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CO₂ compressors
Donaldsonville LA

INSTRUCTIONS FOR INSTALLATION AND OPERATION

15" STROKE TYPE 5HHE-4

CARBON DIOXIDE COMPRESSORS

35-1/2" & 35-1/2" & 20-1/2" & 11-1/2" & 6-1/2" x 15"

BUILT FOR

HOECHST-UHDE CORPORATION

DONALDSONVILLE, LOUISIANA

PURCHASE ORDER: 2-260-20-004

EQUIPMENT NO: C-102A & B

UNIT SERIAL NOS: XHH-1422 & XHH-1423

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Ingersoll-Rand®

PAINTED POST PLANT

031-31253 (1968)

-- OPERATING CHARACTERISTICS AND GENERAL DATA --

I. COMPRESSOR TYPE: 15" 5HHE-4

II. CYLINDER DATA AND PERFORMANCE:

Service		CARBON DIOXIDE			
Stage		1	2	3	4
Cylinder Dia., in.		(2)35-1/2	20-1/2	11-1/2	6-1/2
Stroke, in.		15	15	15	15
Cylinder Type		DA	DA	DA	DA
Material		CI	CI	CI	SB
Liner		YES	YES	YES	YES
R E G U L A T I O N	Pockets,	FVCP			
		8350			
	Volumes, (cu. in.)	VVCP			
		9000			
and Labels					

Percent of Full Load	100			
Pockets Open				

Intake Pressure, psig	0	54.8	211	706
Intake Temperature, °F	100	109	109	109
Discharge Pressure, psig	56.2	215	720	2285
Discharge Temperature, °F *	328	266	271	281
Piston Displacement, cfm	11192	1851	566.6	165
Capacity at Inlet, cfm	7015	1415	409	103.3
Dry Cubic meter per hour ref. 14.7 psia & 32 °F	9840	9840	9840	9840

Dry CFH at 14.7 & 60° F 367,000
CO₂ at discharge: H₂O dropped out 336,000 14.7 psia & 100° F

BHP per Stage	990	695	637	516
Total BHP	2838			
RPM	327			
Barometric Pressure, psia	14.7			

* Discharge Temperature is estimated as an adiabatic rise.
 Key to abbreviations:

- | | |
|---------------------------------------|---|
| CBOH = Clearance Bottle in Outer Head | SAFE = Single Acting Frame End |
| CI = Cast Iron | SAOE = Single Acting Outer End |
| CS = Cast Steel | SB = Steel Billett |
| DA = Double Acting | SF = Steel Forging |
| FVCP = Fixed Volume Clearance Pocket | TR = Tail Rod |
| NI = Nodular Iron | VVCP = Variable Volume Clearance Pocket |

III. REGULATION

A. Starting Unloading ---Manual Vent Valves

B. Capacity Reduction---Fixed Volume Clearance Pocket in one First Stage Cylinder. (Serial Nos: X6X7278 & X6X7283)

Variable Volume Clearance Pocket in other First Stage Cylinder.
(Serial Nos: X6X7277 & X6X7282)

IV. ELECTRIC MOTOR DRIVER:

Make & Type--Electric Machinery Engine Type Synchronous Motor

BHP 3500 RPM 327 Voltage 4000

Phase 3 Frequency 60 Power Factor 1.0

Deg. C. Rise 40 Service Factor 1.0

Special Features--Open Enclosure, Class "B" Non-Hygroscopic Epoxy Sealed

Insulation, Brushless Excitation, with Space Heater.

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PART V

SUPPLEMENTARY INSTRUCTIONS FOR COMPRESSOR
INSTALLATION, OPERATION AND MAINTENANCE

CYLINDER DATA, ASSEMBLY AND MAINTENANCE

GENERAL DATA (See pages 45, 52, 60 and 67 of Parts List for illustrations)

ITEM	FIRST STAGE	SECOND STAGE	THIRD STAGE	FOURTH STAGE
Dia. of Cylinder	(2)35-1/2"	20-1/2"	11-1/2"	6-1/2"
Stroke	15"	15"	15"	15"
Material	CI	CI	CI	SB
Cylinder Liner	YES	YES	YES	YES
Double or Single Acting	DA	DA	DA	DA
Inlet	TOP	TOP	TOP	TOP
Valve Type	A116 Chan.	A67 Chan.	A60 Chan.	54K

GENERAL

The cylinders furnished on this unit are of a type and design best suited to handle the requirements of this application. The cast iron cylinders have cooling water jackets which completely surround the cylinders, valve bores, and piston rod packings. The outsides of the cylinders have hand holes or covers for cleaning out any sludge or mud which may be deposited by the cooling water in the jackets. The removal of valve covers will provide for inspection of the valves and gas passages.

The fourth stage steel billet cylinder has holes drilled through the cylinder bore and packing area. The cylinder has bolted-on water jacket covers. These covers can be easily removed to clean out any sludge or mud which may be deposited by the cooling water in the jacket or cylinder. Lifting slings must not be put around bolted on water jackets.

Water cooling is an important feature in any compression service. Even heat distribution and prevention of localized hot spots are essential to optimum performance and extend the life of piston rings and piston rod packings.

Each cylinder barrel has provisions for inlet and discharge valves and is closed at the frame end by a frame head and at the outer end by an outer head. The frame head contains the piston rod packing.

The cylinders are equipped with supports which, when properly grouted, hold the cylinders steady and level and prevent any longitudinal stress due to cylinder weight.

These specific instructions are to be followed in addition to the cylinder and piston instructions given in Parts I thru IV.

MINIMUM LUBE CONSTRUCTION

This unit has been designed to operate with a minimum amount of cylinder and packing lubrication. However, it should be emphasized that it is not designed for non-lubricated operation and that a small amount of lubricant is required for good valve, ring and packing life. The rate of wear will be dependent on the amount of lubrication. TFE packings and piston rings as well as rider bands have been used to permit this type of operation. It is recommended that this unit be broken in as any other, with normal quantities of lubricant. As a good glaze is developed in the cylinders, lubricant can be substantially reduced. The amount of lubricant ultimately used for normal operation can only be determined by frequent inspection to establish wear rates etc. Refer to subsequent instructions for information on this.

- A. Because TFE will wear more rapidly than would cast iron parts, steps must be taken to compensate for this additional wear. The frequency of these steps will vary with different installations because so many factors enter into the situation. In view of variable operating conditions, this is something which each compressor operator must work out for his own protection.
- B. When it becomes necessary to handle TFE parts, it should be remembered that they are comparatively fragile and can be nicked and broken through careless handling.
- C. In normal cleaning operations, it should be remembered that any solvent which might contaminate the compressor system is to be avoided.
- D. Extreme caution must be exercised in handling the piston and rod prior to installation or during overhaul periods. Whenever the piston is out of the cylinder, it should stand on end so that no flats will develop on the rider ring surfaces. Be very careful not to chip or mar the rider ring surfaces in any manner.

These points are all essential to good operation and will serve to eliminate maintenance problems and expense brought on by lack of knowledge or attention.

PISTONS, PISTON RODS AND PISTON RINGS

The 35-1/2" and 20-1/2" pistons are aluminum castings held on the rods by two collars made of a low expansion metal. The piston is designed so that the expansion of the two collars and the part of the aluminum piston between them will equal the expansion of the steel piston rod. This assures a tight fit between the piston and rod under all temperature and pressure conditions.

The piston is held in position against the flange of the piston rod by a piston rod nut at the outer end of the rod.

The 11-1/2" piston is of solid cast iron construction, and is secured to the piston rod by a nut at the outer end of the piston rod.

The 6-1/2" piston is integral with the piston rod. The rod and piston assembly is a steel forging and the piston has TFE rider and piston rings.

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The 35-1/2", 20-1/2" and 11-1/2" piston rods are machined from high quality carbon steel and are of the slip fit type, having machined shoulders on which the pistons bear.

Each piston rod is secured to its crosshead by a jam nut and is prevented from turning by a lock dowel. When any piston end clearance adjustment is made, the lock dowel must be removed and the crosshead jam nut backed off before the piston rod can be turned. After any adjustment, special attention must be given the tightening of the jam nut and re-insertion of the lock dowel.

PISTON AND RIDER RING CLEARANCES

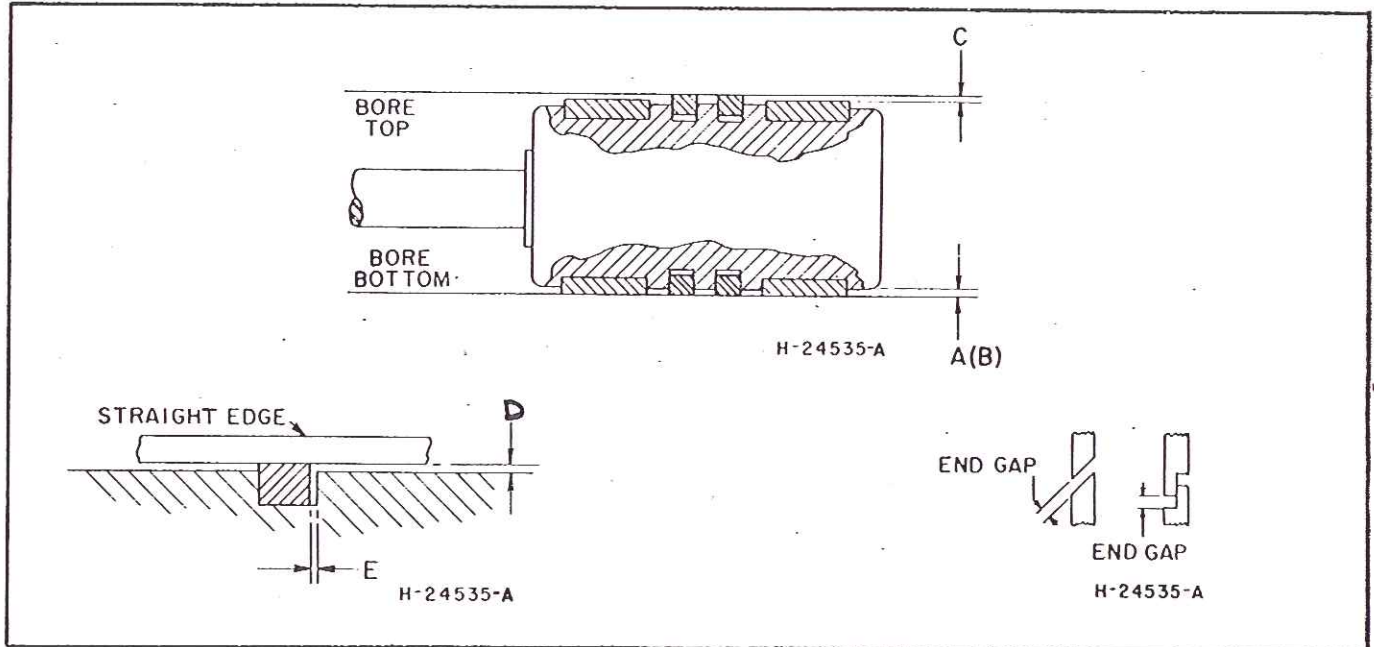


Fig.1 Points for Checking Clearances.

BORE SIZE	RING	RING MATERIAL AND TYPE JOINT
35-1/2"	Rider Piston	TFE, Part No. 1W97847 (Band Type) <i>BRONZE</i> TFE, Part No. 1W97848 (Angle Cut)
20-1/2"	Rider Piston	TFE, Part No. 1W107501 (Band Type) ✱ TFE, Part No. 1W97852 (Angle Cut)
11-1/2"	Rider Piston	TFE, Part No. 1W97882 (Band Type) TFE, Part No. 1W97881 (Angle Cut)
6-1/2"	Rider Piston	TFE, Part No. 1W97738 (Angle Cut) TFE, Part No. 1W97737 (Angle Cut)

✱ CHANGED