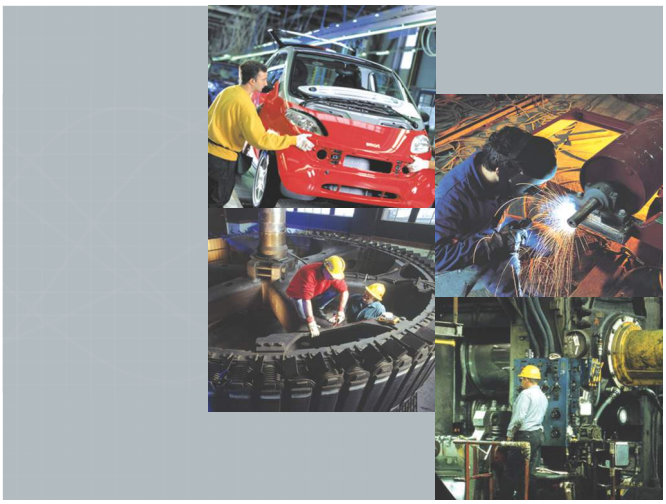


AUTO TRANSFORMER STARTER

BCH ELECTRIC LIMITED

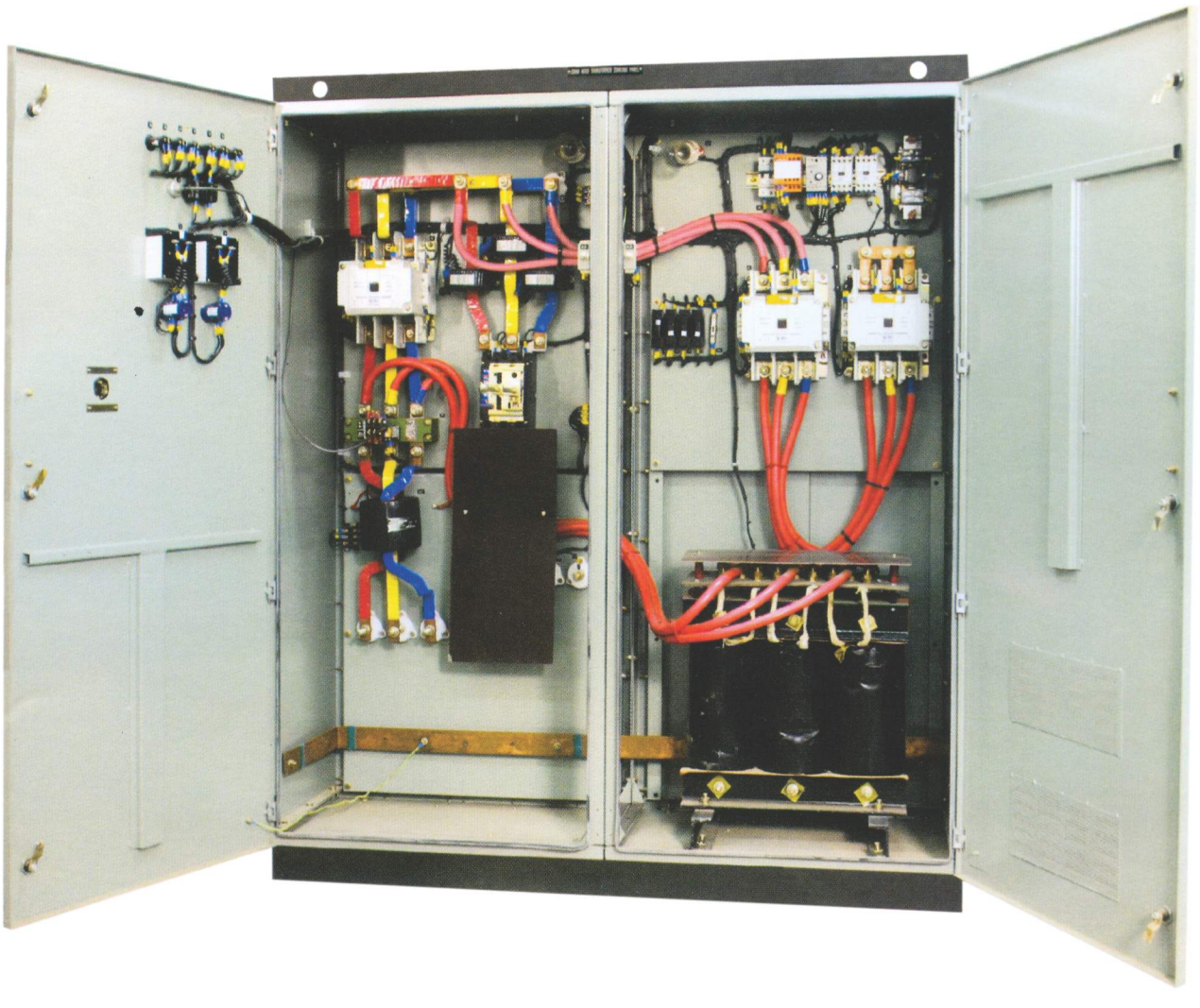
Introduction

When a squirrel cage motor is started on full voltage Direct On Line, the electrical system experiences a current surge. The peak starting current can be as high as 6-8 times the rated current & this can cause a voltage dip in supply system. Also, the motor & driven equipment experiences a torque surge, which can cause serious mechanical problems,. In most cases, it is desirable to reduce these surges to safe levels, particularly for higher rating motors (>10HP)

The normal approach is to start the motor on reduced voltage & open-transition Star-Delta starting is most common. For this, the motor must have all leads (6 or 12) brought out to facilitate star/delta connection. Supply is applied to motor with stator winding star-connected. This gives the effect of reduced voltage (58%) on the windings & the peak starting current is limited to 1.7-2.5 time rated. The peak starting torque is also limited to 0.25-0.4 times rated torque. When the motor speed is close to torque-equilibrium, the Star contactor is opened & Delta contactor is energised to connect the stator windings in Delta.

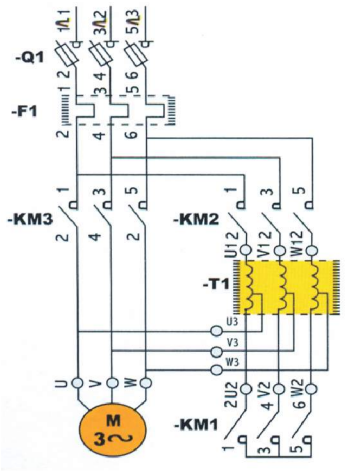
S-D starting can be used in applications where low starting torque is permissible. However, main problem comes during transition from star to delta. A high transient current is generated during transition, & care must be taken to prevent nuisance tripping of SCPD. In certain applications, equipment may be subjected to mechanical jerk also, leading to high wear & tear.

An effective reduced voltage starting method is Auto Transformer Starter, which provides solution to transient problems & has other advantages over star-delta starting.



Auto-transformer Starter - How it Works?

BCH Auto-transformer starters can be used with any standard squirrel-cage induction motor. Motor connections are the same as for DOL starting. The motor is started at reduced voltage, which is supplied through taps of 3-phase auto-transformer. The starting sequence has 3 stages :



Auto-transformer starter

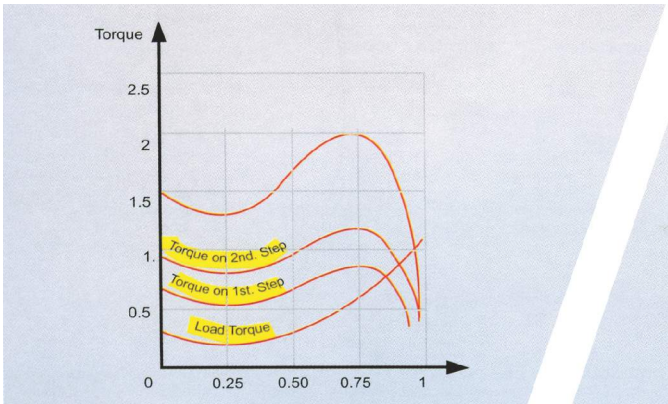
Stage 1 - The auto-transformer is star-connected by energising Star contactor KM1, and then the Run contactor KM2 is closed. This starts the motor with a reduced voltage, the value of which depends upon the ratio selected for the transformer. The standard taps are 50%, 65% and 80% of the full line voltage & the best ratio can be chosen during commissioning.

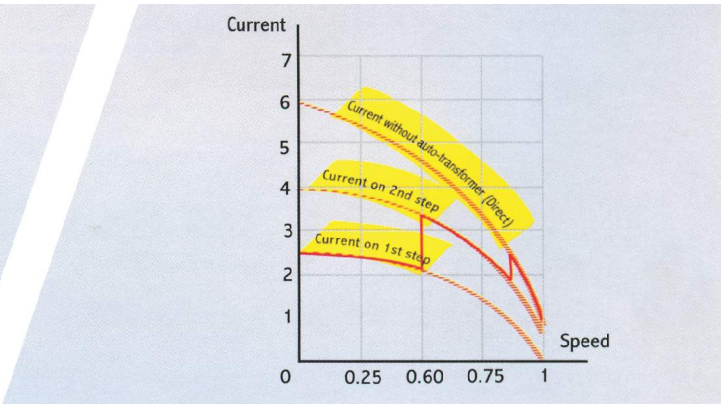
Stage 2 - After the pre-set time delay, the Star contactor KM1 is opened, and the auto-transformer acts as an inductor connected in series with the motor. The supply to the motor is, thus, maintained during transition. This transition is normally timed to occur when the motor speed has stabilized at the end of the run-up period.

Stage 3 - The transformer is shunted completely by energizing Main contactor KM3, so that the motor is directly connected to the supply and KM2 is opened.

Advantages of Auto-transformer Starter

1. Flexibility : Different voltage taps of auto-transformer allows adjustments for a range of starting current and torque requirements. In applications like mixing, extruding or conveyor, such flexibility to alter starting parameters can be a definite advantage, because the best tapping can be selected during commissioning as per required starting torque. The standard taps are 50%, 65% and 80% of the full line voltage. Accordingly, the starting torque is 25%, 42% and 64%. Voltage applied to the motor may be increased in multiple steps also to achieve very smooth acceleration.
2. Smoothness : BCH ATS are closed transition type, an arrangement that maintains a continuous power supply to the motor during the transition from reduced to full voltage. This avoids the high transient switching current characteristic of open-transition type starters, & there in no danger of nuisance tripping of SCPD in case of ATS. Also, the transition is smooth & no mechanical jerk is forced on the equipment. This feature is particularly useful in applications like pumps, fans & compressors, where it helps to reduce wear & tear of equipment.
3. Performance : An ATS provides highest starting torque per ampere of line current drawn. So, it is best used where high torque is required to overcome the inertia of the load, & at the same time starting current must be limited to minimum. For standard tap settings, while the current to the motor is 50%, 65% and 80% respectively, the line current drawn will be 25%, 42% and 64% of the full voltage rating.





Typical Value, as per selected tapping

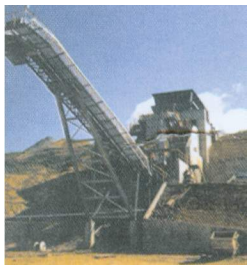
- Starting Current : 1.5 to 4 times In
- Starting Torque : 0.25 to 0.8 times Tn

ATS Applications

a.	Pumps	:	Submersible pumps, Boosting pumps for water supply, Dewatering pumps in mines & Ports, Oil extraction pumps, Sewage pumps
b.	Mixers	:	Chemical industry, Food & beverage industry
c.	HVAC	:	Centralized air-conditioning, Chillers, Compressors
d.	Blowers/Fans	:	Ventilation & ID/FD applications
e.	Extruders & grinders	:	Oil mills, Solvent plants, Poultry feed plants
f.	Crushers	:	Paper mills, Sugar mills
g.	Conveyors	:	Heavy industry like cement & steel







Parameters	Citation Air-cooled ATS	Oil-cooled ATS
Range Specifications	Up to 800HP Choice of standard models, as well as customised starter.	Up to 250HP Standard models only
Standard Protection	Fast acting BCH Citation-M bimetal overload relay with in-built single-phase prevention. In-built thermal cut-off in AT	Poor quality of overload relay has unreliable tripping characteristics. No protection for AT
Customised Features	Complete solution incomer BCH MCCB electronic relays for UV/OV, SPP, ELR. Possible to incorporate high-end communication capable motor protection relays. Possible to provide dry-run preventor & level controller.	Not available
Monitoring	A+ASS, V+VSS, KWH meter can also be provided. LED indications for R/Y/B, motor On/Trip. Provision for remote on/off.	Not available
Performance	High electrical life. High fault withstand capacity. Suitable for 6-12 starts/hour. High starting time possible	Low life & breaking capacity. Limitation of 3-4 starts/hour & low starting time.
Maintenance	Virtually trouble-free operation. No preventive maintenance shutdown. Easy to change spares, if sometimes required.	Mandatory preventive maintenance Shutdowns. Oil must be changed at least once every year to avoid danger of short-circuit. Difficult & Time consuming to replace spares.
Testing	Each AT is tested in-house for dielectric strength & temperature rise.	Insufficient test facilities.
Aesthetics	Bolted type panel construction in powder coated finish gives high aesthetic appeal & gels with other distribution panels.	Odd-looking construction & overall poor appearance

Citation ATS Range

Model	Rating	Dimensions (W x H x D)
Standard Version : PU Gasket Enclosure, 3nos. Power Contactor, Bimetal OLR, Motor On LED Indication.	20HP	700 x 600 x 350 mm
	25HP	700 x 600 x 350 mm
	30HP	700 x 600 x 350 mm
	35/40HP	700 x 900 x 475 mm
	50HP	700 x 900 x 475 mm
	60HP	700 x 1200 x 475 mm
	75HP	700 x 1200 x 475 mm
	100HP	700 x 1500 x 475 mm
Premium Version : PU Gasket Enclosure, MCCB Incomer, 3nos. Power Contactor, Bimetal OLR, UVR, OVR Electronic SPP, ELR+CBCT, A+ASS, V+VSS, phase & Motor On/Trip Indications	30HP	700 x 900 x 475 mm
	35/40HP	700 x 1200 x 475 mm
	50HP	700 x 1200 x 475 mm
	60HP	700 x 1200 x 475 mm
	75HP	700 x 1500 x 475 mm
	100HP	1400 x 1200 x 475 mm
	125HP	1400 x 1200 x 475 mm
	150HP	1400 x 1200 x 475 mm
	175HP	1400 x 1200 x 475 mm
	200HP	1400 x 1200 x 475 mm
	225HP	1400 x 1200 x 475 mm
	250HP	1400 x 1500 x 475 mm
	300HP	1400 x 1500 x 475 mm
	350HP	1400 x 1500 x 475 mm
	400HP	1400 x 1500 x 475 mm

Note : 1. Dimensions excluding foundation channel & lifting lug.
2. ATS as per customized specifications available on request.

Salient Features of Citation ATS

1. Panel Construction: Bolted type panel with PU Foam gasket

2. Sheet Thickness
a) Enclosure : 2 mm CRCA
b) Mounting Plate : 2.5 mm CRCA
c) Cable gland plate : 2.5 mm CRCA
d) Cable entry : From bottom
e) Foundation channel : ISMC-75
f) Lifting Angle : 50 x 50 x 6 mm Angle

3. Painting
a) Pretreatment : 10 Tank Process
b) Surface finish : Structure finish Powder Coating Shade RAL 7032

4. Air Cooled Auto Transformer
a) Frequency of Oper. : 6 starts/hour (evenly spaced) or as per specification
b) Starting time : Suitable for 12sec starting or as per specs
c) Taps : 50% / 65% / 80% or as per specification
d) Thermal cut-off : in-built
e) Testing : Temp. rise, dielectric strength

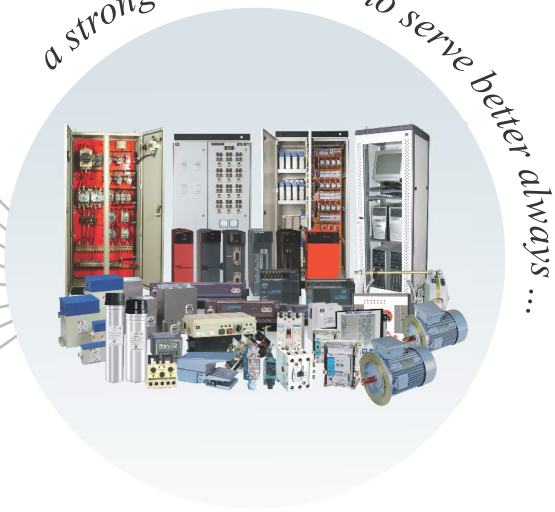
5. Contactors : AC3 duty rated at 55deg C ambient

6. Protection
a) Incomer : MCCB with Rotary Handle
b) Over load : Through thermal overload relay
c) Earth leakage : ELR+CBCT (optional)
d) U/V, O/V : Electronic Relay
e) Ph failure/unbalance : Electronic Relay
f) Control supply : HRC fuse-link / DP MCB

7. Metering and indication
a) 96 x 96 mm Voltmeter with selector switch
b) 96 x 96 mm Ammeter with selector switch
c) LVGP LED type R, Y, B phase indication
d) LED type ON and Trip indication

- Switchgear & Control Gear
- Automation
- Enclosures
- Electric Motors
- Wires & Cables
- Reactive Power Management
- Brakes and Crane Control
- Custom Build Products

a strong commitment to serve better always ...



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