



Rotary Converters MT

Manufactured by



# Rotary Converters MT

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 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.

A Static Converter can also be considered for single motor applications. This style of converter is typically used



in a single operator environment where only one machine is used at a time. Please consult the Static Converter sales leaflet.

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 MT converter outputs take the form of an industrial-style socket/plug, or a terminal arrangement (three-phase, neutral and earth). The output neutral facilitates the use of 240-volt 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, multi-speed motors and sequential starting do not apply to the Rotary Converter.

## Remote Terminals for MT Rotary Converters



This allows the user to wire a separate wired remote control in order to operate the Rotary Converter.

This option of extra terminals is available at no extra charge.

There are occasions where customers wish to locate their TRANSWAVE MT Rotary Converter in a different area to where the operated equipment is located.

The Remote Terminal option allows the operator to switch the converter on and off remotely, generally replicating the start/stop buttons on the converter itself.



## 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.**

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*
MT1.1	No Minimum	0.75kW/1hp	1.1kW/1.5hp	13A	2.5mm
MT1.5	No Minimum	1.1kW/1.5hp	1.5kW/2.0hp	13A	2.5mm
MT2	No Minimum	1.5kW/2.0hp	2.2kW/3.0hp	20A	2.5mm
MT3-DD	No Minimum	2.2kW/3.0hp	3.0kW/4.0hp	25A	4.0mm
MT4	No Minimum	3.0kW/4.0hp	4.0kW/5.5hp	25A	4.0mm
MT5	No Minimum	4.0kW/5.5hp	5.5kW/7.5hp	32A	6.0mm
MT7	No Minimum	5.5kW/7.5hp	7.5kW/10.0hp	40A	6.0mm
MT11	No Minimum	7.5kW/10.0hp	11.0kW/15.0hp	60A	10.0mm
MT15	No Minimum	11.0kW/15.0hp	15.0kW/20.0hp	80A	16.0mm
MT18	No Minimum	15.0kW/20.0hp	18.5kW/25.0hp	100A	25.0mm
MT22	No Minimum	15.0kW/20.0hp	22.0kW/30.0hp	120A	25.0mm

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

The full load running current (flc) of an induction motor operating on a single-phase supply is approximately 4 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 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 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.

## Dimensions

Model	Rotary Converter Rating	Height mm	Width mm	Depth mm	Weight kg
MT1.1	1.1kW/1.5hp	350	510	350	33
MT1.5	1.5kW/2.0hp	350	510	350	35
MT2	2.2kW/3.0hp	350	510	350	44
MT3-DD	3.0kW/4.0hp	800	610	370	70
MT4	4.0kW/5.5hp	800	610	370	83
MT5	5.5kW/7.5hp	800	610	370	100
MT7	7.5kW/10.0hp	800	610	370	105
MT11	11.0kW/15.0hp	800	610	370	130
MT15 #	15.0kW/20.0hp	915	750	450	215
MT18 #	18.5kW/25.0hp	915	750	450	220
MT22 #	22.0kW/30.0hp	915	750	450	225

# = Only Terminal Arrangement on Output Available

*(Terminal output available on all models by request)*

## ROTARY CONVERTER – MT RANGE - INSTALLATION & OPERATING INSTRUCTIONS

NOTE 1 - 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.

NOTE 2 - THE OUTPUT FROM A TRANSWAVE CONVERTER IS INHERENTLY IMBALANCED FROM THE PERSPECTIVE OF BOTH VOLTAGE AND CURRENT. IF THE EQUIPMENT BEING CONNECTED TO THE CONVERTER OUTPUT INCORPORATES ANY PHASE IMBALANCE, CURRENT IMBALANCE, OR PHASE FAILURE PROTECTION, THE EQUIPMENT IS UNLIKELY TO OPERATE SUCCESSFULLY IN CONJUNCTION WITH A CONVERTER.

NOTE 3 - 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.

NOTE 4 – VOLTAGES ON A CONVERTER OUTPUT DO NOT RELATE TO EARTH AS THEY WOULD ON A MAINS THREE-PHASE SUPPLY. SIMILARLY, THERE IS LIKELY TO BE A VOLTAGE POTENTIAL BETWEEN EARTH & NEUTRAL. THIS WOULD NOT BE THE CASE ON A MAINS THREE-PHASE SUPPLY.

NOTE 5 – CONVERTER OUTPUT PHASES L2 AND L3 WILL NOT OFFER A 220-240V SUPPLY TO NEUTRAL AS WOULD BE THE CASE ON A MAINS THREE-PHASE SUPPLY. ANY 220/240V SINGLE PHASE CONTROL CIRCUIT REQUIREMENTS MUST BE CONNECTED TO PHASE L1 AND NEUTRAL ON THE CONVERTER OUTPUT.

IMPORTANT - IF THE APPLICATION CONNECTED TO THE CONVERTER OUTPUT INCORPORATES SINGLE PHASE DEMAND THAT IS CONNECTED TO MORE THAN ONE PHASE AND NEUTRAL, THIS DEMAND MUST BE EITHER CONNECTED TO THE SINGLE-PHASE SUPPLY FEEDING THE CONVERTER OR RE-ROUTED ELECTRICALLY TO ENSURE ONLY ONE PARTICULAR PHASE ON THE CONVERTER OUTPUT (L1) AND NEUTRAL IS USED. SUCH A SCENARIO WOULD LEAD TO ADDITIONAL CURRENT BEING DRAWN ON THE L1 PHASE SO THE CONVERTER SHOULD BE SIZED CORRECTLY TO MEET THIS INCREASED DEMAND

NOTE 6 - 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.

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 IN THE TABLE ABOVE. IF THE CONVERTER IS DESIGNED FOR CONNECTION TO A 3-WIRE 440/480V LIVE-LIVE-NEUTRAL SPLIT SINGLE-PHASE SUPPLY, FUSE/BREAKER RATINGS ARE HALVED AND CABLE SIZES CAN BE REDUCED.

### **IMPORTANT NOTE:**

IF, FOR SOME REASON, THE MOTOR IN THE CONVERTER DOES NOT START SUCCESSFULLY, PLEASE SEEK ADVICE FROM OUR SUPPORT TEAM.

WAIT FOR TWO MINUTES BEFORE ATTEMPTING TO START THE MOTOR/CONVERTER A SECOND TIME. FREQUENT, UNSUCCESSFUL ATTEMPTS TO START THE MOTOR/CONVERTER COULD LEAD TO THE MOTOR BEING DAMAGED.

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) OR TERMINALS (MT15 UPWARDS). ALL EARTH CONNECTIONS SHOULD BE SECURELY CONNECTED TO A GOOD EARTH POINT. REMOVAL OF THE SOCKET WILL COMPROMISE ANY WARRANTY OFFERED BY THE MANUFACTURERS.

THE MT CONVERTER INCORPORATES A THREE-PHASE MOTOR, 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 THAT IF VOLTAGES WERE CHECKED AT THIS POINT PHASE TO PHASE READINGS WOULD BE SIMILAR TO THOSE EXPERIENCED ON A MAINS THREE-PHASE SUPPLY. PHASES L1-L2 AND L2-L3 ARE SET HIGHER THAN L1-L3. THESE HIGHER VOLTAGES WILL REDUCE ONCE DEMAND IS CONNECTED TO THE CONVERTER OUTPUT. SWITCH THE CONVERTER OFF AND CONNECT DRIVEN MACHINES TO THE CONVERTER OUTPUT.

CARE SHOULD BE TAKEN WITH THE CONNECTION OF THE MACHINE TO THE OUTPUT 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 COULD 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 MT 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 (SEE NOTE 5 ABOVE)

MULTI-MOTOR APPLICATIONS SHOULD BE SUPPLIED FROM THE CONVERTER OUTPUT VIA A THREE-PHASE RADIAL OR SIMILAR. NOTE THAT 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. ANY TWO PHASES CAN BE SWAPPED ON THE MOTOR SIDE OF THE CONTROL WIRING.

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.

**IF THE CONVERTER IS FITTED WITH A HAND/AUTO SWITCH FOR WELDING APPLICATIONS, THE FOLLOWING PROCEDURE MUST BE FOLLOWED.**

- a) **START THE UNIT AS NORMAL WITH THE SWITCH IN THE "AUTO" POSITION.**
- b) **WHEN WELDING IS TO TAKE PLACE AND WITH THE CONVERTER RUNNING SWITCH TO "HAND".**
- c) **ONCE WELDING HAS BEEN COMPLETED THE SWITCH MUST BE PUT INTO THE "AUTO" POSITION.**

**FAILURE TO START THE CONVERTER IN THE "AUTO" POSITION WILL CAUSE THE CONVERTER TO FAIL.**

## 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/Thicknessers; 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 and 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



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