Design Upgrade

ACS5000 water-cooled (Generation 2)

General

ABB continuously tracks product quality to develop enhancements to ensure the highest reliability and optimum performance of your drive.

Some of these enhancements are made available for updating older generation drives to support our customers in keeping the performance of their drives at the highest possible level. ABB classifies these upgrades as “Design Upgrades” in our database to keep our local ABB Service Unit informed about the available upgrades for each installed drive.

Introduction

The primary protection for the input transformer is the overcurrent protection relay “R”.

As shown in the figure above, the protection usually depends on current transformers (CT) installed on the primary side of the input transformer.

The protection relay will trip in response to a phase-to-phase short-circuit of:
1. The input section of the VSD (e.g. diode failure)
2. One secondary winding of the multi-winding transformer
3. Power cable between the input transformer and the VSD

It is complicated to derive the protection relay settings for these three cases, especially for multi-winding transformers. The settings depend on the transformer data (e.g. tolerances of the impedance voltage) as well as the actual short-circuit capability of the supply network.

Recommendation

To minimize the risk of transformer failure, we recommend using load-dependent overcurrent settings.

Example with three different overcurrent trip settings:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Overcurrent setting</th>
<th>Actual motor shaft power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set 1</td>
<td>70% of transformer nominal current</td>
<td>0 – 60%</td>
</tr>
<tr>
<td>Set 2</td>
<td>110%</td>
<td>&gt;60 – 100%</td>
</tr>
<tr>
<td>Set 3</td>
<td>160%</td>
<td>&gt;100 – 150%</td>
</tr>
</tbody>
</table>

In this example, the settings are chosen to be below the minimum fault currents and at least 10% above the maximum load current during normal operation.

The digital inputs of the protection relay are used to switch between Set1, 2 and 3. The switch-over is controlled by either the distributed control system (DCS) or the VSD itself.

In general, the overcurrent protection relay must have inrush detection and trip blocking. These are required to avoid increasing the instantaneous element setting based on the inrush current.
Feature upgrade option for ACS5000 water-cooled Generation 2

To minimize the reaction time of the ACS5000 water-cooled drive, the supervision of the line supply unit (LSU) has been improved. This CVMI-board based LSU supervision is based on voltage measurements. In the event of a diode or thyristor fault, the time to detect the fault and to trigger MCB and VSD trip is < 21 milliseconds, independent of the operation point.

The LSU supervision has been improved to minimize the transformer load and to provide redundancy for the primary transformer protection (transformer protection relay). ABB decided to make this feature available for the installed base of ACS5000 water-cooled Generation 2 drives as an alternative to the load-dependent overcurrent settings of the protection relay as recommended above. In addition, the transformer stress can be further reduced by using the latest firmware version:

ACS5000 water-cooled driving:
- induction motor        AD AMC SW     LKOI6700 (or higher)
- synchronous motor     SD AMC SW     LLOI6600 (or higher)

The LSU supervision is enabled with the MCB on command, that means that the supervision is active when the MCB is closed. If an input transformer pre-magnetization unit is used the coordination with the LSU supervision can be optimized by deploying the "Premag Control" function now integrated in the firmware.

In the event of an LSU failure, the drive with the latest firmware reacts with a protection firing and converts a two-phase short-circuit into a symmetrical three-phase short-circuit. In addition, a "Lockout" function has been introduced to prevent simple resetting after a protection firing. This function avoids an immediate re-energizing for events that might have been caused by damaged hardware.

An upgrade will be handled as a customer project as it includes a firmware upgrade. It will not be available from Business Online (BOL).

For more information please contact your local ABB representative.

Yours sincerely,

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