# SERVICE BULLETIN

**Title:** 17EX With 17FX Compressor Familiarization
**Models Affected:** 17EX

**Number:** C9720
**Date:** 6/25/97
**Supersedes:** New

## Purpose:

This bulletin is intended to provide information about the new compressor, drive train, and associated components being offered on the 17EX unit platform. This bulletin is set-up in sections as follows. (See next page for table of contents.)

**File: Installation-Start-Up-Operation**

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## Background:

This new compressor was developed and offered with the 17EX product platform to improve the efficiency of the machine. It is intended to be offered as a standard product rather than through the Special Order process as was the 17FA single shaft compressor. The new product will be offered within the framework of the existing 17EX model codes.

| Position | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | 1 | 7 | E | X | 4 | 8 | 5 | 7 | 5 | 9 | 9 | G | F | H | 6 | 6 | 1 | - |

This compressor will only be offered with the Frame 4 cooler [Positions 5 and 6]; 45, 46, 47, or 48, and the Frame 4 and 5 condenser [Positions 7 and 8]; 45, 46, 47, 55, 56, or 57.

**Compressor:**

The compressor is a spin-off of the single shaft version of the 17FA compressor. Internally, the compressor aerodynamics are identical to the 17FA compressor. It is being offered with shrouds 3 through 6, 8, and 9 [Position 10], with diameters 1, 3, 5, 7, and 9 [Position 11]. This combination of heat exchangers and compressor aerodynamics offer a machine with a nominal capacity range of 1500 to 2100 tons.

The mechanical portion of the compressor is similar to the existing 17FA single shaft compressor. The Kingsbury-type tilting shoe thrust bearing is employed in this compressor. The journal bearings employed in the machine are tilting shoe journals. The tilting shoe journal bearings in both the seal end and thrust end, improved the system's critical speed response.

The lubrication system for the compressor is a forced lubrication system, comprised of a pump and combination cooler/filter. The application of the external gear has allowed for the return to an in-house manufactured cooler/filter package. The new oil cooler is a Shell and Helical Coil design, similar to the ones used on the 19EA/EB compressor. Internal to the cooler is the replaceable oil filter. Two 30µ rated filters are used. Drains and shut-off valves are included in the oil lines to facilitate servicing. The compressor uses a POE oil, Carrier Part Number PP23BZ107, which does not have the high pressure additives. The compressor is shipped from the factory with the operational oil charge.

Oil recovery from the evaporator is slightly different from the 17FA single shaft compressor. Oil reclaim is more like the 17EX machines. An oil recovery ‘‘skimmer’’ tube is inserted into the cooler at about the level of the refrigerant. The tube is connected to the suction housing of the compressor. Oil that is in the cooler is removed from the cooler via the skimmer line to the suction housing. Eventually, the oil returns to the reservoir from the aerodynamic portion of the compressor through the check valve and orifice assembly found in all FA compressors. The oil reservoir is vented to the evaporator through a demister and vent line in the seal end cover.

The seal used in this compressor will be a design similar to the 17MPS seal. It is scheduled to complete reliability testing shortly. The first few 17EX machines with 17FX compressors will use the John Crane seal used on the 17FA single shaft compressor. A shutdown oil seal reservoir has been incorporated into both seal designs to maintain an oil seal during shutdown. A control algorithm has been added to periodically run the oil pump to maintain the oil level in the rear seal reservoir. A seal oil leakage pump is activated based on the oil level in the seal leak reservoir to return any oil to the main oil reservoir.

These compressors are designed for operating speeds of 7700 to 9600 rpm.

Available common Special Order items for the compressor that must be submitted on a Quote Control include:

- Bentley-Nevada Vibration Equipment (requires remote monitoring)
- Thermometers
- Pressure Gages RTDs (requires remote monitoring)
- µ Filters with a 5 µ bypass.
- Auxiliary Oil Pump A Quote Control is required for all of the above items and any other items not listed above, since some combinations of items will preclude the installation of others.

**Gear:**

The gear designation is the only designation that distinguishes the 17FX compressor in the 17EX model number [Position 12]. Valid gear codes for 60 Hz machines are ‘‘G,’’ ‘‘J,’’ ‘‘L,’’ or ‘‘N.’’ Valid gear codes for 50 Hz machines are ‘‘L,’’ ‘‘N,’’ ‘‘P,’’ or ‘‘S.’’

The gear is manufactured by Nuttall Gear Corporation. It is a double helical design.

The bearing system in the gear is a split-sleeve bearing system.

The lubrication system for the gear is a forced lubrication system, comprised of a pump and combination cooler/filter. The standard product does not offer an internal shaft driven pump. The pump is a gear-type pump with a pressure regulator installed in the pump. The pump will internally bypass flow from the discharge of the pump to the suction, if the set point is reached. The gear also has an oil pressure regulator, set at the Nuttall factory for the internal lubrication of

the gear mesh. The gear oil cooler is a Shell and Helical Coil design, identical to the one used on the compressor. Internal to the cooler is the replaceable oil filter. Two 30µ rated filters are used. A drain and shut-off valves are included in the oil lines to facilitate servicing. The gear requires a Mineral based oil, Carrier Part Number PP23BB005. Due to possibility of losing the oil charge during shipping, the oil is not shipped with the unit and must be ordered separately.

The oil level in the gear can be monitored by a level glass. At the present time there are two levels scribed on the glass, one for running conditions and the other for shutdown. Oil should be added until the level in the glass reaches the lower scribe mark. Be sure that all service valves are open and all oil lines and the cooler/filter package is full of oil. The oil level should not be above the upper scribe line during operation. If the oil level is above the upper limit, the gear mechanical losses will increase and oil droplets will be exiting the gear through the breather cap, due to the churning of the oil.

Available common Special Order items for the gear that must be submitted on a Quote Control include:

- Bentley-Nevada Vibration Equipment, radial only (requires remote monitoring)
- Thermometers
- Pressure Gages
- RTDs (requires remote monitoring)
- Auxiliary Oil Pump

- Oil Heater (recommended for ambients below 60° F)
- A Quote Control is required for all of the above items and any other items not listed above, since some combinations of items will preclude the installation of others.

**Motor:**

With the introduction of the 17FX compressor to the 17EX line, several new motors were also introduced. The standard motor offered has a service factor of 1.05. Offered as a factory installed option is a motor with a service factor of 1.15. An additional motor horsepower offering, 1600 horsepower is available with this compressor.

| Horsepower | Motor Code [Position 14] | |
|---|---|---|
| | 1.05 Service Factor | 1.15 Service Factor |
| 1250 | F | A |
| 1500 | G | B |
| 1600 | H | — |
| 1750 | J | C |
| 2000 | K | D |

The motor enclosure [Position 13] offerings for the motor are changing slightly. The Open Drip Proof, ODP and Totally Enclosed Water to Air Cooled, TEWAC, will be offered. Our motor manufacturer has developed a single enclosure for the Weather Protected Type I and Type II. As a result, Carrier will no longer be offering the WP1 enclosure as standard.

| Enclosure [Position 10] | Description |
|---|---|
| F | Open Drip Proof (ODP) |
| H | Weather Protected Type II (WP2) |
| J | Totally Enclosed Water to Air Cooled (TEWAC) |

Standard features from the factory on the motors include: Klixon temperature sensors, Stator RTDs, 115 Volt space heaters, and moisture detectors in TEWAC enclosures. Optional equipment available from the factory includes the motor bearing RTDs. The Bentley-Nevada vibration instrumentation is no longer standard and must be requested on a Quote Control.

As with the 17EX motors, the 17FX motors are shipped without oil due to possibility of losing the oil charge during shipping. A mineral based oil must be ordered separately and used, Carrier Part Number PP23BZ091. Oil levels can be monitored through sight glasses mounted in the bearing housings.

Available Special Order items for the motor that must be submitted on a Quote Control include:

- Bentley-Nevada Vibration Equipment (requires remote monitoring)
- and 11 kV motors
- Forced Lubrication System
- A Quote Control is required for all of the above items and any other items not listed above, since some combinations of items will preclude the installation of others.

**Couplings:**

Couplings on the low and high speed shafts are disc-type couplings. No maintenance is required, other than normal inspection.

As with the current 17EX, a factory cold alignment is performed. This assures that the shafts are aligned. The alignment, however, will not arrive at the job site in the same condition as it left the factory. Minor movement during shipping is not uncommon. Do not start the machine without performing a field cold alignment. A field hot alignment is also required.

All field alignments should start at the compressor, completing the compressor and gear alignment first, and then the gear and motor alignment. When aligning the compressor and gear, the gear shaft should be mechanically centered and located to the compressor with the compressor shaft is in the thrust position. When aligning the gear and motor, the motor should be located to the gear with the gear shaft positioned at its mechanical center, and the motor shaft positioned at the motor's mechanical center, not magnetic center.

**Controls:**

The 17FX compressor is PIC compatible.

The controls now include a new board, 4 IN/2 OUT. This board has 4 analog inputs and 2 analog outputs. It is used to control the gear lubrication system. Each input has 3 terminals, and is configurable by a movable jumper for various types of inputs, thermistor (configuration ‘‘T’’), 4-20 ma (configuration ‘‘C’’), or 0-10 Volts-DC (configuration ‘‘V’’). The type is determined by a removable jumper on the board. The input jumpers are factory set to ‘‘V’’ for Channel 1 and ‘‘T’’ for Channel 2. The input channels are monitoring the gear oil temperature and pressure. The two output channels have two terminals and are also configurable to either 4-20 ma (configuration ‘‘C’’) or 0-10 Volts-DC (configuration ‘‘V’’). As with the input channels, the output channels are configured from the factory for ‘‘V.’’ The output channel controls the relay to activate the gear oil pump starter.

The device also has a field configurable DIP Switch, to designate its address. It should be factory set with the following switches ‘‘OPEN,’’ 1, 2, 3, 4, 6, and 8. Switches 5 and 7 should be ‘‘CLOSED.’’

The SIO bus is slightly different from the standard PIC modules. The standard PIC modules connect Pin 1 (Positive), Pin 2 (Common), and Pin 3 (Negative). The 4 IN/2 OUT connects Pin 1 (Positive), Pin 2 (Negative), and Pin 3 (Common). If these are miswired, the control board will not function properly.

The board includes the standard LED displays, red and green. A blinking red light signals that the board is operating normally. A steady red light indicates a failure of the board, and it should be replaced. A blinking green light signals communications with the PSIO. If the green light is not blinking, there is no communications with the system.

The board's ground is through the mounting holes. All fasteners must be able to complete the ground to the chassis through the mounting holes. All of the mounting holes are connected internally in one of the layers of the board.

The gear oil pump is activated through the 4 IN/2 OUT board's control of a DC relay. To activate the relay, the board sends a 3 vdc signal to the relay, which in turn activates the contactor.

PIC control requirements for the external gear are minor, so the basic 17/19EX software was modified to include the following:

- STATUS04 was added with the Gear Oil Pressure and Temperature readings
- SERVICE01 has the configuration screens for the external gear. The default value is the external gear enabled. The options of a mechanical (internal) gear oil pump as the primary pump and the Auxiliary Oil Pump enable commands are in this screen. The gear oil temperature and pressure alert set points are also set at this screen.
- CONTROLS TEST includes the option to test the gear oil pump.

Available common Special Order items for the controls that must be submitted on a Quote Control include:

- NEMA 4 Control and Power Boxes
- PLC Controls

A Quote Control is required for all of the above items and any other items not listed above, since some combinations of items will preclude the installation of others.

**Literature:**

The following literature supports the product offering:

- 17EX-1SI — Installation Instructions
- 17EX-1SS — Start-Up, Operation and Maintenance Instructions
- 17EX-1PD — Product Data
- RCD-3517-025 — Service Parts Guide