

ZVC Auto-Transformer Starter

Designed To Order, Metal Enclosed, Arc-proof, Air-insulated, Modular, Integrated Motor Starting Auto-Transformer

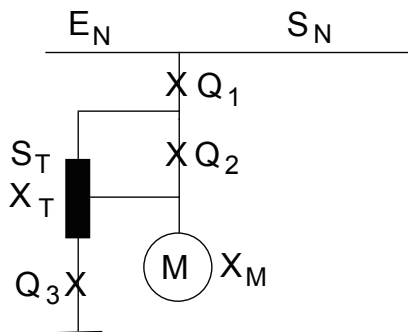
- ✓ Control voltage drop in the supply network when starting motor
- ✓ Control load torque during start
- ✓ Control starting time to keep thermal stresses in the rotor reasonable

With ease of operation, increased reliability and compact footprint, ZVC will provide your Power Process System installations with significantly lower Total Cost of Ownership.

Auto transformer is another form of reduced voltage motor starter. The auto-transformer starter employs high voltage devices to control the current flow and therefore the voltage applied to the motor.

Motor Starting Technology

Auto transformer reduces the terminal voltage of the motor during the starting. The auto-transformer reduces the starting current by the voltage ratio of the transformer in power two. Simplified voltage drop calculation based on reactance.



- E_N = rated net voltage
- S_N = busbar fault level
- X_M = motor short circuit reactance
- X_N = net reactance
- I_{st} = starting current in DOL starting
- X_T = transformer reactance
- T_{st} = starting torque in DOL starting
- μ = transformer voltage ratio
- μ_{sc} = transformer short circuit ratio
- S_T = transformer rating power



Starting current with auto transformer, $I_{stM} = \mu^2 I_{st}$
 where $\mu = E_N/E_M$

Starting torque with auto transformer, $T_{stM} = \mu^2 T_{st} = (I_{stM}/I_{st}) T_{st}$

Auto transformer short circuit reactance, $X_T = \mu_{sc} (E^2_M/S_T)$

Voltage drop, $\Delta E = \mu X_n / (X_M + X_N + X_T)$
 where $X_N = E^2_M / S_N$

The starting procedure for synchronous machines is following:


The starting begins by closing the circuit breakers Q_3 and Q_1 . When the motor is synchronized to the net, a time relay will be activated and after a certain time period it will give the command to open circuit breaker Q_3 . After Q_3 is opened the auto-transformer limits the current as a choke for some time before the circuit breaker Q_2 is closed and the motor is direct on line.

The dimensioning criteria of the starting transformer are line voltage starting power: starting current times line voltage starting time number of starts per time unit.

Auto transformer rating, $S_T = \sqrt{3} I_{stM} E_N$

Usual auto-transformer short circuit ratio μ_{sc} is around 5...6 %

Technical data

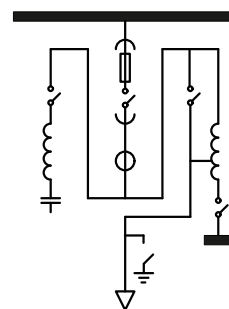
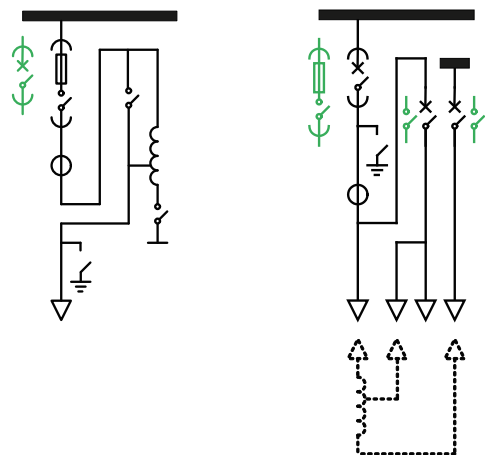
ZVC-AT	7.2kV	12kV
Interface with switchgear platforms	UniGear, OE-ZVC, BC, Compact	
Type of construction	Metal enclosed with withdrawable contactor or breaker	
Compartmented to IEC 62271-200	Partition class PM	
Loss of service continuity	Category LSC2A	
Internal arc classification	AFL (or AFLR with arc gas duct)	
Insulation level	7.2/20/60 kV	12/28/75 kV
Rated main busbar current (40°C)	Up to 4000A	
Rated normal current	Up to 630A	
Motor Soft Starter	Up to 6000kW	Up to 11000kW
	Up to 8000HP	Up to 14000HP
Rated short time current	Up to 50kA	
Arc fault withstand current	Up to 50kA	
Tested according to	IEC standards	
Overall dimensions		
	H [mm]	1800 / 2200 / 2400 / 2595
	W [mm]	1325 / 1650 / 1975
	D [mm]	1800
Auto-Transformer	Dry type, Integrated or External mounted	
Marine Approval	Lloyd's Register	

The above data are not limiting values.

Design Features

- Integrated auto-transformer, switching line/run/start devices and timer coordination
- Direct connection to UniGear switchgear panels.
- Wall standing. Front power cable access.
- Safe, all operations behind closed doors.
- Earth switch viewing window.
- Integral interlock fault make earth switch.
- Full range of type test to AS and IEC standards.
- Can be designed for Indoor or Outdoor installations
- Can be equipped with motor racking mechanism.
- Racking mechanism proven for 10000 operations.
- Can be equipped with capacitor bank for reactive power compensation, or for network with very low short circuit capacity.
- Built-in control logic between auto-transformer, earth switch and line/run/start devices status
- Minimise site work by maximising factory installation, power cabling and test

Single Line Diagram for typical circuits



For more information please contact:

ABB Australia Pty Limited
 Bapaume Road, Moorebank 2170
 NSW Australia
 Locked Bag 7315
 Liverpool BC NSW 1871
 Tel: +61 2 98210111
 Fax: +61 2 96022454
 E-mail: abb.zvc@au.abb.com
 Internet: www.abbaustralia.com.au

The data and illustrations are not binding. We reserve the right to make changes in the course of technical development of the product.

1VGA671031 – Rev. B, December 2010