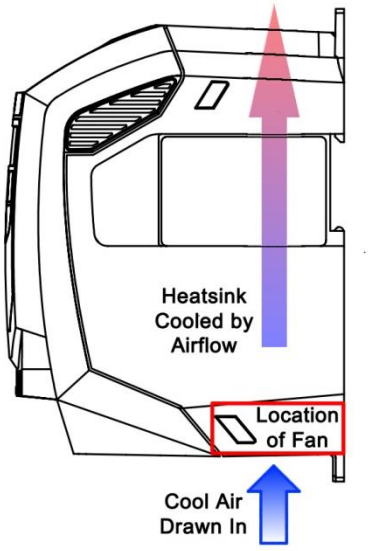
Optidrive Applications Support Library

Application Note	**AN-ODE-2-062**
Title	**Use Of Fan Components In Drive Construction**
Related Products	**Optidrive E2**
Level **1**	1 – Fundamental - No previous experience necessary 2 – Basic – Some Basic drives knowledge recommended 3 – Advanced – Some Basic drives knowledge required 4 – Expert – Good experience in topic of subject matter recommended

Overview

This application note details the use of fan components in the Optidrive E2 construction. Primarily it lists the number and location of fans used in the Optidrive E2 product, but also details the types of fans used and their advantages in drive applications. The application note also looks at environmental conditions that may have an adverse effect on fan component life cycle.

Optidrive E2 uses high quality long life ball bearing fans, designed to give continuous and reliable operation across the full life cycle of the product. These represent an additional investment in material cost but provide for longer service life over a greater temperature range.



Optidrive E2 uses Fan components for two separate purposes within the drive construction. Individual models may have none, one, or both of these functions performed by the fan and this is clearly listed for each model in the Drive Model Summary Table. The definition of the functions is given below.

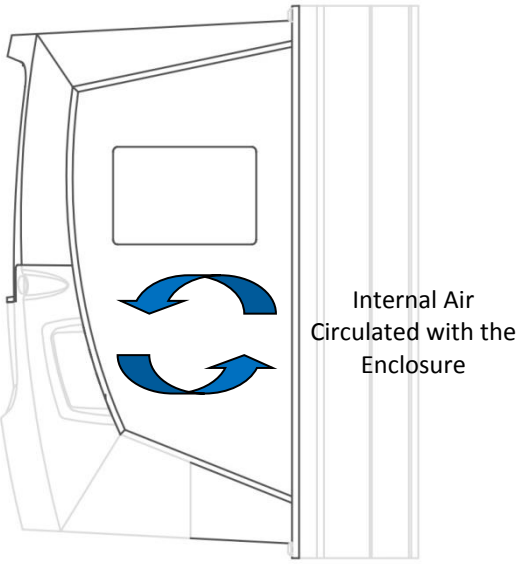
a. Heatsink cooling fans

These fans are fitted directly to the heatsink of the drive to help force air-flow across the heatsink fins and assist drive cooling. The Optidrive E2 is designed with the heatsink cooling fans located at the bottom of the drive to push cool air up from the bottom of the drive. This means that cool air is drawn by the fan (prior to being heated by the Heatsink) and prolongs Fan life / operation. Some drives are sufficiently cooled by natural convection (air rising up through the heatsink as it is heated) and do not require Heatsink cooling fans.

	Optidrive E2 units with IP66 enclosures have only natural convection cooled heat-sinks and are not fitted with heatsink cooling fans. This is an important criterion for applications that require wash down or that carry high levels of material in the air stream that might otherwise block a fan. Optidrive E2 provides the ideal solution in applications where fan blockage or reliability on a drive has previously been an issue.

b. Internal Stirrer fans

Internal Stirrer fans are fitted inside some of the higher IP rated drive enclosures which circulate the air internally within the enclosure. This circulation prevents the build-up of heat in the air surrounding heat generating components and toward the top of the enclosure and provides increased reliability for circuits and components within the drive. The dissipation of heat from the drive enclosure is aided by having a stirrer fan providing uniform temperature with the drive enclosure.



When Will the Fans Operate?

Both the Heatsink cooling fan and the Internal Stirrer Fan only operate when required by the temperatures within the drive, in order to maximise drive efficiency in low ambient or low load conditions or during periods of inactivity.
The fans will automatically come on when the unit gets to approximately 45°C on the heat-sink. This applies to all Optidrive models with fans fitted.

Can the Fans be tested?

Where a drive heatsink fan or internal stirrer fan is fitted it can be tested manually to ensure it is operational. Ensure the drive is in a stop condition. To activate the fan, push all five push buttons on the front of the drive, starting with the Stop button. This will cause all segments to light on the drive display and cause the heat sink fan or internal stirrer fan (if fitted) to come on. If the fan does not activate when the display segments are lit then this indicates a fan fault.

Trips relating to fan problems

The following trip condition might be related to an issue with the drive heat-sink fan. Issues might include the fan not operating, contamination reducing fan efficiency or preventing the fan from operation, or restricted air-flow in the cooling channel surrounding the drive.

Fault	Description	Corrective Action
O-t	Heatsink over temperature	The drive is too hot. Check the ambient temperature around the drive is within the drive specification. Ensure sufficient cooling air is free to circulate around the drive. Increase the panel ventilation if required. Ensure sufficient cooling air can enter the drive, and that the bottom entry and top exit vents are not blocked or obstructed.

Factors Effecting Fan Reliability

The Optidrive E2 uses high quality long life ball bearing fans, designed to give continuous and reliable operation across the full life cycle of the product. However there are still several factors that might derogate a fans useful life or prohibit its efficient operation.

The most common issue found when investigating failed or poor performing fans in the presence of material or particles within the environment that clog or block the fan. For enclosure drives (IP20) the electrical cabinet that the drives are installed into should provide sufficient protection against such blockages.

When fans on electrical enclosures become blocked the system owner will often run the equipment with the cabinet door left open to ensure the enclosure does not over heat. It stands to reason that the same contaminants that blocked the enclosure fans will also block any drive fans and such action rarely provides a safe or suitable solution. Correct enclosure design to the operating environment is always required from the design stage.

It is important that drive heat sink fans are kept clear of any contamination and where such potential might exist they are monitored and maintained on a regular basis. Likewise the channels through the drive heatsink must remain equally clear and might be required to be blown out by compressed air should the potential for restricted air flow exist.
Optidrive E2 IP66 enclosure drives provide a good solution as they have no external heatsink cooling fans, using natural convection to cool the drive. As air is not drawn through the heat-sink in the same way as a fan cooled drive there is also less potential for particles to be drawn into the heat sink channels and restrict further airflow.

The other issue with contaminants in the atmosphere (such as fine dust particles is that over time the dust can work its way into the fan bearings, causing additional friction and premature wear. Wear in the fan bearing has the additional effect of increasing the audible (nuisance) noise emitted by the fans.

Restricted airflow to the fans has the effect for reducing fan efficiency as well as increasing the load on the fan itself leading to the fan wearing prematurely. The guidelines given in the user guide state clearances above and below the drive to allow the free flow of air and these distances should be adhered to in all applications.
At higher altitudes the air thins and its ability to cool the drive heat sink is also reduced. At altitudes above 1000 a.m.s.l the manufacturer or drive supplier should always be consulted to check if any de-rating of the product might be required.

As with most electrical devices the drive fan life cycle is effected by ambient temperature with higher temperatures having an adverse effect. Drive fans are specified for reliable operation based on the maximum specified operating ambient for the drive and the values quoted in the product manual should be adhered to.

Vibration puts additional stresses on the bearings of the fan. In some cases high vibration, beyond the designed maximum for the product may result in premature failure of fans.

All of the information mentioned above might apply equally to fans used to provide ventilation into the electrical enclosures where drive units might be fitted. The same guidance and advice might also be applied to gain maximum life time and reliable operation from these fans also.

Drive Model Summary Table:

110V - 115V: 1ph In - 3ph Out: IP20: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-11005-1H012	1	0.5	2.3	0	0
ODE-2-11010-1H012	1	1	4.3	1	0
ODE-2-21015-1H042	2	1.5	5.8	1	0
200V - 240V: 1ph in - 3ph Out: IP20: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12037-1K#12	1	0.37	2.3	0	0
ODE-2-12075-1K#12	1	0.75	4.3	1	0
ODE-2-12150-1K#12	1	1.5	7	1	0
ODE-2-22150-1K#42	2	1.5	7	1	0
ODE-2-22220-1K#42	2	2.2	10.5	1	0
ODE-2-32040-1K#42	3	4.0	15	1	0
200V - 240V: 1ph in - 3ph Out: IP20: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12005-1H#12	1	0.5	2.3	0	0
ODE-2-12010-1H#12	1	1	4.3	1	0
ODE-2-12020-1H#12	1	2	7	1	0
ODE-2-22020-1H#42	2	2	7	1	0
ODE-2-22030-1H#42	2	3	10.5	1	0
ODE-2-32050-1H#42	3	5.0	15	1	0
200V - 240V: 3ph In - 3ph Out: IP20: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12037-3K#12	1	0.37	2.3	0	0
ODE-2-12075-3K#12	1	0.75	4.3	1	0
ODE-2-12150-3K#12	1	1.5	7	1	0
ODE-2-22150-3K#42	2	1.5	7	1	0
ODE-2-22220-3K#42	2	2.2	10.5	1	0
ODE-2-32040-3K#42	3	4.0	18	1	0
200V - 240V: 3ph In - 3ph Out: IP20: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12005-3H#12	1	0.5	2.3	0	0
ODE-2-12010-3H#12	1	1	4.3	1	0
ODE-2-12020-3H#12	1	2	7	1	0
ODE-2-22020-3H#42	2	2	7	1	0
ODE-2-22030-3H#42	2	3	10.5	1	0
ODE-2-32050-3H#42	3	5	18	1	0
380V - 480V: 3ph In - 3ph Out: IP20: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-14075-3K#12	1	0.75	2.2	1	0
ODE-2-14150-3K#12	1	1.5	4.1	1	0
ODE-2-24150-3K#42	2	1.5	4.1	1	0
ODE-2-24220-3K#42	2	2.2	5.8	1	0
ODE-2-24400-3K#42	2	4	9.5	1	0
ODE-2-34055-3K#42	3	5.5	14	1	0
ODE-2-34075-3K#42	3	7.5	18	1	0
ODE-2-34110-3K#42	3	11	24	1	0
380V - 480V: 3ph In - 3ph Out: IP20: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-14010-3H#12	1	1	2.2	1	0
ODE-2-14020-3H#12	1	2	4.1	1	0
ODE-2-24020-3H#42	2	2	4.1	1	0
ODE-2-24030-3H#42	2	3	5.8	1	0
ODE-2-24050-3H#42	2	5	9.5	1	0
ODE-2-34075-3H#42	3	7.5	14	1	0
ODE-2-34100-3H#42	3	10	18	1	0
ODE-2-34150-3H#42	3	15	24	1	0

110V - 115V: 1ph In - 3ph Out: IP66: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-11005-1H01#	1	0.5	2.3	0	0
ODE-2-11010-1H01#	1	1	4.3	0	0
ODE-2-21015-1H04#	2	1.5	5.8	0	0
200V - 240V: 1ph In - 3ph Out: IP66: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12037-1K#1#	1	0.37	2.3	0	0
ODE-2-12075-1K#1#	1	0.75	4.3	0	1
ODE-2-12150-1K#1#	1	1.5	7	0	1
ODE-2-22150-1K#4#	2	1.5	7	0	1
ODE-2-22220-1K#4#	2	2.2	10.5	0	1
ODE-2-32040-1K#4#	3	4.0	15	0	1
200V - 240V: 1ph In - 3ph Out: IP66: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12005-1H#1#	1	0.5	2.3	0	0
ODE-2-12010-1H#1#	1	1	4.3	0	1
ODE-2-12020-1H#1#	1	2	7	0	1
ODE-2-22020-1H#4#	2	2	7	0	1
ODE-2-22030-1H#4#	2	3	10.5	0	1
ODE-2-32050-1H#4#	3	5	15	0	1
200V - 240V: 3ph In - 3ph Out: IP66: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12037-3K#1#	1	0.37	2.3	0	0
ODE-2-12075-3K#1#	1	0.75	4.3	0	1
ODE-2-12150-3K#1#	1	1.5	7	0	1
ODE-2-22150-3K#4#	2	1.5	7	0	1
ODE-2-22220-3K#4#	2	2.2	10.5	0	1
ODE-2-32040-3K#4#	3	4.0	18	0	1
200V - 240V: 3ph In - 3ph Out: IP66: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12005-3H01#	1	0.5	2.3	0	0
ODE-2-12010-3H01#	1	1	4.3	0	1
ODE-2-12020-3H01#	1	2	7	0	1
ODE-2-22020-3H#4#	2	2	7	0	1
ODE-2-22030-3H#4#	2	3	10.5	0	1
ODE-2-32050-3H#4#	3	5	18	0	1
380V - 480V: 3ph In - 3ph Out: IP66: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-14075-3K#1#	1	0.75	2.2	0	1
ODE-2-14150-3K#1#	1	1.5	4.1	0	1
ODE-2-24150-3K#4#	2	1.5	4.1	0	1
ODE-2-24220-3K#4#	2	2.2	5.8	0	1
ODE-2-24400-3K#4#	2	4	9.5	0	1
ODE-2-34055-3K#4#	3	5.5	14	0	1
ODE-2-34075-3K#4#	3	7.5	18	0	1
380V - 480V: 3ph In - 3ph Out: IP66: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-14010-3H#1#	1	1	2.2	0	1
ODE-2-14020-3H#1#	1	2	4.1	0	1
ODE-2-24020-3H#4#	2	2	4.1	0	1
ODE-2-24030-3H#4#	2	3	5.8	0	1
ODE-2-24050-3H#4#	2	5	9.5	0	1
ODE-2-34075-3H#4#	3	7.5	14	0	1
ODE-2-34100-3H#4#	3	10	18	0	1

110V - 115V: 1ph In - 1ph Out: IP20: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-11005-1H#12-01	1	0.5	7	1	0
ODE-2-21007-1H#42-01	2	0.75	10.5	0	0
200V - 240V: 1ph In - 1ph Out: IP20: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12037-1K#12-01	1	0.37	4.3	1	0
ODE-2-12075-1K#12-01	1	0.75	7	1	0
ODE-2-22110-1K#42-01	2	1.1	10.5	0	0
200V - 240V: 1ph In - 1ph Out: IP20: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12005-1H#12-01	1	0.5	4.3	1	0
ODE-2-12010-1H#12-01	1	1	7	1	0
ODE-2-22015-1H#42-01	2	1.5	10.5	0	0
110V - 115V: 1ph In - 1ph Out: IP66: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-11005-1H#1#-01	1	0.5	7	0	0
ODE-2-21007-1H#4#-01	2	0.75	10.5	0	0
200V - 240V: 1ph In - 1ph Out: IP66: kW					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12037-1K#1#-01	1	0.37	4.3	0	0
ODE-2-12075-1K#1#-01	1	0.75	7	0	1
ODE-2-22110-1K#4#-01	2	1.1	10.5	0	1
200V - 240V: 1ph In - 1ph Out: IP66: HP					
Model Number	Frame Size	Output Power	Output Current	Heatsink Cooling Fan	Internal Stirrer Fan
ODE-2-12005-1H#1#-01	1	0.5	4.3	0	0
ODE-2-12010-1H#1#-01	1	1.0	7	0	1
ODE-2-22015-1H#4#-01	2	1.5	10.5	0	1

Appendix

Revision History			
Issue	Comments	Author	Date
01	Document Creation	JP	16/04/12
02		KB	24/04/14