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FIELD SERVICE MANUAL

VULCANNAIRE SUPERTHERM

600

900

1200

VULCAN IRON WORKS INC.
CHATTANOOGA U.S.A.

GUARANTEE

The VULCAN IRON WORKS INC. guarantees this product to be constructed in a substantial and workmanlike manner of the best materials for the service intended.

Should any part of the product prove to be defective within six months from the time it is put into operation, the manufacturer will replace such part, F. O. B. our plant, upon its return for examination to VULCAN IRON WORKS INC., transportation charges prepaid, provided that the failure has not been caused by misuse, abuse or neglect on the part of the user.

The VULCAN IRON WORKS INC. excludes from the above guarantee any and all electrical, pneumatic and valve devices not of our manufacture. In these instances, we extend only such guarantees as are extended by the manufacturers of these devices.

Claims for contingent damages or for expense incurred in transportation, repairs or delay will not be allowed.

IMPORTANT: Nothing in the above Guarantee shall be construed as to apply to either the air compressor upon which this equipment is installed, or the internal combustion engine used to drive such air compressor. This Guarantee is void if any replacement parts are used other than those supplied or manufactured by the VULCAN IRON WORKS INC.

ORDERS

When ordering SUPERTHERMS or replacement parts for units already in service certain information will be required to expedite such orders. While these units are manufactured in more than one size, it is virtually impossible to ship these units complete in every detail to fit any given size and make of compressor due to various modifications which occur from time to time by each of the compressor manufacturers. Therefore, each installation takes on the auspices of a custom piece of equipment. As a result, we will require the make of compressor, capacity, and make and model of engine. We will also require the voltage of the electrical system and must be informed whether or not the engine is equipped with a Nelson muffler which is integral with the exhaust manifold.

GENERAL INFORMATION

The installation of the VULCANAIRE SUPERTHERM is intended to raise the volume of air produced by compressor through the expansion of air by the use of heat. To achieve this; exhaust gases, which are normally wasted, are diverted through the use of a diverter valve and transferred through a heat exchanger through which also passes air from the receiver on the compressor. The temperature of the air is maintained within certain limits by the use of an automatic control device to produce the greater volume of air to be used on equipment at an elevated temperature.

The VULCANAIRE SUPERTHERM will give reliable service if the installation and operating instructions given in this book are carefully studied and adhered to when installing as well as when operating after installation is complete. This equipment embodies all modern automatic controls and "fail-safe" devices necessary to insure the safety of your air compressor as well as operating personnel.

The use of the SUPERTHERM on pneumatic equipment as related to the use of pile driving equipment will enable a pile hammer to be operated with a smaller compressor and at a lower engine RPM than would normally be possible. Also when used with recommended oil good lubrication, free of moisture, will result; and the difficulty frequently encountered due to icing under certain atmospheric conditions will not exist.

SHIPPING INFORMATION

The VULCANAIRE SUPERTHERM is shipped in two pieces. One is the Heat Exchanger, which is shipped on a skid, and the other a box which contains all other components. Upon receipt, be sure to check the contents of the box against the packing documents to be sure that all necessary components are present to assure trouble-free assembly.

PRE-ASSEMBLY INFORMATION

As shown in subsequent illustrations and diagrams, the VULCANAIRE SUPERTHERMS are installed on the air compressor in the following order:

- 1 - Diverter Housing Assembly
- 2 - Heat Exchanger Assembly
- 3 - Air Distribution Assembly
- 4 - Gas Transfer Assembly
- 5 - Automatic Control Assembly
- 6 - Insulation Group

For effective, easy installation, follow the procedures outlined in the text and illustrations carefully with particular attention to sequence.

GENERAL INSTALLATION INFORMATION

After the decision to install a SUPERTHERM on any particular compressor has been reached, certain points should be kept in mind. It will be necessary to connect an air line between the inlet side of the exchanger and the discharge of the receiver. And further, it will be necessary to connect the exhaust from the engine to the gas inlet on the heat exchanger with the diverter valve interposed somewhere between. Due caution should be exercised to insure that the center line of the heat exchanger when properly located is parallel to the center line of the compressor, as near as practicable.

The heat exchanger location and height from the hood of the compressor will be governed by the location of these transfer lines. In the course of such an installation, keeping the aforementioned points in mind, the diverter valve may be located almost anyplace along the gas transfer line between the manifold and the gas inlet on the heat exchanger. It may be placed in one of several positions and the air control cylinder may be easily relocated using existing holes in flange for the sake of compatibility with position required.

On the air transfer piping the check valve may also be relocated should this become necessary; however, caution should be exercised to insure that this valve is not placed in an inverted position. Also, please note that the air transfer piping can be easily assembled, bolting together the twin flanges of the air transfer piping to the mating twin flanges on the end of the heat exchanger. All gaskets and bolts for these assemblies are furnished in a separate box with each unit.

If the compressor should be of the type with sufficient room under the hood to receive the diverter valve directly onto the engine manifold, as will be found on Worthington and Ingersoll-Rand 600, powered by a GM 671 engine, the manifold exhaust flange gas studs will have to be removed to receive studs shipped with unit. This modification can best be completed after removing the manifold from the engine. A sufficient amount of coolant should be drained from the radiator prior to removal of the exhaust manifold to prevent water or coolant from draining into the exhaust port when the manifold studs are removed. To insert studs furnished with this unit, it will be necessary to drill and retap existing holes in the manifold exhaust flange. Raise these holes by drilling through with a 27/64 drill and tap with a 1/2"--13 UNC tap. Install in the retapped holes the diverter housing studs, Part No. VAM-17, which are furnished loose.

Should this be the type of installation where the diverter valve is placed directly on the manifold, it will be necessary to modify the opening in the compressor hood directly above the diverter valve since there will now be two stacks coming through the hood, one of which will go to the heat exchanger, and the other to the atmosphere. Also, should the diverter flanges protrude above the hood, it will be necessary to increase the rectangular opening as needed. To simplify the layout of the aforementioned

opening, center lines can be laid out from the side of the stack prior to its removal.

On models which lack sufficient space under the hood to receive the diverter valve, the installation of the valve may be made on the side of the heat exchanger by using the diverter support bracket, Part No. VAM-1-A or VAM-1-A-9, depending upon size of unit to be installed. In this type of installation the heat exchanger and the air transfer piping is located on the compressor. The approximate location of the diverter valve is established and connected to the manifold by the single opening, and to the heat exchanger by the side having the double opening. In which case, the opening nearer the heat exchanger will be used with the other opening going either to the atmosphere or to the muffler. This type of installation is most frequently used on compressors with a low profile hood or compressors having a V-type engine on which must be installed an exhaust harness or collector. This is achieved by pipe fitting on the particular engine using subassemblies furnished with the kit for this particular installation. On engines equipped with the Nelson muffler which is integral with the manifold, such as will be found on 6110GM engines, a special flange, Part No. VAM-29-A, will be furnished as part of the installation kit. After all pipe fitting has been achieved, saddles or support brackets for the heat exchanger can be moved to suitable locations and welded to the heat exchanger, and bolted to the hood.

Installation of the automatic control assembly will consist of the air cylinder on the diverter housing, an air-operated bypass valve located on the air transfer assembly, and an automatic control box. Since the air cylinder and air-operated valve are already installed, it will now be necessary only to install the control box which should be located in a place under the hood where it will be readily accessible to the operator. This may be on the after fire wall or one of the air filter support brackets.

After this installation has been completed, a source of air will be needed to activate the unit. This may be taken directly from an outlet on the discharge pipe as provided on some compressors or it may be necessary to install a pipe tee between the air receiver and the dump valve. The necessary pipe and hose fittings will be furnished to complete this air line, which will be indicated by tags attached to the proper inlet on the control box. Air lines will also have to be connected between the proper outlets on the control box as indicated by labels and the correspondingly labelled fittings of the air cylinder and the air operated valve. These hose connections are to be made with clips using pliers provided.

The wire attached to the control box will be used for the electrical pickup. This will be fastened to the compressor by the use of clips furnished for this purpose, cut to the proper length, fitted with a solderless connector which is furnished and then attached to the oil pressure gauge switch. One

side of this switch will be found hot. The other side will be hot only when the engine is running and has oil pressure. This latter terminal is the side which should be used. This renders the control box inactive when the engine is shut down. Next, the capillary tube leading from the control box must go aft and be attached to the weldolet on the underside of the air discharge pipe. Due to the small diameter of this tube, caution should be exercised to avoid kinking; therefore, this coil should be unrolled and then fitted through an opening in the hood of the compressor to the air discharge pipe fitting.

In the elbow which transfers the air down the back of the compressor will be found another weldolet. Into this will fit a dial thermometer. At the elbow below this will be found still another weldolet in vertical position. Into this will be fitted a fusible plug which is determined to melt upon a temperature rise of 450°F.

Shipped with this unit will be found all necessary materials to insulate the heat exchanger and the hot air discharge pipe, including fiberglas cloth and resin. This insulating material is a preformed asbestos but will require that certain openings be cut for gas transfer pipe and exhaust stack; therefore, it is advisable that these pieces be laid out on one side and marked holding approximately the same end distance on the heat exchanger. After one side has been fitted, then the other side may be fitted and as each section is completed, may be tied in place with a string or tape and then ultimately wrapped in a spiral manner with fiberglas tape as furnished, allowing approximately 1/2" overlap and tied. This same procedure will apply to the air discharge piping. It should be pointed out that each end of the asbestos must be completely covered with fiberglas to prevent weather erosion. After insulation and fiberglas has been installed and tied in place, mix bottle of hardener in gallon container of resin as per instructions printed thereon and brush onto fiberglas. All fiberglas when properly treated will appear wet. It should be pointed out that care should be taken when fiberglas cloth is applied, for after treatment of this cloth has commenced, it will be difficult to correct any loose laps or open surfaces.

Testing of this equipment after installation has been completed will first be approached in the area of control operation. The engine should be started with the control box set on zero. In this position it will be noted visibly that on the dial thermometer that the temperature does not rise with the air from the receiver going to the atmosphere. Also, it will be noted that the exhaust cover or rain cap on the muffler will be opened.

Note the position of the air cylinder; that is to see if the cylinder is opened or closed. Next, check the rear of the compressor. The indicator on this valve should be in the horizontal position. Now, rotate the dial control to high heat, and on so doing, you will note the indicator on the air operated valve on the rear of the compressor will move to the vertical position.

Standing back from the compressor, a quick visual check should indicate to you that the exhaust gases have now opened the rain cap on the heat exchanger and the rain cap on the muffler or exhaust stack should now have closed. Checking the air cylinder on the diverter valve, it should be noted that this has also changed its position. The position of this cylinder if undisturbed during installation should function normally; however, should it be necessary for the sake of convenience during installation to move the air cylinder to the opposite side, this will alter the timing of the valve by 180 degrees; therefore, should this cylinder be moved 180 degrees, the hose connections going to this cylinder can then be reversed either on the cylinder or at the control box to allow for this change.

On the initial warmup of this unit, the time required to obtain hot air will depend largely on the outside air temperature. Due to the mass flow with no equipment attached to this unit, on some compressors, it may be necessary to use a slight restriction to speed up the warming of the unit. If the compressor is allowed to reach its maximum pressure too soon, the engine governor will cut in and slow the unit to an idling speed and the highest temperatures will not be reached.

ASSEMBLY SPARES

Diverter Housing Assembly Complete	DH600R	DH900R	DH1200R
Gas Transfer Assembly Complete	GT600R	GT900R	GT1200R
Heat Exchanger Assembly Complete	HE600R	HE900R	HE1200R
Air Distribution Assembly Complete	AD600R	AD900R	AD1200R
Automatic Control Assembly Complete	AC600R	AC900R	AC1200R
Heat Exchanger Insulation Group	HEI600R	HEI900R	HEI1200R

TROUBLE-SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
No Heat	Failure of diverter valve and/or Jamesbury valve to operate	Solenoid valve failed to operate. Check electrical circuit first and then proceed to Solenoid coil. Air supply pressure.
Low Heat--will not reach max. temp.	Jamesbury open to bypass and Diverter open to heat. Manual bypass open.	Reverse the hoses on Diverter control cylinder. Close manual control valve.
Fusible plug blown	Too hot	Thermostat failure--check Solenoid valve, electrical circuit
Low Heat	Solenoid valve flutters	Poor ground
No current to controls	Faulty relay or oil pressure switch on engine	Replace
No Air	Check valve flow in wrong direction	Reverse
Loss of Pressure	Too hot Fusible plug blown	Faulty thermostat

VULCANAIRE SUPERTHERM OIL SPECIFICATION

The recommended oil for hammer lubrication when using the Vulcaire Supertherm at 400°F is Gulf Harmony Oil No. 69. This oil is specified principally because of its high OC flash point. Any oil used with the Vulcaire Supertherm must meet or exceed the below given specifications. It is also recommended strongly that an oil having an OC flash point of 450°F be used to lubricate the air end of the air compressor on which the Vulcaire Supertherm is installed.

GRAVITY: °API.....	28.7
VISCOSITY, SUV: SEC.	
70°F.....	1823
100°F.....	.610
130°F.....	.270
210°F.....	69.4
VISCOSITY INDEX.....	97
INTERFACIAL TENSION	
77°F: DYNES/CM.....	26
FLASH P-M: °F.....	450
FLASH OC °F.....	500
FIRE OC °F.....	560
POUR °F.....	Plus 10
COLOR ASTM D 1500.....	2.0
CARBON RESIDUE	
Ramsbottom: %.....	0.10
RUST-PREVENTIVE TEST	
ASTM D 665	
Procedure A 24 Hrs.....	Passes
NEUTRALIZATION NO.	
ASTM D 974	
Total Acid No.....	0.06
OXIDATION TEST, ASTM D 943	
TIME OXIDIZED	
Hr. for 2.0 Acid No.....	1500

VULCANAIRE SUPERTHERM CAPACITY

The table below sets out approximate CFM delivery of air compressors equipped with Vulcaire Supertherm. The delivery capacities given are based upon a discharge temperature of 400°F at 100 PSI at the point of delivery at the air distribution assembly outlet. Delivery rates are stated as approximate because delivery rates are affected by compressor condition.

SIZE	ENGINE	DELIVERY W/O SUPERTHERM	DELIVERY W/SUPERTHERM
365	4-71	365 CFM	500 CFM
600	6-71	600 CFM	820 CFM
600	6V-71	600 CFM	820 CFM
900	6-110	900 CFM	1230 CFM
900	8V-71	900 CFM	1230 CFM
1200	(2)6-71*	1200 CFM	1640 CFM
1200	12V-71	1200 CFM	1640 CFM

*LE ROI COMPRESSOR

SUPERHEATED COMPRESSED AIR 400°F

THE TABLE BELOW SETS OUT COMPARATIVE SIZES OF PORTABLE AIR COMPRESSORS WITH AND WITHOUT VULCANAIRE SUPERTHERM EQUIPMENT FOR THE HAMMER AND EXTRACTOR SIZES GIVEN.

<u>HAMMERS</u>	<u>WITHOUT SUPERTHERM (Air Disch'g. Temp. 100°F Plus Ambient Temp.)</u>	<u>WITH SUPERTHERM (Air Disch'g. Temp. 400°F)</u>
020	(1) 1200 CFM & (1) 600 CFM	(1) 900 CFM & (1) 600 CFM
016	(1) 1200 CFM & (1) 600 CFM	1200 CFM
014	(1) 1200 CFM & (1) 600 CFM	1200 CFM
010	1200 CFM	900 CFM
08	1200 CFM	900 CFM
06	900 CFM	600 CFM
1	600 CFM	365 CFM
200C	(1) 1200 CFM & (1) 600 CFM	(1) 900 CFM & (1) 600 CFM
140C	(1) 1200 CFM & (1) 600 CFM	1200 CFM
80C	1200 CFM	900 CFM
65C	1200 CFM	900 CFM
50C	900 CFM	600 CFM
30C	600 CFM	365 CFM
8M	1200 CFM	900 CFM
5M	900 CFM	600 CFM
3M	600 CFM	365 CFM
DGH900	600 CFM	365 CFM
<u>EXTRACTORS</u>		
1200A	1200 CFM	900 CFM
800A	900 CFM	600 CFM
A4	900 CFM	600 CFM
A3	600 CFM	365 CFM

NOTES:

1. Where multiple compressors are indicated it is necessary that they be connected to a common unloader and have a fully lagged receiver of adequate size.
2. Certain Hammer sizes not given represent no advantage in reduction of compressor size by use of VULCANAIRE SUPERTHERM.
3. The above table assumes that the compressor is in good condition and that the CFM delivery conforms to manufacturer's specifications.