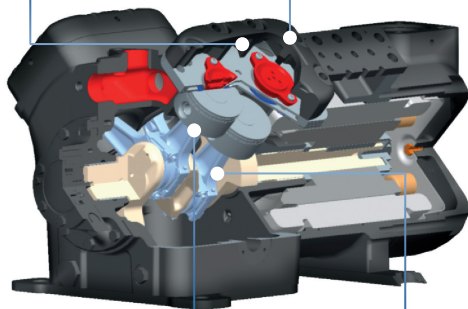
### Inside View Of Stream Compressor

Discus® valve plate with additional & larger suction & discharge gas passageways for efficiency and pulsation

Small cylinder heads for compactness and less weight

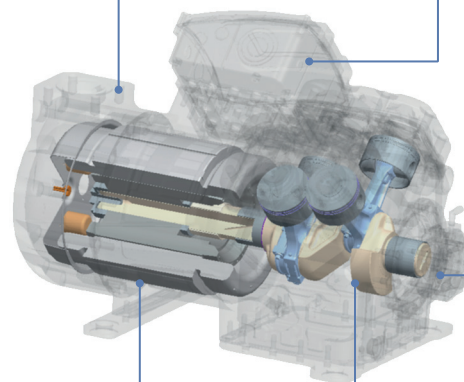
Larger gas passage ways around motor for increased envelope without cooling fan

Robust plastic terminal box



Compact cylinder bank for efficiency & compactness

Cylinder bores & stroke for maximum cooling capacity



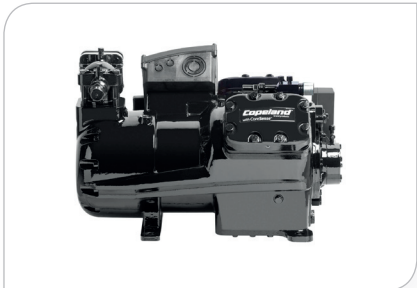
Optimized motor size

Larger bearings for better robustness

Reduced crankshaft length for increased reliability and compactness



**Copeland**  
with CoreSense™  
brand products





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