EDS Solar Thermal
8046647 (46121-10)

LabVolt Series

Datasheet

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Festo Didactic
en 120 V - 60 Hz
07/2023

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General Description

The EDS Solar Thermal is a solar hot-water heating system that teaches students the basic principles of thermal energy, and how it can be collected, stored, and supplied. During the course of their training, students learn how to install the system components, operate the system, and measure different parameters, such as pressure, temperature, and flow rate. The training system enables students to set up various realistic heating systems, such as radiant floor heaters, passive and active solar water heaters, space heaters, and hot water heat exchangers.

The training system includes a small-scale hot water supply, a radiator, and a hydronic floor heating system that teach students how solar radiant energy can be harnessed from the sun and converted to solar thermal energy in order to increase air, water, and surface temperatures in residential, commercial, and industrial buildings.

The training system can be configured to exchange and store thermal energy. The training system permits experimenting with open- and closed-loop heating systems. The main (primary) loop can collect thermal energy and a secondary loop can distribute and apply heat to a gas, liquid, or solid in order to dissipate the thermal energy.

Courseware

The courseware for each of the topics consists of a student manual and an instructor guide as well as a textbook titled Solar Water Heating, by Bob Ramlow and Benjamin Nusz. Each student manual consists of a series of job sheets. The job sheets include a description of the objectives, a list of required equipment, a list of safety procedures, and a list of steps required to attain the objectives. To obtain detailed information about covered topics, students should refer to the textbooks or ask their instructor to guide their learning process.

All student manuals and instructor guides are fully illustrated and color printed. All student manuals and instructor guides are available as PDF files on a CD-ROM (P/N 87330-A).

Features & Benefits

- Includes everything required to operate as a stand-alone, hands-on training system

- Made with high-quality components currently used in residential, commercial, and industrial applications
- Easy and safe to use, durable, and manufactured to the highest quality standards
- A fixed-plate electrical panel allows all electrical devices to be securely fixed to the workstation side with a power
- Comprehensive curriculum consisting of fully illustrated student manuals and instructor guides
- Estimated courseware duration: 32 hours

List of Equipment

Qty	Description	Model number
1	Solar Thermal Mobile Workstation	589998 (46500-20)
2	Analog Thermometer	579801 (46501-00)
1	Pressure Relief Valve	579802 (46503-00)
1	Pressure Relief Valve	579803 (46504-00)
1	Plate Heat Exchanger	579804 (46505-00)
1	Check Valve Assembly (with two Drain Valves)	579805 (46507-00)
2	Circulator Pump	589171 (46508-10)
1	Temperature Sensor	579808 (46509-00)
2	Expansion tank	590003 (46510-10)
1	Automatic Air Vent	579810 (46511-00)
1	Radiant Floor	579811 (46512-00)
2	Fill Bowl	589187 (46519-10)
1	Hoses and accessories	590004 (46520-10)
1	EDS® Solar Thermal (User Guide)	590100 (52550-E0)
1	Halogen Work Light	784187 (87038-10)
1	Digital Multimeter	592641 (6394-B0)
2	Shutoff Valve	589163 (6520-A0)
1	Radiator	589168 (6531-B0)
2	Rotameter	589161 (6550-A0)
2	Pressure Gauge (Analog, Low Range)	589164 (6553-E0)

Manual

Description	Manual number
EDS® Solar Thermal (User Guide)	590100 (52550-E0)

Optional Equipment

Qty	Description	Model number
1	Pyranometer	579784 (8989-00)
1	EDS Vacuum Tube Collector	8046648 (46530-10) [1]

Spare Part

Qty	Description	Model number
1	Hoses and accessories	590004 (46520-10)

[1] For indoor demonstrations of the working principle of direct-flow evacuated tubes.

System Specifications

Parameter	Value
Power Requirements	
Voltage	120 V
Current	12 A
Frequency	60 Hz
Intended Location	On the floor (stands on casters)
Dimensions (H x W x D)	140 x 76 x 176 cm (551.18 x 29.92 x 69.29 in)
Net Weight	150 kg (330.69 lb)

Equipment Description

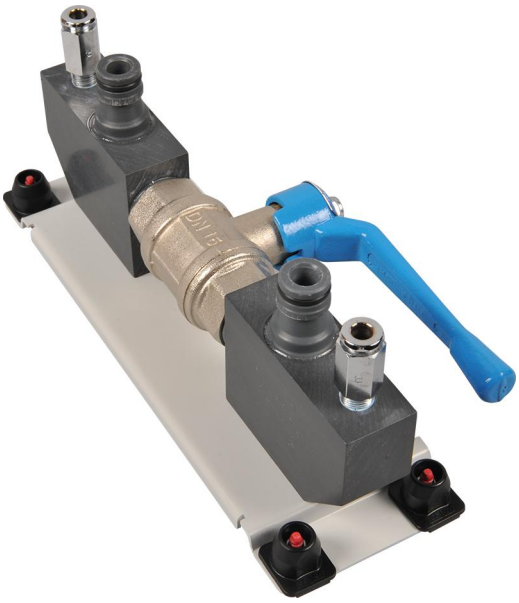
Digital Multimeter 592641 (6394-B0)

The Digital Multimeter is used for ac/dc voltage, dc current, and resistance measurements.

Specifications

Parameter	Value
Multimeter	
Type	Digital, handheld (portable)
Functions	AC/DC voltage, dc current, resistance, continuity diode test, and battery test
Accuracy	±2.0% or better
Display	3½ digit, liquid-crystal
Features	Safety-recessed test lead connections, low-battery indication, audible continuity, overload protection, mounted on a base that clamps to the work surface using twist-lock fixations
Physical Characteristics	
Dimensions (H x W x D)	22 x 12 x 6.3 cm (8.66 x 4.72 x 2.48 in)
Net Weight	0.759 kg (1.67 lb)

Shutoff Valve
589163 (6520-A0)



The hand-operated two-way valve controls fluid flow in an on or off fashion and also helps when necessary to ensure that a system component is safely isolated from other parts of the system.

Specifications

Parameter	Value
Valve	
Type	Hand-operated, two-way, ball
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Pressure Taps	Two, one at the inlet and one at the outlet, with quick-connect ball check
Physical Characteristics	
Dimensions (H x W x D)	22.5 x 9.2 x 14.5 cm (8.86 x 3.62 x 5.71 in)
Net Weight	0.835 kg (1.84 lb)

Radiator
589168 (6531-B0)

The radiator contains a 15.2 cm^2 (2.36 in^2) radiator core with a 1.06 m^2 (11.41 ft^2) heat exchanger area to transfer thermal energy from water to air, and allows manual control of its blower speed for changing the air flow rate. The maximum air flow rate is 3060 L/min (106 ft^3/min). The dual blower consists of two electric motors with fan blades powered by a 24 V dc, 2.4 A power supply output. The power supply input is rated appropriately for the ac power mains. A magnetic surface thermometer can be placed between the blower vents (slightly above the center) to monitor output temperature. Its measurement range is from -17.8°C to 65.6°C.

Specifications

Parameter	Value
Cooling Unit	
Type	Forced-air cooling coil with variable-speed fans
Fans	
Quantity	2
Ratings	
Voltage	24 V dc
Current	2.4 A dc
Maximal Air Flow Rate	3060 L/min (106 ft³ /min)
Temperature Measurement Ports	2 inlets/outlets
Fan Speed Control	
Direction	Direct or reverse
Modes	Manual with built-in adjustment knob or external using 0-5 V or 4-20 mA signals
Physical Characteristics	
Dimensions (H x W x D)	32 x 17 x 27 cm (12.6 x 6.7 x 10.63 in)
Net Weight	5.44 kg (12 lb)

Rotameter 589161 (6550-A0)

The rotameter is an analog device that measures the flow rate of a fluid as the material pushes on a floating indicator. Rotameters help to ensure that system fluid flow rates are normal and passageways are not excessively restricted or blocked, which could dramatically raise fluid pressure. The rotameter is calibrated in both liters per minute (L/min) and gallons per minute (gal/min), and the cleartapered tube permits visual inspection of the internal fluid and observation of trapped air bubbles, dirt, and debris within a system loop.

Specifications

Parameter	Value
Rotameter	
Type	Tapered tube with float indicator
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Flow Range	1-7.5 L/min (0.2-2 gal US/min)
Mouting	Vertical
Accurancy	±5% of full scale
Pressure Taps	Two, one at the inlet and one at the outlet, with quick-connect ball check
Physical Characteristics	
Dimensions (H x W x D)	39.2 x 7 x 8 cm (15.43 x 2.76 x 3.15 in)
Net Weight	0.807 kg (1.78 lb)

Pressure Gauge (Analog, Low Range)
589164 (6553-E0)

The pressure gauge provides a direct reading of the pressure in one of many convenient measurement units. It features two interconnected pressure ports, and is equipped with a mounting bracket for simple installation on the workstation.

Specifications

Parameter	Value
Pressure Gauge	
Type	Analog, bourdon tube
Range	0-103.4 kPa (0-15 psig)
Accurancy	±3% of full scale
Dial Diameter	6.4 cm (2.5 in)
Pressure Taps	Two inlets with quick-connect ball-check socket
Physical Characteristics	
Dimensions (H x W x D)	11.5 x 12 x 7.5 cm (4.53 x 4.72 x 2.95 in)
Net Weight	0.439 kg (0.97 lb)

Solar Thermal Mobile Workstation
589998 (46500-20)

The Solar Thermal Mobile Workstation consists of a sturdy steel frame painted using powder-coated paint for a durable surface. The unit is mounted on four swivel casters with a locking mechanism that allow easy motion and stable operation. The workstation includes three perforated work surfaces for module installation and operation, as well as an electrical Panel that houses a variety of electrical modules. These include:

- Differential controller
- Thermostat controller
- Emergency stop button
- Circuit breaker switch
- DC power source connector
- AC outlet

Electrical Panel

120 V/60 Hz variant for the electrical panel

230 V/50 Hz variant for the electrical panel

The electrical panel is available in different variants depending on ac power network voltages and frequencies.

Differential Controller

The differential controller is a digital device that controls circulators by using the difference between two temperatures to determine operating set points for its circulator. The differential temperature range can be set between 1.1°C and 22.22°C (2°F and 40°F). The Differential Controller uses several remotely located, 1 kΩ, platinum RTD sensors (Model 46509), and includes a digital display and three push-button switches (+, -, and OK) to select various options. It also includes an override switch to turn the pump on without using the controller's settings, turn the pump off, or turn the pump on using the controller's settings.

Thermostat Controller

The thermostat controller is an electromechanical switch that uses a temperature threshold to activate or deactivate a circulator. It detects temperature levels through a remote-sensing bulb with a fluid-filled capillary tube and triggers the switch as required. The temperature set point is adjustable from 0°C to 40°C (32°F to 104°F) using a rotating knob and is compensated for the ambient temperature. An internal single-pole, double-throw (SPDT) switch opens the circuit when the temperature rises to the manually adjusted set point, and closes the circuit when the temperature falls by a certain value below the set point.

Emergency Stop

The large red push-button safety switch is easy to locate in emergency situations. Activation of the emergency-stop switch immediately turns off all power in the training system.

Circuit Breaker Switch

When activated (to "I" position), the circuit breaker switch turns the system on.

DC Power Source Connector

The dc power source connector is used to provide dc power to the radiator.

AC Outlet

The ac outlet is used for powering the working lights (Model 87038)

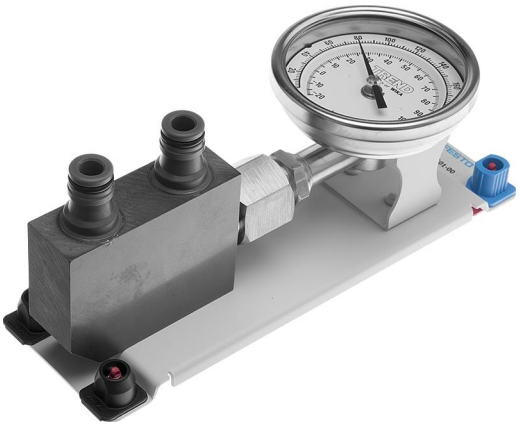
Solar Collector

The solar collector converts radiant energy (light) into thermal energy (heat) and transfers that energy to a fluid, commonly water or a water and antifreeze mixture.

Specifications

Parameter	Value
Mobile Workstation	
Physical Characteristics	140 x 76 x 176 cm (551.18 x 29.92 x69.29”)
Net Weight	150 kg (330.69 lb)
Differential Controller	
Type	Digital display and three push buttons
Input/Output Rating	120 V, 0.75 A, 60 Hz
Temperature-Differential Range	1.1°C to 22.22°C (2°F to 40°F)
Remote-Temperature Sensor	Two-wire, 1 kΩ at 25°C, 4 platinum RTD
Display	Liquid-crystal
Dimensions (H x W x D)	17.9 x 10.8 x 4.7 cm (7.05 x 4.25 x 1.85 in)
Thermostat Controller	
Type	Remote bulb temperature controlled electrical switch
Contact Rating	230 V, 16 A
Application	Heat only, the switch opens when temperature increases
Temperature Setpoint Range	0°C to 40°C (32°F to 104°F)
Remote Temperature Sensor	Armored hydraulic capillary tube and bulb
Dimensions (H x W x D)	15.9 x 5.3 x 5.9 cm (6.26 x 2.09 x 2.32 in)
DC Power Source Connector	
Output Ratings	24 V dc, 2.4 A
AC Outlet	
Rating	120 V ac, 10 A, 60 Hz
Solar Collector	
Tilt Angle	0° to 45°
Dimensions (W x H)	120 x 80 cm (47.24 x 31.50 in)
Volume	0.6 L (0.15 gal)
Absorption Rating	95%

Analog Thermometer 579801 (46501-00)

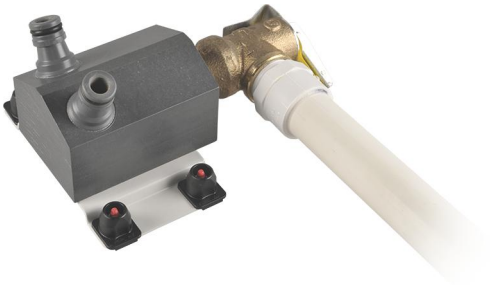


The analog thermometer provides a quick indication of fluid temperature in degrees Celsius (°C) or Fahrenheit (°F). The device uses a coiled bimetallic strip to indicate the fluid temperature sensed in a brass immersion well. The Analog Thermometer also helps to ensure that system fluid temperature ratings are not exceeded.

Specifications

Parameter	Value
Type	Bimetallic
Accuracy	±2% of full-scale
Range	0°C to 121.1°C (32°F to 250°F)
Physical Characteristics	
Dimensions (H x W x D)	22.5 x 8.3 x 11.2 cm (8.86 x 3.27 x 4.41 in)
Net Weight	0.735 kg (1.62 lb)

Pressure Relief Valve 579802 (46503-00)

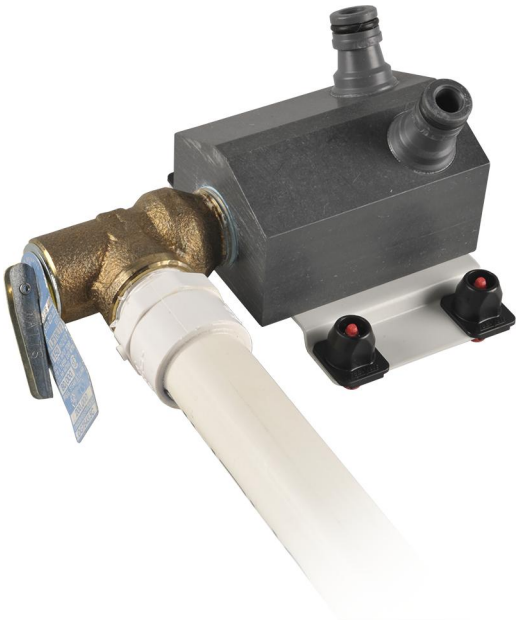


The pressure relief valve or safety relief valve opens at a safely rated fluid-pressure level. The device also helps to ensure that the system fluid-pressure ratings are not exceeded. A discharge line (left- and right-side modules included) safely redirects the fluid as it is expelled from a relief valve. Although the training system operates safely without pressure relief valves, they are useful to demonstrate the normal safety precautions necessary in actual system installations.

Specifications

Parameter	Value
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Rating	
Pressure	10.34 bar (150 psig)
Temperature	98.9°C (210°F)
Physical Characteristics	
Dimensions (H x W x D)	79.7 x 15.3 x 7 cm (31.38 x 6.02 x 2.76 in)
Net Weight	0.318 kg (0.7 lb)

Pressure Relief Valve 579803 (46504-00)



The pressure relief valve or safety relief valve opens at a safely rated fluid-pressure level. The device also helps to ensure that the system fluid-pressure ratings are not exceeded. A discharge line (left- and right-side modules included) safely redirects the fluid as it is expelled from a relief valve. Although the training system operates safely without pressure relief valves, they are useful to demonstrate the normal safety precautions necessary in actual system installations.

Specifications

Parameter	Value
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Rating	
Pressure	10.34 bar (150 psig)
Temperature	98.9°C (210°F)
Physical Characteristics	
Dimensions (H x W x D)	79.7 x 15.3 x 7 cm (31.38 x 6.02 x 2.76 in)
Net Weight	0.318 kg (0.7 lb)

Plate Heat Exchanger 579804 (46505-00)

The plate heat exchanger, an external device, is a copper, brazed-plate type of heat exchanger that transfers thermal energy through a fluid containment wall.

Specifications

Parameter	Value
Type	Copper, brazed flat plate
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Number of Ports	1 input, 1 output (cold side); 1 input, 1 output (hot side)
Number of Plates	10
Thermal Transfer Area	0.121 m² (1.3 ft²)
Solar/Transfer Fluid Volume	114 mL (0.03 US gal) on each side
Maximal Heat Capacity	13.2 kW (45 000 BTU/hr)
Plate Dimensions	20.32 x 8.26 cm (8 x 3.25 in)
Physical Characteristics	
Dimensions (H x W x D)	22.3 x 12 x 10.5 cm (8.78 x 4.7 x 4.13 in)
Net Weight	1.66 kg (3.66 lb)

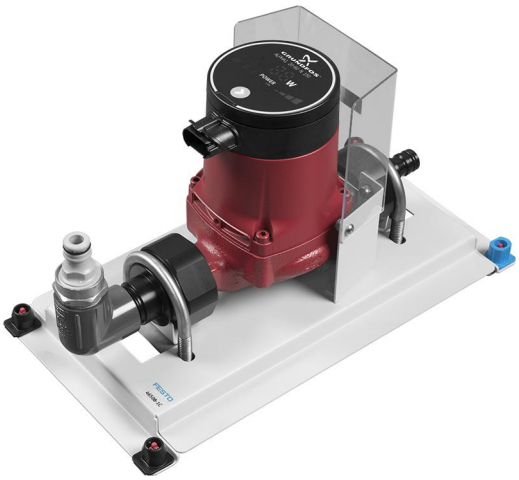
Check Valve Assembly (with two Drain Valves) 579805 (46507-00)

The check valve assembly, also called a flow-check valve or a non-return valve, is an automatic device for controlling fluid flow in only one direction, as indicated on the device. Two boiler drain valves can be used to fill, drain, or purge the system. The Check Valve Assembly helps to ensure that the system fluid travels in only one direction for safe operating conditions. The valve should not be positioned pointing downward.

Specifications

Parameter	Value
Type	Swing-gate check valve with two boiler drain valves to fill, drain, or purge
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Rating	
Pressure	10.34 bar (150 psig), non-shock wog
Temperature	98.9°C (210°F), oil or air
Physical Characteristics	
Dimensions (H x W x D)	8.4 x 22.2 x 16 cm (3.31 x 8.74 x 6.30 in)
Net Weight	1.227 kg (2.705 lb)

Circulator Pump 589171 (46508-10)



The circulator pump is a three-speed water pump driven by an integrated electric motor and impeller assembly that is electronically controlled. The pump does not include any built-in check valve. The Circulator Pump is available in different variants depending on ac power network voltages and frequencies. Because of this, the actual module may vary from the one shown in the picture.

Specifications

Parameter	Value
Circulator Pump	
Type	Centrifugical
Inlet And Outlet Diameter	1.3 cm (0.5 in)
Material	Stainless Steel
Electrical Rating	120 V ac, 0.75 A, 60 Hz
Maximum system pressure	1034.21 kPa (150 psi or 10 bar)
Head Range	0 - 5.80 m (0 - 19 ft)
Flow Range	0 - 79.5 L/min (0 - 21 GPM)
Temperature Range	2°C to 110°C (36°F to 230°F)
Connection Type	4 pin connector
Physical Characteristics	
Dimensions (H x W x D)	32 x 17 x 18.5 cm (12.60 x 6.69 x 7.28 in)
Net Weight	1.91 kg (4.2 lb)

Temperature Sensor 579808 (46509-00)

The temperature sensor is a two-wire, 1 kΩ platinum RTD temperature sensor that is specifically intended for use with the differential controller provided in the training system.

Specifications

Parameter	Value
Temperature Sensor	
Type	Two-wire, 1 kΩ (at 25°C) platinum RTD
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Physical Characteristics	
Dimensions (H x W x D)	7 x 12 x 8.5 cm (2.76 x 4.72 x 3.35 in)
Net Weight	0.373 kg (0.82 lb)

Expansion tank 590003 (46510-10)

The expansion tank contains a flexible diaphragm and a pressurized secondary fluid (air) that permits the safe thermal expansion and contraction of its primary fluid (water). This fluid separation allows changes to occur in primary-fluid volume that are directly related to changes in primary fluid temperature.

Specifications

Parameter	Value
Expansion Tank	
Type	Lined-steel vessel with internal pressurized air bladder
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Maximum Usable Volume	7.95 L (2.1 gal)
Maximum Water Capacity	4.16 L (1.1 gal)
Nominal Operating Pressure	101.3 kPa (14.69 psi or 1.01 bar)
Maximum Operating Pressure	1000 kPa (145.04 psi or 10 bar)
Factory Precharge	250 kPa (36.26 psi or 2.5 bar)
Temperature Range	-10°C to 120°C (14°F to 248°F)
Physical Characteristics	
Dimensions (H x W x D)	32 cm x 22 cm x 21.5 cm (12.60'' 8.66'' x 8.46'')
Net Weight	3.2 kg (7.1 lb)

Automatic Air Vent 579810 (46511-00)

The automatic air vent (float type with valve) is an automatically-operated valve that allows trapped air to bleed from a liquid-based system. It helps to ensure that other system components operate efficiently and do not overheat. The manually-adjusted valve on top of the air vent can be closed so that no air can enter or escape.

Specifications

Parameter	Value
Air Vent	
Type	Automatic float with valve
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Pressure Rating	10.34 bar (150 psig)
Physical Characteristics	
Dimensions (H x W x D)	11 x 12.3 x 9.8 cm (4.33 x 4.84 x 3.86 in)
Net Weight	0.434 kg (0.96 lb)

Radiant Floor 579811 (46512-00)

The radiant floor is a radiant flooring of the hydronic type constructed with copper tubing bonded to a ceramic tile. The flooring acts as a heat exchanger that allows the thermal energy from hot water to partially heat the top floor surface and radiate into the ambient air. It also provides some limited heat storage. Underside construction of the module is visible through a window in the back.

Specifications

Parameter	Value
Radiant Floor	
Type	Ceramic floor tile with copper tubing serpentine underneath
Inlet and Outlet Diameter	1.3 cm (0.5 in)
Tiles	
Dimensions	20.3 x 20.3 cm (8 x 8 in), 412 cm² (64 in²)
Thickness	6.8 mm (0.268 in)
Tile Weight	526 g (1.16 lb)

Parameter	Value
Physical Characteristics	
Dimensions (H x W x D)	31.7 x 22 x 8.3 cm (12.48 x 8.66 x 3.27 in)
Net Weight	1.09 kg (2.4 lb)

Fill Bowl
589187 (46519-10)

The fill bowl, also called manual air vent or manual fluid feeder, consists of a funnel and ball valve that (when open) allows trapped air bubbles to escape from a liquid system, and also allows liquid to be added to the system to replace the air. The Fill Bowl also helps to ensure that other system components operate efficiently and do not overheat

Specifications

Parameter	Value
Fill Bowl	
Type	Manual air vent/fluid feeder with funnel and ball valve
Inlet and outlet Diameter	1.3 cm (0.5 in)
Practical Volume	480 ml (0.127 US gal)
Physical Characteristics	
Dimensions (W x H x D)	27.3 x 12.7 x 15 cm (10.74 x 5 x 5.91 in)
Net Weight	1.55 kg (3.42 lb)

Hoses and accessories
590004 (46520-10)

Hoses and accessories include an assortment of 30.5 cm, 61 cm, 91.4 cm, and 183 cm (12 in, 24 in, 36 in, and 72 in) tubing. These vinyl interconnection hoses feature special one-way valves at each end to help prevent accidental system draining. It also includes a variety of accessories that are necessary for the usage of the trainer. Among them, there is a 1L water pitcher (model 52220), a

magnetic thermometer (model 87244), and a vaccuum breaker (model 87448). All of the components are gathered in a big white box (model 52366).

Specifications

Parameter	Value
Tubing	
Type	UV-resistant black PVC tubing with quick-connect fittings and built-in valves at each end
Pressure Rating	3.03 bar (44 psi) at 22.78°C (73°F)
Maximal Temperature Rating	50°C (122 °F)
Physical Characteristics	
Hose Length	Six 183 cm (72 in)
	Six 91.4 cm (36 in)
	Ten 61 cm (24 in)
	Eight 30.5 cm (12 in)
Hose Inner Diameter	1.3 cm (0.5 in)
Hose Outer Diameter	1.9 cm (0.75 in)

Halogen Work Light 784187 (87038-10)

The Halogen Work Light consists of a 1000 W (two 500 W bulbs) halogen lamp mounted on a heavy-duty telescopic tripod with adjustable legs. The light rack is easily removable to convert the lamp into a portable one. Two settings are available : low setting (only one lamp) and high setting (two lamps).

Specifications

Parameter	Value
Lamp	
Type	Quartz/halogen/tungsten flood lamp
Power Requirements	
Curent	9 A
Service Installation	Standard single-phase outlet
Electrical Rating	Two 500 W lamps, 120 V ac, 60 Hz
Physical Characteristics	
Dimensions (H x W x D)	172.7 x 77.5 x 77.5 cm (68 x 30.5 x 30.5 in) fully extended
Net Weight	4.4 kg (9.7 lb)

Optional Equipment Description

Pyranometer (Optional) 579784 (8989-00)

The Pyranometer is a high-quality instrument for measuring solar irradiance. The thermopile sensor construction measures the solar energy that is received from the total solar spectrum and the whole hemisphere (180° field of view). The output signal of the Pyranometer is a voltage proportional to the measured solar irradiance, expressed in Watts/m². The Pyranometer is a useful instrument when measuring the performance of solar panels versus insolation.

Specifications

Parameter	Value
Spectral Range	310 to 2800 nm
Sensitivity	5 to 20 uV/W/m²
Response Time	‹18 s
Maximum Solar Irradiance	2000 W/m²
Field of View	180°
Operating Temperature Range	-40°C to +80°C (-40°F to +176°F)
Physical Characteristics	
Dimensions (H x W x D)	85 x 130 x 100 mm (3.4 x 5.1 x 3.9 in)
Net Weight	1.1 kg (2.4 lb)

EDS Vacuum Tube Collector (Optional) 8046648 (46530-10)

Ideal for indoor demonstrations of the working principle of direct-flow evacuated tubes. This model allows students to heat water that circulates through the tubes using a powerful lamp and observe the effect on the water temperature. Water can be easily drained from the tubes by tilting the assembly around its central axis.

Optional Manual(s)

Qty	Description	Model number
1	Evacuated Tube Solar Collector (Workbook)	593916 (52844-20)
1	Capteur solaire à tubes sous vide (Workbook)	593917 (52844-21)
1	Colector solar de tubos de vacío (Workbook)	593918 (52844-22)
1	Evacuated Tube Solar Collector (Workbook)	593913 (52844-2C)
1	Vakuumröhren-Kollektormodule (Workbook)	593914 (52844-2G)
1	Capteur solaire à tubes sous vide (Workbook)	593915 (52844-2H)
1	Evacuated Tube Solar Collector (Workbook (Instructor))	593922 (52844-30)
1	Capteur solaire à tubes sous vide (Workbook (Instructor))	593923 (52844-31) [2]
1	Colector solar de tubos de vacío (Workbook (Instructor))	593924 (52844-32)
1	Evacuated Tube Solar Collector (Workbook (Instructor))	593919 (52844-3C)
1	Vakuumröhren-Kollektormodule (Workbook (Instructor))	593920 (52844-3G)
1	Capteur solaire à tubes sous vide (Workbook (Instructor))	593921 (52844-3H)

2

Specifications

Parameter	Value
General parameters	
Number of Tubes	6
Average Efficiency	65%
Temperature Range	-40°C to 60°C (-40°F to 140°F)
Max. Operating Pressure	600 kPa (87 psi or 6 bar)
Tilt Angle	45°
Inlet and Outlet Diameters	1.3 cm (0.5 in)
Manifold	
Outer Material	Aluminum alloy
Insulation	PUF and rock wool
U Pipe	
Material	Copper
Diameter	8 mm (0.31 in)
Thickness	1 mm (0.04 in)
Vacuum Tube	
Size	47/1500 mm (1.85/59.05 in)

Reflecting the commitment of Festo Didactic to high quality standards in product, design, development, production, installation, and service, our manufacturing and distribution facility has received the ISO 9001 certification.

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