

STANDARD COMMISSIONING PROCEDURE FOR VARIABLE FREQUENCY MOTOR DRIVES

BUILDING NAME: _____ **APPLICATION #:** _____
BUILDING ADDRESS: _____

NAME & FIRM OF PERSON(S) DOING TEST: _____
DATE(S) OF TEST: _____

General Notes:

1. This is a generic test procedure for variable frequency drives (VFDs). If the complexity, configuration, or other aspects of a specific project require substitute tests or additional tests, explain on the comments sheets, and attach the additional test procedures and field data. Attach all relevant functional performance verification sheets, and always attach the final signed and dated procedure certification page.
2. In all test sections, circle or otherwise highlight any responses that indicate deficiencies (i.e. responses that don't meet the criteria for acceptance). Acceptance requires correction and retest of all deficiencies, as defined in each test section under "Criteria for Acceptance" or "Acceptance". Attach all retest data sheets. Complete the Deficiency Report Form for all deficiencies.
3. This Commissioning Procedure does not address fire and life safety or basic equipment safety controls.
4. To ensure that this Commissioning Procedure will not damage any equipment or affect any equipment warranties, have the equipment manufacturer's representative review all test procedures prior to execution.

NAMEPLATE DATA (from equipment nameplates, as recorded in field):

Criteria for Acceptance: Nameplate data must be in accordance with approved submittals.

DESCRIPTION	DRIVE # (Pump or Fan Symbol)					
Serves what equipment (describe)?						
Drive Manufacturer						
Drive Model #						
Drive Serial #						
Motor Manufacturer						
Motor Model #						
Motor Rated Horsepower						
Motor Rated Voltage / Phase						
Motor Rated Full Load Amps						
Motor Rated Frequency, Hz						
Drive Rated Horsepower						
Drive Rated Voltage / Phase						
Drive Rated Full Load Amps						
Drive Rated Frequency, Hz						

FUNCTIONAL PERFORMANCE VERIFICATION:

The following sections are a series of field tests that are intended to verify that the variable frequency motor drives operate as they were intended to operate by the manufacturer and designer. If the field observation does not correspond to the intended design operation, write a comment number that refers to an explanatory comment in the comments section or on attached comments sheets. If a test does not apply, write "NA" for not applicable. If you were not able to complete a test, write "ND" for not done, and explain in a comment.

<p>Full Capacity Test: Perform the following tests and measurements by forcing the system to its maximum capacity (e.g. full flow). Verify that the drive maintains the system at setpoint.</p> <p>Criteria for Acceptance: As noted under specific test items. Note: Imbalance (current or voltage) is defined as largest phase difference from the average, divided by the average.</p>						
DRIVE #						
19. Controlled variable setpoint & units of measurement (static pressure, °F, etc.). Acceptance: Setpoint must be as low as possible, consistent with proper system operation.						
20. Measured controlled variable full capacity value. Acceptance: Must be within -15% to +10% of setpoint.						
21. Maximum Hertz setting. Acceptance: <65 Hz						
22. Measured Hertz. Acceptance: Must be within ±10% of maximum setting.						
23. Measured amps into drive. Acceptance: Average must be no more than 5% above rated motor full load amps	/ /	/ /	/ /	/ /	/ /	/ /
24. Measured amps into motor. Acceptance: Current imbalance between phases must be <2%	/ /	/ /	/ /	/ /	/ /	/ /
25. Measured volts into drive. Acceptance: Average must be within ±10% of rating.	/ /	/ /	/ /	/ /	/ /	/ /
26. Measured volts into motor.	/ /	/ /	/ /	/ /	/ /	/ /
27. Voltage imbalance into drive <2%? Acceptance: Must be <2%.						
28. Voltage imbalance into motor <2%? Acceptance: Must be <2%.						

Flying Start Test: Perform this test only if the drive is equipped with a flying start function. This test verifies that the drive is able to start to a spinning load, without undergoing nuisance trips. With the equipment running, momentarily interrupt power to the drive and restore power before the driven equipment comes to a complete stop. Alternative Test: If it is not possible to interrupt power to the drive, use the drive controls to turn it off momentarily, and then turn it back on before the driven equipment comes to a complete stop. Use this alternative only if it is impossible to interrupt power to the drive.

Caution: In some cases, this test has resulted in damage to the VFD because of faulty VFD components. Inform the building operator of this possibility, and get permission to perform the test before starting.

DRIVE #						
29. Did the drive restart & match the spinning load without tripping any safeties? Acceptance: Drive must restart & match load without trips.						
30.						

Normal Operation Test: Monitor or measure kW or Amp input to the drive, and trend EMS VFD output signal and controlled variable input signal (static pressure, °F, etc.) for at least 24 hours to document speed modulation under normal operation. If drive is not observed to modulate to less than 50% of full speed, force the flow control devices to minimum positions by changing setpoints, control signal, etc. as needed. Attach annotated graphs of monitored data to this test sheet. If using an energy management system (EMS) to verify drive operation, record the following values, and then attach annotated trend-logs. Test 1 must be at a control signal of between 60 and 75%, and test 2 must be at a control signal of between 30 and 50% of full speed.

Criteria for Acceptance: As noted under specific test items.

DRIVE #						
31. Test 1: control speed signal, % of maximum signal (60 - 75%)						
32. Divide answer to #31 by 100% and cube the result.						
33. VFD input amps at same time as #31	/ /	/ /	/ /	/ /	/ /	/ /
34. Fractional Current: Divide the avg VFD input amps (#33) by the avg max running amps into the motor (#24).						
35. Calculate the correspondence between the fractional current and the cube of the control signal: (#34 - #32) / #32. Acceptance: The calculated correspondence must be within ±20%.						
36. Test 2: control speed signal, % of maximum signal (30 -50%)						
37. Divide answer to #36 by 100% and cube the result.						
38. VFD input amps at same time as #36	/ /	/ /	/ /	/ /	/ /	/ /
39. Fractional Current: Divide the avg VFD input amps (#38) by the avg max running amps into the motor (#24).						
40. Calculate the correspondence between the fractional current and the cube of the control signal: (#39 - #37) / #37. Acceptance: The calculated correspondence must be within ±20%.						
41. Was VFD observed to modulate to <60% of full speed <u>under normal (non-forced) operation</u> ? If not, comment below on likely reasons. Note if this is to be considered a deficiency. Recommend seasonal retesting if appropriate.						

