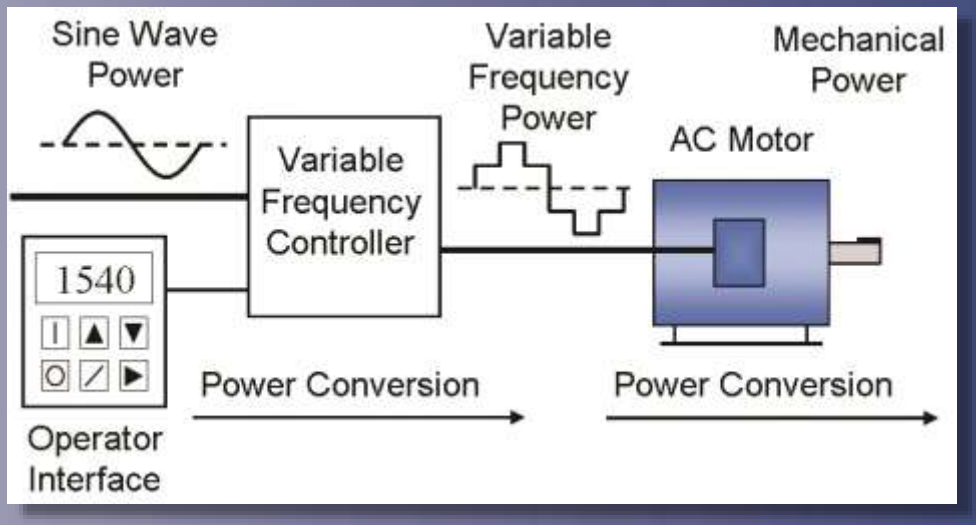
GUIDANCE NOTE – GN 8

INVERTER DRIVES FOR FANS AND PUMPS



2017 Edition

GUIDANCE NOTE – GN 8

INVERTER DRIVES FOR FANS AND PUMPS

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DISCLAIMER

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Introduction

Inverters are now a proven and fully accepted product offering a wide range of improved advantages in the control of AC motor driven machinery. The two main reasons are energy efficiency and controllability. For these reasons it is becoming more common for Inverters to be used on fan and pump drives.

These advantages go far beyond the basic requirement for offering variable speed control as the reduced shock loading provided can dramatically extend the life of the mechanical drive mechanisms.

In fan and pump applications the Inverter offers the potential to reduce energy consumption significantly thereby allowing for capital expenditure payback times of less than 12 months in many instances and applications. An Inverter that has been set up correctly can give major improvements for system operation, energy saving and running cost benefits to the end user.

Setting to work / handover from the BMS Controls Engineer to HVAC Commissioning Engineer:

It is recommended that the HVAC Commissioning Engineer works closely with the BMS Controls Engineer to ensure that all the Inverter minimum and maximum frequencies and associated controls are set to allow efficient operation, of the connected systems.

The Inverter should be commissioned by the manufacturer or the BMS Controls Engineer prior to running the fan or pump in automatic control. i.e. all settings programmed, maximum speed, full load current, KW rating, ramp speeds, rotation and other equally crucial settings. Therefore, it is prudent to ensure the Inverter has been commissioned and tested prior to the dynamic balancing of system fluid flow rates. The most productive solution is for the HVAC Commissioning Engineer to liaise with the BMS Controls Engineer and ensure the Inverter is on the “hand” setting to allow the running speeds and frequencies to be increased or decreased to achieve design performance (or requirements).

Handover from the HVAC Commissioning Engineer on completion of Commissioning

When the system fluid flow rates have been dynamically balanced by the HVAC Commissioning Engineer and relevant frequencies have been set to achieve design performance (or requirements), it is good working practice to ensure the BMS Controls Engineer is made aware of all the relevant settings including, where associated with fans, smoke control modes where applicable, allowing the minimum and maximum frequencies to be set, and the Inverter to be returned to automatic control.

It is also essential for the HVAC Commissioning Engineer to record relevant Inverter settings in their daily diary / daily report book and also, more essentially, recorded on the commissioning test sheets, thus ensuring an accurate record of the relevant Inverter settings is available to the end user.

Inverter functions and potential incidents that may occur:

If a fan or pump and associated controls are programmed to automatic through the Inverter but the system is not enabled, this can sometimes be overridden by switching the Inverter to the “hand” position. However, there is a risk that this may override all control functions e.g. on ventilation systems the fan may start with the automatic control damper remaining closed, thus causing excessive pressure at the supply fan Inlet or the extract fan outlet. This may also cause excessive noise and vibration and may also lead to damage dependent on the excess pressure created within the component or ductwork system. Automatic control dampers should always be checked for correct function prior to releasing the system to automatic control / full design speed.

If an Inverter has a hard wired fire alarm interlink and this is activated during Dynamic Balancing, there is a risk the Inverter may change speed thus affecting the balancing process.

The same principles apply to hydraulic systems where 2-port valves are installed. The 2-port valves may remain closed thus causing excessive pressure at the pump discharge where the 2 port valve is located after the pump or possible zero pressure at the pump inlet where the 2-port valve is located before the pump. Zero pressure at a pump inlet can cause cavitation which could potentially damage the pump bearings. Again, there is also potential for damage to the installation dependent on the excess pressure created. Automatic control valves should always be checked for correct function prior to releasing the system to automatic control / full design speed.

Some Inverters have a function where the rotation can be reversed. If this function is inadvertently used, this will cause the fan/pump impeller to run in the wrong direction. This function should be locked out once the fan or pump rotation has been confirmed as correct. This task should form part of the BMS Controls Engineer’s Pre-Commissioning works.

On most Projects, within the UK, the common Inverter maximum setting is 50 Hz. However, where necessary, it has become common practice to increase the frequency as high as 100 Hz provided the motor F.L.C / kW rating and speeds permit. Increasing the Inverter beyond 50 Hz could be compared to simulating a pulley change; this should only be carried out providing the manufacturer’s etc are in agreement and it is recommended that written confirmation is obtained from them.

As it is becoming more common for plant frequencies to run in excess of 50 Hz, it is important to have the manufacturer’s published design data during the commissioning stage as this will stipulate the design frequency in which the Inverter should be set at to achieve design requirement.

An Inverter should be rated to cope with the motor it is installed to operate, thus allowing the inverter to run the motor at its maximum operating frequency. If a motor is rated at 3.0 kW then the Inverter must also be capable of operating at 3.0 kW. If an Inverter is undersized then there is normally a warning on the display of the Inverter intermittently displaying the actual frequency in which it will not exceed. This should have been highlighted by the BMS Controls Engineer during their Pre-Commissioning works. However, this is dependent on what frequency the BMS Controls Engineer ran the Inverter at during this stage.

N.B All operational parameters will be proportionally below design performance if the Inverter is not set to meet the recommended frequency as detailed within the manufacturer's data.