

Electric Components:

Electric Powertrain:

Internal permanent magnet motor utilizing inner rotor topology which produces high torque and power density. The motor also includes a robust thermal protection system that is tied-into the vehicle cooling system.

Peak Power: 250 kW (335hp)

Continuous Power: 160kW (215hp)

Peak Torque: 15,700 Nm (11,579 ft-lbs)

Continuous Torque: 2100 Nm (1549 ft-lbs)

On Board Charging System:

The vehicle has a 20 kW unidirectional AC charging and up to 150kW DC charging system. The DC charging system is capable of bi-directionality pending the regulation for vehicle to grid.

The coupler conforms to the most recent J1772 Combo CCS1 SAE standard. Note that the nominal battery voltage system is 608V, therefore the EVSE needs to be capable of voltages of approximately 700V.

All charging components will have UL/CSA Certification. All charging system components shall meet or exceed the most current SAE standards and comply with IEEE standards and will be capable of operating from -30 to -40c with no more than 10% degradation in performance and be capable of supporting the most recent SAE J1772 standard and DC level II SAE combo coupler capable of 90KW of power transfer at 200 Amps.

The charging operation assumes that battery is pre-heated to 0 deg C. Energy consumption to heat or cool the battery during charging as well as any temperature related variation in the system is within 10% of the performance (estimated).

Batteries:

The Battery System consist of 2 Strings of 3 Battery Packs each achieve a total capacity of 210kWh and a nominal voltage of 608V. Each Pack has a 1P63S cell configuration. The cells are prismatic and use LFP chemistry.

Lithium-Ion Batteries (6), 210 kWh total, 608V, 345Ah total

Vehicle efficiency: 0.84 kWh/km

Level 2 charge time: $20\text{kW} \times T = 60\% \times 210\text{kWh}$, $T = 378$ minutes

Useable capacity = $70\% \times 210\text{kWh} = 147$ kWh

Pack C-Rate = 1 (continuous discharge)

Pack C-Rate = 0.7 (continuous charge)

Pack E-Rate = In development with supplier.

Charge/ discharge cycles 4,000 cycles, 80% DOD

Battery storage temperature is -35C ... +65C

Battery Discharge range -35 C ... +65C

Battery Charge range 0C... +65C

When vehicle is not in use during cold temperatures it is recommended to keep battery temp above 0C by keeping the vehicle plugged in. When vehicle is in use, the vehicle BMS will control temperature.

There are no additional maintenance or operational requirements.

Rear Axle

23,000 Rear Axle is Standard on Electric CE's

Heating:

The vehicle will come equipped with a dual heating system that includes both an electric and fuel fired heating units. Both systems will operate on a closed loop and will be seamless to the operator. The electric heater (21kW) comfort down to -10C (14F) ambient temperature. Comfort defined by 65-75F interior temperature. The electric heater is critical for preheating the cabin and batteries while the vehicle is on charge. Range degradation using the electric heating system will be expected. The use of the fuel fired heating system is recommended in cold climates where range degradation is a concern.

See attachments for heater specifications.

Prepared For:

Ministry Of Education
Joel Palmer
PO Box 9151, Stn Prov Govt
Victoria, BC V8W 9H1
(250)356 - 2362
Reference ID: 2021 eCE decont

Presented By:

WESTERN CDN IC BUS INC.
Joel Landry
16103 66TH STREET
EDMONTON AB T5E 5S7
(403)346-4321

Thank you for the opportunity to provide you with the following quotation on a new IC Corporation vehicle. I am sure the following detailed specification will meet your operational requirements, and I look forward to serving your business needs.

Model Profile
2021 INTEGRATED CE S BUS (PB105)

APPLICATION:	School Transportation
MISSION:	Requested GVWR: 31000. Calc. GVWR: 0 Calc. Start / Grade Ability: 0.00% / 0.00% @ 0 MPH Calc. Geared Speed: N/A
DIMENSION:	Wheelbase: 276.00, CA: N/A, Axle to Frame: 157.00
AXLE, FRONT NON-DRIVING:	{Meritor MFS-10-122A} I-Beam Type, 10,000-lb Capacity
TIRE, FRONT:	(2) 11R22.5 Load Range H AH37 (HANKOOK), 499 rev/mile, 75 MPH, All-Position
TIRE, REAR:	(4) 11R22.5 Load Range H DH37 (HANKOOK), 497 rev/mile, 75 MPH, Drive
SUSPENSION, REAR, AIR, SINGLE:	{International IROS} 21,000-lb Capacity, 9.25" Ride Height, with Shock Absorbers
PAINT:	Cab schematic 272NB Location 1: 4421, School Bus Yellow (Std) Location 2: 0011, Blk Non Ref (Nrf) Chassis schematic N/A

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

<u>Code</u>	<u>Description</u>
PB10500	Base Chassis, Model INTEGRATED CE S BUS with 276.00 Wheelbase, N/A CA, and 157.00 Axle to Frame.
1CAC	FRAME RAILS High Strength Low Alloy Steel (50,000 PSI Yield); 10.125" x 3.062" x 0.312" (257.2mm x 77.8mm x 8.0mm); 480.1" (12195mm) Maximum OAL <u>Includes</u> : CHASSIS PAINT Chassis Painted Prior to Body Mounting : FRAME RAILS All holes Laser Aligned and Machine Punched, Powder Coated Prior to Full Assembly, Assembled in Fixture using "Grade 8" Bolts : FRAME REINFORCEMENT, SPECIAL 3.30" x 1.80" x 0.312" x 31.50" Inverted "L" in Front Shock Absorber Mounting Area
1LLE	BUMPER, FRONT Contoured, Steel, Severe Duty <u>Includes</u> : BUMPER, FRONT THICKNESS 1/4 Inch
1LNW	CROSSING GATE, FRONT Air, Yellow Blade, Bumper Mounted <u>Includes</u> : CONTROL ASSEMBLY Located Rear of Front Bumper, Heater not Required : CROSSING GATE, FRONT Matches Contour of Bumper
1SAM	CROSSMEMBER, REAR, AF (2)
1WJE	WHEELBASE RANGE 276" (700cm) Only
2ASH	AXLE, FRONT NON-DRIVING {Meritor MFS-10-122A} I-Beam Type, 10,000-lb Capacity <u>Includes</u> : AXLE, FRONT SQUARING to Plus or Minus .015 Inch, using a Special Fixture to Assure Parallelism of Springs <u>Notes</u> : The following features should be considered when calculating Front GAWR: Front Axles; Front Suspension; Brake System; Brakes, Front Air Cam; Wheels; Tires.
3ADB	SUSPENSION, FRONT, SPRING Parabolic Taper Leaf, Shackle Type, 10,000-lb Capacity, with Shock Absorbers <u>Includes</u> : SPRING PINS Bolt and Nut Type : SPRING PINS Rubber Bushings, Maintenance-Free <u>Notes</u> : The following features should be considered when calculating Front GAWR: Front Axles; Front Suspension; Brake System; Brakes, Front Air Cam; Wheels; Tires.
4091	BRAKE SYSTEM, AIR Dual System for Straight Truck Applications <u>Includes</u> : BRAKE LINES Color and Size Coded Nylon : DRAIN VALVE Twist-Type : GAUGE, AIR PRESSURE (2) Air 1 and Air 2 Gauges; Located in Instrument Cluster : PARKING BRAKE CONTROL Yellow Knob, Located on Instrument Panel : PARKING BRAKE VALVE For Truck : QUICK RELEASE VALVE On Rear Axle for Spring Brake Release: 1 for 4x2, 2 for 6x4 : SLACK ADJUSTERS, FRONT Automatic (with Air Cam Brakes) : SLACK ADJUSTERS, REAR Automatic (with Air Cam Brakes) : SPRING BRAKE MODULATOR VALVE R-7 for 4x2, SR-7 with relay valve for 6x4/8x6 <u>Notes</u> : Rear Axle is Limited to 19,000-LB GAWR with Code 04091 BRAKE SYSTEM, AIR and Code 04NDC BRAKES, REAR, AIR CAM Regardless of Axle/Suspension Ordered

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

<u>Code</u>	<u>Description</u>
	: Rear Axle is Limited to 20,000-LB GAWR with Code 04092 BRAKE SYSTEM, AIR and Code 04NCW BRAKES, REAR, AIR CAM Regardless of Axle/Suspension Ordered
4732	DRAIN VALVE {Berg} with Pull Chain, for Air Tank
4AZS	AIR BRAKE ABS {Bendix AntiLock Brake System} 4-Channel (4 Sensor/4 Modulator) Electronic Stability Program, with Automatic Traction Control
4EBS	AIR DRYER {Bendix AD-9} with Heater
4EXP	BRAKE CHAMBERS, FRONT AXLE {Bendix} 20 SqIn
4EXU	BRAKE CHAMBERS, REAR AXLE {Bendix EverSure} 30/30 Spring Brake
4JCJ	BRAKES, FRONT, AIR CAM S-Cam; 16.5" x 5.0"; Includes 20 Sq. In. Long Stroke Brake Chambers
	<u>Notes</u>
	: The following features should be considered when calculating Front GAWR: Front Axles; Front Suspension; Brake System; Brakes, Front Air Cam; Wheels; Tires.
4NDB	BRAKES, REAR, AIR CAM S-Cam; 16.5" x 7.0"; Includes 30/30 Sq.In. Long Stroke Brake Chamber and Spring Actuated Parking Brake
	<u>Notes</u>
	: The following features should be considered when calculating Front GAWR: Front Axles; Front Suspension; Brake System; Brakes, Front Air Cam; Wheels; Tires.
4VCY	AIR TANK LOCATION (1) Mounted Left Side to Provide Clearance for Larger Body Builder Supplied Battery Box
4WDM	DUST SHIELDS, REAR BRAKE for Air Brakes
4WZT	GVWR LIMITATION FOR BUS with Air Brakes, Limited to 33,000-lbs Maximum to meet FMVSS 121 Requirements, for Conventional Bus
5708	STEERING COLUMN Tilting
5CAL	STEERING WHEEL 2-Spoke, 18" Dia., Black
8000	ELECTRICAL SYSTEM 12-Volt, Standard Equipment
	<u>Includes</u>
	: FUSES, ELECTRICAL SAE Blade-Type
	: HAZARD SWITCH Push On/Push Off, Located on Top of Steering Column Cover
	: HEADLIGHT DIMMER SWITCH Integral with Turn Signal Lever
	: MISCELLANEOUS FEATURES Modular, Loom Protected, Grommets in all Applicable Body Openings, Assembled in Computer Assisted Fixture which Verifies Continuity and Correct Assembly Prior to Installation
	: PARKING LIGHT Integral with Front Turn Signal and Rear Tail Light
	: STARTER SWITCH Electric, Key Operated
	: TURN SIGNAL FLASHER
	: TURN SIGNAL SWITCH Self-Cancelling with Lane Change Feature
	: TURN SIGNALS, FRONT Includes Reflectors; Flush Mounted
	: WINDSHIELD WIPER SWITCH 2-Speed with Wash and Intermittent Feature (5 Pre-Set Delays), Integral with Turn Signal Lever
	: WIRING, CHASSIS Color Coded and Continuously Numbered
8TUT	COLLISION MITIGATION SYSTEM Omit
8VAZ	HORN, ELECTRIC (2) Trumpet Style, Mounted on Top of Mega-Bracket
8WPB	HEADLIGHTS Halogen, Composite Aero Design, with Daytime Running Lights
8WPY	WIRING MODIFICATIONS Includes Headlights, Tail Lights, Park/Marker Lights, and Panel Lights To Function with Ignition Key Switch On and Headlight Switch Off

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

<u>Code</u>	<u>Description</u>
8WXB	HEADLIGHT WARNING BUZZER Sounds When Head Light Switch is on and Ignition Switch is in "Off" Position
9WAB	HOOD TILT ASSIST {EASY TILT} Mechanical
9WAY	FRONT END Tilting, Fiberglass, with Three Piece Construction
	<u>Includes</u> : AIR INTAKE SYSTEM Integrated Pre-Cleaning System to Enhance Air Filter Life : GRILLE Removable; Fiberglass Painted Hood Color : SPLASH SHIELD Integral with Front End Assembly
10020	CHASSIS PAINT Full Chassis
10072	PAINT SCHEMATIC, PT-1 Two Tone, Design 272.
10661	PAINT, NON-REFLECTING Non-Reflecting Paint
10788	PAINT TYPE Urethane, One or Two Colors, Other than Imron or International.
12703	ANTI-FREEZE Red, Extended Life Coolant; To -40 Degrees F/ -40 Degrees C, Freeze Protection
12VVN	CRUISE CONTROL Electronic
	<u>Notes</u> : Cruise Control Switches Mounted on Steering Wheel are Non-Illuminated.
14TBS	SUSPENSION, REAR, AIR, SINGLE {International IROS} 21,000-lb Capacity, 9.25" Ride Height, with Shock Absorbers
	<u>Notes</u> : The following features should be considered when calculating Rear GAWR: Rear Axles; Rear Suspension; Brake System; Brakes, Rear Air Cam; Brake Shoes, Rear; Special Rating, GAWR; Wheels; Tires.
16010	COWL Flat Back
16HBB	GAUGE CLUSTER English with Metric Electronic Speedometer
	<u>Includes</u> : GAUGE CLUSTER (5) Engine Oil Pressure (Electronic), Water Temperature (Electronic), Fuel (Electronic), Tachometer (Electronic), Voltmeter : ODOMETER DISPLAY, Miles, Trip Miles, Engine Hours, Trip Hours, Fault Code Readout : WARNING SYSTEM Low Fuel, Low Oil Pressure, High Engine Coolant Temp, and Low Battery Voltage (Visual and Audible)
	<u>Notes</u> : Standard in Canada
16HKT	IP CLUSTER DISPLAY On Board Diagnostics Display of Fault Codes in Gauge Cluster
16HLJ	GAUGE, DEF FLUID LEVEL
16VCD	DASH INSULATOR
27DUW	WHEELS, FRONT {Accuride 51408} DISC; 22.5x8.25 Rims, Powder Coat Steel, 2-Hand Hole, 10-Stud, 285.75mm BC, Hub-Piloted, Flanged Nut, with Steel Hubs
28DUW	WHEELS, REAR {Accuride 51408} DUAL DISC; 22.5x8.25 Rims, Powder Coat Steel, 2-Hand Hole, 10-Stud, 285.75mm BC, Hub-Piloted, Flanged Nut, with Steel Hubs
29580	WHEEL SEALS, FRONT {International} Oil-Lubricated Wheel Bearings
47AGK	BODY, BUS Conventional; 78" Headroom, 34'2" Body Length, 77 Passenger, 276" WB
47AJC	BODY TAG, METAL Capacity to Include the Total Number of Passengers
47AJR	BODY VIN TAG On Windshield Ledge, Visible From Outside

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

Code	Description
47AKK	STEP, FRONT ENTRANCE DOOR 25 3/4" Depth; 14ga Steel <u>Includes</u> : STEP, FRONT ENTRANCE DOOR OPENING, 35 Inch Width; Continuous Bottom to Top
47ALP	INTERLOCK, STARTER with Key Switch, Electric Entrance Door with Vandal Locks, Outward Opening
47APR	HEADLINER, BODY Conventional; 25'11"-34'11" Body Length, Perforated Full Length with Sound Insulation Full Length
47APX	FASTENERS, HEADLINER Screws
47ARH	BOWS, ROOF 14 ga., One Piece Construction <u>Includes</u> : BOWS, ROOF Positioned Floor Line to Floor Line, Threaded Through Roof Strainers and Drip Rail
47ARP	LIGHT BARS Plastic
47ASG	SKIRT, BODY for Conventional, 14 1/2", 16ga <u>Includes</u> : SKIRT, BODY Extra Smooth Steel Supported by Floor Gussets
47ASL	LETTERS, DOOR, REAR Decals; "EMERGENCY DOOR", 2" Black Letters Inside and Outside for Canada (DUAL LANGUAGE)
47ASM	LETTERS, SCHOOL BUS FRONT/REAR Decal; "SCHOOL BUS", with 8" Black Reflective Letters, Diamond Grade, On Front and Rear Cap 1-1/4" Brush Stroke for Canada
47ASN	LETTERS, HEADER Decal; "WATCH YOUR STEP", 1" Black, Above Windshield, (Dual Language) For Canada
47AUR	TIE DOWNS, BODY Grade 8 Bolts, Every Body Section <u>Includes</u> : TIE DOWNS, BODY with Formed Tab that Fits into Floor Structure to Prevent Turning
47AXT	RUB RAILS, BODY (4) Conventional; Steel, 31'2", 31'11", 32'8", 33'5", 34'2", 34'11", Body Length, Includes Snow Rail <u>Includes</u> : RUB RAILS Full Length, Primer Coated (Both Sides), Attached to Body without Cuts or Splices
47AYB	BODY, REAR Includes Emergency Door <u>Includes</u> : DOOR, REAR EMERGENCY with Concealed Hinges : HEADER BUMPER Padded, Mounted Over Rear Door; Upholstered to Match Passenger Seat Color
47AZE	SIDE SHEET, BODY, EXTERIOR Conventional, 16ga., Smooth, 31'2", 31'11", 32'8", 33'5", 34'2", 34'11", Body Length
47AZL	FLOOR, BODY with Wheel Wells
47BAK	BUMPER, REAR Painted, 12" High, 3/16" Thick
47BAR	SUPPORTS, REAR BUMPER Bolted to Frame
47BAW	TOW HOOK, LEFT REAR (01)
47BAX	TOW HOOK, RIGHT REAR (01)
47BBH	LINING, SIDE INTERIOR, LOWER Embossed Steel, Clear Coated
47BBZ	SEALER Extra; Sidewall to Floor, In Wheel Pocket Area, and Rear Wall to Floor

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

Code	Description
47BCV	CONTROL, CHASSIS AIR DRAIN Clip and Cable for Remote Operation of Chassis Air Tank Drain Valve, with 1 Berg Pull Chain
47BJR	WASTE CONTAINER Removable Dry, 7 Quart Capacity, Located in Driver Area
47BLG	LETTERS, STEPWELL Decal, "WATCH YOUR STEP", 2.0" Black Lettering, Behind Door on Step Riser, (Dual Language) for Canada
47BLT	BROOM HOLDER Mounted to Corner of Driver Heater, Beside Driver
47DAJ	COVER, REAR DOOR INSIDE HANDLE Partial Coverage
47DAK	FASTENERS, REAR DOOR Bolts and Nutserts, Rear Door To Body
47DDE	HANDLE, ASSIST, ENTRANCE DOOR Outside Entrance
47DDH	HOLD BACK, REAR DOOR Stationary, No Cables, with Plastic Cover
47DDV	LATCH, REAR DOOR Three Point Slide Bar, Cam Operated, with One Inch Stroke
47DEK	LOCK, VANDAL, REAR DOOR with Ignition Starter Interlock
47DEY	HANDLE, EXTERIOR, REAR Emergency Door; Yellow
47DNB	DOOR, ENTRANCE, FRONT Electric, Outward Opening, with Split Pane Glass <u>Includes</u> : DOOR, ENTRANCE, FRONT Aluminum Frame with Pin Style Hinges, Ball Bearing Assisted, Interchangeable Top and Bottom Glass Vandal Lock : LOCK, VANDAL, ENTRANCE DOOR With Key Switch
47DNK	SWITCH, LOCATION Steering Wheel; Includes Master Flasher, Flasher On/Off, Red Override, and Door Control <u>Includes</u> : SWITCH, STEERING WHEEL, LIGHT Includes Illuminated Switches
47DRW	RELEASE, ENTRANCE DR EXTERIOR Manual Door Control Right Front Electric Entrance Door
47EUT	COMPARTMENT, LUGGAGE, RT FWD 87"x 24" x 22" <u>Includes</u> : HINGES Rubber : LATCH, T-HANDLE, LOCKING Stainless Steel
47EWS	LOCK, VANDAL, ENTRANCE DOOR , Electric Close Only with Toggle Switch
47KCU	BODY CERTIFICATION TAG Mylar Label; For Canada (DUAL LANGUAGE); with Actual Tire Load Rating
47KDN	STRIPING, SEATLINE {3M} 1" Yellow Fluorescent Diamond Grade, with 90% of Body Compartment Outlined, for Canada
47KDV	LETTERS, INTERIOR Decal; Canada D-250-16 Label, Black Letters on White Background, for Dual Language English/French
47LAT	NOISE REDUCTION, ROOF BOW Conventional; Insulation, 31'2", 31'11", 32'8", 33'5", 34'2", 34'11", Body Lengths
47LAU	INSULATION, ROOF AND SIDES 1.50", All Models
47MBA	UNDERCOAT, BODY Fire Resistant, Water Based, TT-C-730 Spec <u>Includes</u> : UNDERCOATING Performed Before and After Mounting on Chassis
47MBC	INSULATION, STEPWELL

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

Code	Description
47MNT	ARROW, RR DOOR, INSIDE Decal; Red, .75" Stroke, Indicating Handle Direction
47MNV	ARROW, RR DOOR, OUTSIDE Decal; Black .75" Stroke, Indicating Handle Direction
47MTY	WIRING DIAGRAM Schematic, Electrical
	<u>Includes</u> : ACCESS PANEL for Wiring Diagram Schematic Located on Body Exterior; Below Driver Window
47MZA	MONITOR, POST TRIP INSPECTION Omit
47MZC	STRIPING, E/E WINDOW, LEFT (01) Perimeter, Omit
47MZD	STRIPING, E/E WINDOW, RIGHT (01) Perimeter, Omit
47MZE	STRIPING, PERIMETER, REAR Omit Emergency Door
47MZK	LETTERS, SIGN, REAR Decal, "DO NOT PASS WHEN RED LIGHTS FLASHING", 5" Max Letters
47MZR	PAINT, HOOD LOGO ADAPTOR PLATE 0011 Black, Non-Reflective
47NAB	PAINT COLOR, RUB RAILS 0001 Canyon Black
47NGS	PAINT HOOD TOP 0011 Non-Reflecting Black
47NGW	SEAL, RUB RAILS Top Edge, All Rails
47NJA	PAINT COLOR, BODY EXTERIOR 4421 School Bus Yellow
47NJM	PAINT FLASHER BACKGRD 0001 Canyon Black
47NJS	PAINT COLOR, BUMPER Rear, 0001 Canyon Black
47NKL	PAINT, RUB RAIL Flange to Flange
47NKM	PAINT COLOR, BODY INTERIOR 9384 Spring White
47NTH	LOGO, ROOF LINE Decal; Wing and Shield, Above First Passenger Window Both Sides
47NUA	LETTERS, E/E WINDOW, RIGHT (2) Decal Sets, "EMERGENCY EXIT", Black, Inside and Outside (Dual Language) for Canada
47NUC	OPERATING INSTR, REAR Decal, Inside Rear Emergency Door (Dual Language) for Canada
47NUG	LETTERS, E/E WINDOW, LEFT (2) Decal Sets, "EMERGENCY EXIT", Black Inside and Outside (Dual Language) for Canada
47NWS	STRIPING, REAR END {3M} Yellow Fluorescent Diamond Grade, 1" Horizontal and 2" Vertical
47PBZ	HANDLE, ASSIST Windshield Side Mounted, Left and Right, Body Color
47SBS	SUB FLOOR, PLYWOOD Conventional; B-C Exterior Grade, Less Sealed Edges, 5/8", 5 Ply, for 31'2",31'11", 32'8",33'5", 34'2", 34'11", Body Length
47SPL	ALPHA/NUMERIC DECAL GUIDE Quantity 101-110
48ACN	SEAT BELT, DRIVER, COLOR with Blaze Orange Seat Belt Webbing
48ANW	WINDOW, DRIVER Storm
48APP	WINDOW, STOPS 9" Opening
48APX	WINDOW, ENTRANCE DOOR, TOP Storm, Clear, Tempered
48APY	WINDOW, ENTRANCE DOOR, BOTTOM Storm, Clear, Tempered
48ART	WINDOW, SASH (19) 27" Sections, 9"x 23" Opening
48ASP	WINDOW, SASH +9 SECTIONS (2) 9" x 32 1/4" Opening

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

<u>Code</u>	<u>Description</u>
48BAH	WINDOW, E/E, LEFT (2) Vertical Hinge
48BJA	COLOR, WINDOW FRAME, PASS Passenger Window, Natural Aluminum Finish
48BKP	WINDOW, E/E, RIGHT (2) Vertical Hinge
48BUB	WINDOW, PASSENGER, TINT Conventional; 28% Light, Tempered Glass, 78" Headroom, with 34'11", 31'2", 31'11", 32'8", 33'5", 34'2" Body Lengths
48BXD	SEAT,UCRA,LT,39",2 LEG (02); with 2 UCRA Position per Seat
48BXV	SEAT,UCRA,RT,39",2 LEG (02); with 2 UCRA Position per Seat
48DML	ANCHOR, TETHER UCRA (8)
48NAT	FITTINGS, AIR SEAT for Driver Seat
48PAM	WINDSHIELD 3 Flat Pieces, 73% Light, with Band
48PAV	WHEEL POCKET COVER Plastic, ABS
48PAY	AISLE POSITION Center, for balanced seating
48PBE	FLOOR COVERING, COLOR Light Gray #788
48PJR	FLOOR COVERING, TRIM Aluminum
48PJZ	FLOOR COVERING, TYPE {Koroseal} All Body Lengths
48PKC	HOSE CLAMPS, HEATER HOSE Constant Torque for Heater System
48PKN	FAN, DEFOG FAR RIGHT (01) Black, Mounted Right Above Windshield, Forward Entrance Door, 2-Speed Switch in Panel
48PKS	FAN, DEFOG RIGHT CENTER 6.50" Diameter, Black, Mounted Over Windshield, 15" Right of Centerline, 2-Speed Switch in Panel
48PLK	GRILLE, STATIC VENT, FRONT Adjustable with Screen, Requires Vent
48PPS	ROOF VENT, FRONT Static
48PTT	ARM REST, DRIVER, RIGHT {National}
48PUT	NUTS, BELT MOUNTING Standard Nuts For Seat Belt Mounting
48PVA	UPHOLSTERY, DRIVER SEAT, STYLE Plain, with Cloth Insert
48PVN	UPHOLSTERY, DRIVER SEAT, COLOR Drivers Seat, Gray
48PWD	UPHOLSTERY, PASS SEATS, COLOR Gray, for Seats, Barriers and Head Bumpers
48PWN	UPHOLSTERY, DRIVER SEAT, TYPE Vinyl, 42 oz.
48PXA	UPHOLSTERY, BARRIER, TYPE (1-2) Vinyl, 42 oz.
48RAE	BARRIER, CRASH, AFT ENTRY DOOR 39", 1 Leg
48RAL	BARRIER, CRASH, AFT DRIVER 39", 1 Leg
48REP	PANEL, MODESTY, AFT OF DRIVER Mounted Under Barrier
48RET	PANEL, MODESTY, AFT ENTR DOOR Mounted Under Barrier
48RLX	CUSHION, SEAT 15" Depth
	<u>Includes</u> : WARRANTY Four Years
48RRA	UPHOLSTERY, SEAT, STITCHING Single

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

<u>Code</u>	<u>Description</u>
	<u>Includes</u> : WARRANTY Two Years
48RYW	SEAT, DRIVER {National 2000} Air Suspension, High Back with Integral Headrest, Isolated, with 2 Position Front Cushion Adjustment, 6 to 17 Degree Seat Back Adjustment, Mechanical Lumbar Support, Includes Additional Back Padding <u>Includes</u> : SEAT BELT, DRIVER Adjustable D-Loop Seat Belt, Single Locking Retractor
48RZJ	STEP TREADS {Koroseal} Pebble Top with White Nosing, with Non-Metal Backing
48SAD	SEAT,PASS,LT,26",2 LEG (01)
48SBG	UPHOLSTERY, PASS SEATS, TYPE Vinyl, 42 Ounce
48SDT	SEAT,PASS,LT,39",2 LEG (10) <u>Notes</u> : BTI Seating System Base Seat. Retrofittable, Contact IC Bus Application Engineering for more information.
48SGA	SEAT,PASS,RT,30",2 LEG (01)
48SKL	SEAT,PASS,RT,39",2 LEG (10) <u>Notes</u> : BTI Seating System Base Seat. Retrofittable, Contact IC Bus Application Engineering for more information.
48USA	ROOF HATCH, FRONT {Transpec 1175-028-0122-03} (1) Triple Value, for CSA D250, Includes French and English Decals
48USB	ROOF HATCH, REAR {Transpec 1175-028-0122-03} (1) Triple Value, for CSA D250, Includes French and English Decals
48USV	SEAT BACK, PASSENGER High Back
48UYW	HAND RAIL, ENTRANCE DOOR, AFT Stainless Steel, 28" Above Floor
49005	BODY PLAN, APPROVED VARIATION Number 005
49AAZ	SWITCH, INTERRUPT CROSS GATE Single Cycle; with Auto Reset, Located In Driver Compartment
49ABE	WIRING MOD, BACK UP LIGHTS Connected to Rear Emergency Door Switch to Activate Backup Lights on the Rear Panel Only
49ADX	LIGHTS, TAIL, LICENSE PLATE (2) 4" Red with Light Window
49AHV	LIGHT, STROBE, STOP SIGN, FRT In Lieu Of Flashing Lights Furnished with Stop Sign, Speciality
49AHY	LIGHT, STROBE, STOP SIGN, REAR In Lieu of the two Flashing Lights Furnished with Stop Sign, Speciality
49AJH	CONNECTION, LIGHTS Cluster, Clearance and Side Marker To Tail Lights
49AMB	WIRE, FEED 4 Gauge, Chassis To Body <u>Notes</u> : Terminals have heat shrink protection.
49AMD	SWITCH, DRIVER PANEL, TYPE Rocker
49AMJ	ALARM, BACKING {Ecco #575} 107 db
49AMR	CIRCUIT, PROTECTION Fuse, Electrical System <u>Includes</u> : ACCESS PANEL for Body and Chassis Fuses/Circuit Breakers Located on Body Exterior; Below Driver Window

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

Code	Description
49ANH	SWITCH, MAGNETIC, DISCONNECT Master, Ignition Operated, All Body Circuits
49ANU	SOURCE, POWER 12 VDC, Mounted In Dash
49APA	LIGHT, DRIVER, CEILING Deluxe, with Separate Switch, Mounted in Light Bar
49APB	LIGHTS, DOME Rectangular Recessed Type, Stagger Mounted in Light Bars
	<u>Includes</u> : WIRING HARNESS Main Body Wiring Harness Accessed by Removing Dome Light
49ARK	SWITCH, DOME LIGHTS, RHEOSTAT For All Dome Lights
49ARM	SWITCH, DOME LIGHT, REAR Separate, for Rear Row Dome Lights, Last Light on Each Side
49ARP	LIGHT, STEP Wired to Ignition
49ATV	LIGHT, INDIC, WARNING LIGHTS Red and Amber
	<u>Includes</u> : LIGHTS, WARNING Indicator Located in Instrument Cluster
49AWT	SPEAKERS AND WIRING (4) Flush Mounted in Light Bar
49BCR	LIGHT, EXTERIOR, CHECK Automatically Activates Lights for Pre Trip Inspection
49BGP	FLASHER SYSTEM (8) Warning Lights, 8-Lamp System, Electronic Relay Flasher, Sequential Operation, Red Lights Activate after Amber Lights, Lights Deactivate with Door Closing
49BJG	LIGHTS, DIRECTIONAL, SIDE (2) {Truck Lite 35001Y} Armor Type, Amber LED, 1 Each Side, First Section Aft Entrance Door
49BMA	STOP ARM, FRONT {Specialty 2980} Air, 18" Octagon, Double Sided, 1/2" White Border, Hi Intensity Grade, Strobing LED Lights
49BWG	STOP ARM, LEFT REAR {Specialty 2981} Air, Hi Intensity, Strobing LED Lights, with Letters on Back
49BXB	LIGHT, ENTRY DOOR LED; Light Mounted Above Entrance Door, Activated by Stop Arm on School Bus or by Step Light on Commercial Bus, Includes 5 Second Deactivation Timer
49BYT	LIGHTS, STOP (2) {Sound Off/OptiLuxx} and Tail; 7" Round LED, Red
49BYV	LIGHTS, MARKER, FRONT, REAR {Sound Off/OptiLuxx} Rectangular LED, Armored, (8) Four Amber Front and Four Red Rear
49BYZ	LIGHTS, DIRECTIONAL, REAR (2) {Sound Off/OptiLuxx} LED, 7" Round Amber
49BZG	LIGHTS, BACK UP (2) {Sound Off/OptiLuxx} LED, 7" Round Clear
49BZU	RADIO, ENTERTAINMENT {Custom Radio} AM/FM Stereo/USB Input, Includes Antenna and Cable, with Public Address System
49CBD	VALVE, DUAL CONTROL Front and Rear Air Stop Arm
49DDC	LIGHTS, CLUSTER {Truck Lite 07045A & 07045R} LED; Amber Front and Red Rear
49DDG	KIT, FIRST AID 36M-SBK-CSA-METAL BOX, for Provinces of Alberta, British Columbia, Manitoba, Ontario, Saskatchewan
49EAD	VISOR, INTERIOR, LEFT FRONT {A66-3060-4Cc} 6" x 30", Transparent, For Left Windshield, Canada Tint
49EAW	LIGHTS, MARKER, SIDE {Sound Off/OptiLuxx} Rectangular LED, Armored Type, Intermediate, Centered; Required for Units 30 Foot or Longer
49EGC	MIRROR, INSIDE 6" x 30", Clear Safety Glass, Metal Back, Round Corners
49EGM	MIRROR, CROSS VIEW, EXTERIOR Heated, Black, Rosco

Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

<u>Code</u>	<u>Description</u>
	<u>Includes</u> : MIRROR MOUNT Attached to Body with Metal Backing Plates
49EVL	SWITCH, NOISE SUPPRESSION Actuator Legend States, "NOISE SUPP ", for Separate Solenoid, with Red Switch in Panel
49EWM	LIGHT, STROBE ECCO 6550C, Low Profile, Double Flash, 4.9" High
49EXD	MIRROR, REAR VIEW, EXTERIOR {Rosco} Open View, Black, Heated, Motorized, Non-Detent
49GBV	WINDSHIELD WIPERS (2) Cowl Mounted <u>Includes</u> : WINDSHIELD WIPERS CONTROL Single Motor, Overlapping Wipe Pattern
49GBZ	MIRROR HEATER SWITCH {Rosco SW-5-HT} Momentary Type; with 12 Minute Timer Relay 12 Volt
49GCH	LOCATION, FIRST AID KIT Right Side Front Bulkhead with Screws
49GDA	LATCH, DOOR BULKHEAD Spring Latch, for Bulkhead Mounted Safety Compartment or Destination Sign Access Doors
49GEE	COMPARTMENT, OVER WINDSHIELD with Latch, No Lock, No Buzzer, Centered Over Windshield, with Single Piece Panel, (Requires Latch)
49GHN	REFLECTORS, REAR (2) 3", Red, Adhesive Back
49GHR	REFLECTORS, SIDE, REAR (2) 3", Red, Adhesive Back
49GHV	REFLECTORS, SIDE, FRONT (2) 3", Amber; Adhesive Back, 1 Aft Drivers Window Left, 1 Aft Entrance Door Right
49GHX	REFLECTORS, SIDE, INTERMEDIATE (2) 3" Amber, 1 Each Side, Below The Third Rub Rail From the Top, Adhesive Back
49GKY	SAFETY TRIANGLES Warning Reflectors, Mounted to Rear Left Floor next to Rear Rear Wall
49GUB	CUTTER, SEAT BELT {TIE TECH Safecut} for Cutting Seat Belts
49GUK	FENDERS, RUBBER, REAR (2)
49GUX	MUD FLAPS, FRONT WHEELS (2) Rubber
49GVC	MUD FLAPS, REAR WHEELS (2) Rubber
49GWW	WINDSHIELD WASHER Kit; 6 Quart Capacity, Bottle <u>Includes</u> : WINDSHIELD WASHER ELECTRICAL CONNECTIONS Sealed and Locking Type
49JBL	LIGHTS, MARKER, SIDE, EXTRA (2) {Sound Off/OptiLuxx} Slim-Line Rectangular Armored LED, Red, Each Side Rear at Floor Line Above Bumper
49JCN	FIRE EXTINGUISHER, DRIVER AREA Bilingual for Canada, 5 lb 2A-40BC, Minimum with Flexible Hose and Metal Nozzle, Mounted on Modesty Panel Behind Driver
49MRP	EXTRA WIRING Accessory Power Connection in Electrical Panel; Four Positions Fused at 20 Amps Each
49NGJ	LIGHTS, WARNING (8) {Sound Off/OptiLuxx} (4) 7" Round Red Strobing LED and (4) 7" Round Amber Strobing LED, 2 Front, 2 Rear Each Color
49UEK	PROVINCE OF OPERATION British Columbia
50JCE	BODY PLAN, NON-SPECIAL NEEDS Conventional; 34' 2" Body Length, ` 76 Passenger, 276" WB, DX5675A000
7382135809	(2) TIRE, FRONT 11R22.5 Load Range H AH37 (HANKOOK), 499 rev/mile, 75 MPH, All-Position

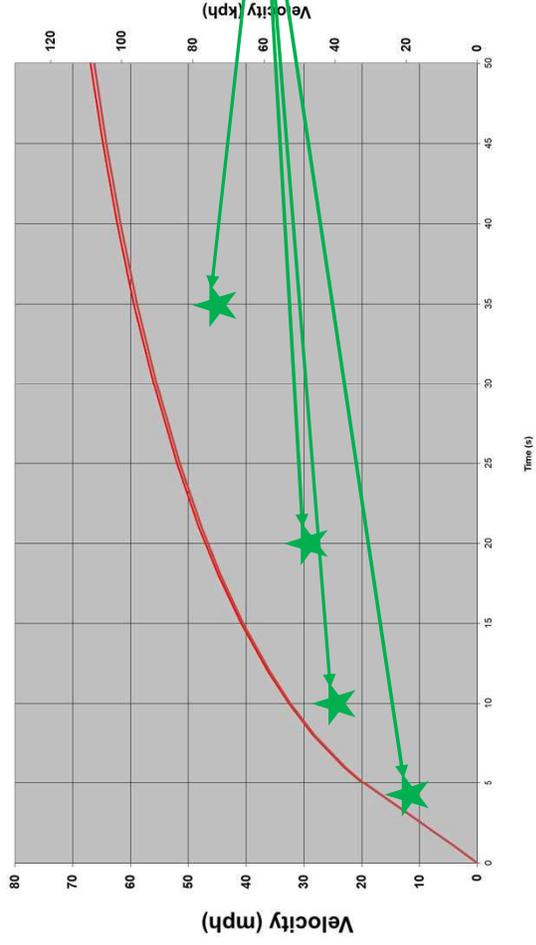
Vehicle Specifications
2021 INTEGRATED CE S BUS (PB105)

February 19, 2020

<u>Code</u>	<u>Description</u>
7382135810	(4) TIRE, REAR 11R22.5 Load Range H DH37 (HANKOOK), 497 rev/mile, 75 MPH, Drive
OBD001	COUNTRY IDENTITY COUNTRY IDENTITY,10NCA FOR CANADA
OBD002	SWITCH, REAR DOOR BUZZER 49ABE CONFLICTS WITH REQUIRED SWITCH, REAR DOOR BUZZER = 49ABE IS REQUIRED FOR D250-16
Services Section:	
40126	WARRANTY Standard for CE, RE, BE School Bus Models, Effective with Vehicles Built March 1, 2017 or Later, CTS-3304H
49GVN	WARRANTY 5-Year, Limited

LWB eCE-DVP School Bus Performance w/6.5 FDR (Power limit - 210 kW)

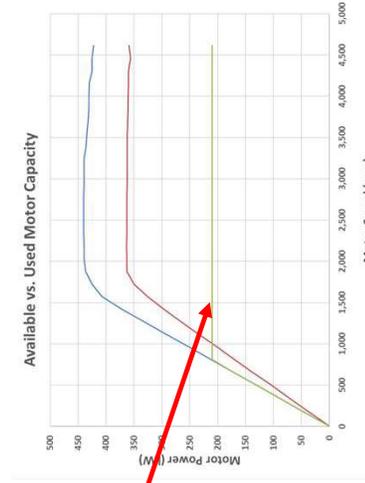
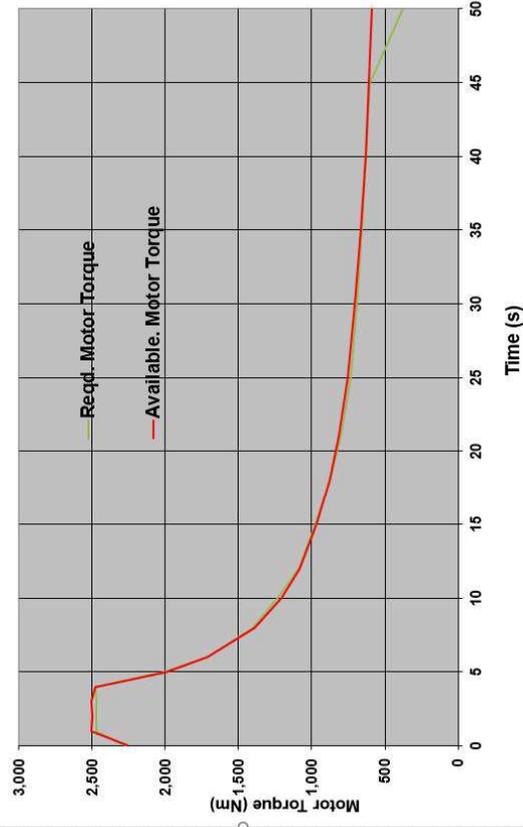
WOT - Performance



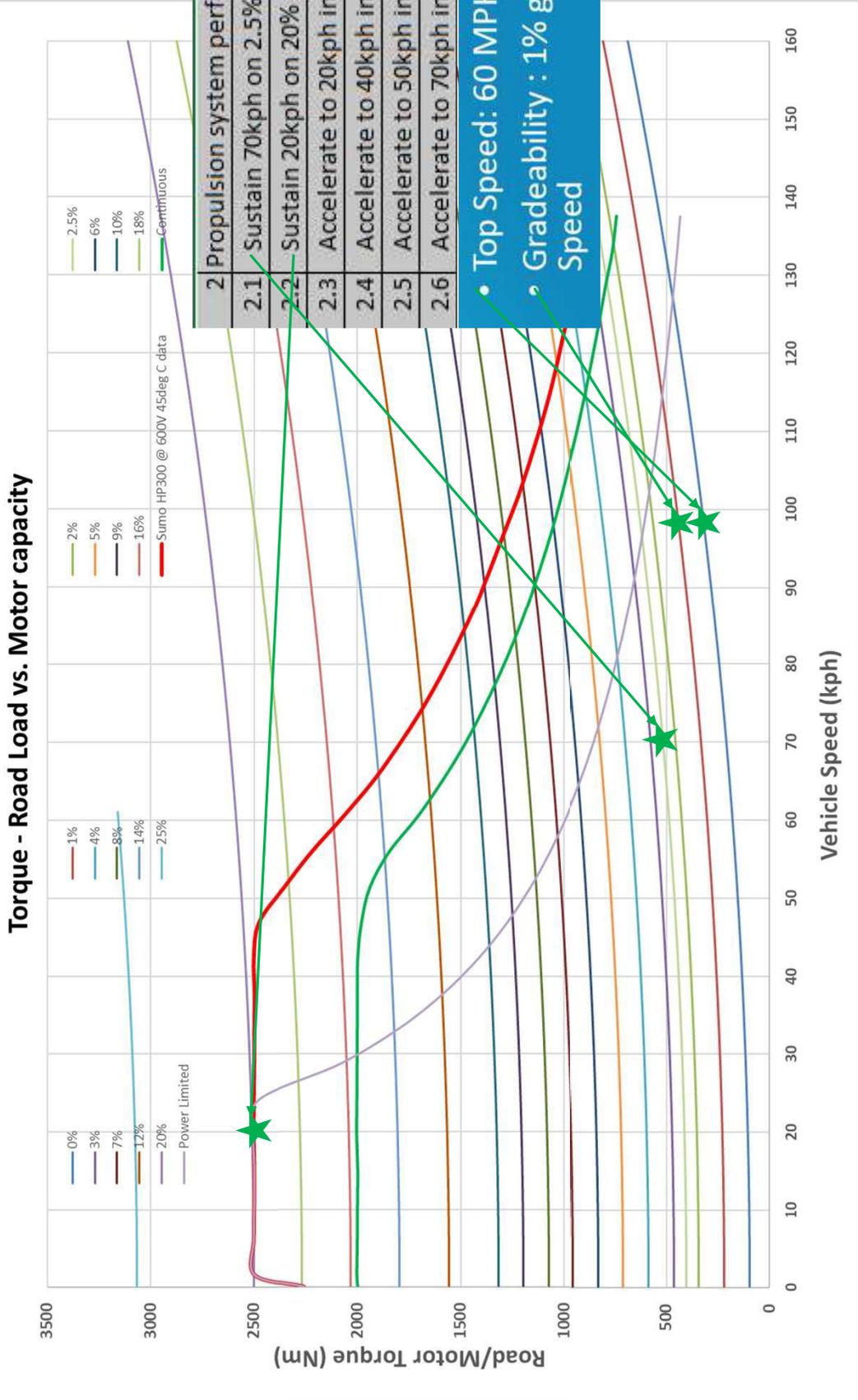
	Propulsion system performance:
2.1	Sustain 70kph on 2.5% grade
2.2	Sustain 20kph on 20% grade
2.3	Accelerate to 20kph in 4 seconds
2.4	Accelerate to 40kph in 10 seconds
2.5	Accelerate to 50kph in 20 seconds
2.6	Accelerate to 70kph in 35 seconds

(Meeting)

WOT - Motor Torque

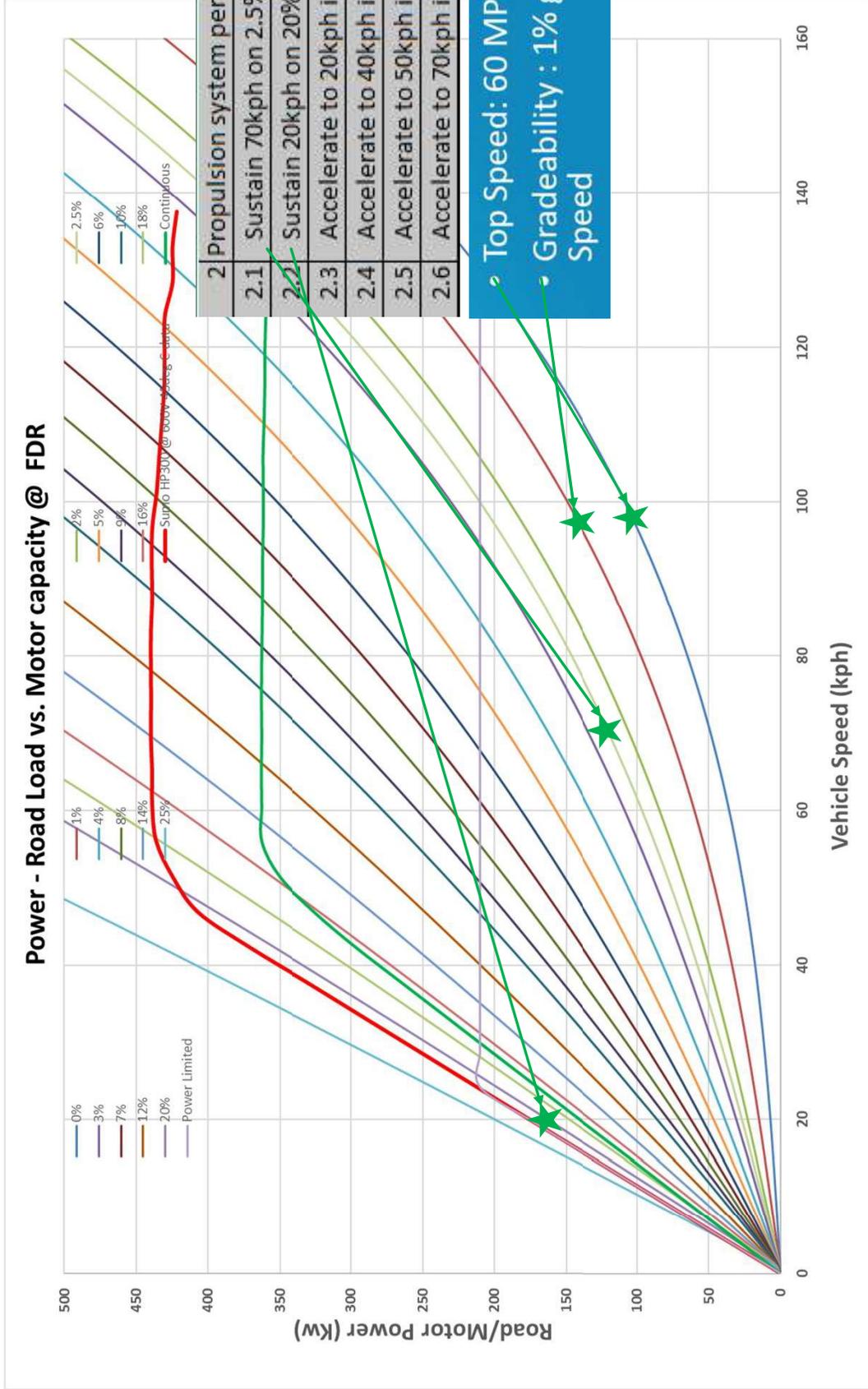


LWB eCE-DVP School Bus Performance w/6.5 FDR (Power limit - 210 kW)



(Meeting)

LWB eCE-DVP School Bus Performance w/6.5 FDR (Power limit - 210 kW)

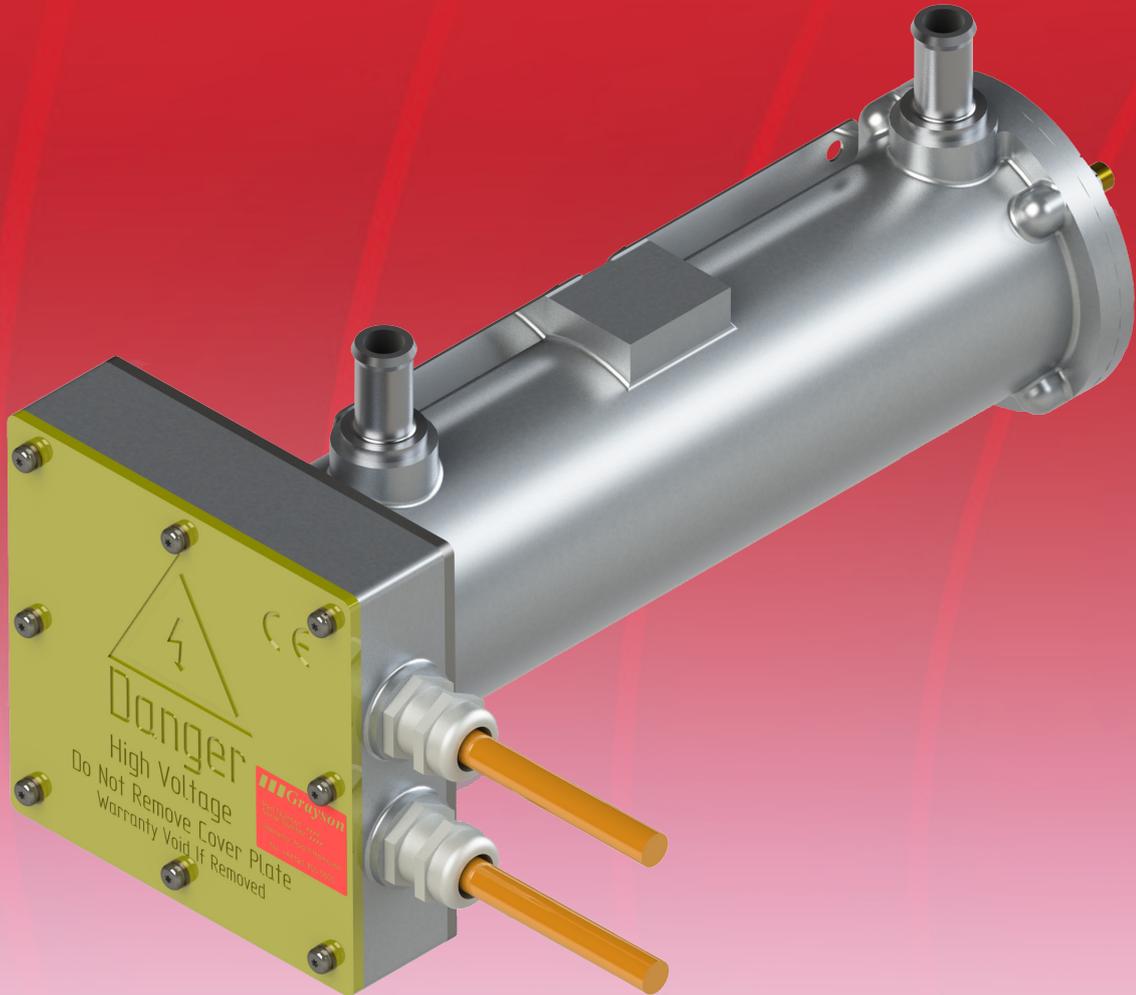


(Meeting)

EWVH

ELECTRIC WATER HEATER

e MOBILITY
RANGE



Faster engine
warm up time



Quieter
operation



Environmentally
friendly solution

Creating the future of
thermal management



Grayson
THERMAL SYSTEMS



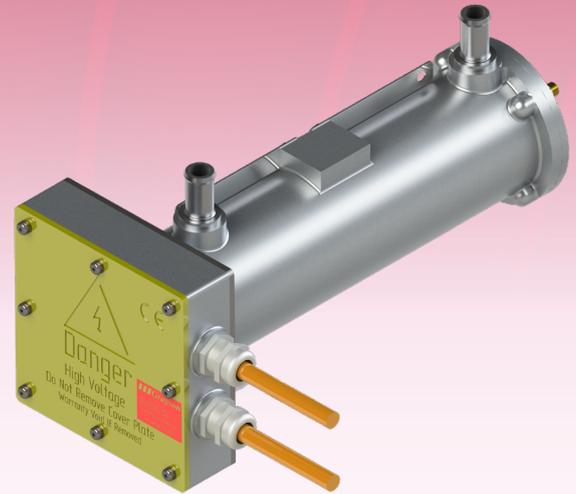
**Excellence in
product quality
and service**

Electric Water Heater

System overview

The Electric Water Heater (EWH) is an instant source of clean heat generation. This heat can then be transferred to driver or carriage for passenger and driver comfort.

By removing the need for a diesel-powered heater, the EWH enables vehicles to use less fuel, emit lower levels of pollutants, and to reduce noise levels.



Features & Benefits

- Removal of diesel heater
- Utilises waste energy to heat the vehicle
- High Voltage Capability (up to 800v)
- Easy Fitment
- No Consumables
- No Annual Servicing
- Compact Design
- Small Envelope Package
- IP67 Rated
- Fully potted terminal box
- Variety of kW outputs
- Cost Effective vs. Diesel Heater

EWH
ELECTRIC WATER HEATER

e MOBILITY
RANGE

Standard Power Outputs	(600V DC Version) 5kW, 10kW, 20kW, 25kW, 30kW
Example	42Ω element 2.9kW @ 350 VDC 15.2kW @ 800V DC
Orientation	North, South, East or West
Weight	18.42kg 40.60lb
Rating	IP67
Voltage	300 - 800V DC
Vehicle Type	Hybrid or Electric



Proven
Technology



Quieter
operation



Environmentally
friendly solution



Faster engine
warm up time



2 year
standard
warranty



Plug and Play
Solution

We are here to help! Contact us for assistance...



t +44 (0)121 700 5600 **f** +44 (0)121 700 5601
e sales@graysonts.com **w** graysonts.com

Wharfdale House, 257 Wharfdale Road, Tyseley,
Birmingham B11 2DP, UK

Follow us on social media: @GraysonTS

GRAYSON CORP USA

t +1 (317) 739-3290
e sales-northamerica@graysonts.com

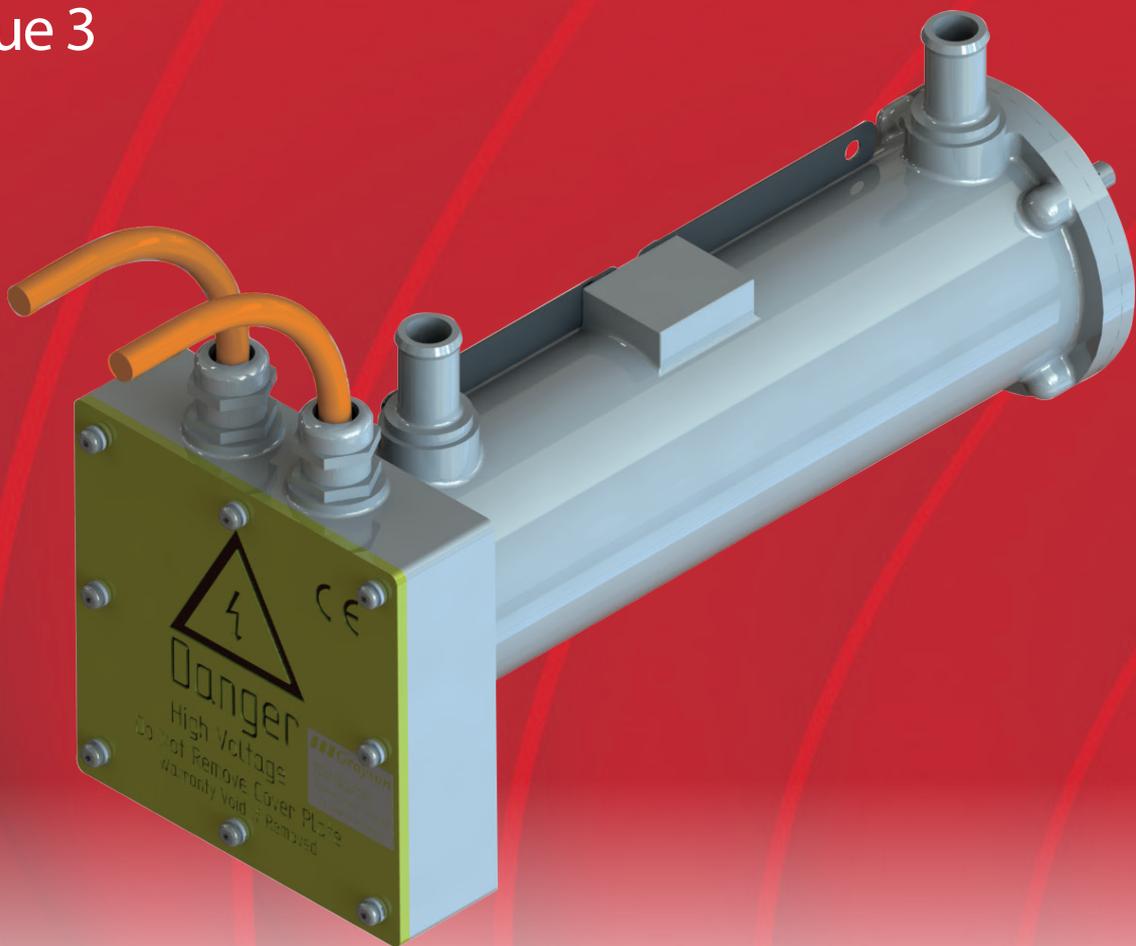
980 Hurricane Road, Franklin, Indiana,
IN 46131, USA

grayson-thermal-systems

Grayson Electric Water Heater (EWH)

Specifications & Technical Information

Issue 3



Creating the future of
thermal management



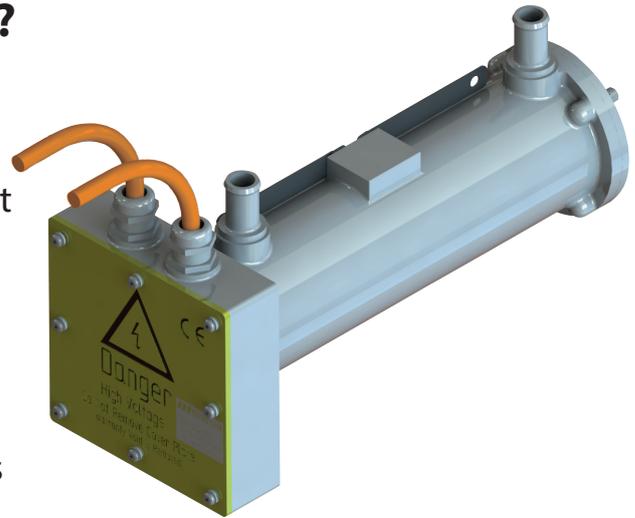
Grayson
THERMAL SYSTEMS

What is an Electric Water Heater?

System Overview

The Electric Water Heater (EWH) is an instant source of clean heat generation. This heat can then be transferred to driver or carriage for passenger and driver comfort.

By removing the need for a diesel-powered heater, the EWH enables vehicles to use less fuel, emit lower levels of pollutants, and to reduce noise levels.

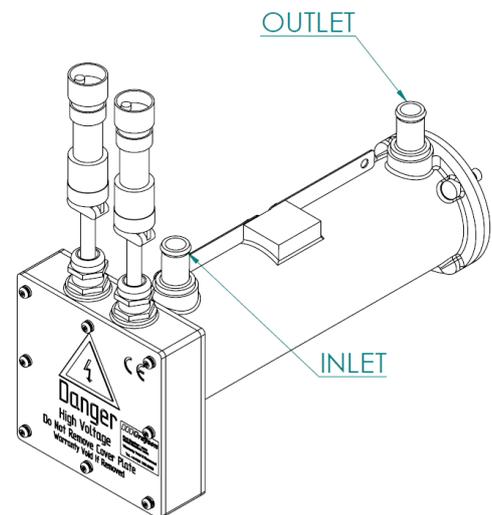
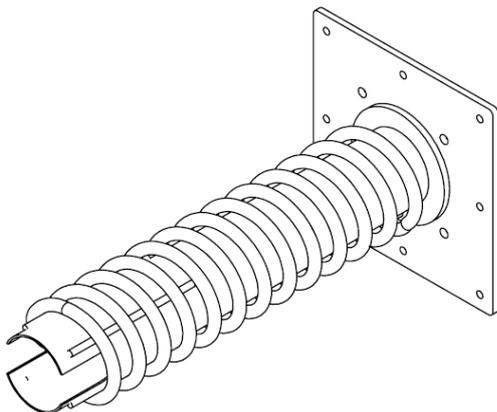


Electric Water Heater

- Uses less fuel
- Vehicle runs quieter
- Minimal maintenance
- Emits lower levels of pollutants
- Faster engine warm up time

Diesel-powered Heater

- Costly
- Noisy
- High maintenance
- Generates both CO₂ and particulate emissions

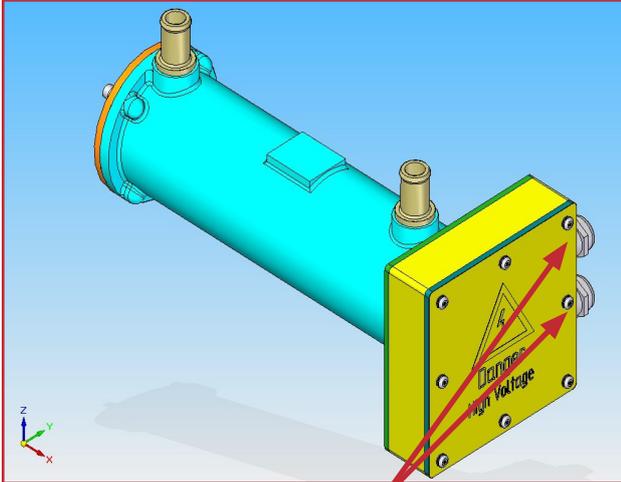


TYPICAL EXAMPLE EWH:

FLASH TESTED AT 2200V DC FOR NO LESS THAN 1 MINUTE
NO BREAKDOWN SHOULD OCCUR WITH A 1 MILLI AMP TRIP SETTING
THE INSULATION RESISTANCE CHECK SHOULD BE GREATER THAN
1000 MEGA OHMS AT THE ELEMENT TERMINALS
COLD RESISTANCE: 40.62 OHMS +/- 7.5%
APPLIED VOLTAGE: 600V DC
PEAK VOLTAGE: 800V DC
WORKING RESISTANCE: 42.25 OHMS

WATER CONNECTORS MUST ALWAYS BE VERTICALLY
ORIENTATED IN THE "UP" POSITION
PRESSURE DECAY TEST TO 45 PSI FOR 5 MINS
HEATER UNITS TO BE SUPPLIED WITH H.T. CABLES
FITTED & SEALED.

Technical Specification



IP 68 Cable Glands -
Used to secure &
seal cables

Element sub assembly – 9, 12, 20, 25kW

Weight - 18.42kg

Larger units can also be supplied if required

IP68 seals

Terminal box cover

Cable glands

Outer case

Fittings

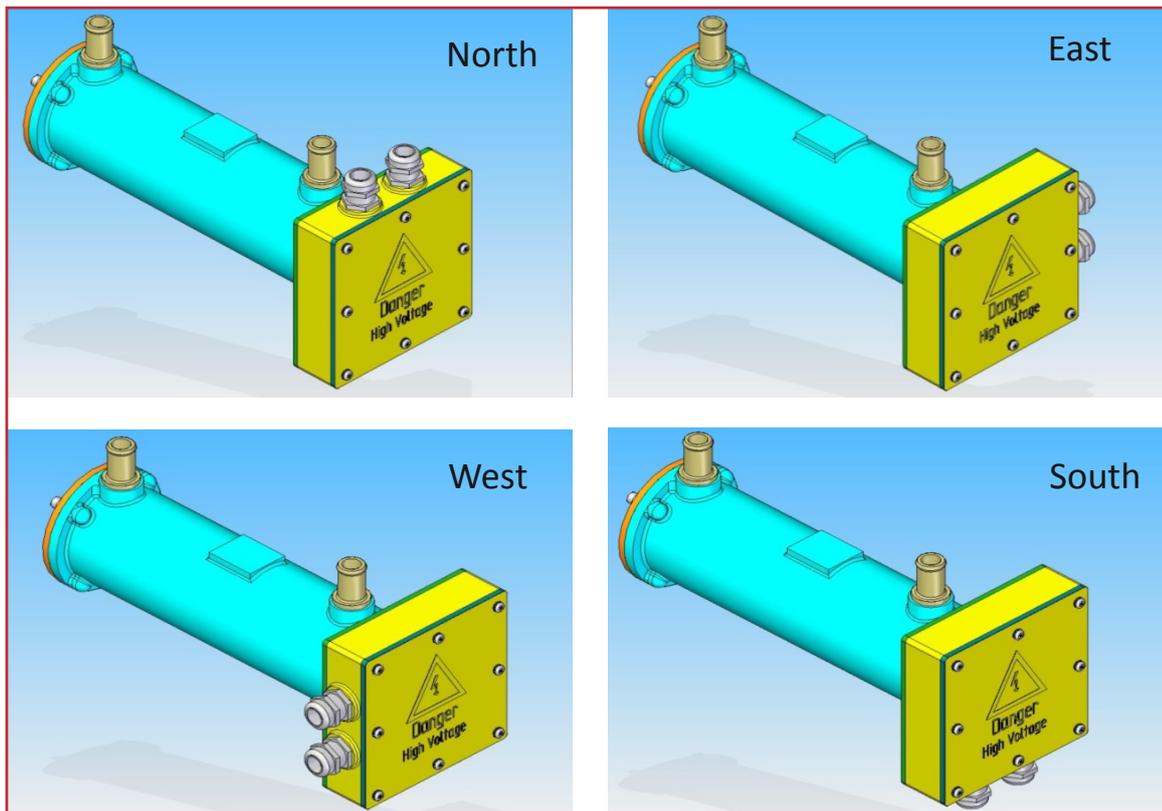
End plate

Temperature probe

Electrical cables

Orientations

The EWH can be supplied in 4 different orientations to suit the application.



Safety Feature

A flow switch must be incorporated into the customers circuit.

Default temperature control Logic for GTS heaters use a temperature sensor which is read by the customers controller and determines what temperature the heater turns off and on at. (The electrical schematic shows a different simpler control logic that requires a thermostatic switch with a set temperature that turns the heater off, the value of this switch must be approved by GTS).

Operation

After correct installation, connection and during regular operation, the electric water heater works without any special maintenance requirements.

After emptying and refilling the operating coolant, it is necessary to prevent any contact of this coolant with the electrical terminal box due to the detrimental effects to the insulation status or possibility of short-circuits.

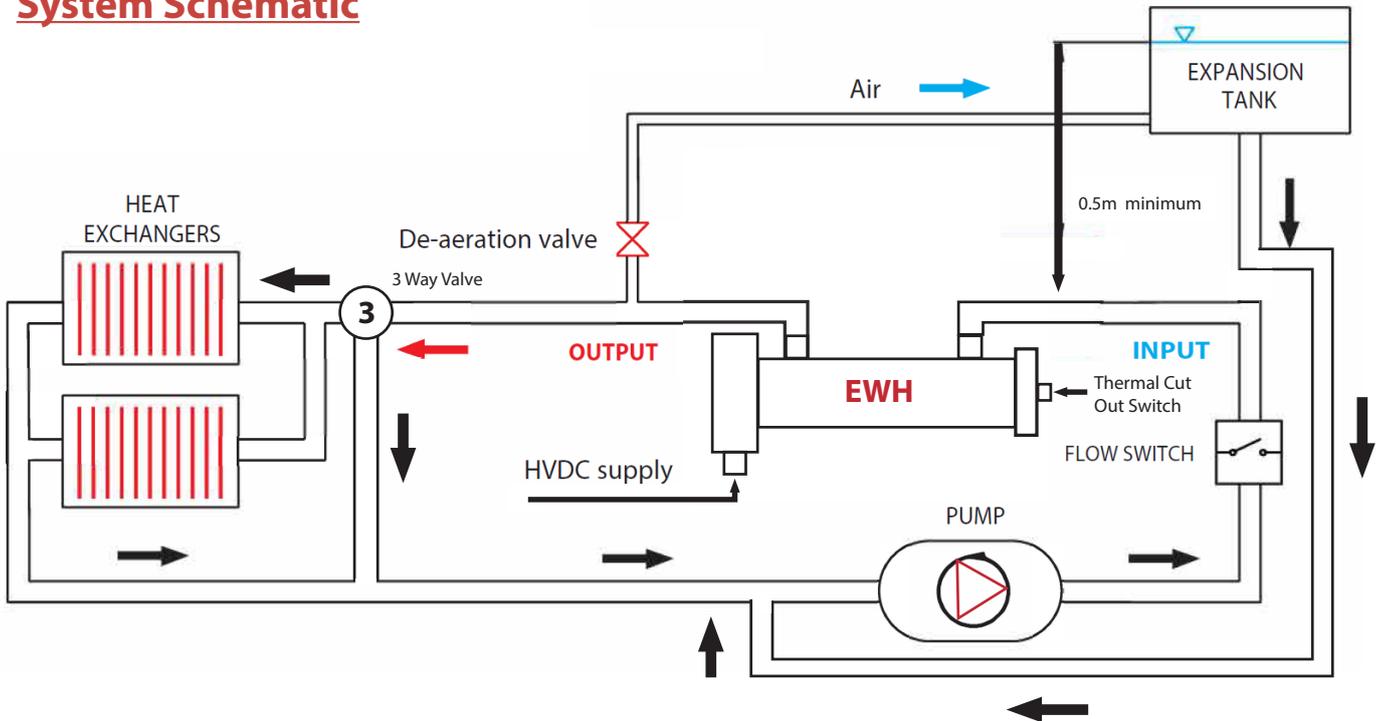
The heater must not be in contact with aggressive substances, which would impact the aluminium shell. During operation the system must not be aerated - not only will this decrease the efficiency of heating, it will also decrease the service life of the heating element.

For the de-aeration, it is possible to use the valve which shall be placed in the heating circuit. The vehicle system has to ensure de-aeration before and during heat exchanger operation. It is required that the heat circuit is equipped with a flow switch for safe operation of this type of heat exchanger, because this heat exchanger must never be operated without coolant flow. Ensure the Coolant system is fully de-aerated before operating the electric water heater.

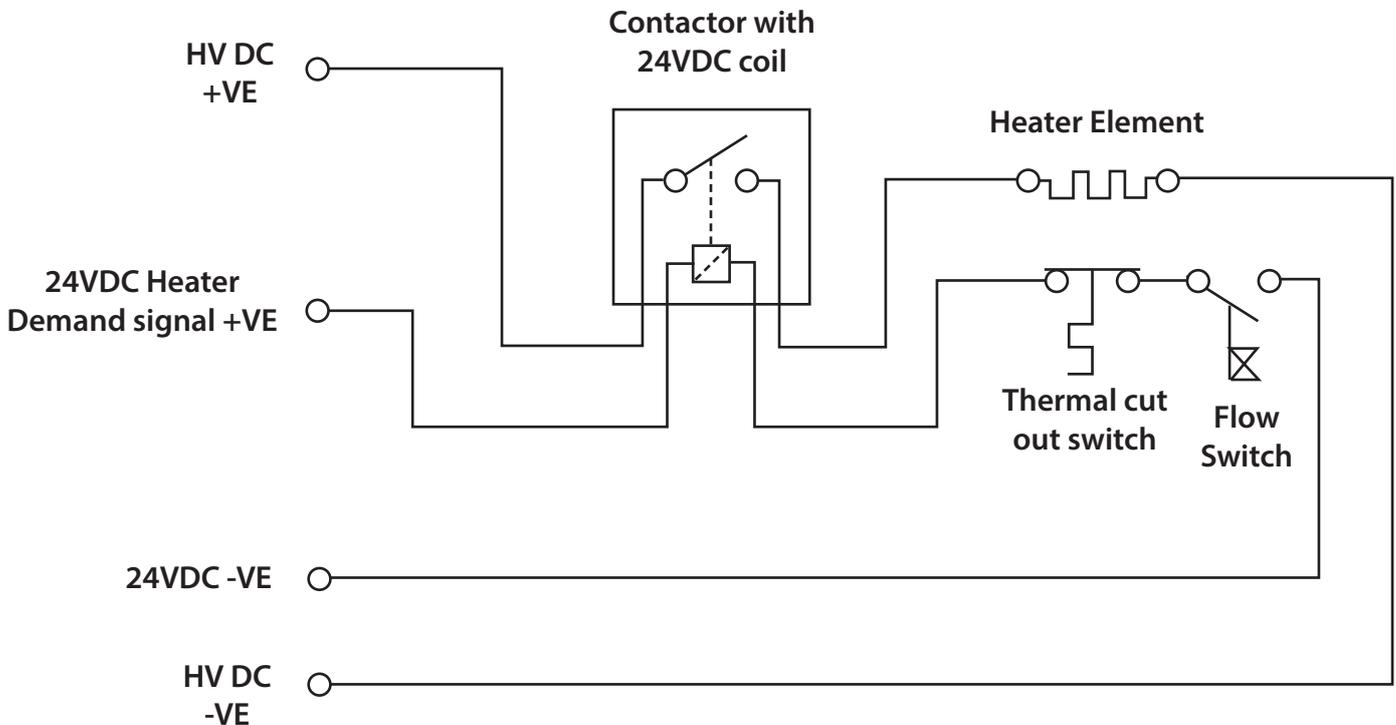
A 3 way valve must be fitted before the heat exchangers this allows the heater to have a cool down cycle where the pump continues to run for a minimum of 3 minutes after the heater has been turned off and the water valve switched to bypass the heat exchangers.

Only a correctly installed and connected electric water heater may be commissioned without any damage. In the case of any deviations from the standard status, it must be taken out of operation and inspected.

System Schematic



Electrical Schematic



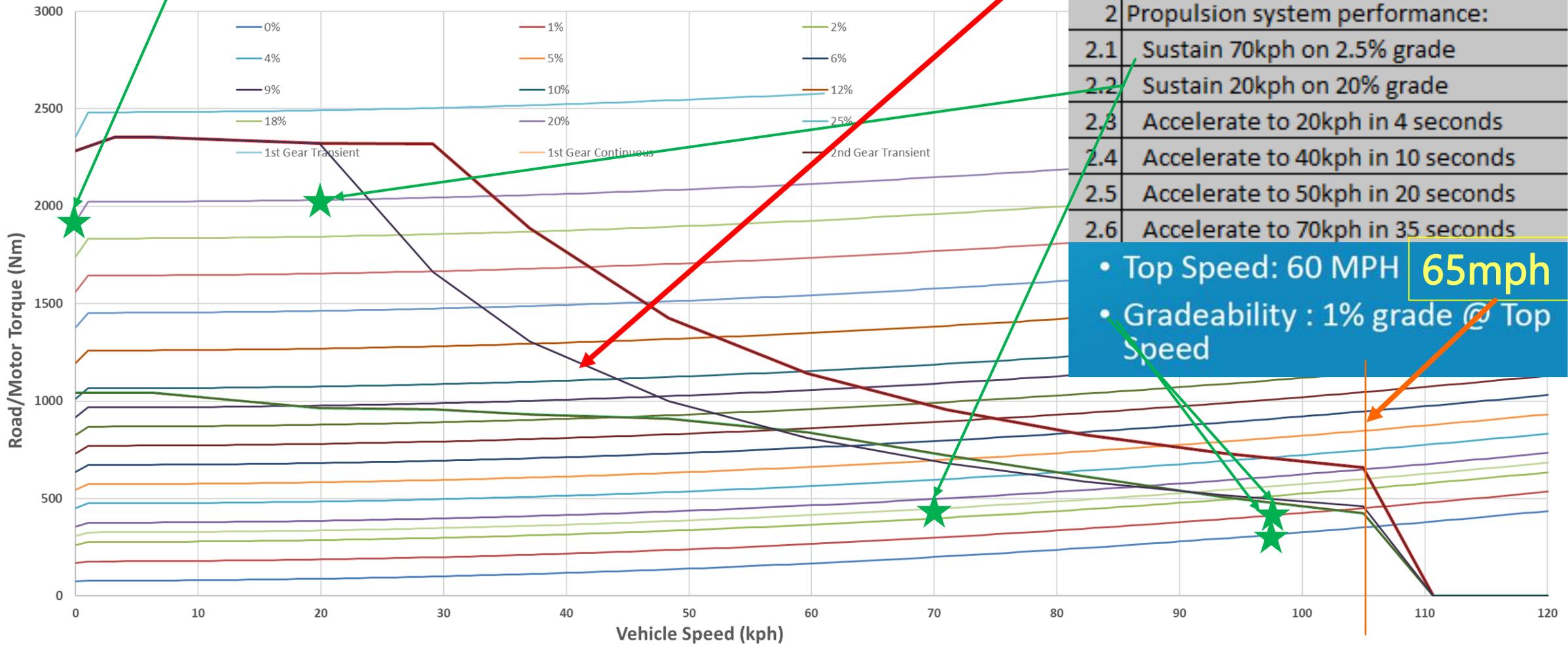
The following additional system components are available from GTS:
3 way coolant valve, contactor, pump, heat exchangers, header tank and thermostatic switch.

LWB eCE-DVP School Bus **Max** Performance w/6.83 FDR

Startability @ 20% grade

Current limit – 345 A,
Mech Power limit – 178.5 kW

Torque - Road Load vs. Motor capacity



2	Propulsion system performance:
2.1	Sustain 70kph on 2.5% grade
2.2	Sustain 20kph on 20% grade
2.3	Accelerate to 20kph in 4 seconds
2.4	Accelerate to 40kph in 10 seconds
2.5	Accelerate to 50kph in 20 seconds
2.6	Accelerate to 70kph in 35 seconds

• Top Speed: 60 MPH **65mph**
• Gradeability : 1% grade @ Top Speed

(Meeting)

LWB eCE-DVP School Bus Performance

Objectives Apply at all Operating Temp Range		Requirements	Dana HV2200
GVWR			31k
Weight of Vehicle for Performance			28.1K
Start-ability grade @90% GVWR		> 20%	22.50%
1% Grade Speed @90% GVWR		> 60MPH	66
Top Speed @90% GVWR		Accept: 60MPH	67
E-Powertrain energy conversion efficiency from 30MPH to 60MPH		Min. 90%	tbd
HV battery (propulsion)		650V	608.6
LV battery controls and accessories		12V	15
Speed @ 4 seconds (after IVM)	Perform on Flat @ typical	> 16MPH	20.3
Time to Distance: IVM - 100 feet	usage load (90% of GVWR)	< 6 sec.	5.2
Time to Speed: IVM - 20 mph		< 6 sec.	3.9
Time to Speed: IVM - 30 mph		< 11 sec.	7.0
Time to Speed: IVM - 50 mph		< 30 sec.	18.6
Transient Acceleration Elapse Time: 20 - 35 mph		< 10 sec.	5.1
Transient Acceleration Elapse Time: 35 - 55 mph		< 23 sec.	14.3
Speed @ 4 seconds (after IVM)		> 13MPH	15.0
Time to Distance: IVM - 50 feet	Climb based on Eisenhower Pass, Dillon, CO. (Max. Grade ~6%)	< 5 sec.	4.2
Time to Distance: IVM - 100 feet		< 7 sec.	6.0
Speed During Climb - Min. Speed for entire run		> 36MPH	Yes

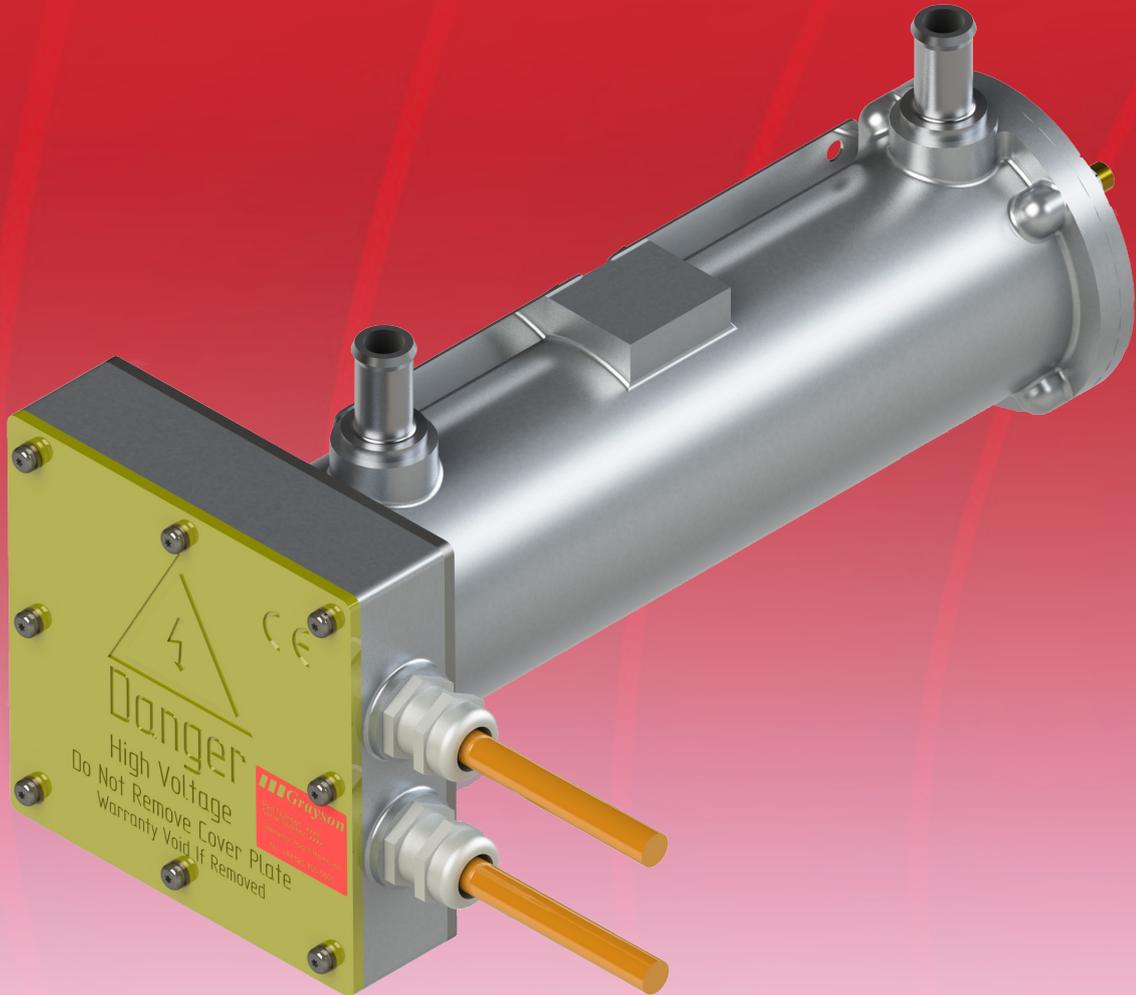
Acceptance Criteria +/- 6%

Nominal Voltage – 608V
 Current Limit – 421 A,
 Mech Power limit – 218 kW

EWVH

ELECTRIC WATER HEATER

e MOBILITY
RANGE



Faster engine
warm up time



Quieter
operation



Environmentally
friendly solution

Creating the future of
thermal management



Grayson
THERMAL SYSTEMS



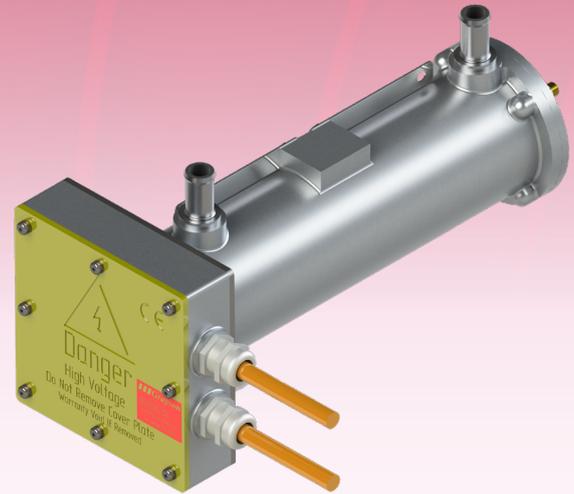
**Excellence in
product quality
and service**

Electric Water Heater

System overview

The Electric Water Heater (EWH) is an instant source of clean heat generation. This heat can then be transferred to driver or carriage for passenger and driver comfort.

By removing the need for a diesel-powered heater, the EWH enables vehicles to use less fuel, emit lower levels of pollutants, and to reduce noise levels.



Features & Benefits

- Removal of diesel heater
- Utilises waste energy to heat the vehicle
- High Voltage Capability (up to 800v)
- Easy Fitment
- No Consumables
- No Annual Servicing
- Compact Design
- Small Envelope Package
- IP67 Rated
- Fully potted terminal box
- Variety of kW outputs
- Cost Effective vs. Diesel Heater

EWH
ELECTRIC WATER HEATER

e MOBILITY
RANGE

Standard Power Outputs	(600V DC Version) 5kW, 10kW, 20kW, 25kW, 30kW
Example	42Ω element 2.9kW @ 350 VDC 15.2kW @ 800V DC
Orientation	North, South, East or West
Weight	18.42kg 40.60lb
Rating	IP67
Voltage	300 - 800V DC
Vehicle Type	Hybrid or Electric



Proven
Technology



Quieter
operation



Environmentally
friendly solution



Faster engine
warm up time



2 year
standard
warranty



Plug and Play
Solution

We are here to help! Contact us for assistance...



t +44 (0)121 700 5600 **f** +44 (0)121 700 5601
e sales@graysonts.com **w** graysonts.com

Wharfdale House, 257 Wharfdale Road, Tyseley,
Birmingham B11 2DP, UK

Follow us on social media: @GraysonTS

GRAYSON CORP USA

t +1 (317) 739-3290
e sales-northamerica@graysonts.com

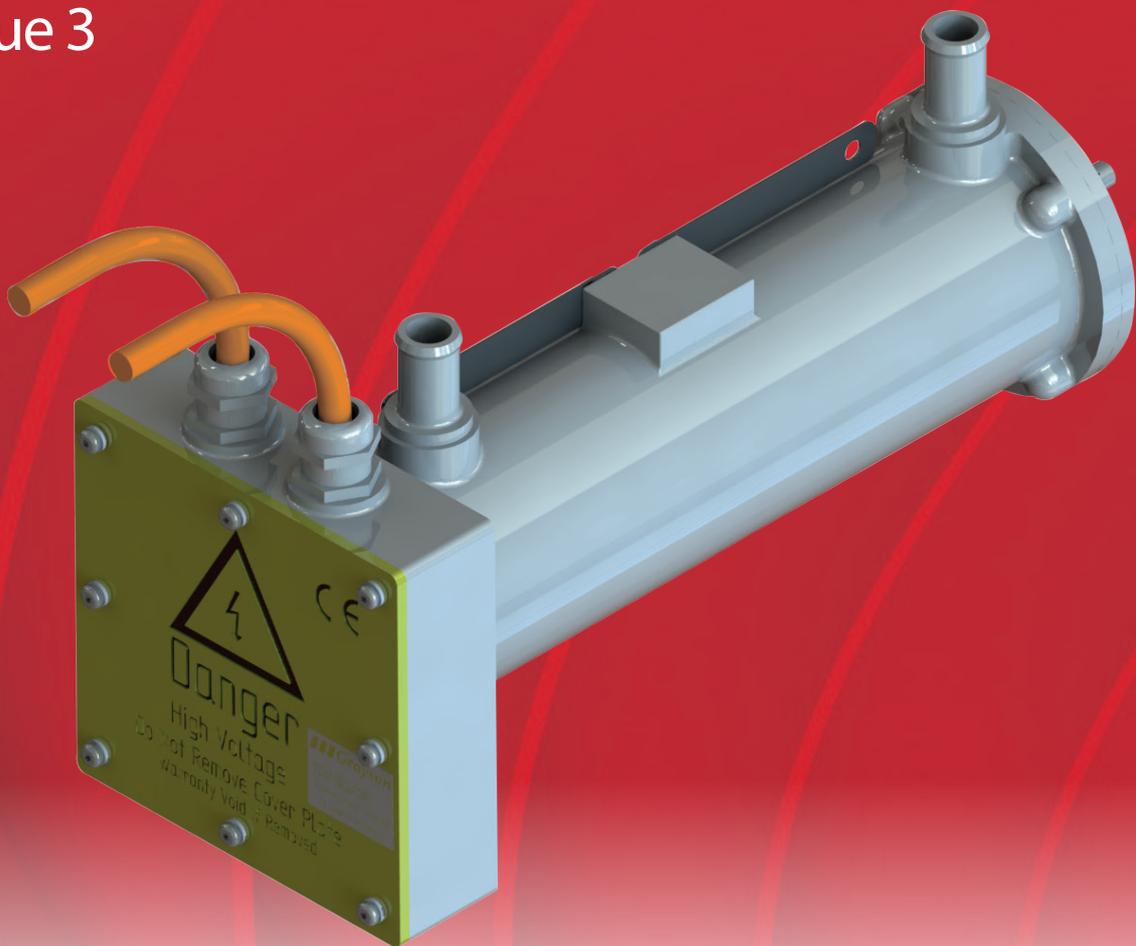
980 Hurricane Road, Franklin, Indiana,
IN 46131, USA

grayson-thermal-systems

Grayson Electric Water Heater (EWH)

Specifications & Technical Information

Issue 3



Creating the future of
thermal management



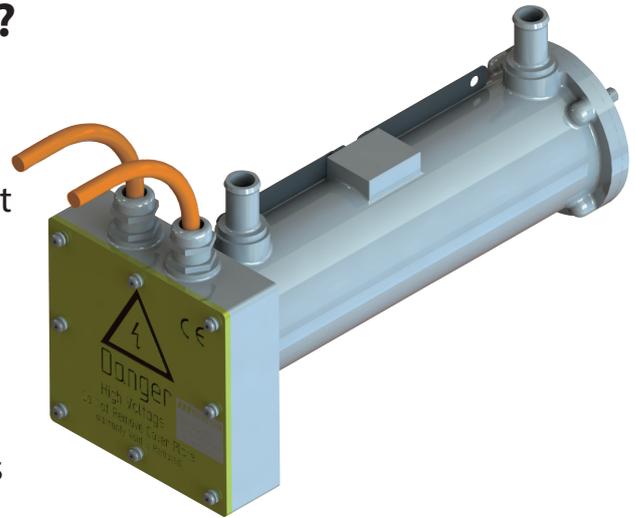
Grayson
THERMAL SYSTEMS

What is an Electric Water Heater?

System Overview

The Electric Water Heater (EWH) is an instant source of clean heat generation. This heat can then be transferred to driver or carriage for passenger and driver comfort.

By removing the need for a diesel-powered heater, the EWH enables vehicles to use less fuel, emit lower levels of pollutants, and to reduce noise levels.

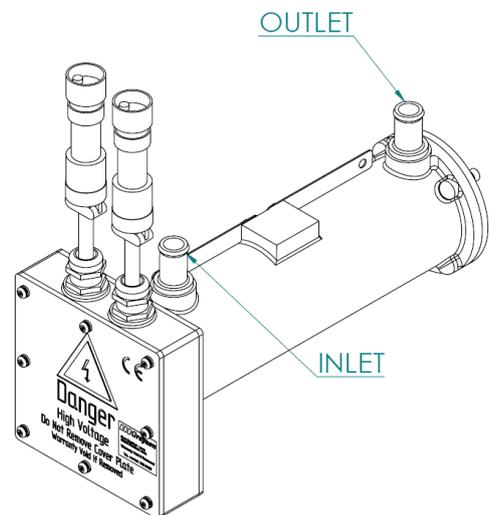
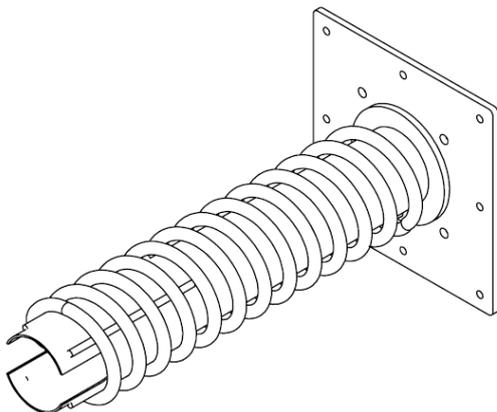


Electric Water Heater

- Uses less fuel
- Vehicle runs quieter
- Minimal maintenance
- Emits lower levels of pollutants
- Faster engine warm up time

Diesel-powered Heater

- Costly
- Noisy
- High maintenance
- Generates both CO2 and particulate emissions

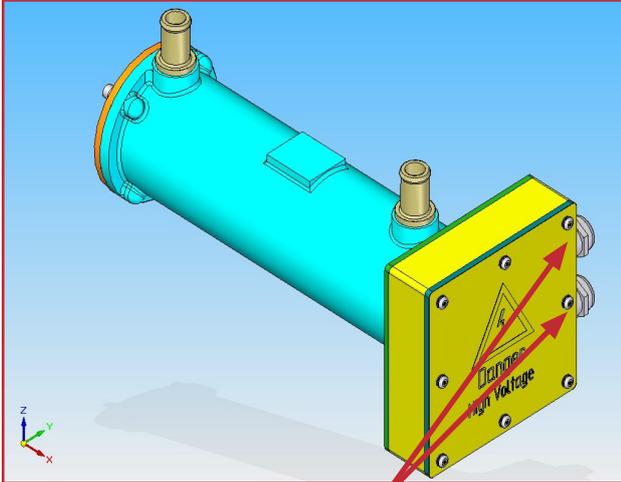


TYPICAL EXAMPLE EWH:

FLASH TESTED AT 2200V DC FOR NO LESS THAN 1 MINUTE
NO BREAKDOWN SHOULD OCCUR WITH A 1 MILLI AMP TRIP SETTING
THE INSULATION RESISTANCE CHECK SHOULD BE GREATER THAN
1000 MEGA OHMS AT THE ELEMENT TERMINALS
COLD RESISTANCE: 40.62 OHMS +/- 7.5%
APPLIED VOLTAGE: 600V DC
PEAK VOLTAGE: 800V DC
WORKING RESISTANCE: 42.25 OHMS

WATER CONNECTORS MUST ALWAYS BE VERTICALLY ORIENTATED IN THE "UP" POSITION
PRESSURE DECAY TEST TO 45 PSI FOR 5 MINS
HEATER UNITS TO BE SUPPLIED WITH H.T. CABLES FITTED & SEALED.

Technical Specification



IP 68 Cable Glands -
Used to secure &
seal cables

Element sub assembly – 9, 12, 20, 25kW

Weight - 18.42kg

Larger units can also be supplied if required

IP68 seals

Terminal box cover

Cable glands

Outer case

Fittings

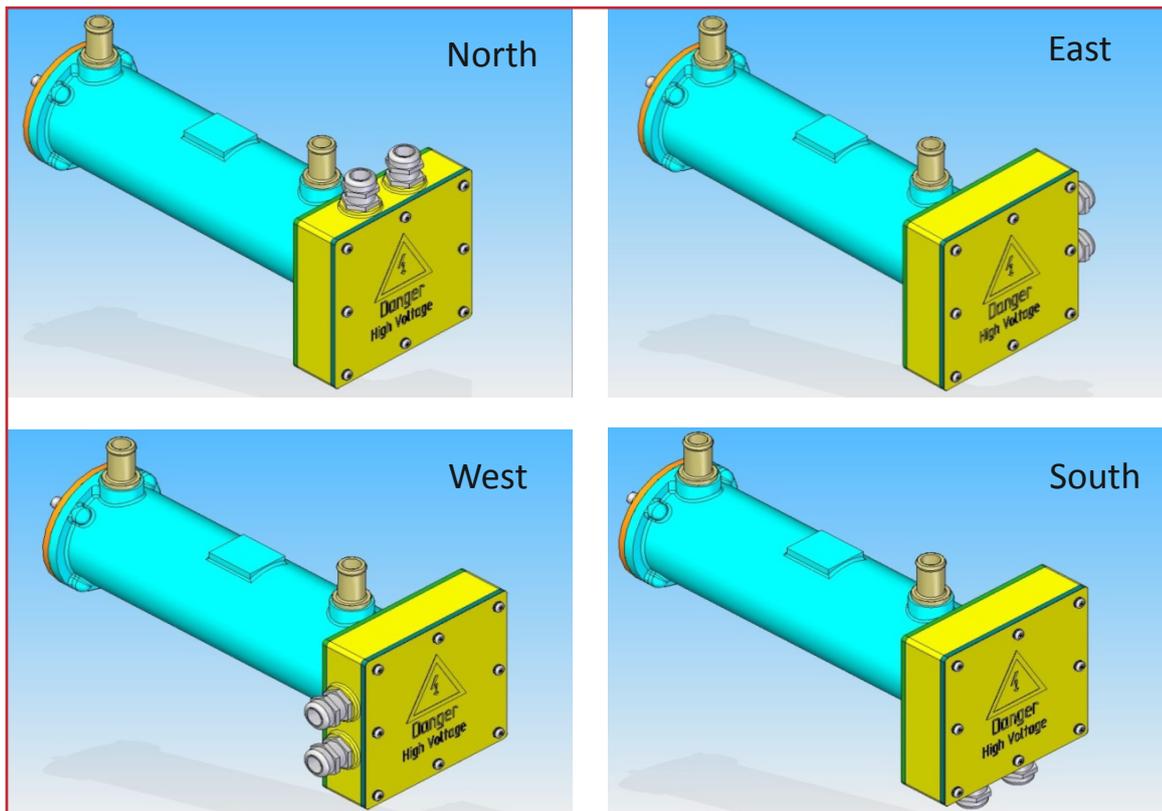
End plate

Temperature probe

Electrical cables

Orientations

The EWH can be supplied in 4 different orientations to suit the application.



Safety Feature

A flow switch must be incorporated into the customers circuit.

Default temperature control Logic for GTS heaters use a temperature sensor which is read by the customers controller and determines what temperature the heater turns off and on at. (The electrical schematic shows a different simpler control logic that requires a thermostatic switch with a set temperature that turns the heater off, the value of this switch must be approved by GTS).

Operation

After correct installation, connection and during regular operation, the electric water heater works without any special maintenance requirements.

After emptying and refilling the operating coolant, it is necessary to prevent any contact of this coolant with the electrical terminal box due to the detrimental effects to the insulation status or possibility of short-circuits.

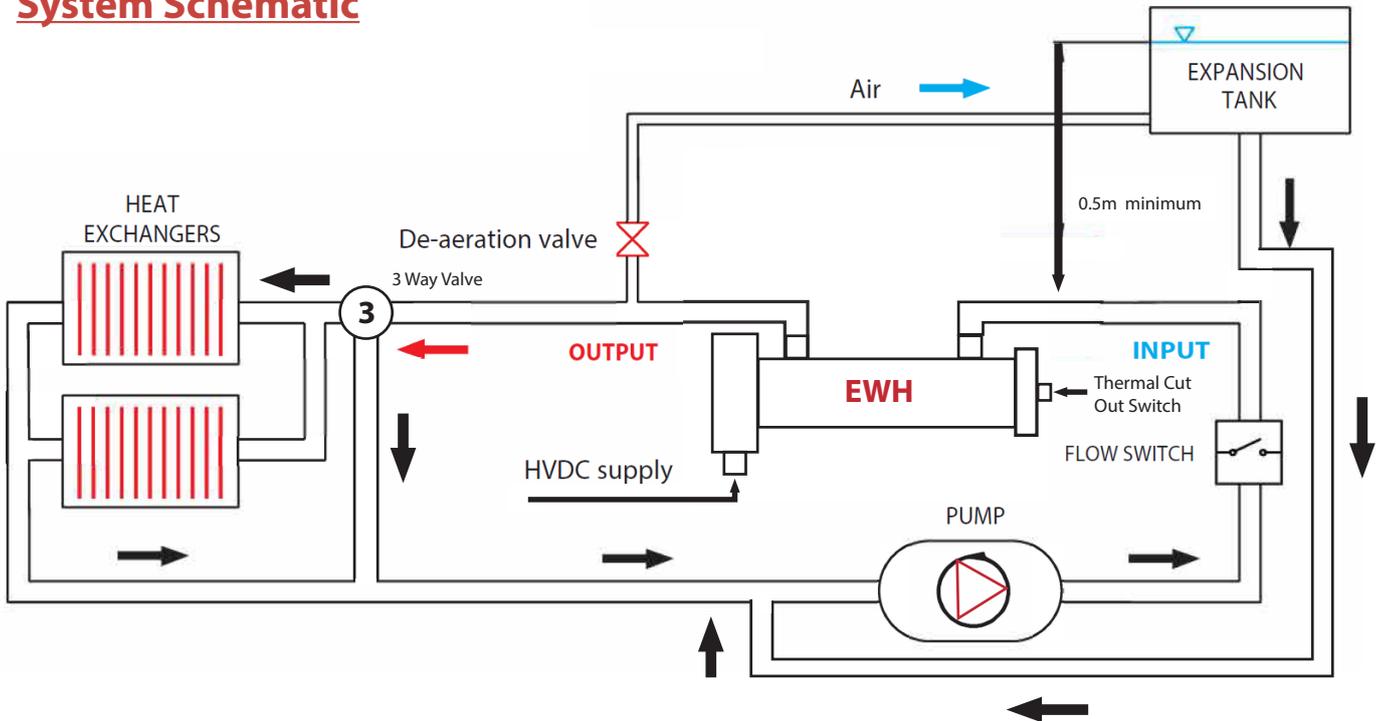
The heater must not be in contact with aggressive substances, which would impact the aluminium shell. During operation the system must not be aerated - not only will this decrease the efficiency of heating, it will also decrease the service life of the heating element.

For the de-aeration, it is possible to use the valve which shall be placed in the heating circuit. The vehicle system has to ensure de-aeration before and during heat exchanger operation. It is required that the heat circuit is equipped with a flow switch for safe operation of this type of heat exchanger, because this heat exchanger must never be operated without coolant flow. Ensure the Coolant system is fully de-aerated before operating the electric water heater.

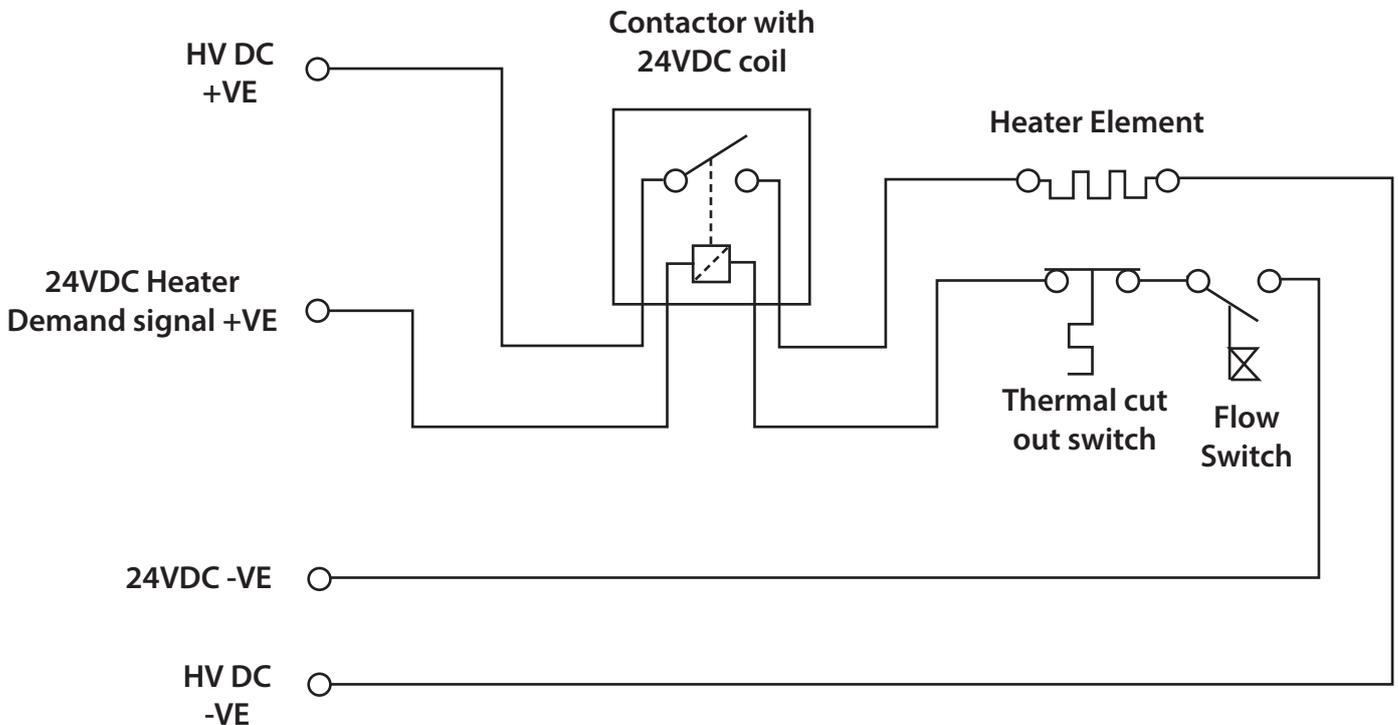
A 3 way valve must be fitted before the heat exchangers this allows the heater to have a cool down cycle where the pump continues to run for a minimum of 3 minutes after the heater has been turned off and the water valve switched to bypass the heat exchangers.

Only a correctly installed and connected electric water heater may be commissioned without any damage. In the case of any deviations from the standard status, it must be taken out of operation and inspected.

System Schematic



Electrical Schematic



The following additional system components are available from GTS:
3 way coolant valve, contactor, pump, heat exchangers, header tank and thermostatic switch.