Water-to-Water Heat Pumps With High Speed Centrifugal Compressors

Refrigerant R1234ze / R515B
GVWF 116 XSH G - 426 XSH G (380 - 1510 kW)

XSTREAM EXCELLENT

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TRANE TECHNOLOGIES

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Introduction

The new **Trane XStream™ Excellent GVWF XSH G Heat Pumps** series is the result of a search for higher reliability and higher energy efficiency, for today's environment.

EcoWise™

XStream™ Excellent GVWF XSH G Heat Pumps with **R1234ze** low GWP refrigerants are part of the **EcoWise™** portfolio of products that are designed to lower their environmental impact with next-generation, low global warming potential (GWP) refrigerants and high-efficiency operation.

In an effort to reduce energy consumed by heating and to contribute to decarbonization by eliminating CO_2 emissions. Trane has developed the **XStream Excellent heat pumps** with higher efficiencies and a more reliable design than any other water-to-water equipment available on the market today.

The **XStream Excellent GVWF XSH G** uses the High Speed Centrifugal compressors.

The industrial-grade design of this heat pumps is ideal for both industrial and commercial markets, in applications such as office buildings, hospitals, schools, retail buildings, and industrial facilities.

The major advantages of the **XStream Excellent** are:

- Very low environmental impact thanks to near zero GWP (<1) R1234ze refrigerant.
- High efficiencies specially at part load
- Great versatility to adapt to varying applications requirements

Features and benefits

High Speed Centrifugal Compressors

- **Two stages, high speed centrifugal compressors with higher aerodynamic efficiency**
  - High lift and high pressure ratio for heat pumps applications
- **Magnetic bearings provide quiet, reliable and 100% oil free operation**
- **Soft start module significantly reduces high in-rush current at startup**
- **Integrated variable frequency drive**
- **Variable speed adjusts to changes in load and/or condensing temperature**
- **One main moving part. The two impellers are keyed directly to the motor rotor.**

Variable Primary Flow

An attractive heating system option may be a variable primary flow (VPF) system. VPF systems present building owners with several cost-saving benefits that are directly related to the pumps. The most obvious cost savings result from eliminating the secondary distribution pump, which in turn avoids the expense incurred with the associated piping connections (material, labor), electrical service, and variable-frequency drive.

Building owners often cite pump related energy savings as the reason that prompted them to install a VPF system. With the help of a TRANE software analysis tool, you can determine whether the anticipated energy savings justify the use of variable primary flow in a particular application. It may also be easier to apply variable primary flow in an existing heating plant.

Unlike the "decoupled" design, the bypass can be positioned at various points in the heating loop and an additional pump is unnecessary. The condenser in the **XStream Excellent GVWF XSH** series can withstand up to 50% percent water flow reduction as long as this flow is equal to or above the minimum flow-rate requirements.

The microprocessor and capacity control algorithms are designed to handle a maximum of 20% change in water flow rate per minute.

Factory Testing Means Trouble-Free Start-up

All **XStream Excellent GVWF XSH G heat pumps** are given a complete functional test at the factory. This computer-based test program completely checks the sensors, wiring, electrical components, microprocessor function, communication capability, expansion valve performance, and fans. In addition, each compressor is run-tested to verify capacity and efficiency. Where applicable, each unit is factory preset to the customer's design conditions. An example would be the leaving-liquid temperature set point. The result of this test program is that the unit arrives at the job site fully tested and ready for operation.

Factory-Installed and Tested Controls and Options Speed Installation

All **XStream Excellent GVWF XSH G heat pump** options are factory installed and tested. Some manufacturers send accessories in pieces to be field installed. With Trane, the customer saves on installation expense and has assurance that ALL unit controls and options have been tested and will function as expected.

Superior Control with Symbio™ 800 unit controls

The Adaptive Control™ microprocessor system enhances the **XStream Excellent GVWF XSH G heat pump** by providing the very latest unit control technology. With the Adaptive Control microprocessor, unnecessary service calls and unhappy tenants are avoided. The unit does not nuisance-trip or unnecessarily shut down. Only when the unit controls have exhausted all possible corrective actions and the unit is still violating an operating limit, will the heat pump shut down. Controls on other equipment typically shut down the unit, usually just when it is needed the most.

Features and benefits

SmartFlow control

XStream Excellent series units are fully compatible with variable flow operation both on condenser and evaporator sides. The modulation of the pump speed is managed to ensure that unit ΔT stays constant. Entering and leaving temperatures at the heat exchangers will be measured directly by the unit controller, through the factory-supplied sensor. A ΔT setpoint will be present on the unit controller. The option for constant ΔT is intended to be used with 3-way valves on water systems, or 2-way valves on water system but constant flow at the by-pass.

Series counterflow unit configuration

When considering multiple heat pumps plant, designers conventionally go for parallel-piped units configuration. Nevertheless, there are ways to bring more efficiency by using a different lay-out.

An effective alternative to consider is to pipe the units in series. Larger ΔT and low flow design save energy on the pumping. Series units configuration allows as well, to get a better efficiency from the upstream units, more lightly loaded. Combining this configuration with Variable Primary Flow (VPF) will further increase system efficiency.

Series piping principle can also be applied to evaporator side. This is called Series-Series counterflow configuration. This will result in similar advantages on the evaporator side, enlarging the opportunity for savings on the overall system.

Product certification

Trane as a Global leader in the HVAC industry participates to both Eurovent heat pump certification programs. Through this third party certification, Trane commits to deliver units that comply with the declared performance.

Base unit description

	GVWF XSH G
Power supply	400 V - 3 Ph - 50 Hz - Single point
Compressor type	High Speed Centrifugal
Compressor technology	Magnetic bearings – Oil free
Number of circuits	1 or 2
Compliance	CE - PED
Refrigerant R134a R1234ze	R1234ze / R515B
Relief valve	Single relief valve on condenser
Condenser water connections Direct Connection - Grooved pipes	Direct Connection - Grooved pipes
Condenser nbr of passes	2
Condenser water side pressure 10 bars	10 bars
Evaporator water connections	Direct Connection - Grooved pipes
Evaporator nbr of passes	2 (GVWF 116 & 226 XSH G) - 1 (GVWF 326 & 426 XSH G)
Evaporator water side pressure	10 bars
Flow Control	Constant Flow - Pump signal On/Off (Condenser + Evaporator)
Power protection	Fused
Electrical IP protection	Enclosure with Dead Front protection
Installation accessories	Optional

Options description

Option Description		Application	GVWF 116 XSH G	GVWF 226 XSH G	GVWF 326 XSH G	GVWF 426 XSH G
Refrigerant						
R515B		A1 classification	●	●	●	●
Power						
400 V - 3 Ph - 50 Hz - Dual point	"2 distinct power supplies, one per circuit"	Renovation. Replacement of two smaller units by one only			●	●
Disconnect switch with Fuses		Power protection	●	●	●	●
Disconnect Switch with Circuit Breakers		Power protection	●	●	●	●
Condenser						
Size	Alternative Condenser	Adapt unit to large Δt or Variable flow operation	●	●	●	●
Right hand (facing the control box) direct connection	Position of water box	Water connections arrangement	●	●	●	●
Left hand (facing the control box) direct connection	Position of water box	Water connections arrangement	●	●	●	●
Evaporator						
Size	Alternative Evaporator	Adapt unit to large Δt or Variable flow operation			●	●
Right hand (facing the control box) direct connection	Position of water box	Water connections arrangement	●	●		
Left hand (facing the control box) direct connection	Position of water box	Water connections arrangement	●	●		
Right hand (facing the control box) connection with External pipe	Additional external connection pipe for single pass evaporators	Water connections arrangement			●	●
Left hand (facing the control box) connection with External pipe	Additional external connection pipe for single pass evaporators	Water connections arrangement			●	●
No insulation on cold parts		For field supplied insulation by customer	●	●	●	●
Acoustics						
Sound attenuation package	Additional refrigerant lines insulation	Overall reduction of Sound Power level	●	●	●	●
Relief Valve						
Single relief Valve on both condenser and evaporator	Additional relief valve on low pressure side	Additional pressure safety device	●	●	●	●
Dual relief Valve condenser only	2 relief valve with bypass 3 way valve on high pressure side	Maintenance	●	●	●	●
Dual relief Valve on both condenser and evaporator	3 relief valve with bypass 3 way valve on both high and low pressure side	Maintenance	●	●	●	●
SmartFlow Control						
VPF Constant Delta T Condenser	Optional PC board delivering a 2-10 V modulating signal output to control a pump motor speed inverter	Condenser variable speed pump control based on a constant Delta T	●	●	●	●
VPF Constant Delta T Evaporator	Optional PC board delivering a 2-10 V modulating signal output to control a pump motor speed inverter	Evaporator variable speed pump control based on a constant Delta T	●	●	●	●
VPF Constant Delta T Evaporator and Condenser	Optional PC board delivering a 2-10 V modulating signal output to control a pump motor speed inverter	Evaporator and Condenser variable speed pump control based on constant Delta T's	●	●	●	●

Options description

Smart Com protocole						
BACnet MSTP interface	Communication card	Communication with BMS through BACNet MSTP Protocol	●	●	●	●
BACnet IP interface	Communication card	Communication with BMS through BACNet IP Protocol	●	●	●	●
ModBus RTU interface	Communication card	Communication with BMS through Modbus RTU Protocol	●	●	●	●
ModBus TCP interface	Communication card	Communication with BMS through Modbus TCP Protocol	●	●	●	●
LonTalk interface	Communication card	Communication with BMS through LonTalk Protocol	●	●	●	●
External Set points & Capacity outputs - Voltage Signal	Programmable Input/ Output card and sensors	Remote Control or remote monitoring	●	●	●	●
External Set points & Capacity outputs - Current Signal	Programmable Input/ Output card and sensors	Remote Control or remote monitoring	●	●	●	●
Electrical IP Protection	IP 20 protection	Electrical Safety	●	●	●	●
Master slave operation	Communication card	Operation of two heat pumps on a same water loop	●	●	●	●
Energy metering	Additional energy meter	Monitors electricity consumption (kWh) of the full unit	●	●	●	●
Power losses						
Rapid restart	Control feature	Alows a faster restart time of unit after of a power failure	●	●	●	●
Condenser Refrigerant Pressure Output						
Condenser Water Control Output	Communication card - 0-10 V - Analog output	Allows to control a valve on condenser loop to perform proper unit start when condenser water loop is cold	●	●	●	●
Condenser Pressure (%HPC) Output	Communication card - 0-10 V - Analog output	Allows control of cooling device based on codenser pressure (i.e Cooling tower fan, 3 way valve...)	●	●	●	●
Differential Pressure Output	Communication card - 0-10 V - Analog output	Allows control od a 3 way valve on condenser water loop	●	●	●	●
Power socket	230 V Power socket	Power socket 230 V Power socket Local Power source to connect an electrical device such as a Laptop	●	●	●	●
Flow Switch						
Condenser or Evaporator Flow switch	One Flow Switch delivered to be installed either on Condenser or Evaporator side	Allows to check flow detection	▲	▲	▲	▲
Condenser and Evaporator Flow switch	Two Flow Switches delivered to be installed respectively on Condenser or Evaporator side	Allows to check flow detection	▲	▲	▲	▲
Accessories						
Neoprene isolators			▲	▲	▲	▲
Neoprene pads			▲	▲	▲	▲
Grooved pipe with coupling & pipe stub	4 Grooved pipe adapters	Allows welded connection to unit	▲	▲	▲	▲

● Factory mounted ▲ Accessory (not fitted)

General Data

GVWF XSH G (R1234ze)

Unit size		GVWF 116 XSH G	GVWF 226 XSH G	GVWF 326 XSH G	GVWF 426 XSH G
Air conditioning application (1)(4)					
Max Net Heating Cap	(kW)	380.5	760.4	1129.3	1507.0
Net COP		4.26	4.07	4.15	4.14
Medium temperature application (2)(4)					
Max Net Heating Cap	(kW)	383.0	758.6	1143.1	1512.0
Net COP		3.93	3.80	3.87	3.90
SCOP (5)		5.53	5.40	5.72	5.78
Space heating efficiency (ηsh)	(%)	213	208	221	223
High temperature application (3)(4)					
Max Net Heating Cap	(kW)	-	696.9	1045.2	1381.4
Net COP		-	3.58	3.66	3.66
Compressor					
Circuit 1		1	1	2	2
Circuit 2		-	1	1	2
Condenser					
Pass		2	2	2	2
Minimum Flow	l/s	10.25	13.00	22.90	25.15
Maximum Flow	l/s	37.60	47.60	84.00	92.10
Water Connection Type		Grooved end			
Water Connection Size	in	6	6	5	6
Evaporator					
Pass		2	2	1	1
Minimum Flow	l/s	10.8	12.6	23.2	34.1
Maximum Flow	l/s	39.6	46.2	85.1	130.1
Water Connection Type		Grooved end			
Water Connection Size	in	5	5	6	8
Refrigerant					
Type		R1234ze	R1234ze	R1234ze	R1234ze
Charge Circuit 1	kg	106	65	196	169
Charge Circuit 2	kg	-	65	96	169
Dimensions & weight					
Length	mm	2863	3036	4718	4779
Width	mm	1127	1127	1710	1808
Height	mm	1975	2299	2032	2135
Operating weight	kg	2247	2505	4683	5758

(1) At 40/45°C Entering/Leaving condenser and 10/7°C Entering/Leaving evaporator

(2) At 47/55°C Entering/Leaving condenser and 10/7°C Entering/Leaving evaporator

(3) At 55/65°C Entering/Leaving condenser and 10/7°C Entering/Leaving evaporator

(4) Net performances calculated as per EN 14511-2022.

(5) ηs,h / SCOP as defined in Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for space heaters with 400 kW maximum rated capacity - COMMISSION REGULATION (EU) N° 813/2013/EU of 2 August 2013. ηs,h / SCOP calculated according to EN14825-2022

GVWF XSH G (R515B)

Unit size		GVWF 116 XSH G	GVWF 226 XSH G	GVWF 326 XSH G	GVWF 426 XSH G
Air conditioning application (1)(4)					
Max Net Heating Cap	(kW)	373.1	745.5	1107.8	1478.5
Net COP		4.18	3.99	4.08	4.07
Medium temperature application (2)(4)					
Max Net Heating Cap	(kW)	375.2	743.3	1120.5	1484.2
Net COP		3.85	3.73	3.80	3.82
SCOP (5)		5.40	5.30	5.58	5.65
Space heating efficiency (ηsh)	(%)	208	204	215	218
High temperature application (3)(4)					
Max Net Heating Cap	(kW)	-	685.2	1028.3	1355.2
Net COP		-	3.50	3.58	3.59
Compressor					
Circuit 1		1	1	2	2
Circuit 2		-	1	1	2
Condenser					
Pass		2	2	2	2
Minimum Flow	l/s	10.25	13.00	22.90	25.15
Maximum Flow	l/s	37.60	47.60	84.00	92.10
Water Connection Type		Grooved end			
Water Connection Size	in	6	6	5	6
Evaporator					
Pass		2	2	1	1
Minimum Flow	l/s	10.8	12.6	23.2	34.1
Maximum Flow	l/s	39.6	46.2	85.1	130.1
Water Connection Type		Grooved end			
Water Connection Size	in	5	5	6	8
Refrigerant					
Type		R515B	R515B	R515B	R515B
Charge Circuit 1	kg	106	65	196	169
Charge Circuit 2	kg	-	65	96	169
Dimensions & weight					
Length	mm	2863	3036	4718	4779
Width	mm	1127	1127	1710	1808
Height	mm	1975	2299	2032	2135
Operating weight	kg	2247	2505	4683	5758

(1) At 40/45°C Entering/Leaving condenser and 10/7°C Entering/Leaving evaporator

(2) At 47/55°C Entering/Leaving condenser and 10/7°C Entering/Leaving evaporator

(3) At 55/65°C Entering/Leaving condenser and 10/7°C Entering/Leaving evaporator

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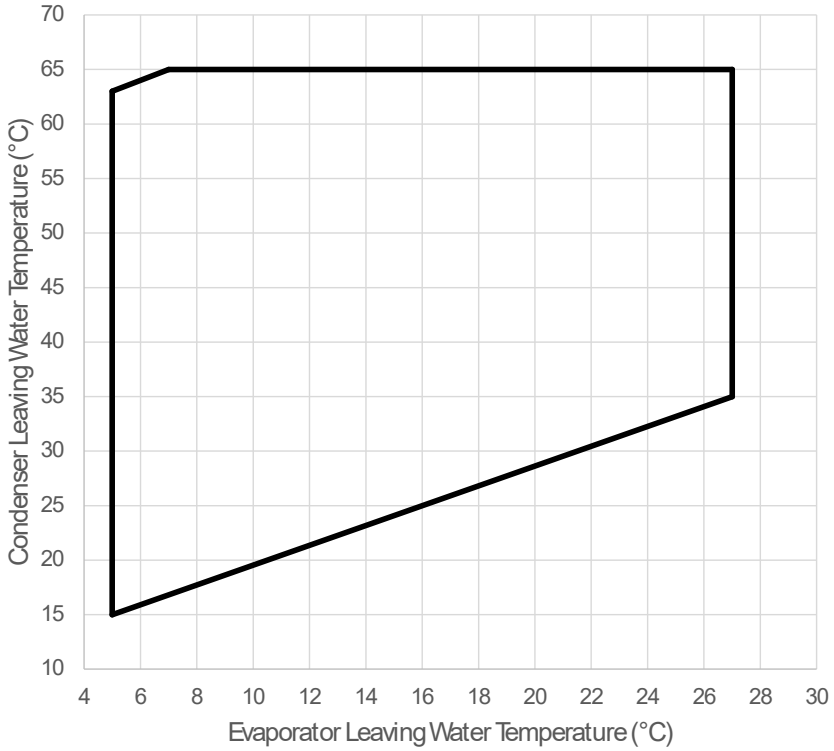
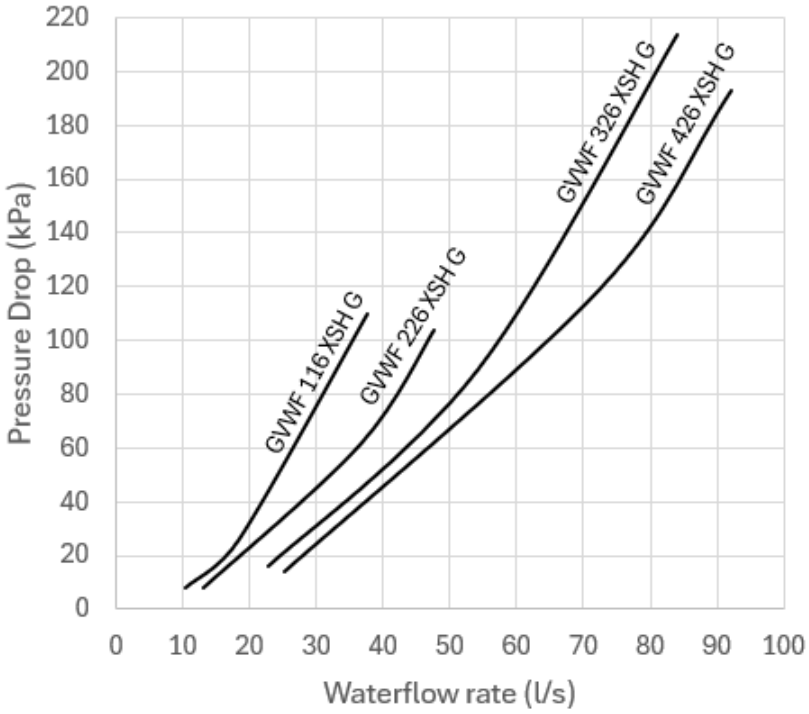
General Data

GVWF 116, 226 , 326 & 426 XSH G



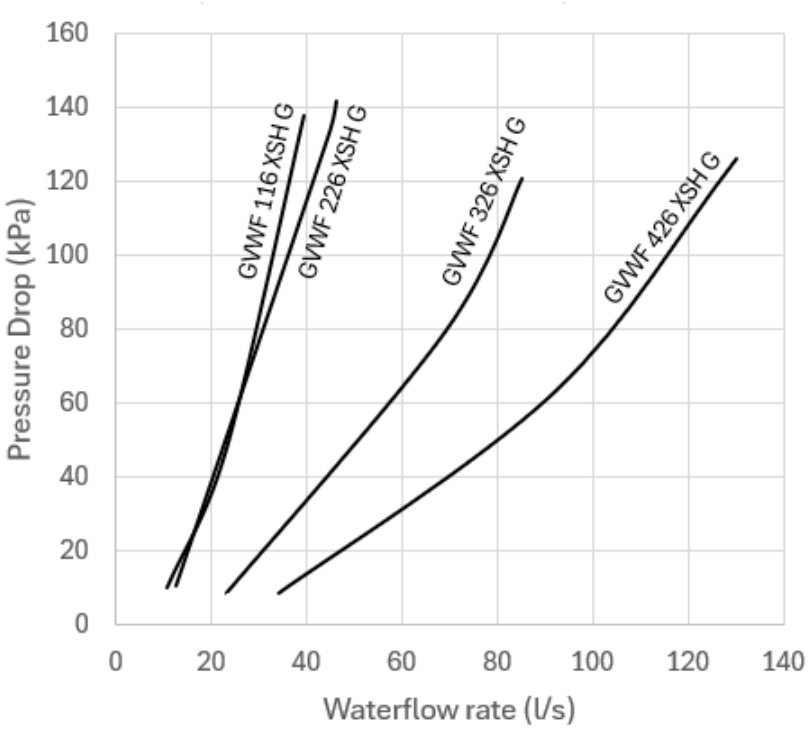
Operating Map

Condenser pressure drop



Operating Map

Evaporator pressure drop



Pressure drop

		GVWF 116 XSH G	GVWF 226 XSH G	GVWF 326 XSH G	GVWF 426 XSH G
Max current	(A)	167	332	497	662
Starting current	(A)	<10	<10	<10	<10

Pressure drop

	"At Max Capacity Global Sound Power SWL (dB(A))"	"Global Sound Pressure level at 1m SPL (dB(A))"
GVWF 116 XSH G	96	78
GVWF 226 XSH G	99	80
GVWF 326 XSH G	100	81
GVWF 426 XSH G	102	82

Notes

Notes

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

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