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Document number	MCW-PC-003
Revision	0.0
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Product	Rotary Converters

Title	Rotary Converters – General Information
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Summary	This document gives some general information to aid the correct choice and installation/connection of rotary converters
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NOTE: Please read in conjunction with rotary converter user guides, installation & operating instructions.

Rotary Converters - Introduction

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 Rotary Converter is particularly suited to the multi-motor, multi-operator environment. Multi-motor applications can be accommodated up to the maximum loading of the converter provided that the specified maximum single motor load is not exceeded.

The Rotary Converter is often operated in conjunction with machine tools, however it is also suitable for applications where equipment has a heavy starting load or is subjected to an abnormal surge current. Vehicle Hoists, Compressors, Pumps and Extractor Fans fall into this latter category. It should be noted that converters are designed for applications with a cyclic duty. Please seek advice for continuous duty applications.

Currently, eleven sizes of Rotary Converter are available designed to operate single motor loads up to 18.5kW (25hp) and multi-motor loads up to 22.0kW (30hp). For applications with single motors in excess of 18.5kW (25hp) or combinations of motors in excess of 22kW (30hp) please seek further advice.

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 Rotary Converter establishes an artificial three-phase supply independently of the driven machine/load. The converter has no minimum load, however there is a maximum single motor load that should not be exceeded for starting reasons.

The RT and MT converter outputs take the form of an industrial-style socket/plug (three-phase, neutral and earth). The output neutral facilitates the use of 240V control circuits and small auxiliary loads. The use of a three-phase distribution board or similar is recommended for multi-motor applications requiring more than one output from the converter.

Any number of motors can be operated simultaneously from the Rotary Converter provided the converter rating is not exceeded, either on a single motor or multi-motor basis. Regulation of output power is automatic. The operator does not have to regulate the power level to suit the particular motor in circuit as would be necessary with a Static Converter. Anomalies associated with the use of a Static Converter relating to fractional horsepower motors, multispeed motors and sequential starting do not apply to the Rotary Converter.

Technical Data

The rotary 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.

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 a three-phase neutral and earth socket (Notation: L1, L2, L3, and N). All earth connections should be securely connected to a good earth point. Removal of the socket will compromise any warranty offered by the manufacturers.

Rotary Converter Part number	Rotary Converter Minimum load single motor	Rotary Converter Maximum load single motor	Rotary Converter Maximum load multi motor	Single phase supply 220/240V fuse or circuit breaker	Single phase supply 220/240V Cable*
MT-1.1kW	No minimum	0.75kW/1HP	1.1kW/1.5HP	13A	2.5mm ²
MT-1.5kW	No minimum	1.1kW/1.5HP	1.5kW/2HP	13A	2.5mm ²
MT-2.2kW	No minimum	1.5kW/2HP	2.2kW/3HP	20A	2.5mm ²
MT-3.0kW	No minimum	2.2kW/3HP	3kW/4HP	25A	4.0mm ²
RT-3.0kW	No minimum	2.2kW/3HP	3kW/4HP	25A	4.0mm ²
RT-4.0kW	No minimum	3kW/4HP	4kW/5.5HP	25A	4.0mm ²
RT-5.5kW	No minimum	4kW/5.5HP	5.5kW/7.5HP	32A	4.0mm ²
RT-7.5kW	No minimum	5.5kW/7.5HP	7.5kW/10HP	40A	6.0mm ²
RT-11kW	No minimum	7.5kW/10HP	11kW/15HP	60A	10.0mm ²
RT-15kW	No minimum	11kW/15HP	15kW/20HP	80A	16.0mm ²
RT-18.5kW	No minimum	15kW/20HP	18.5kW/25HP	100A	25.0mm ²
RT-22kW	No minimum	15kW/20HP	22kW/30HP	120A	25.0mm ²

* Minimum cable size for a run of up to 20m.

The Full Load running Current (FLC) of an induction motor operating on a single-phase supply is approximately 5 amps per kW. When operated in conjunction with a TRANSWAVE Converter, the starting current of a three-phase motor is limited to approximately 3 times its FLC. 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 FLC.

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 recommended. 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.

The RT converter incorporates a rotary transformer, which establishes the artificial three-phase output from the converter when energised.

Before any machinery is connected to the output of the converter, switch the converter on by using the 'ON' button located on the converter. The converter will automatically attain its full operating speed within a few seconds.

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 starting against load and switching off once the motor has attained its full running speed. If the boost light does not go out within a few seconds the converter should be switched off to avoid the possibility of electrical damage. The reason for this condition should be checked and corrected before the converter is restarted.

Note: If voltages were checked at this point phase to phase readings would be similar to those experienced on a mains three-phase supply. Note that the voltages do not relate to earth as they would on a mains three-phase supply. Switch the converter off and connect driven machines to the converter output socket.

Blue box rotary converters

If the rotary converter is to supply a 415 to 230/110V transformer or some control equipment, use L1 & L3 phases from the rotary converter. Phases L1 & L3 are the balanced output phases.

There is also an output neutral to facilitate the use of 240V control circuits and small auxiliary loads. Connect between neutral and L1.

Note: The output neutral is for control circuit loads only. It should not be connected to any single-phase inductive or resistive loads.

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 the phase-neutral supply is maintained and the other two phases reversed.

Grey box rotary converters

If the rotary converter is to supply a 415 to 230/110V transformer or some control equipment, use L1 & L2 phases. Phases L1 & L2 are the balanced output phases.

There is also an output neutral to facilitate the use of 240V control circuits and small auxiliary loads. Connect between neutral and L1.

Note: The output neutral is for control circuit loads only. It should not be connected to any single-phase inductive or resistive loads.

NOTE: The balanced phases for the rotary converters are mentioned above. These phases may not correspond to the control circuit phases on the equipment being supplied. Care should be taken to make sure that the rotary converter balanced phases are connected correctly to the equipment.

If the rotation of the driven machine motor is incorrect, ensure that the converter phases marked L1 and L2 are changed for 415-volt phase-phase control circuitry. For 240-volt phase-neutral control circuitry, ensure that the phase-neutral supply is maintained and the other two phases reversed.

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.

An over-temperature sensor protects the converter. If the converter trips out on over-temperature, the output supply lamp will go off. The converter will not restart until it has sufficiently cooled. Checks should be carried out to ascertain why the converter has overheated, before restarting.

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. 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.

Rotary converters connected to phase detection equipment

A rotary converter, which has a more balanced 3 phase output when compared to a static converter, can potentially be used where the input requires a balanced 3 phase supply or if there is input phase measurement equipment installed which is expecting a balanced 3 phase supply.

Please contact the supplier of your equipment to see if it is compatible with being supplied from a rotary converter.

Note: Do not use a static converter in this type of application.

Dimensions

Rotary Converter Style	Rotary Converter Rating	Height mm	Width mm	Depth mm	Weight kg
MT	1.1kW/1.5HP	350	510	350	45
MT	1.5kW/2HP	350	510	350	45
MT	2.2kW/3HP	350	510	350	50
MT	3kW/4HP	350	510	350	60
RT	3kW/4HP	430	380	510	70
RT	4kW/5.5HP	430	380	510	70
RT	5.5kW/7.5HP	430	380	510	75
RT	7.5kW/10HP	460	405	585	90
RT	11kW/15HP	460	405	585	90
RT	15kW/20HP	460	530	635	120
RT	18.5kW/25HP	460	530	635	125
RT	22kW/30HP	460	530	635	130

PROVEN EXAMPLES OF EQUIPMENT OPERATED IN CONJUNCTION WITH TRANSWAVE ROTARY CONVERTERS

WOODWORKING MACHINERY

Saws: Circular; Band; Re-saws; Rip; Cross-Cut; Panel; Wall; Radial-Arm; Surface Planers; Planer/Moulders; Feed Units; Planer/Thickeners; Four-Sided Planers; Spindle Moulders; Single-End Tenoners; Chisel Mortisers; Chain Mortisers; Woodturning Lathes; Copy Lathes (Electronic); Copy Lathes (Hydraulic); Sanders: Single-Belt; Wide-Belt; Speed; Pad; Disc; Edge & Profile; Routers; Borers; Multi-Borers; Edgbanders*.

METALWORKING MACHINERY

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

AGRICULTURAL & HORTICULTURAL MACHINERY

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

GARAGE EQUIPMENT & MISCELLANEOUS APPLICATIONS

Compressors; Vehicle Hoists (Electro-Mechanical & Hydraulic); Brake Testing Equipment; Spray Booths; Printing Presses; Guillotines; Cutting Presses; Wine Presses; Looms & Weaving Machinery; Pugmills; Shoe Repair Machinery; Window Making Machinery; Glass & uPVC Cutting Machinery; Masonry Saws; Food Processing Equipment; Welding Equipment*.

(* Modification necessary to converter or machine)

NOTE: The TRANSWAVE converters are not suitable for applications such as cookers & sunbeds or applications that include heater elements.