



Static Converters STC

Manufactured by



Static Converters STC

Operate three-phase machinery from your single-phase supply



In a home workshop, farm, garage or small business environment there is often a requirement for the operation of machinery driven by three-phase induction motors where only a single-phase electricity supply is available.

The TRANSWAVE Converter provides an artificial means by which a three-phase motor can be operated from a single-phase supply thereby offering a cost-effective solution to this dilemma. In most instances, no modification to the machine is necessary.

The Static Converter is designed to operate three-phase motors with starting characteristics and duty cycles as generally experienced on machine tool applications (i.e. light to medium duty and relatively constant load conditions). This style of converter is typically used in single operator environments where only one machine is used at a time.

The use of a Rotary Converter is recommended for multi-operator and/or multi-motor working environments. Please consult the separate Rotary Converter sales leaflet.

Currently, seven sizes of Static Converter are available designed to operate single motor loads between 0.37kW (0.5hp) and 5.5kW (7.5hp) and multi-motor loads between 1.1kW (1.5hp) and 7.5kW (10hp).

For applications with single motors in excess of 5.5kW (7.5hp) or combinations of motors in excess of 7.5kW, please seek further advice. Enquiries

are invited from machinery manufacturers wishing to incorporate custom-built assemblies into their equipment.

TRANSWAVE Converters manufactured since January 2016 can support specific single motor applications where equipment has a heavy starting load or is subjected to an abnormal surge current or duty cycle. Compressors, Pumps, Extractor Fans and Vehicle Hoists fall into this category. It should be noted that converters are designed for applications with a cyclic duty (i.e. maximum 12 hour duty in any 24 hour period). Please seek advice for continuous duty applications.

The Static Converter is a passive device that depends upon an interaction between the converter and the driven motor(s) to induce an artificial third phase.

Static Converter Rating

Each size of Static Converter has a minimum load, a maximum single-motor load (for starting reasons) and an overall multi-motor capacity. The minimum load corresponds to the smallest size of motor capable of operating independently from the Static Converter. Not every motor can induce a satisfactory electrical condition across the three phases. The maximum single motor load is approximately 60-70% of the overall capacity of the converter. This is a reflection of the starting losses incurred by the artificial supply.

Power Regulating Switch

The Static Converter incorporates a power-regulating switch below the on/off switch. The operator is invited to select the optimum power level to suit the particular motor or combination of motors in circuit. This switch controls both the starting and running modes of the motor.

Single or Multi-Motor operations

Any number of motors can be operated simultaneously from a Static Converter provided the converter rating is not exceeded, either on a single motor or multi-motor basis. When considering a Static Converter for the operation of a multi-motor application the use of a three-phase distribution board or similar is recommended. In such instances it is imperative that the largest motor is started first and switched off last. Note also that the setting of the power regulating switch may have to be adjusted in line with increases and decreases in load. If this is impractical, the use of a Rotary Converter is recommended. Please consult the separate Rotary Converter sales leaflet.

The converter output takes the form of an industrial-style socket/plug (three-phase, neutral and earth). The output neutral facilitates the use of 240-volt control circuits and small auxiliary loads.

Starting Surge

All TRANSWAVE Converters automatically control the motor starting surge, maintaining the surge until the motor has attained its full running speed irrespective of time taken. The operator need not leave the driven machine to reset the converter for starting.

Voltmeter

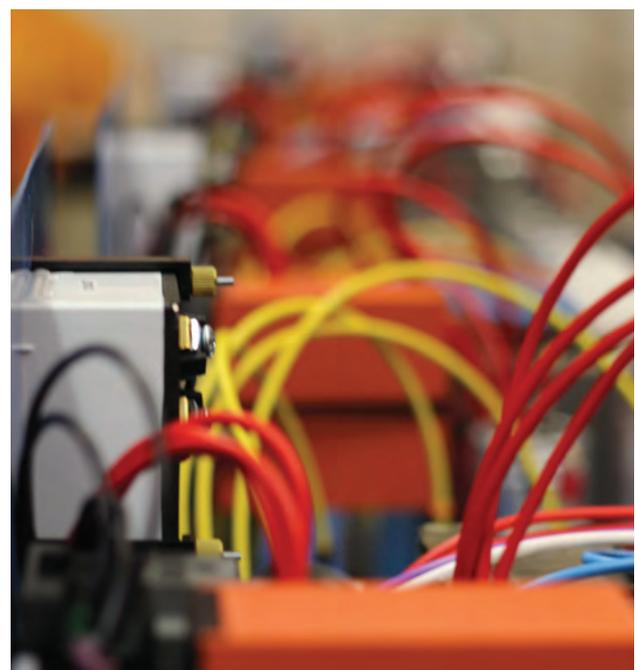
The TRANSWAVE Static Converter incorporates a voltmeter indicating the voltage induced on the "artificial" phase. This helps greatly when commissioning and operating the driven equipment.

Special Applications

The use of a Rotary Converter is often recommended for three-phase applications with small motors, motors of unusual magnetic characteristics (i.e. multi-speed) or motors subjected to abnormal short term overload conditions such as guillotines, power presses and hydraulically driven machines. This style of converter should also be considered for applications where the motor is frequently stopped and started or where the direction of the motor is constantly changed (e.g. screw-cutting). Please consult the separate Rotary Converter sales leaflet.

Fractional Horsepower Motors

Where machinery incorporates ancillary motors of a fractional horsepower nature (e.g. suds/coolant pump; table traverse/feed; table rise/fall) these motors are likely to fall below the minimum load of a Static Converter. Under such circumstances, it is imperative that these motors are operated in conjunction with and not independently of the main drive motor. If this is impractical, the use of a Rotary Converter is recommended. Please consult the separate Rotary Converter sales leaflet.



Technical Data

The converter offers no inherent overload protection to either the circuit cable or the driven machinery. Adequate overload protection for both the motors in the driven machinery and the supply circuit to the converter is the responsibility of the customer. The customer should also ensure that the electricity system and cable supplying the converter is of sufficient capacity to allow the motor to start without causing undue supply disturbances as a consequence of voltage drop.

| STATIC CONVERTER Part Number | STATIC CONVERTER Minimum Load Single Motor | STATIC CONVERTER Maximum Load Single Motor | STATIC CONVERTER Maximum Load Multi Motor | SINGLE-PHASE SUPPLY 220/240V Fuse or Circuit Breaker | SINGLE-PHASE SUPPLY 220/240V Cable* |
|------------------------------|--|--|---|--|-------------------------------------|
| STC1.1 | 0.37kW/0.5hp | 0.75kW/1hp | 1.1kW/1.5hp | 13A | 2.5mm |
| STC1.5 | 0.37kW/0.5hp | 1.1kW/1.5hp | 1.5kW/2hp | 13A | 2.5mm |
| STC2 | 0.37kW/0.5hp | 1.5kW/2hp | 2.2kW/3hp | 13A | 2.5mm |
| STC3 | 0.55kW/0.75hp | 2.2kW/3hp | 3.0kW/4hp | 20A | 2.5mm |
| STC4 | 0.55kW/0.75hp | 3.0kW/4hp | 4.0kW/5.5hp | 25A | 4.0mm |
| STC5 | 0.75kW/1hp | 4.0kW/5.5hp | 5.5kW/7.5hp | 32A | 6.0mm |
| STC7 | 0.75kW/1hp | 5.5kW/7.5hp | 7.5kW/10hp | 40A | 10.0mm |

**Minimum cable size for run of up to 20 metres. For longer cable runs consult current edition of BS7671/AS300 amend. 2*

The full load running current (f.l.c.) of an induction motor operating on a single-phase supply is approximately four amps per hp. When operated in conjunction with a TRANSWAVE Converter, the starting current of a three-phase motor is limited to approximately 3 times its f.l.c. This is significantly lower than the motor starting current of an equivalent sized single-phase motor, which would typically draw between 6-8 times its f.l.c.

As the starting characteristics of a three-phase motor supplied by a converter are similar in nature to Star/Delta starting on a three-phase supply, significant reductions in starting torque are experienced when compared with direct-on-line starting on a three-phase supply.

Generally, when machinery is operated in conjunction with a TRANSWAVE Converter direct-on-line starting is recommend. For machinery fitted with a Star/Delta starter, the period in the star connection should be set as short as possible to ensure a successful start. This is not the case when machinery is operated on a mains three-phase supply.

Warranty

Power Capacitors Limited (PCL) is prepared to offer a 21 day no obligation money back guarantee (carriage excluded) on condition that the converter is returned to PCL in a state fit for resale. The TRANSWAVE converter is covered by a **24-month parts warranty** against failure due to faulty manufacture, further details of which are available on request.

| Converter Style | Converter Rating | Height mm | Width mm | Depth mm | Weight kg |
|-----------------|------------------|-----------|----------|----------|-----------|
| STC | 1.1kW/01.5hp | 300 | 460 | 310 | 17 |
| STC | 1.5kW/02.0hp | 300 | 460 | 310 | 17 |
| STC | 2.2kW/03.0hp | 300 | 460 | 310 | 23 |
| STC | 3.0kW/04.0hp | 300 | 460 | 310 | 27 |
| STC | 4.0kW/05.5hp | 300 | 460 | 310 | 27 |
| STC | 5.5kW/07.5hp | 350 | 510 | 350 | 37 |
| STC | 7.5kW/10.0hp | 350 | 510 | 350 | 43 |



STATIC CONVERTER – STCHD RANGE - INSTALLATION & OPERATING INSTRUCTIONS

The TRANSWAVE converter offers no inherent overload protection to either the circuit cable or the motor. Adequate overload protection for both the motor and the supply circuit to the converter is the responsibility of the customer. The customer should also ensure that the electricity system and cable supplying the converter is of sufficient capacity to allow the motor to start without causing undue supply disturbances as a consequence of voltage drop.

THE CUSTOMER MUST ENSURE THAT THE OUTPUT NEUTRAL FROM THE CONVERTER IS NOT CONNECTED TO THE ELECTRICITY PROVIDER'S SUPPLY NEUTRAL OR THE SUPPLY NEUTRAL FROM A GENERATOR. THE SINGLE PHASE SUPPLY NEUTRAL MUST BE KEPT ELECTRICALLY SEPARATE FROM THE CONVERTER OUTPUT NEUTRAL TO AVOID DAMAGING THE CONVERTER.

Ensure that the details on the converter rating plate are compatible with the electricity supply system and the required motor loads.

The incoming supply should be connected to the converter via an isolator and protection device (i.e. fuse or type C "motor rated" circuit breaker). Recommended fuse ratings and cable sizes are indicated below.

The output from the converter takes the form of an industrial-style three-phase neutral and earth socket (Notation: L1, L2, L3 and N reading clockwise from earth). All earth connections should be securely connected to a good earth point. Removal of the socket will compromise any warranty offered by the manufacturers.



Care should be taken with the connection of the machine to the output plug/socket. If the machine has a contactor starter the 400/415v control coil must be fed from the phases marked L1, and L3. If the control circuit is fed incorrectly (i.e. connected to the phase marked L2) the contactor will either not operate or chatter when operating. Similarly, a control transformer and/or lighting transformer with a primary winding of 415v must be fed from the L1 and L3 phases.

CONNECTION TO THE L2 PHASE COULD DAMAGE EITHER THE CONTACTOR COIL OR THE CONTROL TRANSFORMER.

The static converter can accommodate both a 415v control circuit (as above) and a single phase 240v

control circuit provided the L1 phase is used in conjunction with the output Neutral. Multi-motor applications should be supplied from the converter output via a three-phase ring main or similar.

Before the output plug is inserted into the socket, switch the converter on using the on/off switch. The "supply on" light and the "boost on" light should both come on. Note that if the open circuit voltages were checked at this point phase to phase readings would be as follows: 400/420v between L1 and L3; 560/580v between L2 and L3; 160v between L1 and L2. Note that the voltages do not relate to earth, as they would on a mains three-phase electricity supply. Switch the converter off and insert the output plug.

Care should be taken with the setting of the power-regulating switch below the on/off switch. The lowest setting corresponds to the minimum loading, the highest setting to the maximum loading of the converter. The initial surge required to start the motor is provided by the boost circuit of the converter. The "boost on" light indicates the circuit is energised. The circuit is controlled automatically from within the converter, switching on whenever a motor is ready to start and switching off once the motor has attained its full running speed. If the setting of the switch is too low the motor will struggle to start and the boost light will stay on. If the setting is too high the motor will sound rough when running, again the boost light may stay on.

The optimum setting for a given single or multi-motor application is determined by quantifying the phase to phase voltages at the motor/starter with the boost light out and the motor(s) running. The voltmeter above the switches indicates the voltage drawn between L1 and L2. This is the "artificial" phase induced by the motor. When commissioning the driven machine, bear in mind that this voltage is only established once the boost light is out and the motor is running. Adjust the selector switch to the setting where this voltage is as close to 400/415 volt as possible. The best overall balance of voltages will correspond to the correct switch setting.

If the rotation of the driven machine motor is incorrect, ensure that the converter phases marked L1 and L3 are changed for 415-volt phase-phase control circuitry. For 240-volt phase-neutral control circuitry, ensure that phases L2 and L3 are changed. Any two phases can be swapped on the motor side of the control wiring.

If the boost light does not go out within a few seconds the machine should be switched off to avoid the possibility of electrical damage to the motor. The reason for this condition should be checked and corrected before the motor is restarted. Generally, the setting for the start and run modes of the motor will coincide. However for certain applications particularly those with high torque starting requirements it may be necessary to trim the switch back from a higher to a lower setting once the boost light has gone out to ensure a satisfactory balance of voltages for the running condition. For a multi-motor load, the largest motor should always be started first. An increase or decrease in load may necessitate an adjustment on the selector switch setting to accommodate the load variation. The boost light may switch on and then off when an additional motor is started. This is normal and may be disregarded.

The motor starting current is limited to approximately three times the full load current of the motor. The starting characteristics of a three-phase motor supplied by a converter are similar in nature to Star/Delta starting on a three-phase system. Significant reductions in starting torque are experienced when compared with direct on line starting on a three-phase supply. For machinery supplied by a converter, direct-on-line starting is recommended. For machinery fitted with Star/Delta starters, the period in the star connection should be as short as possible to ensure a successful start.

Where machinery incorporates ancillary motors of a fractional horsepower nature (e.g. table traverse/feed, suds/coolant pump or table rise/fall) it is imperative that these motors are operated in conjunction with and not independent of the main drive motor. Stop functions should be interlocked accordingly.

When reversing a motor, ensure the motor is allowed to come to rest before the rotation change is effected. If either of these conditions is unacceptable (i.e. frequent stop/start, frequent forward/reverse, screw cutting) the use of a pilot motor may offer a solution (see below). The use of the Rotary Converter is also recommended as an alternative.

For some three phase applications with small motors, motors of unusual magnetic characteristics (i.e. multi-speed/reversing) or motors subjected to abnormal load conditions it may be necessary to connect a pilot motor in parallel to the driven machine to maintain a satisfactory artificial phase. In these instances, the pilot motor should be at least equal in rating to the driven machine, preferably larger. The use of a 2-pole (2800rpm) motor fitted with a starter and overload protection device is recommended. The use of the Rotary Converter is also recommended as an alternative.

NOTE - The output from a TRANSWAVE Converter cannot be compared directly to a mains three-phase electricity supply. The TRANSWAVE Converter offers an artificial means by which a three-phase motor (or motors) can be operated from a single-phase electricity supply. The TRANSWAVE Converter cannot be made to work equally on all motors, even though the horsepower, speed and voltage ratings are the same. Motors of differing manufacture and motors designed for differing applications vary considerably in their electrical characteristics. Therefore it is not always possible to make a universally applicable converter to operate a motor of given horsepower and rating. TRANSWAVE Converters are not designed for use in conjunction with continuous duty applications.

Proven Examples of Equipment Operated with Transwave Static Converters

Woodworking Machinery

Saws: Circular; Band; Re-saws; Rip; Cross-Cut; Panel; Wall; Radial-Arm; Surface Planers; Feed Units; Planer/Thicknessers; Spindle Moulders; Single-End Tenoners; Chisel Mortisers; Chain Mortisers;

Woodturning Lathes; Copy Lathes (Electronic); Sanders: Single-Belt; Pad; Disc; Edge & Profile.

Metalworking Machinery

Lathes; Milling Machines; Pedestal Drills; Surface Grinders; Band Saws; Power Hacksaws; Polishers; Shapers; Deburring Machines.

Agricultural and Horticultural Machinery

Produce Conveyors; Grading Equipment; Rolling Mill/Mixing Equipment; Potting/Compost Machinery.

Garage Equipment & Miscellaneous Applications

Compressors; Vehicle Hoists (Electro-Mechanical & Hydraulic); Printing Presses; Shoe Repair Machinery; Window Making Machinery; Glass & uPVC Cutting Machinery; Food Processing Equipment.



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