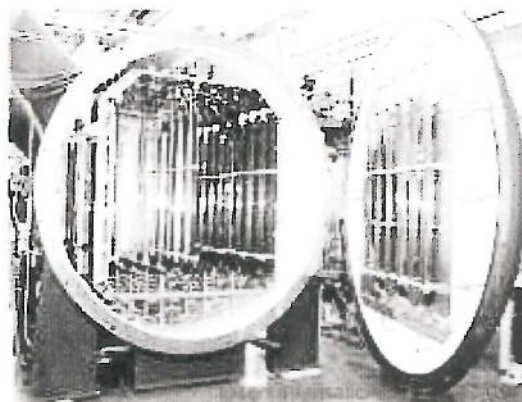




Quotation Price Summary



Ipsen Proposal Number: 07-10607 Rev B Final

Project: Horizontal Vacuum Titanium Stress Relief Furnaces

Item	Quantity	Description
1	3	<p>Ipsen Model HR-40x48x240-1-Bar Horizontal Loading Vacuum Titanium Stress Relief Furnaces, each to which include:</p> <p>1.1. Vacuum Furnace</p> <ul style="list-style-type: none">• The furnace work area will be divided into two work zones, each side will accommodate a fixtured load stack measuring 40" (1016 mm) wide, 48" (1219) high, 240" (6096 mm) long.• Furnace gross load weight capacity of 22,000 pounds (9979 kg), 11,000 pounds per side at 1,450°F (788°C)• Normal operating temperature range between 900°F (482°C) to 1,400°F (760°C). Maximum temperature for bake out/clean-up operation 1,450°F (788°C).• The furnace chamber is round, double-wall, water cooled, of carbon steel construction. The inner wall is coated with a low out-gassing, rust preventative, and high temperature paint.• Sliding front door assembly, with hinge mounted rear door.• The hot zone is modular with multiple sections. Each section consists of a carbon steel angle frame with 1" of graphite board with 0.015" grafoil hot face backed with 1" of graphite felt and side graphite heating elements. A vertical graphite heating element runs longitudinal between the two work zones.• There will be eight (8) individually trimmed heating zones, utilizing the Ipsen Digital-Trim Control System. Temperature uniformity is $\pm 25^{\circ}\text{F}$ (13.8°C) above 900°F (483°C).



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- Power to heating elements is provided by a Variable Reactance Transformer (not UL Listed) rated at 1,200 KVA total, which is divided into eight (8) separate zones.
- The work load is supported by graphite hearth rails.
- The entire furnace system is painted Ipsen light grey machine enamel or machine enamel of other color as specified by the customer

1.2. Vacuum Pumping System

- Two (2) Stokes Model 1738-VFD(300/2,000 CFM) mechanical/blower pump systems with variable frequency drive to the blower and two (2) BOC Edwards 291-J series exhaust filter.
- Two (2) Varian Model HS-35 diffusion pump systems and DC-704 pump oil.
- Two (2) Varian Model DS-402 rotary vane holding pumps
- Maximum Operating Pressure: 5.0×10^{-5} Torr
- Pump Down rate: From atmosphere to 5×10^{-5} torr in 30 minutes or less.
- Leak-up rate: 4 micron/hr (under Clean, Dry, Empty (CDE) condition).

1.3. Load Cooling System

- Two (2) Ipsen Model GQ9000-125 HP VFD external argon gas cooling systems (variable frequency drive) with gas injection manifold nozzle arrangement located on the outside of the hot zone. Backfill pressure for convection cooling is set at 633 Torr (-5" Hg).

1.4. Peripheral Equipment

- Dual loop cooling water manifolds for both furnace and gas cooling system, equipped with interlocked flow switches.
- VRT supporting structures of carbon steel construction
- A carbon steel constructed service platform at the top of the furnace for maintenance access to power feed-throughs and VRT supporting structures
- Inert gas actuated pneumatic system.
- One (1) graphite temperature survey fixture for first furnace pre-shipment testing.
- Forty-eight (48) type "N" load survey thermocouples for first furnace pre-shipment testing.

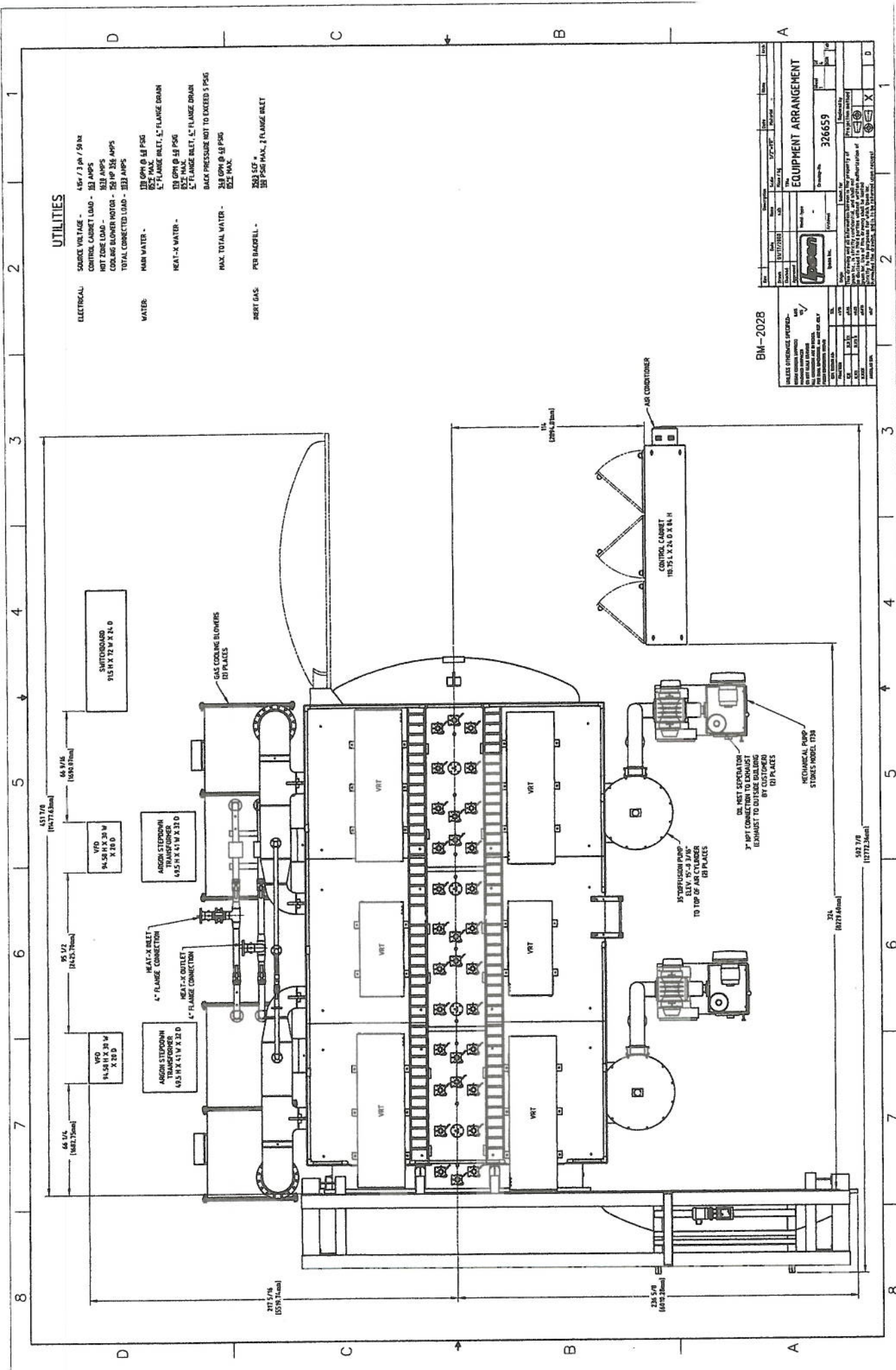


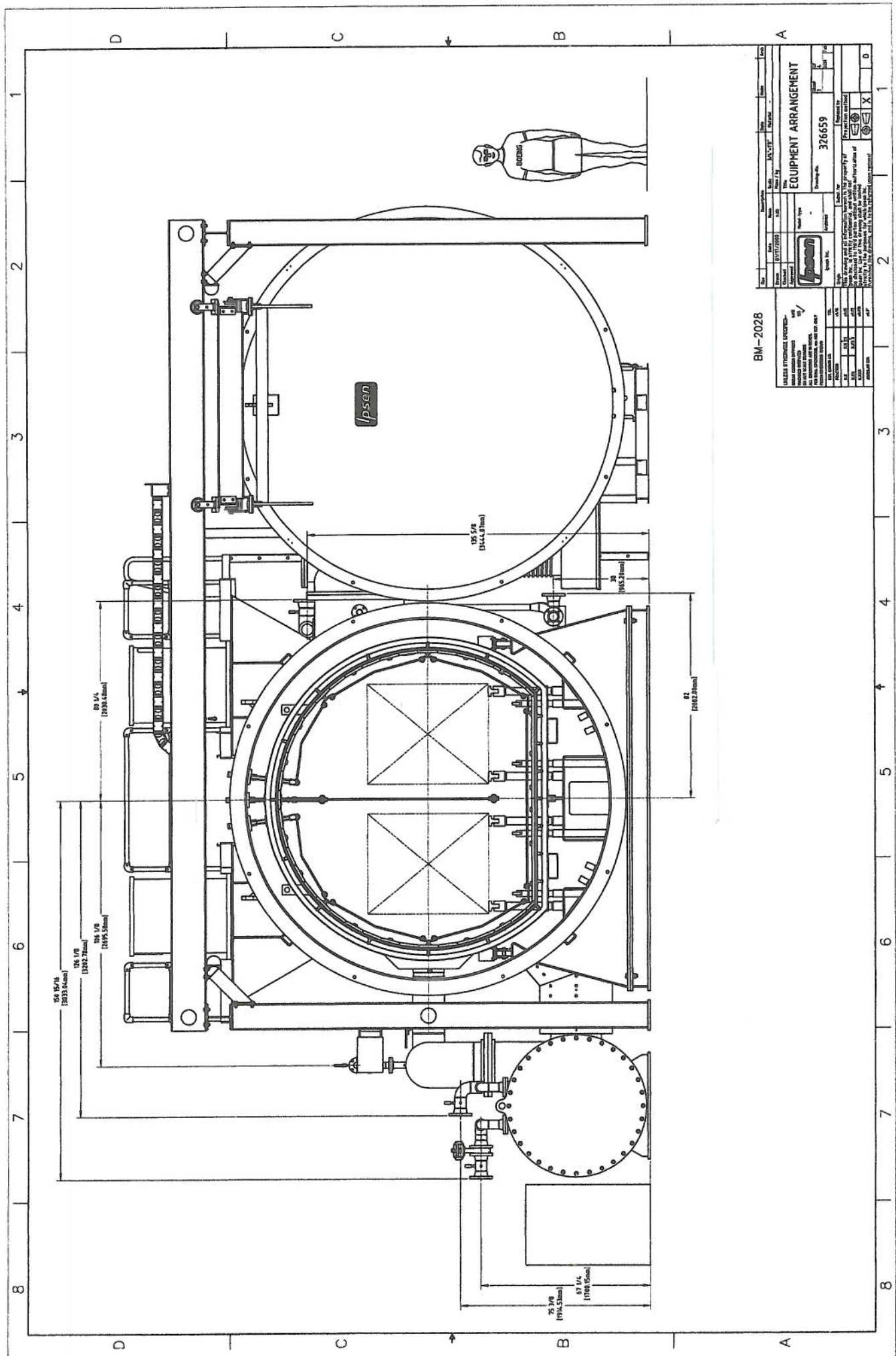
Quotation Price Summary

1.5. Instrumentation and Control System

- One (1) Ipsen MetalWare furnace control system including the following:
 - A. Cabinet mounted PC with color touch-screen and control display.
 - B. Eight (8) Honeywell over-temperature controllers.
 - C. Eight (8) Honeywell temperature controllers.
 - D. Ipsen Hot Zone Digital-Trim Control System.
 - E. Allen Bradley PLC Programmable controller to perform all furnace sequencing and alarm functions.
 - F. Active cold cathode vacuum gauges for high vacuum measurement.
 - G. Active pirani gauges for low vacuum measurement.
 - H. Type-N thermocouples for zone temperature controls.
 - I. Type-N thermocouples for over temperatures.
 - J. Modem for remote diagnostics and troubleshooting by Ipsen Inc.
 - K. Cabinet lighting and air conditioner for PLC control and recorder cabinets.
 - L. Forty-eight (48) point type-N workload thermocouple jack panel with vacuum feed throughs.
 - M. Digital process recorders for temperature recording.
 - N. Heavy duty UPS system for control cabinet.
 - O. USB, Ethernet, mouse, and keyboard ports
 - P. Switchboard for power distribution to the furnace.
 - Q. Argon step down transformers for 125 hp gas cooling motors.

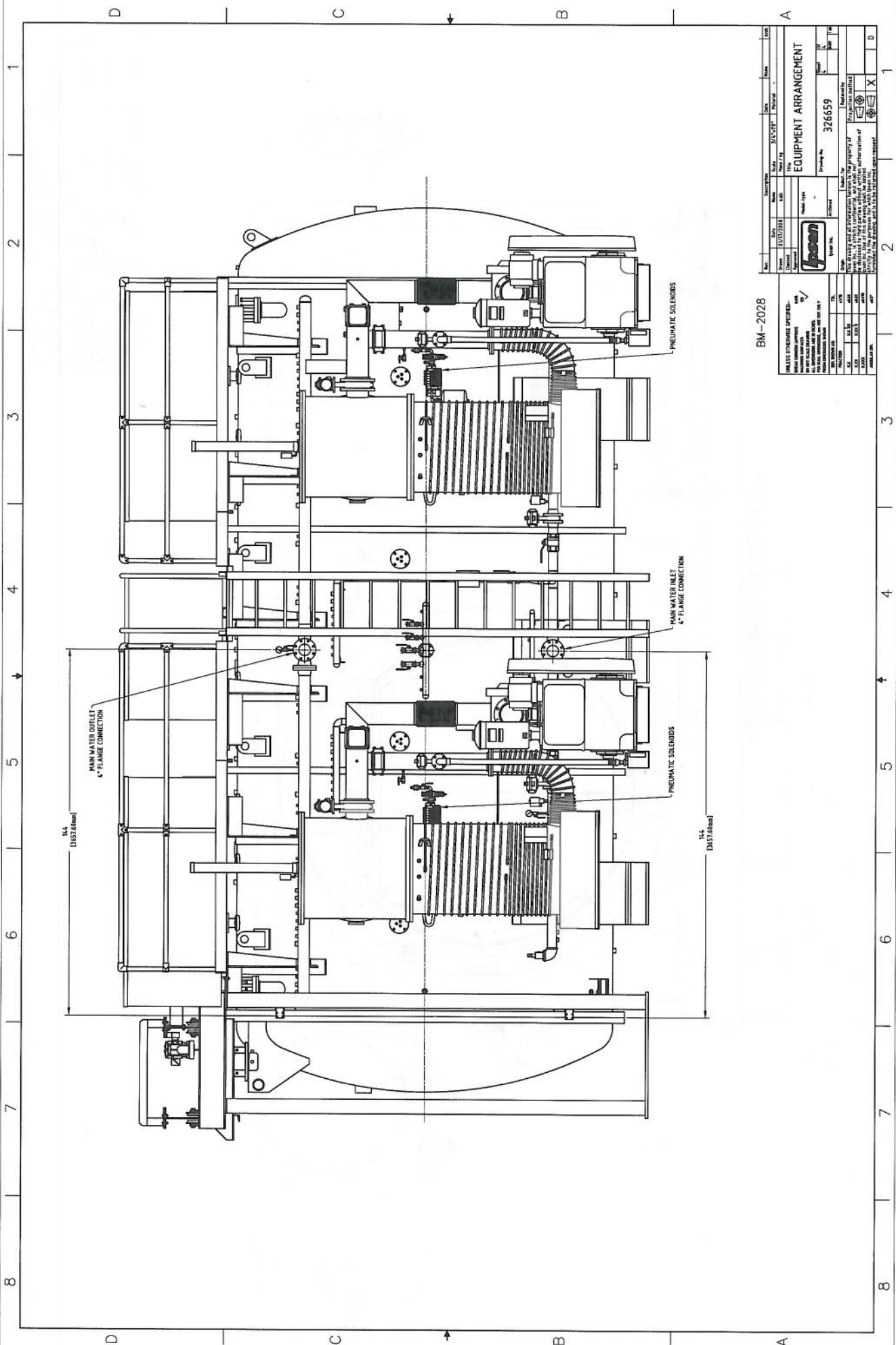
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BM-2028

EQUIPMENT IDENTIFICATION		EQUIPMENT ARRANGEMENT	
Model No.	326659	Model No.	326659
Serial No.		Serial No.	
Year		Year	
Manufacturer		Manufacturer	
Weight		Weight	
Height		Height	
Width		Width	
Depth		Depth	
Volume		Volume	
Capacity		Capacity	
Power		Power	
Pressure		Pressure	
Temperature		Temperature	
Humidity		Humidity	
Light		Light	
Sound		Sound	
Vibration		Vibration	
Electromagnetic Interference		Electromagnetic Interference	
Radio Frequency Interference		Radio Frequency Interference	
Static Electricity		Static Electricity	
Acoustic Noise		Acoustic Noise	
Thermal Shock		Thermal Shock	
Mechanical Shock		Mechanical Shock	
Chemical Contamination		Chemical Contamination	
Biological Contamination		Biological Contamination	
Particle Contamination		Particle Contamination	
Gas Contamination		Gas Contamination	
Liquid Contamination		Liquid Contamination	
Solid Contamination		Solid Contamination	
Other Contamination		Other Contamination	



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UNLESS OTHERWISE SPECIFIED:

Material	Finish	Notes
STEEL	AS SUPPLIED	
BRASS	AS SUPPLIED	
COPPER	AS SUPPLIED	
ALUMINUM	AS SUPPLIED	
PAINT	AS SUPPLIED	
WELDING	AS SUPPLIED	
FASTENERS	AS SUPPLIED	
GLASS	AS SUPPLIED	
PLASTIC	AS SUPPLIED	
ROBUST	AS SUPPLIED	
WOOD	AS SUPPLIED	
GLASS	AS SUPPLIED	
PAINT	AS SUPPLIED	
WELDING	AS SUPPLIED	
FASTENERS	AS SUPPLIED	
GLASS	AS SUPPLIED	
PLASTIC	AS SUPPLIED	
ROBUST	AS SUPPLIED	
WOOD	AS SUPPLIED	

EQUIPMENT ARRANGEMENT	
Model No.	326659
Serial No.	
Manufacturer	
Customer	
Project No.	
Revision	
Drawn By	
Checked By	
Approved By	
Date	
Scale	
Sheet No.	
Total Sheets	