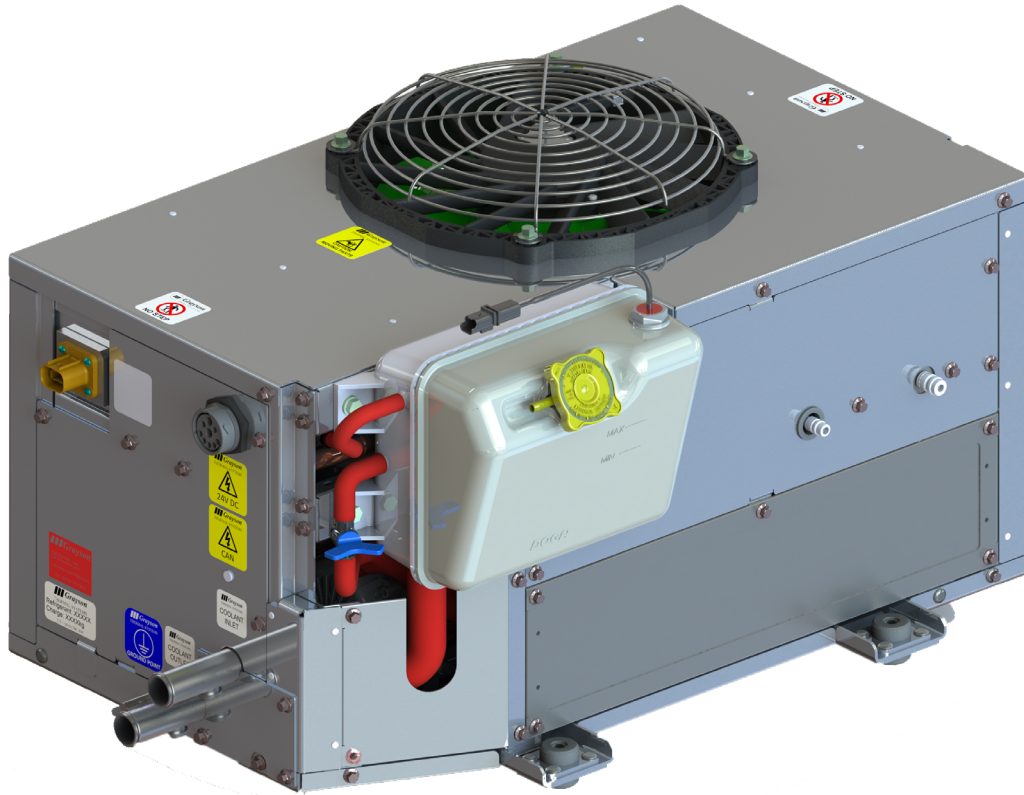


# BATTERY THERMAL MANAGEMENT SYSTEM (BTMS)

generations of knowledge



**Optimises battery**  
efficiency & life



**Plug & play**  
easy installation



**Adapts**  
to ambient temperature



**Production**  
in 4 manufacturing plants



**Specialists in**  
the transportation  
industry



**Designed**  
with Grayson's extensive  
know-how & expertise



**Service**  
exceptional service and  
product support



**Guaranteed**  
reliability



**Lightweight**  
solutions to fit your needs



**Grayson**  
Thermal Systems

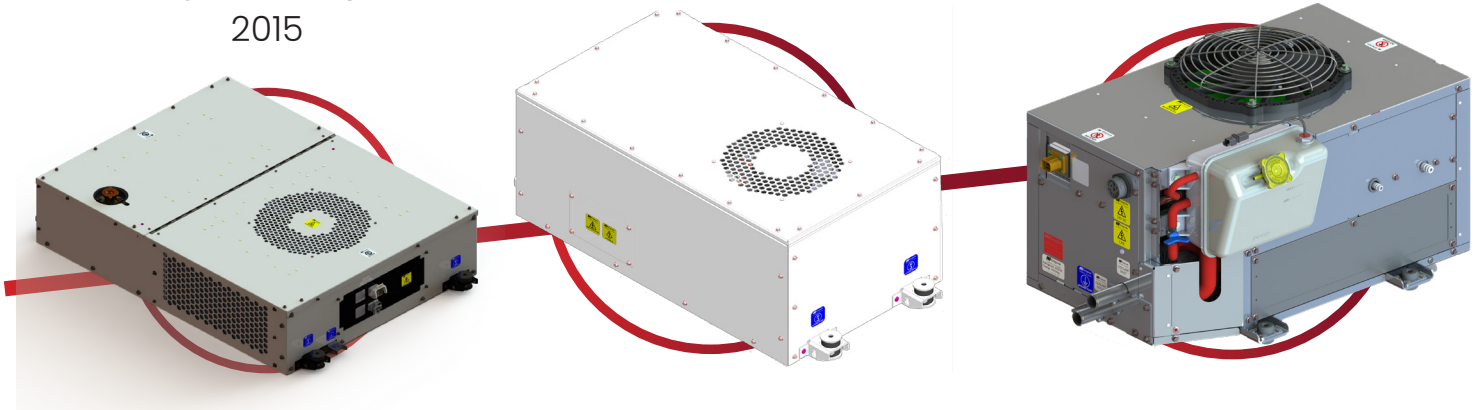
# WE HAVE COME A LONG WAY IN DEVELOPING OUR BTMS

OUR BTMS BEGAN IN 2015 WITH BUS ONLY APPLICATIONS. OUR TECHNOLOGY HAS GROWN AND NOW SERVE A WIDE RANGE OF VEHICLE APPLICATIONS.

**GEN1 BTMS**  
2015

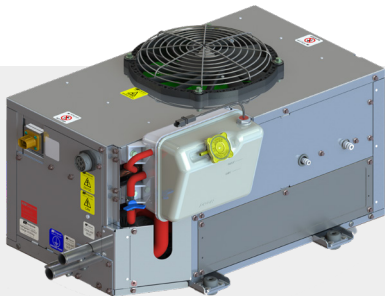
**GEN2 BTMS**  
2017

**GEN3 BTMS**  
From 2021

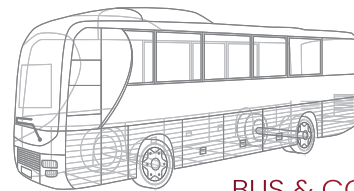


GTS BTMS regulates the temperature of electric vehicle batteries, providing temperature control that is critical to their function and operational life. With further advancements in features and benefits, our Gen3 BTMS can be used across a wide range of applications and markets around the world.

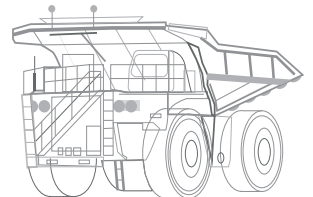
## SUITABLE FOR:



**GEN3 45 BTMS**



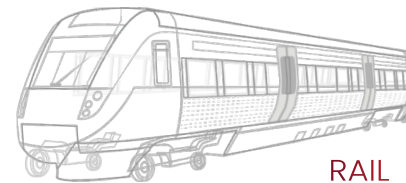
**BUS & COACH**



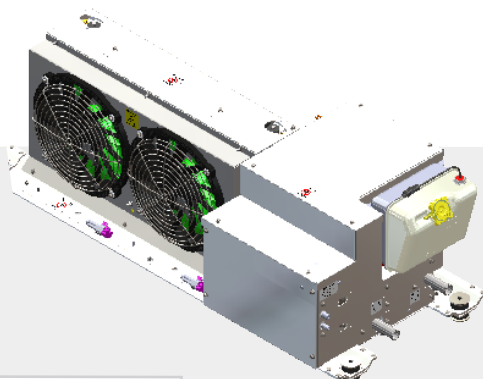
**OFF HIGHWAY**



**TRUCK**



**RAIL**



**GEN3 50 BTMS**

### GEN3 Features

- Configurable with the options of active cooling, passive cooling and/or heating.
- Suitable for roof mounting or chassis / body mounting.
- Integrated water pump.
- CAN J1939 "plug and play" control.
- CAN boot loader for easy software updates.
- DMI diagnostics messages on CAN network.
- Fuse-less smart power distribution on HV and LV circuits.
- Power consumption reporting (optional).
- Electric expansion valves.
- Pressure transducers for PWM fan regulation.
- Brushless fans.
- Lightweight header tank.
- 24VDC for controller, fans and pump



## GEN3 45 RANGE



### RANGE OPTIONS

**3A-6720-0A00** - Active / Passive, Cooling & Heating

**3A-6720-0B00** - Active / Passive, Cooling Only

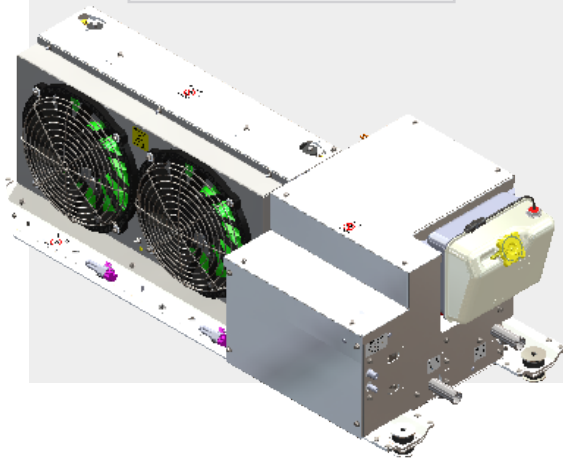
**3A-6720-0C00** - Active Cooling & Heating

**3A-6720-0D00** - Active Cooling Only

### TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Ambient (°C) (°F)	Cooling Capacity (Up To kW) (Btu/hr)	Heating Capacity (Up To kW) (Btu/hr)	Nominal Voltage (VDC)
750 29.5	450 17.7	370 14.5	62 136	45 113	12 40945	3.6 12283	600

## GEN3 50 RANGE



### RANGE OPTIONS

**3A-6725-0A00** - Active / Passive, Cooling & Heating

**3A-6725-0B00** - Active / Passive, Cooling Only

**3A-6725-0C00** - Active Cooling & Heating

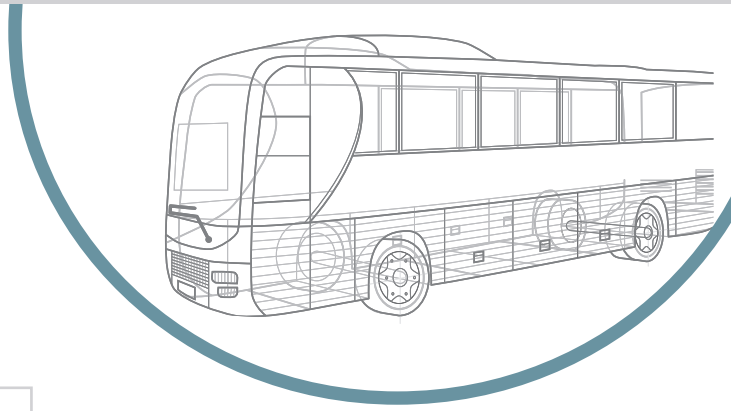
**3A-6725-0D00** - Active Cooling Only

### TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Ambient (°C) (°F)	Cooling Capacity (Up To kW) (Btu/hr)	Heating Capacity (Up To kW) (Btu/hr)	Nominal Voltage (VDC)
1171 46.1	550 21.6	389 15.3	79 174	50 122	13 44357	3.6 12283	600

# SOLUTIONS FOR BUS

OUR RANGE OF BTMS DESIGNED FOR BUS APPLICATIONS



## Rooftop, Body or Chassis Mounted BTMS Applications

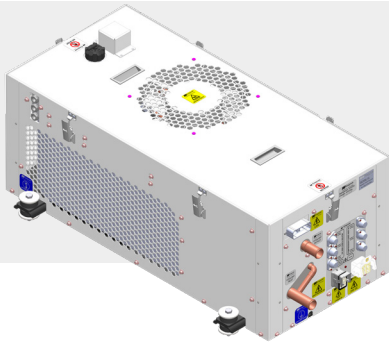


**HP-6418-000**  
Active / Passive / Heating

**HP-6418-200**  
Active / Heating

### TECHNICAL SPECIFICATIONS

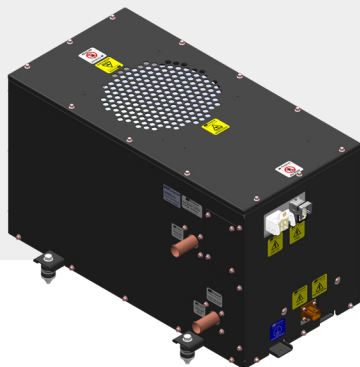
L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VAC)
1319 51.9	615 24.2	389 15.3	96 211	41 105	7 23884	3.6 17060	400
1319 51.9	615 24.2	389 15.3	96 211	41 105	14 23884	5 17060	400



**HP-6103-000**  
Active / Passive / Heating

### TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VAC)
1088 42.8	560 22	420 16.5	91 200	40 104	6 20472	5 17060	400



**HP-4964-300**  
Active / Heating

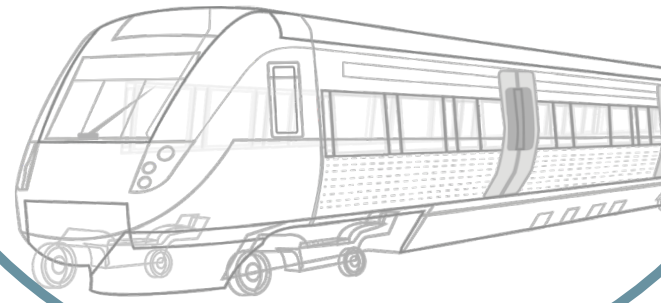
### TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VAC)
850 33.4	376 14.8	438 17.2	52 114	40 104	4.5 15354	1 3412	600



# SOLUTIONS FOR RAIL

OUR RANGE OF BTMS DESIGNED FOR RAIL APPLICATIONS



## APPROVED TO RAIL STANDARDS

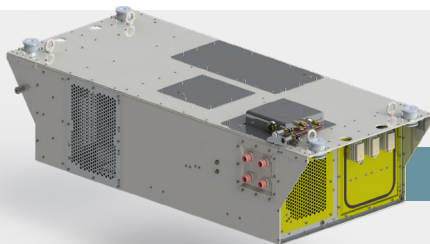
- BS EN 61373 2010** - Shock and Vibration Testing
- BS EN 50155 2017** - Electronic equipment
- BS EN 50126** - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS)
- BS EN 50121-3-2 2016** - Electromagnetic compatibility
- BS EN 45545** - Fire protection on Railway Vehicles
- BS EN 12663-1 2010+A1 2014** - Structural Requirements of Railway Bodies
- EN 50125 2014** - Environmental conditions for equipment
- BS EN 50153 2014 A1 2017** - Protective provisions relating to electrical hazards



**BC-6551-000**  
Active

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VAC)
2184 85.9	607 23.8	810 31.8	235 518	40 104	9 30709	5+5 17060+17060	400



**BC-6607-000**  
Active

UNDER FLOOR MOUNT

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VAC)
1960 77.1	820 32.2	490 19.2	180 396	40 - 45 104-113	10 34121	8.8 30026	400

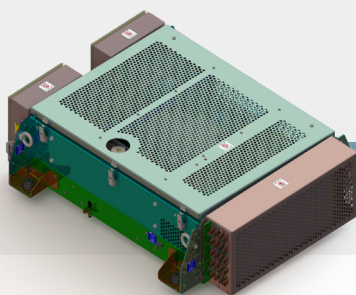


**BC-6531-000**  
Active

ROOF OR FLOOR MOUNT  
WITH CRADLE

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VAC)
1344 52.9	504 19.8	516 20.3	120 264	40 104	6 20472	5 17060	400



**BC-6639-000**  
Active

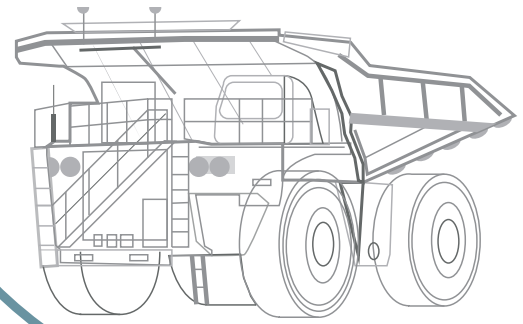
ROOF OR FLOOR MOUNT  
WITH CRADLE

## TECHNICAL SPECIFICATIONS

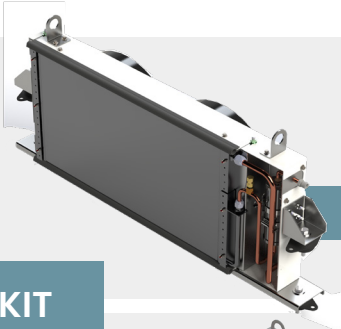
L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VAC)
1310 51.5	1020 40.1	310 12.2	150 330	40 104	7.5 25591	8 27297	400

# SOLUTIONS FOR OFF-HIGHWAY

OUR RANGE OF BTMS DESIGNED FOR OFF-HIGHWAY APPLICATIONS



GTS have a number of split systems for off-highway vehicles. The main advantage this offers is that the condenser and fan assembly can be installed in a location where there is greater air flow and the chiller section of the BTMS can be remotely mounted / packaged.



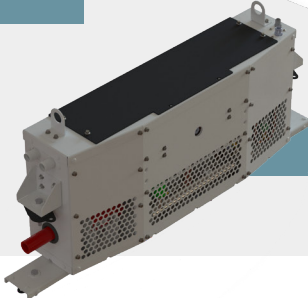
**HP-6483-000**

OPEN AREA INSTALLATION

KIT

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)
1035 40.7	460 18.1	197 7.7	28.6 63	-10 - +35 14 - 95



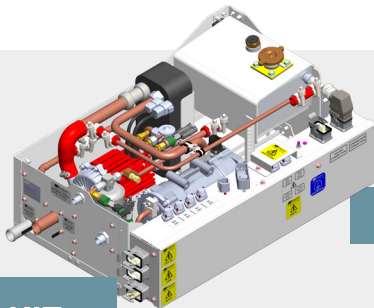
**BC-6482-000**

Active

REAR OF YEAR INSTALLATION

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VDC)
1110 43.7	206 8.1	563.5 22.1	57 125	-10 - +35 14 - 95	6 20472	3 10236	600



**HP-6145-000**

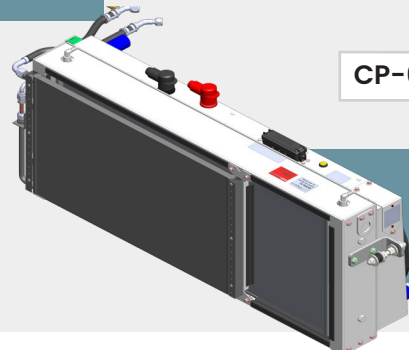
Active

INTERNAL INSTALLATION

KIT

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)	Nominal Voltage (VDC)
700 27.5	506.5 19.9	317 12.4	32.5 71	40 104	5 17060	3.6 12283	600



**CP-6512-000**

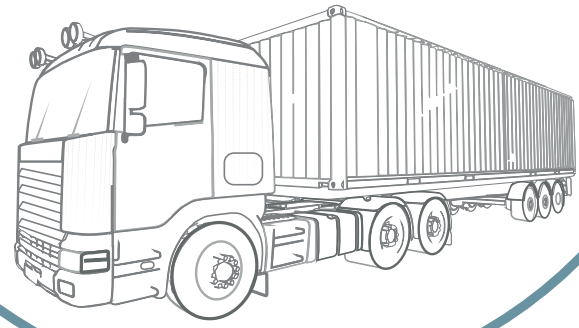
COMBINED CONDENSER AND POWER ELECTRONICS ASSEMBLY FOR ENERGY EFFICIENCY.

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)
767 30.1	506.5 19.9	317 12.4	32.5 71	30-40 86 - 104

# SOLUTIONS FOR COMMERCIAL VEHICLE

OUR RANGE OF BTMS DESIGNED FOR COMMERCIAL APPLICATIONS



**HP-6265-000**  
Active / Heating

REMOTE MOUNTED CONDENSER ASSEMBLY MUST BE SUPPLIED WITH THIS BTMS.

## TECHNICAL SPECIFICATIONS

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Heating (kW) (Btu/hr)
767 30.1	705 27.7	331 13.0	45 99	38 100	12 40945	3.6 12283

## V3 Controller



The GTS-V3 controller is principally used to control and optimize fan speed for our efficient electric fan cooling systems. Small and light enough to fight within the palm of your hand, it is part of our plug and play solutions.

### Controller Overview

The Grayson Thermal Systems GTS-V3 range of controllers have been developed to satisfy the need for a reliable thermal management system implementation.

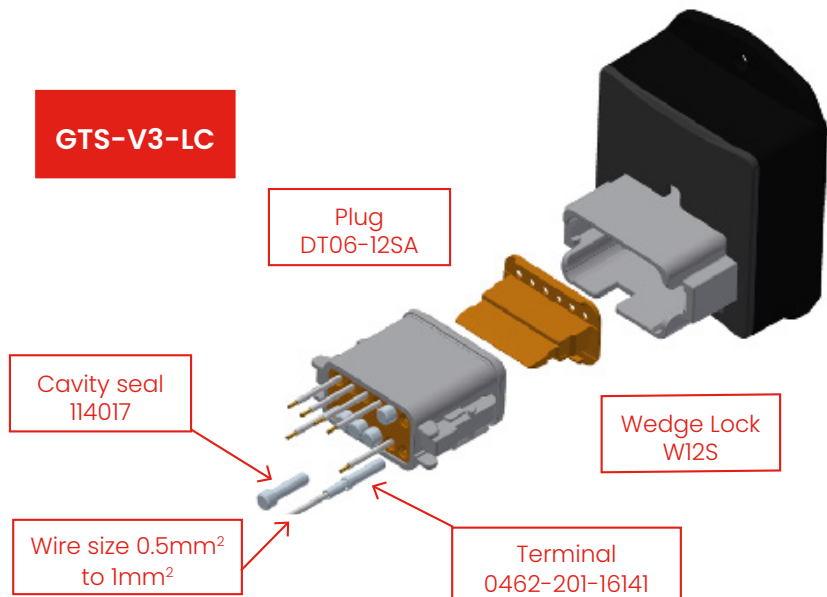
Three variants of the GTS-V3 have been introduced. Two CAN bus (J1939) capable versions which are compatible with common fan variants and a thermistor only version for aftermarket applications.

The GTS-V3 controller is E-marked and has deployed successfully all over the globe.

### Harness Integration

Original Deutsch parts should be used in the harness assembly to ensure long term reliability and IP67 rating.

Housing keying DT06-12SA/ DT06-12SB/ DT06-12SC.



# POWER ELECTRONICS COOLING

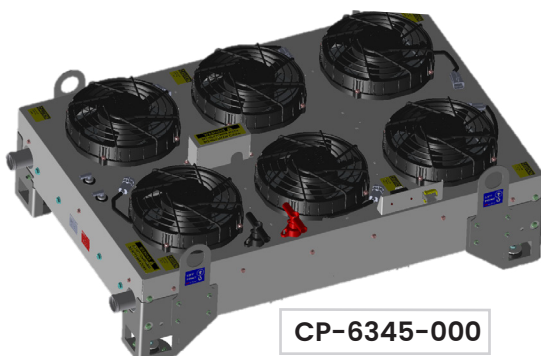
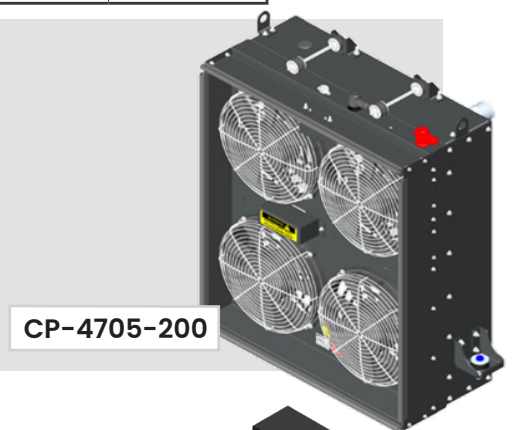
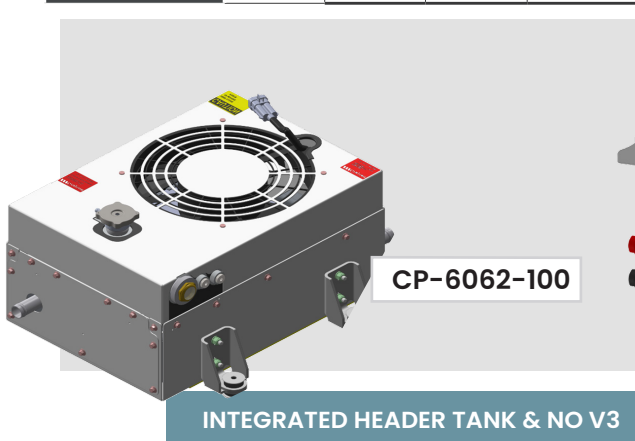
As electric traction systems become more complex GTS have a range of power electronics cooling systems suitable for a variety of applications across the bus and coach, off-highway, commercial vehicle and specialist vehicle sectors.

Starting from 1-fan systems all the way up to 6-fan systems configurable with integrated fan control (V3 controller) and header tanks, we are confident we will have a plug and play solution to meet your needs. To calculate the most suitable system for you based on the thermal performance requirements, all we need to know is ambient temperature limit, coolant flow rate (l/min), heat rejection (kW) and desired coolant temperature.

Taking a solution from our large range of existing products can provide you with the peace of mind that the system is reliable from a proven track record of operating across different vehicle markets worldwide.

## TECHNICAL SPECIFICATIONS

	L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling Capacity (kW) (BTU)	Coolant Flow (l/min)	Coolant Outlet Temperature (°C) (°F)
1 Fan CP-6082-100	530 20.8	371 14.6	230 9	29.5 65	46 114	6 20472	22l/min	55 131
2 Fan CP-6064-000	602 23.7	630 24.8	275 10.8	41.36 91	50 122	25 85303	40 l/min	73 163
3 Fan CP-4771-300	998 39.2	567 22.3	310 12.2	58.25 128	41 105	14 47769	63 l/min	50 122
4 Fan CP-4705-200	827 32.5	1081.5 42.5	393 15.4	110.24 243	48 118	100 341214	200 l/min	95 203
6 Fan CP-6345-000	1364 53.7	906 35.6	438 17.2	132.47 292	50 122	35 119424	50 l/min	55 131



**HIGH VOLTAGE UNIT  
CP-4465-000  
400VAC 3 PHASE**

L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Coolant Flow (l/min)	Coolant Outlet Temperature (°C) (°F)
725 28.5	869 34.2	305 12.0	59.8 131	41 105	20 68242	50 l/min	59 138





# HYDROGEN FUEL CELL COOLING

We have a range of hydrogen fuel cell cooling solutions for fuel cells up to 100kW power output for different vehicle sectors and a proven track record for expertly integrating systems that offer a flexible design and packaging to suit the OEM requirements.

Our range of lightweight and efficient heat exchanger platforms compliment the electric fan airflow characteristics meaning we can offer modular cooling solutions to achieve the parameters set out by fuel cell manufacturers.

Used in conjunction with the GTS Smart CAN Controller, fan RPMs are controlled to achieve the desired coolant temperature providing better efficiency of power consumption which also leads to quieter operation.

Our heat exchangers are compatible with the use of de-ionised water and we also have the know-how to recycle waste heat from the Fuel Cells into the vehicle HVAC system, saving power and creating a more efficient heat pump system for the vehicle.

## TECHNICAL SPECIFICATIONS

	L (mm) (Inch)	W (mm) (Inch)	D (mm) (Inch)	Weight (kg) (lb)	Amb Capability (°C) (°F)	Cooling (kW) (Btu/hr)	Coolant Flow (l/min)	Coolant Outlet Temperature (°C) (°F)
3 Fan CP-4900-000	270 10.6	1190 46.8	476 18.7	29.5 65	40 104	40 136485	247 l/min	59 138
3 Fan CP-4771-300	602 23.7	630 24.8	275 10.8	41.36 91	50 122	25 85303	63 l/min	50 122
4 Fan CP-6622-000	908 35.7	808 31.8	258 10.1	62.3 137	41 105.8	45 153546	150 l/min	59 138
6 Fan CP-6267-000	1301 51.2	870 34.2	413 16.2	130.5 287	40 104	120 409456	133 l/min	59 138



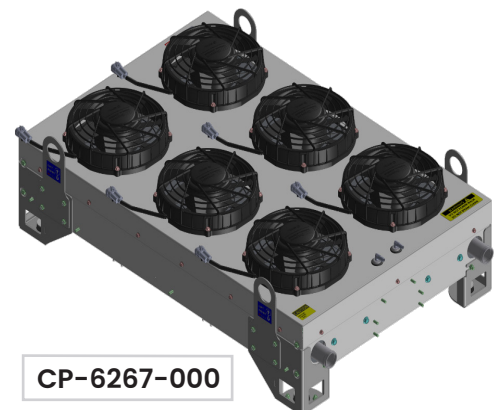
CP-4771-300



CP-4900-000



CP-6622-000



CP-6267-000

# ADDITIONAL GRAYSON PRODUCTS

## eComfort 100

Our Grayson eComfort 100 is a driver cabin reversible heat pump capable of heating, cooling and ventilating. A critical requirement for any transit bus operator of electric vehicles.

The benefits of our system are it is a lightweight solution which is delivered in an extremely low package height of 200mm. Simple fit and forget system delivered fully charged and ready to go with 24V DC or 600V AC



## eComfort 300

The new Grayson eComfort 300 will provide advanced passenger heating and cooling (HVAC) for electric buses, utilising high-efficiency reversible heat pump technology. Its modular construction means the new range of E-Bus Heat Pump has the option to include Battery Thermal Management System with heat recovery, which minimises waste.

One of the main benefits of the eComfort 300 is the innovative air island distribution for single-deck vehicles, dramatically reducing energy consumption and thermal losses. At Grayson, we offer all customers the flexibility of design and functionality to ensure we meet all system requirements without compromising on performance or quality. The C300 also has the capability to operate in 100% fresh air mode to provide passenger protection from Covid 19.



# E-Drive

The E-Drive (Electric Fan Cooling System) is designed to work only when required. It lowers running costs, and environmental impact. Our unique configuration will ensure that energy is not wasted and fuel savings of up to 10% can be achieved.

The E-Drive is designed to customer specifications to include up to 20 fans which only operate when required. The reduced energy loss improves engine efficiency through more accurate control of engine temperatures. The system is ideal for retrofitting and refurbishing within existing fleets, as well as new applications.

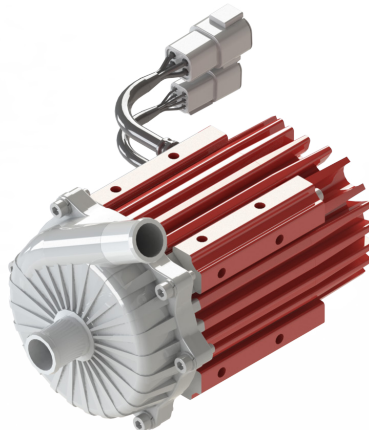


# Electric Water Pump

Grayson Thermal Systems 24V electric water ethylene-glycol (WEG) pump has been developed specifically for hybrid and electric vehicle applications.

The pump, suitable for a global use in a variety of operating and environmental territories, is lightweight whilst offering long motor life, variable flow control and exceptional corrosion and water resistance.

Mounted in a number of orientations, without impacting reliability or performance.



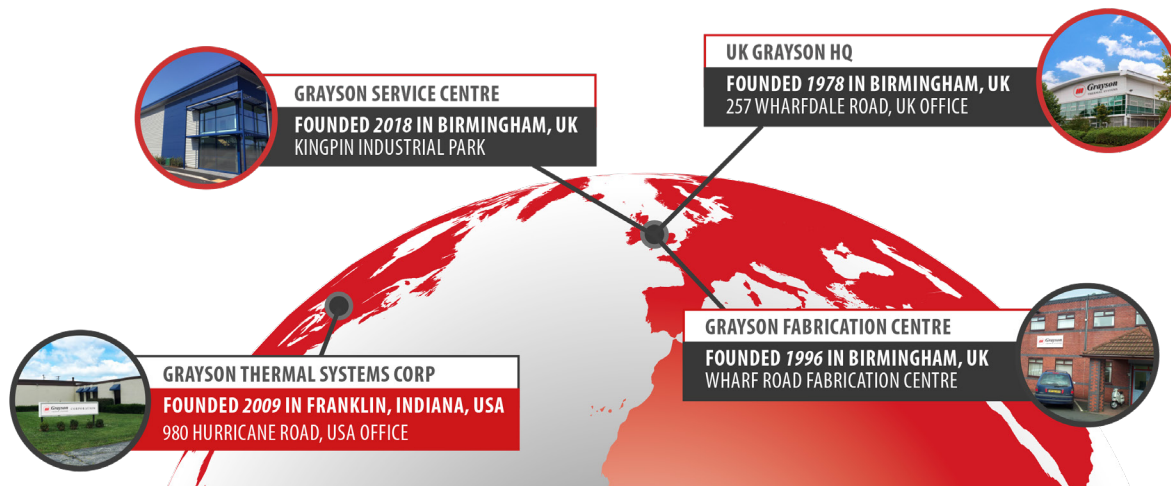
# WHO WE ARE

Grayson are a specialist engineering company with a strong reputation for quality, innovation and working in partnership with customers. We pride ourselves in being able to develop and supply solutions to specific business issues.

We design and manufacture OE and aftermarket cooling and heating products for bus and coach, specialist off-road vehicles and commercial vehicles. Our customers include some of the best known OE manufacturers and vehicle operators.

We are a proud Birmingham business with two extensive manufacturing facilities, dedicated engineering, research and test operations, and a separate service centre. From the heart of England, we serve customers in Britain and right around the globe. Client locations range from China, the US, Eastern and Central Europe and New Zealand. We have opened Grayson North America Corporation, and plan a further programme of satellite businesses across the world.

Grayson has come a long way since 1978 when chairman, Graham Hateley, opened a radiator repair business from a small unit in Hay Mills, Birmingham. Now, we are a proud family-run business with an excess of 290 employees across two continents. Our employees include three generations of the Hateley family.



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B11 2DP

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**e** sales@graysonts.com   **w** graysonts.com



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IN 46131

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**w** graysonts.com