GENERAL

It is the purpose of this manual to set forth the procedures to maintain consistency and reliability in the receiving and processing of compressor and/or parts orders with satisfactory quality control.

The inspection system in effect at Brainerd Compressor is comprised of a minimum of departments necessary to carry out good inspections procedures and maintain a high level of quality control. These departments consist of:

1. Order Processing
2. Customer Technical Assistance
3. Shipping and Receiving
4. Disassembly and Cleaning
5. Machine Shop
6. Motor Shop
7. Parts
8. Sub-Assembly
9. Assembly and Testing
10. Evacuation and Painting

This manual will be reviewed no less than annually to insure that all procedures and materials used by each department will meet or exceed a high level of industry quality in all products and services provided by Brainerd Compressor Inc.

All changes and/or additions to the quality control program will be submitted to management for review before becoming a part of this manual.

This manual is a reference manual to be used as a source of information to insure all practices and procedures or consistent with high product quality and customer satisfaction.
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Section I
Order Processing

Purpose:

To maintain consistency and reliability in the receiving and process of orders, whether written or oral.

Responsibility:

All sales personnel as designated by the sales manager.

Procedures:

A. Sales assisting staff will receive orders either by mail, fax, or phone.

B. A written order in triplicate will be processed that will include, but not be limited to, the following information:

   1) Customer name and address
   2) Shipping address
   3) Purchase order number, date, telephone number
   4) Contact name
   5) Description of order – quantity, make, model, voltage, phase
   6) Shipping date and weight
   7) Price

C. Copies of orders will go to production manager, parts manager, shipping and receiving manager.

D. Orders on all stock items will be processed as soon as possible by the shipping and warehouse manager.

E. Orders on all non-stock items will be given to the production manager for processing until completed and will then be given to the shipping manager.
Section II
Scheduling and In-Process Procedures

Purpose:

To outline the procedures for production and scheduling of compressors, both on order and for stock.

Responsibility:

Production manager and designated staff as assigned by the production manager.

Procedures:

A. Production manager will receive orders from the vice president in charge of production on all stock items and from sales assisting staff on all incoming orders.

B. Production manager will then proceed with the scheduling of all orders in coordination with management of each department.

C. Production manager will oversee the scheduling of “remanufacturing process” as outlined in specifications.

D. After production is finished and compressors have been through their final testing procedures the production manager will turn product over to warehouse manager for final shipping instructions.
Purpose:

To provide for the control of incoming material furnished by suppliers or contractors.

Responsibility:

Quality control manager, parts manager, or qualified representative designated by quality control manager.

Procedure:

A. Quality control manager, parts manager, or designated representative will inspect all incoming materials or supplies for the following characteristics:

   1) Quantity
   2) Damage – deterioration
   3) Conformance to purchase order or factory order requirements. Verification of above conformity will be noted on each shipping document.

B. Any material or supplies received that do not meet proper purchase order requirements will be held in a designated hold area and notification will be made to vendor.

C. Upon final approval of all materials or supplies received, certification and test reports, if requested, will be reviewed for adequacy by the quality control manager and so filed.

D. Prior to acceptance of material or supplies, inspection shall include visual, dimensional, and functional tests. All material will be identified and labeled, listing customer purchase order, factory order, nomenclature and stamped for acceptance.

E. A transfer will then be made to the material hold storage area. Material will then be controlled on the hold area by authorized employees until request is made by production control for release.
Section IV
Receiving Inspection – Compressors

Purpose:

To provide for the control of incoming compressor cores, both exchange and remanufacture.

Responsibility:

Receiving clerk or qualified representative

Procedure:

A. Receiving clerk will inspect all incoming compressors for the following characteristics:

1) Quantity
2) Damage-deterioration
3) Conformance to purchase order or factory order requirements. Verification of exchange compressor or to be remanufactured and returned will be noted on all shipping documents.

B. Any compressors requesting inspection report will be specially tagged and held in designated area.

C. Any compressors designated for remanufacture will be tagged and turned over to the production supervisor to be processed.

D. All other exchange compressors will be tagged for warehouse and held until production supervisor puts them into production.

E. All compressors will be identified and tagged with a minimum of the following information:

1) Customer name and address
2) Customer order or reference number
3) Compressor make
4) Compressor model
5) Voltage
6) Phase
7) Special accessories on compressor
Section V
Remanufactured Compressor Specification

General

1. All remanufactured compressors shall be a combination of new and re-qualified parts that meet dimensional and functional specifications of the original manufacturer.

2. Disassembly - All compressors to be remanufactured shall be completely disassembled, including all internal parts and subassemblies. This is to allow each part to be cleaned, inspected, and refurbished.

Cleaning

1. All parts shall be cleaned to remove major amounts of oil, grease, and metal fragments.

2. All larger cast iron and steel parts and housings shall be cleaned as follows:
   
   A. Parts are to be loaded into an Am-Pro cleaning rack and placed into the Am-Pro Thermal cleaner unit for a period of 30 to 40 minutes and constantly rotated while at a temperature of 350 degrees Fahrenheit. All oil, grease, acid, and paint shall be burned to a dry carbon.

   B. Parts rack shall then be moved to the Am-Pro Air-Blaster unit and rotated for best effect while blasting with stainless steel shot for a period of 20 to 30 minutes. This step shall remove all rust and carbon from the parts.

   C. The parts rack shall then be moved to the Am-Pro Shaker/CoolDown unit where it will be rotated and rocked while cooled by blowers until shot is removed and parts are cooled to 150 degrees Fahrenheit.

   D. After cool down the rack is to be placed in the Am-Pro hi pressure washer to remove all remaining dust and residue, the parts shall be rotated and hi pressure washed with an anti-rust solution for a period of 10 minutes then will be blown dry with a hi pressure, hi volume blower for a period of 5 minutes.

   E. The parts shall be thoroughly inspected for cleanliness. Any part that is not completely free of oil, grease, paint, or rust shall be recycled through the cleaning operation a second time.

3. Small aluminum and steel parts are cleaned using the following procedure:
   (includes rods, pistons, unloaders)

   A. Small steel parts and aluminum parts shall be steam cleaned and/or agitated it a 180-degree caustic solution to remove the majority of oil and grease.
B. Parts shall be placed in a burnishing machine using a combination of stainless steel medium and special a cleaning detergent to thoroughly clean all parts. Each part shall be burnished a minimum of 25 minutes or until clean. This burnishing shall remove all contaminants without damage to the parts.

C. After burnishing, parts shall be treated with an anti-rust preservative and then dried using compressed air.

4. All remaining parts or parts which do not come entirely clean using the above cleaning procedures shall be cleaned individually in a bead blast machine or recycled thru the cleaning procedure.

5. Motors

A. Motors that require rewinding shall have their old windings burned in a temperature-controlled burnout oven designed for this purpose at a temperature not to exceed 700 degrees Fahrenheit. Ovens shall be designed to prevent flames during the burning process. After stripping the old winding from the stator iron, the iron shall be cleaned by glass bead blasting to remove all contaminants and then inspected for damage.

B. All stator cores that are to be rewound shall be subjected to a core loss test. The iron shall be driven at a flux densities of sufficient magnitude to accurately assess the magnetic properties of the metal. Core losses shall be no more than that allowed by the motor manufacturer. Any iron showing shorts or hot spots shall be scrapped. No iron cores shall be rewound that do not successfully pass the core loss test.

C. Motor winding materials shall be approved for sealed hermetic use in a Freon application. No material with less than a Class B 125° C rating shall be used. All materials shall meet or exceed the following minimum requirements:

1. Magnet wire shall be GP/MR-200 modified polyester with amid imide overcoat, (Class H, 200° C) or equal.

2. Motor insulation shall be Nomex/Mylar/Nomex, (Class H 180° C) for slot liners and formed wedges or equal.

3. Phase to phase protection shall be Dacron/Mylar/Dacron, (Class C 155° C) or nomex/mylar/nomex, (Class H 180° C).

4. Motor lead insulation shall be polyester fiber and polyester film hermetic motor lead or equal, (Class B 125° C) or greater. Leads connections shall be welded and insulated with Nomex/Mylar/Nomex tubing, (Class H 180° C).

5. Heat shrink Dacron lacing cord shall be used to lace all motor end coils.
6. Windings, leads, and insulation package shall be satisfactory for operation and off season submersion in refrigerant, lubricating oil, and/or a mixtures of refrigerant and oil.

7. Motors shall be dipped in an epoxy varnish, such as Isopoxy 771 or Dolphon BC-352, which is compatible with refrigerant, and cured at the varnish manufacturer’s specified temperature and time.

D. All motors must pass the following series of electrical tests before qualifying for use in a compressor:

1. Nema hypot – a rewound motor shall be subjected to a voltage equal to two times its rated voltage, plus 1000 volts to verify the integrity of the insulation package. A motor that is re-qualified for use is to be subjected to a reduced voltage NEMA hypot.

2. Double bridge test – each motor shall be tested by applying voltage to each phase and measuring the resistance from lead to lead. There shall not be more than a two percent variation between resistances of any two phases.

3. Surge comparison test – each motor shall be subjected to a surge comparison test with the resultant waveform for each phase of the motor compared to one another on an oscilloscope. Variations in the waveform shape of each phase shall be identified to detect winding errors including, but not limited to, phase-to-phase shorts, turn-to-turn shorts, phase to ground, improper connections, or improperly welded connections.

6. Machining

A. All crankshafts shall be gauged to verify proper dimensional and finish specifications as originally intended by the manufacturer of the compressor. Crankshafts may be plated with industrial hard chrome and reground on a precision grinder to original dimensional tolerances. Crankshafts may also be ground to .010, .020, .030 under size as allowed by original manufacturer. Mixing of sizes between journals is not permitted.

B. All re-qualified rod and pin bores shall be gauged to verify proper dimensions. Dimensions must be within original factory specifications. All scored, galled or otherwise damaged rods are to be scrapped and replaced with new rods.

C. All parts with sealing surfaces shall be machine lapped or surface ground to insure parallel surfaces and establish required finishes.

D. Cylinder liners or cylinder bores shall be checked for proper dimension, and honed to break the glaze and establish a crosshatch in the bore.
E. On models that do not have replaceable liners all cylinders are to be checked for proper dimensions, taper or out of round conditions. Damaged or worn cylinder bores may be bored oversize or sleeved, and re-bored to establish proper cylinder dimensions. All cylinders within factory specifications shall be honed to break the glaze and establish a crosshatch in the bore.

F. Valve plates shall be ground on a surface grinder to establish new parallel sealing surfaces.

7. Subassembly

A. All subassemblies, such as rod and piston assemblies, valve cage assemblies, hand hole covers, oil pumps, etc., shall be assembled using new or re-qualified parts. No subassemblies shall be reused as removed from exchange compressors.

B. All main bearings and bearing inserts shall be new. New bearings shall be installed in all bearing head assemblies using a hydraulic press that inserts the bearing in one continuous stroke.

C. All suction and discharge valves, valve springs, unloader springs and seals shall be new.

D. Suction pressure unloading actuator controls shall be tested and calibrated prior to assembly into a compressor using air and/or oil pressure to insure proper unloader operation.

8. Final Assembly

A. All compressor housing oil lines shall be inspected and replaced if damaged. All oil lines shall be tested to insure proper lubrication and hydraulic pressure distribution to the unloaders where applicable.

B. During assembly, the top dead center tolerance of each cylinder shall be verified to be proper.

C. Crankshaft end play shall be verified to be within original manufacturer's specifications.

D. All bolts shall be torqued during assembly using a calibrated torque wrench.
Section VI
Final Testing Procedure and Preparation

Purpose:
To outline the various testing procedures that each compressor will be subjected to in order to maintain a consistent high quality product.

Responsibility:
Quality control manager or qualified representative as designated by the quality control manager.

Procedures:
A. The compressor is then to be leak tested with a minimum of 125 psi of dry nitrogen.
B. Each compressor shall receive a full charge of new oil, which has been approved for use by the original manufacturer.
C. Each compressor shall be given a comprehensive test on a run in stand capable of simulating compressor operation conditions.
D. Each compressor shall be run at its rated voltage. Part winding start motors shall be operated in the part-winding configuration.
E. The amperage draw of each motor phase shall be verified to be within the compressor manufacturer’s specifications.
F. The CFM of each compressor shall be verified to be within the compressor manufacturer’s specifications.
G. The oil pressure shall be measured and verified gauge readings to be within acceptable limits. When the compressor has hydraulically operated unloaders, the oil pressure shall be checked at each stage of unloading.
H. The compressor is then to be run in the reverse direction and the oil pressure, CFM, amperage and unloading again verified to be acceptable.
I. The discharge valve assemblies shall be placed under a differential pressure to prove the sealing integrity of the discharge valves and internal discharge relief valve.
J. All head bolts shall be re-torqued, using a calibrated torque wrench.
K. After final testing, the compressor shall be evacuated to one mm of mercury, and then supplied with a holding charge of dry nitrogen.
L. The compressor shall be painted with a corrosion-resistant paint and mounted on a skid suitable for return of the exchange compressor.
Section VII
Preservation, Packaging, Stocking and Shipping Procedure

Purpose:

To assure proper and adequate preservation, packaging, stocking and shipping. To assure that all items shipped are in compliance with existing contract data. This data includes all orders, finish specifications and any contract information from the contract administrator.

Responsibility:

Quality control manager, shipping clerk, or qualified representative as designated by quality control manager.

Procedures:

A. Packaging materials such as crates, boxes, and wraps will be stored in a manner to assure cleanliness and to prevent deterioration or contamination.

B. Preservation, packaging, and shipping check list is reviewed and marked to assure proper preparation of compressors to be shipped or stored.

C. A visual examination will follow, to include:

1) Determination of cleanliness and proper painting prior to preservative wrap to be applied.
2) Terminals, nuts and caps on all ports are present and tightened.
3) Sight glass is clear.
4) Comparison of part numbers to match both compressor and applicable purchase order.

D. All compressors going to stock will be properly wrapped, tagged, and transferred to the various stocking locations for that particular model.

E. Compressors leaving the BCR warehouse will be properly packed and crated according to contract packing specifications as follows:

1) Shipping cartons in accordance with level of packaging.
2) Pallets are properly constructed – banded together – and are within dimensional requirements.
3) Designated wraps, cushioning and other required material is properly utilized in package fabrication.
4) Required bracing, bolting, and blocking.
5) All shipping containers are properly labeled as marked.
6) Proper execution of bills of lading.
7) All carrier loading is to be accordance with sound loading practices.
HISTORY OF BRAINERD

In 1951 A.G. Brainerd began what was then known as The Brainerd Company. His business consisted mainly of commercial service and filter changing in Memphis and the Mid-South. In servicing the larger HVAC equipment and in constant need of all types of compressors, Mr. Brainerd began rebuilding his own compressors in-house and soon became an outlet for other service companies.

It was in 1971 that J. Howard Barton purchased The Brainerd Company and merged it with his already existing Barton Service Company. At that time he immediately saw the need and growth potential of the compressor remanufacturing business and separated this into an existing company of its own. His brother Larry already having experience in this business joined him in 1972 and together they developed Brainerd Compressor into one of the largest and most reliable compressor remanufacturers in the country. Now with their vast and unparalleled stock of inventory in three locations, Brainerd has become "The Source" for remanufactured compressors, not only in the United States, but also in countries worldwide.

Warranty

We warrant our remanufactured or exchange compressor to be free from defect in material and workmanship under normal use for one (1) year from date of original purchase to the original purchaser. Warranty shall be limited to furnishing a replacement, F.O.B. our warehouse, for the compressor which upon our examination discloses to our satisfaction to be thus defective.

Warranty shall not be extended to any compressor that has been subjected to liquid slugging, improper voltage, poor system engineering, or installation of compressors into contaminated systems. We recommend the installation of suction line dryer ahead of the compressor on burnouts.

We assume no liability for systems damage or product loss due to a failure of one of our compressors.