

OIL-TO-AIR HEAT EXCHANGERS



**QUALITY
ELEVATOR PRODUCTS, INC.**

BUCR Series Oil-To-Air Heat Exchangers

The BUCR Series heat exchangers are designed to stabilize the oil temperature and uses an internal oil pump and large blower wheel which spins slowly to draw air through an oversized cooler. This combination offers excellent cooling capacity with low noise.

- Stabilizes the oil temperature
- Warm air is directed up and away from work area
- High efficient plate and fin style heat exchangers
- Internal oil pump
- Externally mounted heat exchangers for easy maintenance and cleaning
- Located next to power unit
- Operates in the bypass flow.
- Independent of the power unit
- Controlled by adjustable thermostat (in power unit)
- Adjustable thermostat and wall mounting brackets included
- Optional controller available

Features

- Up to 46,000 BTU/HR or 18 HP cooling capacity*
- 17,000 BTU/HR for BUCR2S*
- 29,000 BTU/HR for BUCR3S*
- 46,000 BTU/HR for BUCR4S*
- Pump flows ranging from 3.1 GPM or 12 GPM
- 1/3 HP to 2 HP electric motor
- 115/230VAC 1 phase or 230/460VAC 3 phase
- Noise levels from 68 dBa to 73 dBa
- Weight from 80 lbs to 160 lbs

*Cooling capacity is a function of the temperature difference between the oil and air temperatures.

Advantages

The advantages of an off line cooling system are a stable cooling performance irrespective of variations in flow and duty cycle of the main hydraulic circuit. This allows the cooler to be sized to fit the heat load and not the maximum return flow of the main circuit. A further advantage is that the off-line cooler is completely isolated from surge pressures in the return line that can potentially damage the cooler. Also, maintenance can be performed without having to shut down the main system.



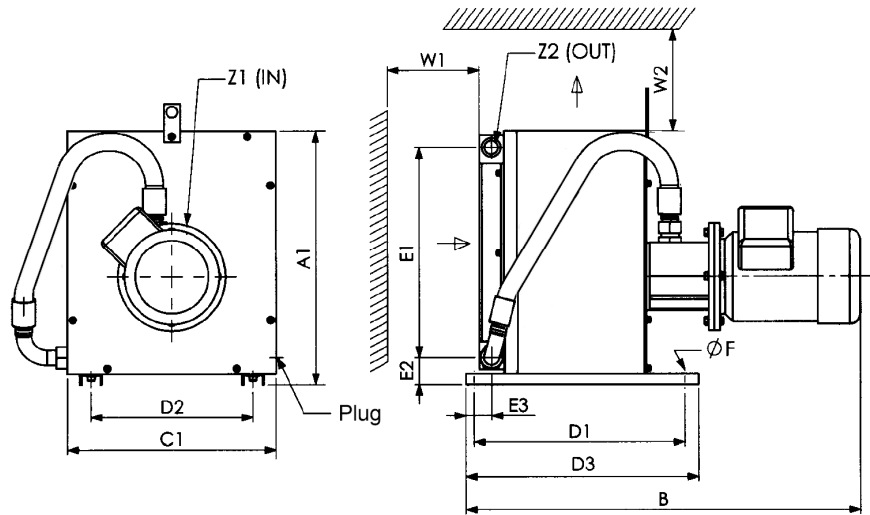
General

Construction	Housing	Welded steel housing, steel filter bracket, steel legs, steel blower wheel
	Heat Exchanger	Aluminum
	Motors	BUCR2S/2S1: TEFC, IEC Frame B5 Flange, BUCR3S/4S NEMA Frame
	Pump	Aluminum alloy housing, steel primary screw, cast iron secondary screw
Mounting Position	Horizontal, motor shaft	
Maximum Pressure	90 PSI (6 BAR)	
Rated Suction Pressure	Min. -5 PSI / Max. 43 PSI (3 BAR), for standard shaft seals	
Fluids	Mineral oil to DIN 51524 Part 1 and 2	
Contamination Limit	Permissible contamination < NAS 12	
Max Viscosity	180 cst	
Ambient Temperature	50°F (10°C) to 104°F (40°C)	
Maximum Oil Temperature	180°F (82°C)	
Air Flow Direction	Pulled across Heat Exchanger	

Specifications

Model	Pump Displacement. Per Pump Code GPM		Noise Level dBa*	Motor VAC	Motor kW	Motor RPM	Weight lbs
BUCR2S-1	Code 10	3.1	68	1 phase 115/230	0.43	1200	80
BUCR2S	Code 10	3.1	68	3 phase 230/460	0.43	1200	80
BUCR3S	Code 40	12	68	3 phase 208-230/460	1.49	1200	137
BUCR4S	Code 40	12	73	3 phase 208-230/460	1.49	1200	160

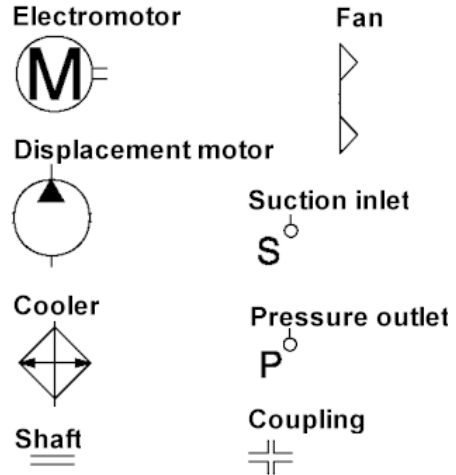
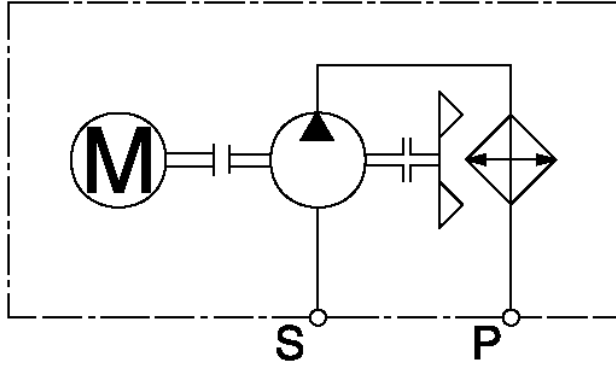
Dimensions



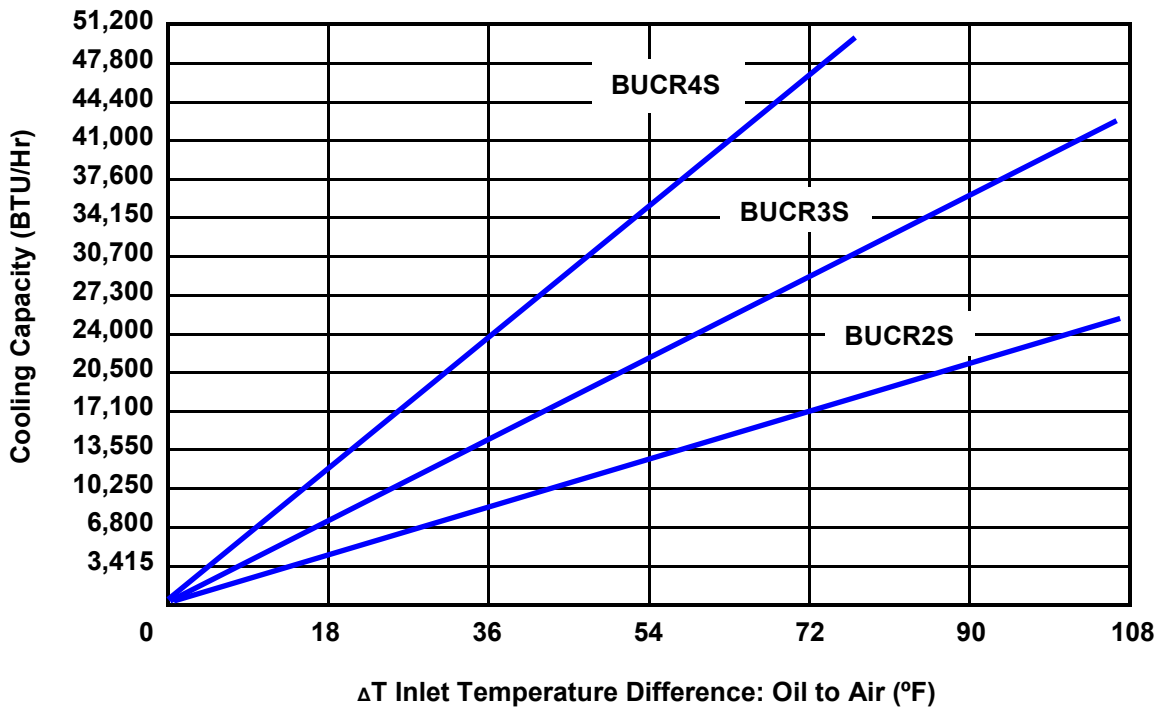
Model	A1	B	C1	D1	D2	D3
BUCR2S	14.76	22.68	13.58	12.60	11.22	14.17
BUCR3S	18.50	36.10	15.16	32.76	11.81	33.54
BUCR4S	20.87	39.29	17.72	35.94	14.17	37.32

Model	E1	E2	E3	F	W1	W2	Z1	Z2
BUCR2S	11.38	1.97	1.87	0.35	11.81	39.37	1 1/16"-12 JIC-12(M)	1 1/16"-12 JIC-12(M)
BUCR3S	15.31	1.99	2.68	0.35	15.75	59.06	1 5/8"-12 JIC-20(M)	1 1/16"-12 JIC-12(M)
BUCR4S	17.28	2.20	2.68	0.37	19.69	78.74	1 5/8"-12 JIC-20(M)	1 5/16"-12 JIC-16(M)

Hydraulic Symbols



Cooling Capacity (function of ΔT)



Example:

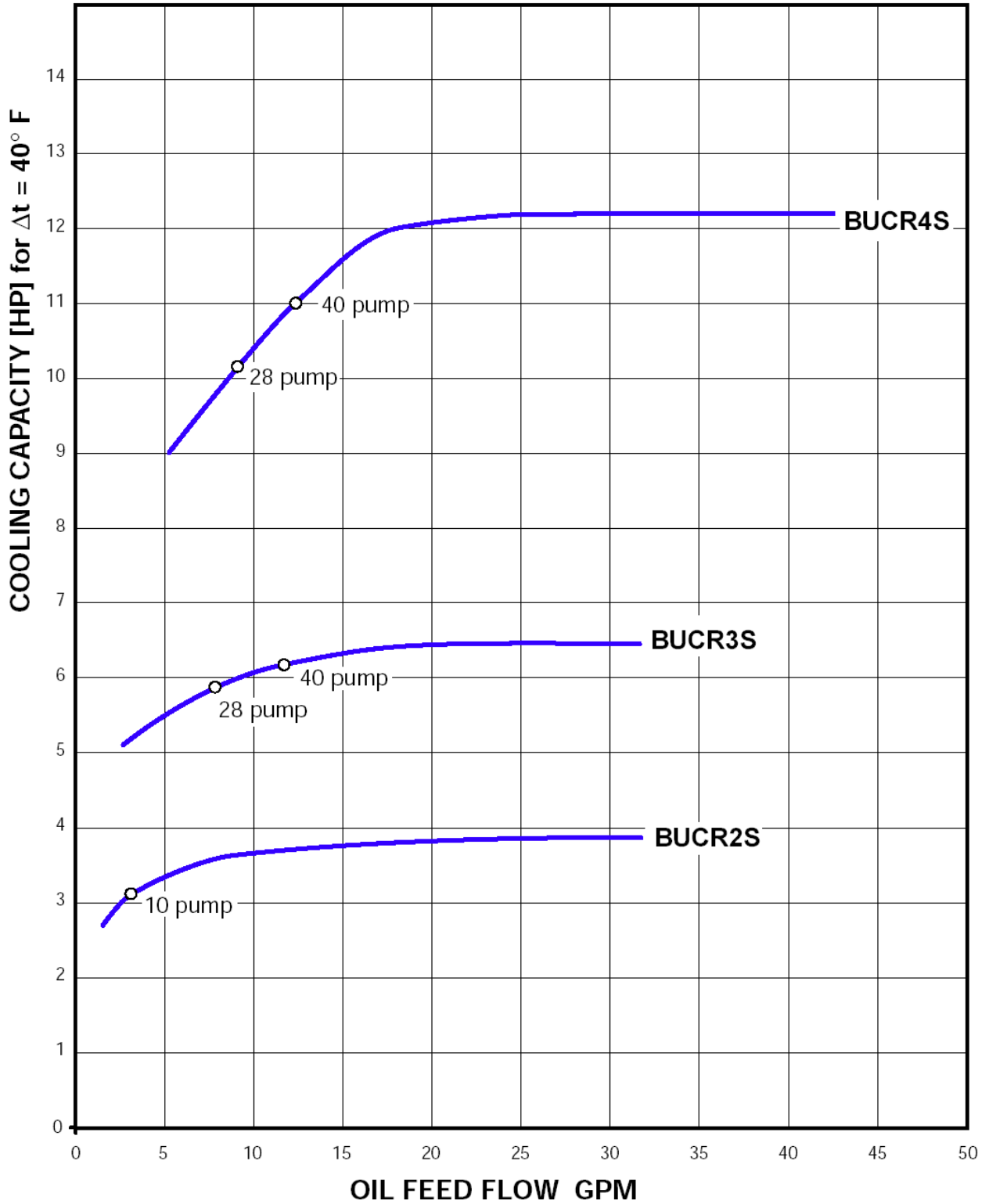
Cooling Capacity of the Oil-Air Coolers as a Factor of the Temperature Difference of Oil to Air.

(A) Oil Temperature 140 $^{\circ}$ F, Air Temperature 68 $^{\circ}$ F, Temperature Difference: 140 $^{\circ}$ F-68 $^{\circ}$ F=72 $^{\circ}$ F
Cooling Capacity for BUCR2S = 17,100 BTU/Hr

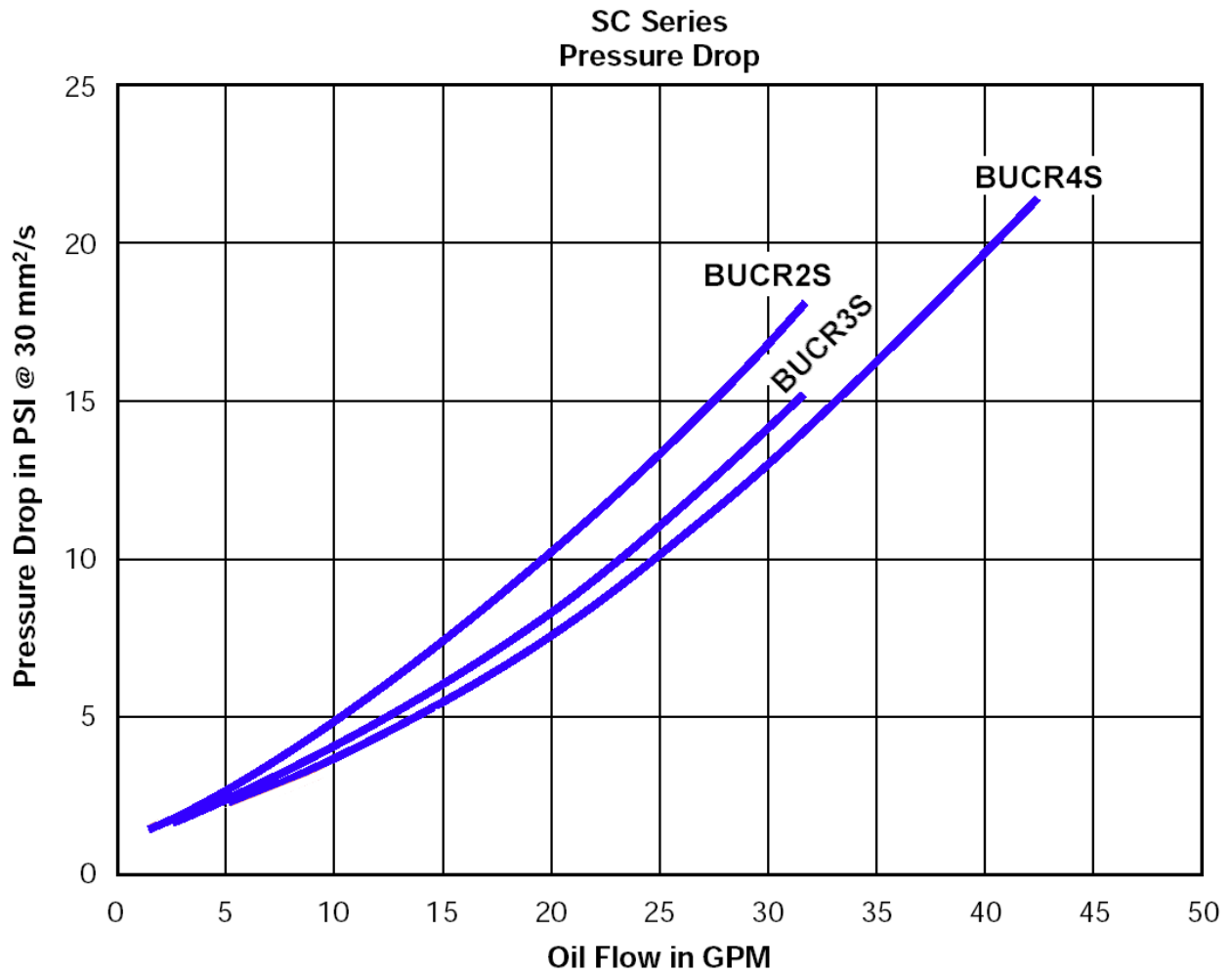
(B) Oil Temperature: 140 $^{\circ}$ F, Air Temperature 86 $^{\circ}$ F, Temperature Difference: 140 $^{\circ}$ F-86 $^{\circ}$ F=54 $^{\circ}$ F
Cooling Capacity for BUCR4S = 34,500 BTU/Hr

Cooling Capacity

Cooling Capacity



Cooling Capacity



Pressure differential Δp depending on flow rate Q and the viscosity of the oil.
 Graph uses oil viscosity of 150 SSU. For oil viscosities other than 150 SSU, in the graph
 above multiply the Δp by the factor k for the corrected pressure drop.

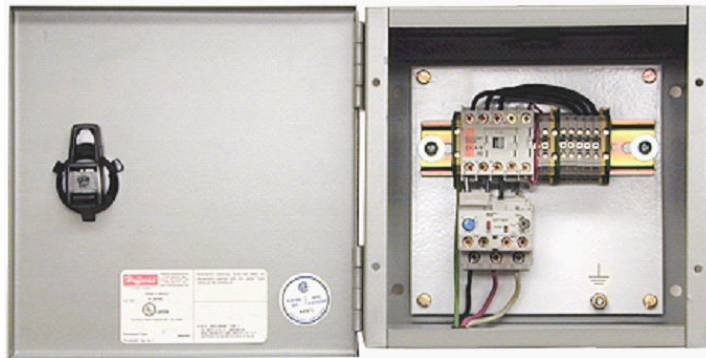
SSU	46	70	102	150	213	250	315	464	695
mm/sec	10	15	22	32	46	54	68	100	150
Factor K	0.5	0.65	0.77	1	1.3	1.52	1.9	2.8	5.3

Electrical Controller

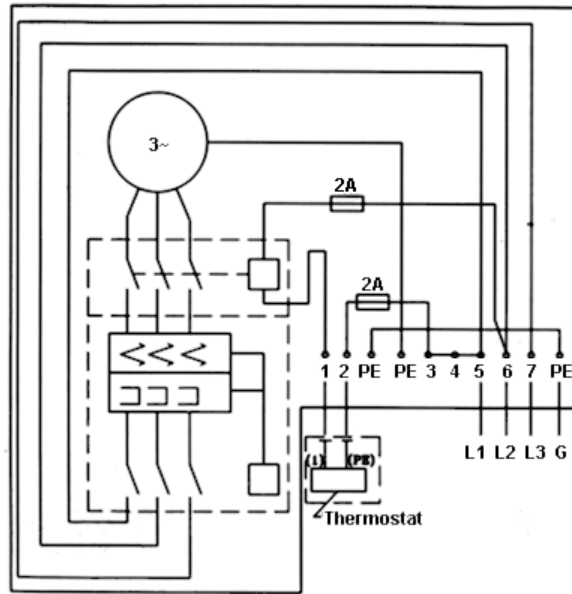
Description

Model BUCSTARTER Electrical Controller designed specifically for BUCR series Cooling Systems with 1 or 3 phase motor and Adjustable Thermostat. Controller includes motor overload.

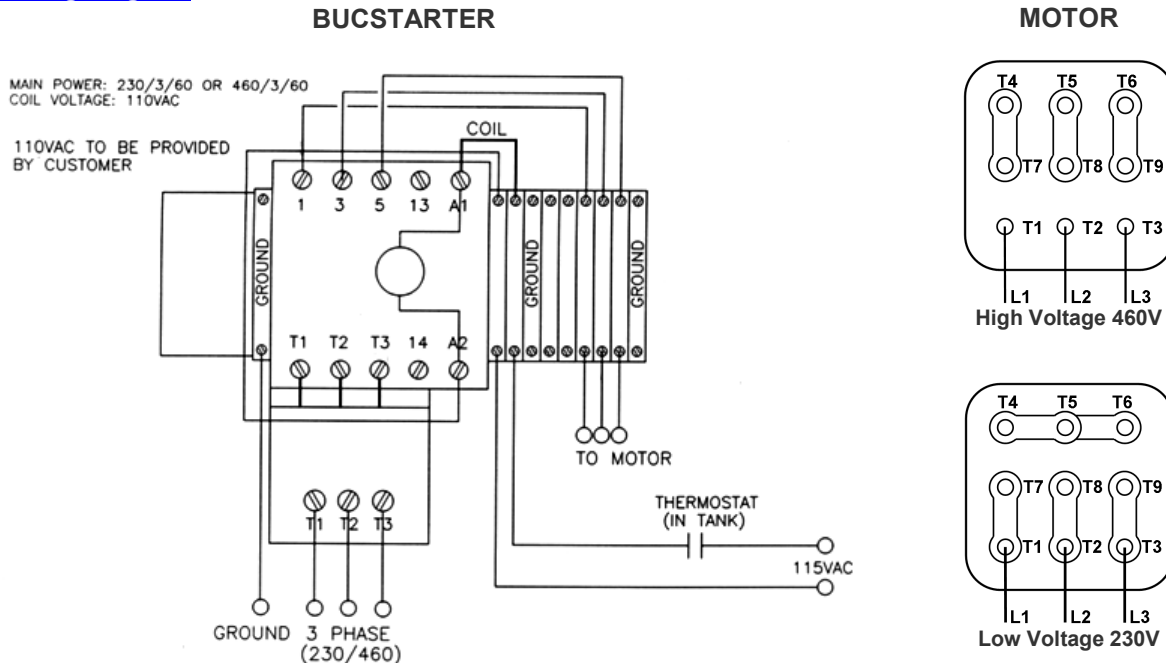
Main power: 115/230/460 VAC
Coil voltage: 110 VAC



Electrical diagram



Wiring diagram

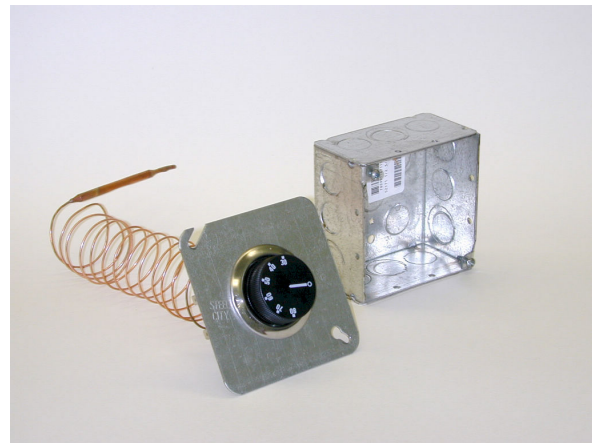


Adjustable Thermostat general description

• **Model BUCR-THERM**

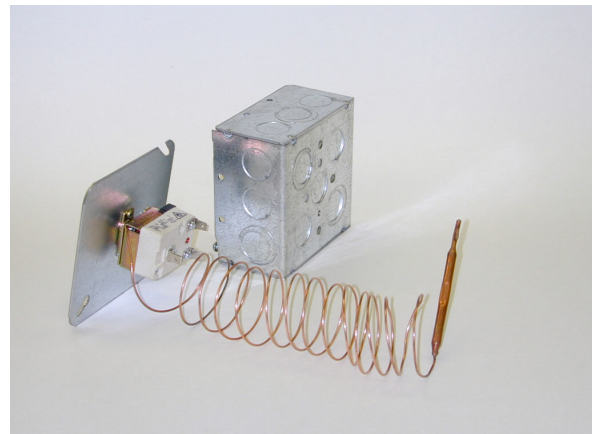
- Included with BUCR series cooler
- Built in wire terminal box
- Switching point adjustable outside of wire terminal box
- Temperature-feeler through hole in cover In oil*

The thermostat can be used for switching a cooling circuit ON and OFF. The operating temperature of the thermostat contact can be set from outside by means of a handwheel. The sensor element is immersed into the oil through the drum lid. It is essential that the sensor element is always immersed in the oil.



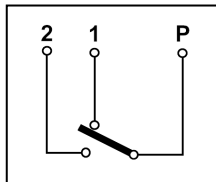
Technical data

Electrical switch resistive power: 10 A 400 VAC
 Electrical switch inductive power: 1 A 400 VAC
 Electrical connections: 6.3mm. DIN 46244
 Temperature adjustment range: 85°F - 195°F
 Protection class: in wire terminal box IP34

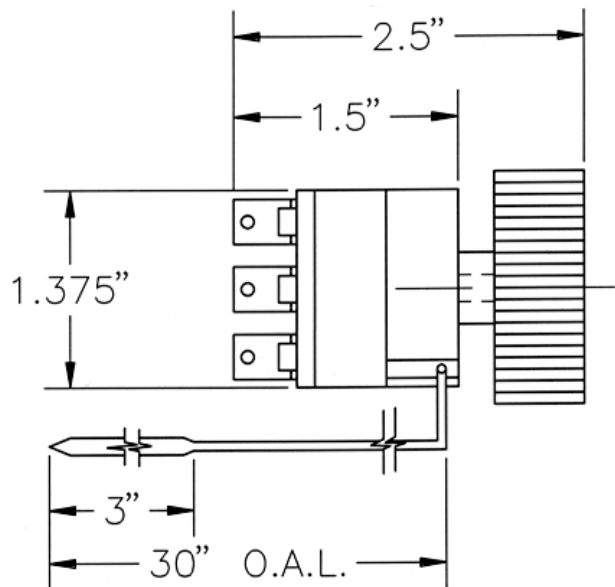
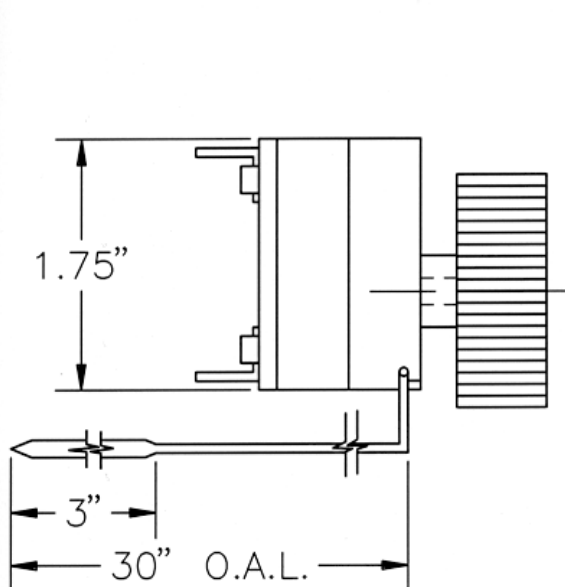


Electrical

Switching at rising temperature.
 Position in "off":



Dimensions



Operating And Maintenance Instructions

TYPES AND CONSTRUCTION

Fan, metal housing, heat exchanger, feed pump, adjustable thermostat, optional accessories.

INSTALLATION

The mounting position of BUCR coolers is optional. In all cases, unrestricted airflow should be ensured. The ideal distance on the suction and pressure side is less than 12' from oil source. The inlet and outlet of the hydraulic connection are labeled. The coolers must only be connected using hydraulic thread-end connections. The hydraulic connection on the heat exchanger, a universal coupling with sealing olive, should be dry and the nut should only be tightened by means of a spanner in order to avoid stripping. For some small cooler elements the highest permissible torque rating on the threaded connections is given on the nameplate on the cooler.

If the cooler is situated more than 4m away from the tank, or the difference in height between the cooler and the tank, is more than 2m, the cross-section should be correspondingly larger. The maximum permissible viscosity is 180mm²/s (COLD START).

PLEASE NOTE: UNITS WITH FEED PUMP MUST NEVER RUN WITH CONNECTIONS CLOSED.

However, a short dry run with open connections (in order to check the direction of rotation) does not do any damage. Coolers with hydraulic motor: The direction of rotation of the fan must be the same as that of the hydraulic motor. The direction of rotation is given on the corresponding sticky label. The hydraulic motor (reversible) is equipped with a tank line. This line must be connected to the tank.

WORKING PRESSURE

On units with a feed pump the maximum working pressure of 6 bar must not be exceeded

ELECTRICAL CONNECTION

Oil coolers have a terminal block connection, to VDE (or prevalent country regulations). PLEASE ENSURE CORRECT VOLTAGE AND FREQUENCY. The direction of rotation is given on the corresponding sticky label.

CONTROL

Simple temperature control achieved using the adjustable thermostat.

ROTATION

Check for correct direction of rotation of the fan as given on the corresponding sticky label, as well as the correct connection and the free flow of the oil.

MAINTENANCE

The BUCR units are virtually maintenance-free. A very dusty environment might necessitate periodic cleaning of the heat exchanger. Cleaning should only be done using a soft brush to avoid damaging the fins of the element which could reduce the performance of the unit. For highly contaminated air an optional air filter mat can be fitted to the suction side of the fan.

Oil cooler frequently asking questions

What is it and what does it do?

The Quality Elevator Products oil coolers are heat exchangers used to lower the oil temperature of hydraulic power units. These oil coolers externally circulate the hydraulic oil, by passing it through a heat exchanger, cooling it, and returning it to the tank.

What are the features and benefits?

Reduces the temperature of the oil in the hydraulic tank which results in the following:

- Elevator will run more efficiently.
- Reduces the possibility of motor and/or valve failure.
- Helps avoid elevator down time.
- Market ready product. Ready to sell off the shelf.
- Wide variety of choices, three sizes available.

How do I market it?

- Determine your market of hydraulic power units (dry & submersible).
- Determine those buildings with high traffic or having an abundance of elderly or handicapped passengers
- Make a pre-mailing of the oil cooler information to all potential customers.
- Explain the tank cooler benefits to your customer.
- Plan a follow-up phone call from the sales representative.
- Schedule a field visits to present further information if there is any interest.

What is the competition?

- Chillers, which cost over \$10,000 and require a water line.
- Water-cooled oil coolers which require a constant water source.
- Exhaust fans which are attached right to the top of the hydraulic unit. These units only exhaust the heat from the tank. They don't reduce the oil temperature.

How many hours should I estimate?

- This is dependent on the installer experience level.
- Most installations require 1/2 team day. The smaller unit (BUCR2S) requires only 1 installer. The larger units (BUCR3S/BUCR4S) may require 1 installer, and 1 apprentice/helper due to the weight

How do I propose it?

- Investigate the type of passenger traffic on the elevator.
- Investigate if there have been any elevator shut downs due to excessive heat.
- Suggest the availability of tank coolers, as well as the features and benefits to the building owner or maintenance supervisor.
- During the field visit, ask the customer how they plan to keep the elevator equipment in optimal running condition

How do I identify leads?

- Know the passenger usage of the equipment
- Know if the building owner has any problems with elevator shut down
- Understand the customers' tolerance for elevator shut downs
- Look for other installed equipment that improves elevator use

How do I close sales?

- Carefully select your leads
- Identify the person responsible if the elevator shuts down
- Give the owner estimates of all solutions
- Stress the urgency to do something to improve elevator performance
- Compare this equipment to any other installed on-site equipment

How do I order an elevator Tank Cooler?

- Determine which size unit you need
- Determine if you need the starter or not
- Determine where the oil cooler will be located, measure the distance from this location to the oil tank. This establishes the hose length.
- Contact Quality Elevator Products, Inc.
Voice 800-222-3688 Fax (847) 581-0095

Conversion Tables

Heat to be removed Heat load is measured generally in three different forms, which are HP, kW, or BTUs/Hr being removed. When designing a new system, a good rule of thumb is that a cooler should be sized to remove approximately 25 - 30% of the input HP or kW. In an existing system with a heat problem where the heat load is unknown, then a heat load test needs to be performed. The test is performed by measuring the temperature rise of the oil over a certain period of time. Take this temperature rise and time in minutes and use it in the following formula to determine the kW heat load.

$$\text{Heat Load Pv} = \frac{\Delta\text{Temperature} \times \text{Specific Heat (1.88 KJ/Kgk)} \times \text{Density of oil (0.951 Kg/L)} \times \text{Volume (L)}}{\text{Operating time (Minutes)} \times 60}$$

Heat Load Calculation Example:

Pv (Heat Load) = kW

ΔT (Temperature Rise) = 34.4°C (61.92°F)

SH (Specific Heat of oil) = 1.88 KJ/Kgk

SG (Specific Density of oil) = 0.915 Kg/l

V (Tank Volume) = 380 L (100 Gal)

t (Operating time in Minutes) = 45 min.

$$Pv = \Delta T \times SH_{oil} \times SG_{oil} \times V / t \times 60 = \text{kW}$$

$$Pv = 34.4 \times 1.88 \times 0.915 \times 380 / 45 \times 60 = 8.32 \text{ kW}$$

$$HP = 8.32 \times 1.341 = 11.16$$

$$\text{Heat to be removed} = 11.16 \text{ HP}$$

Conversion Factors and Formulas

Example: Convert energy of 15 kW to BTU/Hr

$$15 \times 3413 = 51195 \text{ BTU/Hr}$$

Energy

BTU/Hr	HP	Ft-Lbf/Sec	Kilowatt (kW)
1	3.929x10 ⁻⁴	0.2161	2.930x10 ⁻⁴
2545	1	550	0.7457
4.6272	1.818x10 ⁻³	1	1.356x10 ⁻³
3413	1.341	737.6	1

$$HP = \text{Flow (GPM)} \times \text{Pressure (PSI)} / 1714$$

Length

Inches (in)	Feet (ft)	Centimeters (cm)	Meters (m)
1	8.333x10 ⁻²	2.540	2.540x10 ⁻²
12	1	30.48	0.3045
0.3937	3.281x10 ⁻²	1	1x10 ⁻²
39.37	3.281	100	1

Temperature

Fahrenheit (°F)	Celsius (°C)
1	5/9 (°F - 32)
(°C x 9/5) + 32	1

Volume

Gallons	Feet ³	Inches ³	Liters
1	0.134	231	3.785
7.48	1	1728	28.31
4.33x10 ⁻³	5.787x10 ⁻⁴	1	1.64x10 ⁻²
0.2642	3.531x10 ⁻²	61.02	1

Flow

Gallons/Min (GPM)	Feet ³ /Min (CPM)	Inches ³ /Sec (CIS)	Liters/Min
1	0.134	3.85	3.785
7.48	1	28.8	28.31
0.260	3.472x10 ⁻²	1	0.988
0.2642	3.531x10 ⁻²	1.017	1

$$GPM = \text{Displacement (Inches}^3\text{/Rev)} \times \text{RPM} / 231$$

Pressure

PSI	Inches H ₂ O	Cm Hg	KPo (kN/Meter)
1	27.68	5.171	6.895
3.613 x 10 ²	1	0.1868	0.249
0.1934	5.353	1	1.333
0.145	4.015	0.750	1

Viscosity

SSU	Feet/Sec	Imeter/Sec	Centistoke
1	4.987x10 ⁻⁵	4.635x10 ⁻⁶	4.635
201 x 10 ⁴	1		9.29x10 ⁴
2.16x10 ⁵	10.76	1	1x10 ⁶
0.216	1.076x10 ⁻⁵	1x10 ⁻⁶	1