

ZENER

SOFT STARTER

TYPE AMC-G

INSTRUCTION MANUAL

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UNIT DESCRIPTION

The Zener AMC-G is a high tech soft starter. It truly represents the latest state of the art equipment in electronic controlled starting, running and stopping of standard three phase induction motors. This microprocessor controlled unit is able to be connected in most 3 phase starting configurations and has many significant advantages over other reduced starting methods.

FEATURES

Adjustable soft start
Adjustable soft stop
Selectable breakaway torque
Adjustable current limit
3 wire or 6 wire operation
Self calibrating energy saving
Auto restart

PROTECTION

Phase loss trip
Shorted SCR trip
Opencircuit motor lead trip
SCR overtemperature trip
Motor stall/underspeed trip
Start timeout trip

1.0 RECEIVING

INSPECTION

Upon receipt and before installing the controller, make a complete visual check of the controller for damage in shipment or handling. Claims for damage or missing parts should be made to the carrier as soon as possible after receipt of the shipment. Do not attempt to operate the controller if any visual damage exists.

STORAGE

After initial inspection the AMC should be repacked and stored in a clean, dry location until installation is required. Do not store the controller in any area of high condensation or corrosive atmospheres or where the ambient temperature exceeds -20°C to 60°C (-4°F to 140°F).

INSTALLATION

The information contained in this manual is sufficient for installation and start-up of the AMC in most applications. For complete details regarding applications, selection, operation, commissioning and troubleshooting please read this manual carefully.

IDENTIFICATION

Locate the controller nameplate on the AMC chassis which is reproduced below. For your records use this block below to record all the relevant AMC information.

2.0 SPECIFICATION

INPUT VOLTAGE (motor voltage)	208 - 480 VAC; +10%, -10%
CONTROL VOLTAGE (control electronics)	110/230 VAC; +10%, -10%
START STOP CONTROL	110/230 VAC; +10%, -10% 2 or 3 wire control
SOFT STOP CONTROL	onboard 5V DC logic control
STARTING CURRENT CAPACITY	
MEDIUM DUTY	300% FLC 30 seconds (5 starts/hour) 200% FLC 60 seconds (5 starts/hour)
HEAVY DUTY	450% FLC 30 seconds (5 starts/hour) 300% FLC 60 seconds (5 starts/hour) 115% FLC continuously
OPERATING CONFIGURATION	3 or 6 wire motor connection
OPERATING TEMPERATURE	40°C (104°F) increase FLC by 20% 50°C (122°F) nominal 60°C (140°F) derate FLC by 20%
INPUT SUPPLY FREQUENCY	50/60 Hz;
ACCELERATION CONTROL	1, 2, 5, 10, 15, 20, 30, 60 secs.
DECELERATION CONTROL	0.5, 1, 2, 4 times acceleration time
CURRENT LIMIT CONTROL	200%, 300%, 400%, 450% of nominal FLC
CUSTOMER OPTIONS:	
OPTION PACK	Motor stall trip Energy saving Auto restart
OVERTEMPERATURE TRIP	Eliminates overheating damage to the AMC caused by external faults
ALTERNATE CONTROL VOLTAGE	Interface transformer allows control voltage supply to be derived from a 380/415/460V AC; +10%, -10% supply.

AMC-G RATINGS

MODEL NUMBER	MEDIUM DUTY NOMINAL RATINGS				HEAVY DUTY NOMINAL RATINGS			
	3 WIRE		6 WIRE		3 WIRE		6 WIRE	
	(A)	(kW)	(A)	(kW)	(A)	(kW)	(A)	(kW)
AMC-G1	10	4	17	7.5	7	3	12	5.5
AMC-G2	22	11	38	18	16	7.5	28	11
AMC-G3	30	15	52	22	25	11	44	22
AMC-G4	42	22	72	37	31	15	52	22
AMC-G5	55	22	95	45	38	18	66	30
AMC-G6	84	45	145	75	60	30	104	55
AMC-G7	100	55	170	90	70	37	124	55
AMC-G8	135	75	233	132	90	45	155	75
AMC-G9	145	75	250	132	105	55	182	80
AMC-G10	200	110	340	185	140	75	240	132
AMC-G11	230	132	400	220	172	90	300	160
AMC-G12	290	160	500	300	215	110	375	185
AMC-G13	400	220	695	400	300	160	515	300
AMC-G14	440	250	760	440	330	185	570	350
AMC-G15	500	300	866	500	390	220	675	375
AMC-G16	590	350	1020	600	460	250	800	450

PHYSICAL DATA

MODEL	DIMENSIONS (mm)			WEIGHT (Kg)
	H	W	D	
AMC-G1	290	165	155	5
AMC-G2	290	165	155	5
AMC-G3	290	230	170	7
AMC-G4	290	230	170	7
AMC-G5	290	230	170	8
AMC-G6	410	295	160	12
AMC-G7	410	295	160	12
AMC-G8	410	295	160	14
AMC-G9	410	295	160	14
AMC-G10	670	600	295	80
AMC-G11	670	600	295	80
AMC-G12	670	600	295	80
AMC-G13	670	600	295	80
AMC-G14	670	600	295	80
AMC-G15	670	600	295	80
AMC-G16	670	600	295	80

3.0 INSTALLATION AND WIRING

ENCLOSURES

The AMC open chassis controller must be installed in an enclosure. The internal temperature of the enclosure must be kept within the range of 0°C to 50°C (32°F to 130°F).

For ventilated enclosures the following guidelines are recommended in order to limit the maximum controller ambient temperature. The enclosure must be large enough to provide adequate ventilation and sufficient space for wiring and electrical clearances as required by local codes and regulations. The exact size of the enclosure will depend on the power dissipation of the AMC and other equipment that is mounted in the same enclosure. Power dissipation figures for the AMC are given in Section 2 Specifications.

On models AMC-G1 through to AMC-G9 there should be a clearance of at least 150mm (6 in) above and below the controller. For models AMC-G10 to AMC-G16 there should be a clearance of at least 300mm (12 in) above and below the controller. It is considered good engineering practice to allow a clearance of 150mm (6 in) on either side of the controller. This clearance will allow air to flow through the heatsink. Ventilation openings, above and below this airspace are required. An air outlet should be placed at least 150mm (6 in) above the controller. The air inlet should be placed near the bottom of the enclosure. A filter is required to prevent contaminants from entering the enclosure.

MOUNTING

The controller comes as an air cooled unit. It is therefore important to locate the controller in a position which allows access for free air flow to the controller. The controller must be mounted with a minimum of 150mm (6 in) free space above and below and in a vertical position.

ISOLATION CONTACTOR

Zener recommends using an isolation contactor to provide automatic electrical isolation of the controller and motor circuit when the controller is shutdown either manually by pressing the "STOP" pushbutton, or automatically by the occurrence of abnormal conditions due to the protective circuitry.

POWER FACTOR CORRECTION CAPACITORS

If the installation requires the use of power factor correction capacitors, they must be connected on the LINE SIDE of the AMC controller.

CONTROL POWER

Connect the control power to the AMC on the customer connection block at terminals 10 and 50 for 110V AC operation or terminals 20 and 50 for 230V AC operation. The power requirements for the control PCB is 40 VA. Full details are given in Section 9 Connection Diagrams.

FAST ACTING CURRENT LIMITING FUSES

Zener strongly recommends the use of fast acting semiconductor current limiting fuses co-ordinated with the SCRs for short circuit protection of the SCRs.

The fast acting semiconductor current limiting fuses specified in the table do not provide branch circuit protection, and branch circuit protection should be provided separately.

MODEL NUMBER	FUSE RATING (A)	MAX. FUSE I^2t (A ² sec)	RECOMMENDED FUSE TYPES		
			E E GSG/1000	BRUSH	
AMC-G1	30	500	30	32ET	
AMC-G2	45	1000	45	45ET	
AMC-G3	90	8000	90	90EET	
AMC-G4	110	15000	110	110EET	
AMC-G5	150	15000	150	160EET	
AMC-G6	200	60000	200	200MNT	
AMC-G7	300	100000	300	315MNT	
AMC-G8	300	200000	300	315MNT	
AMC-G9	300	250000	300	315MNT	
AMC-G10	1 x 325	100000	325	315MNT	
AMC-G11	1 x 350	130000	350	350MNT	
AMC-G12	1 x 450	240000		450MNT	
AMC-G13	2 x 350	500000	350	350MNT	
AMC-G14	2 x 450	800000		450MNT	
AMC-G15	2 x 500	1200000		500MNT	
AMC-G16	2 x 500	1200000		500MNT	

MOTOR OVERLOAD PROTECTION

Thermal motor overload protection is not provided with the AMC controller. It must be provided separately.

DISCLAIMER

Because solid state equipment has characteristics different to those of electromechanical equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable. Zener will in no event be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Zener cannot assume responsibility or liability for actual use based on examples and diagrams found in this manual.

NOTES:

4.0 SETTING UP

As supplied your Zener AMC has been factory preset and should work in most situations without any further adjustment. The factory settings are:

Starting Mode	Voltage ramp
Breakaway setting	Normal
Acceleration time	10 seconds
Deceleration time	Not selected
3 wire / 6 wire selection	3 wire operation

If you consider that these factory settings are not suitable for your particular application adjust them as described in this manual. All adjustments on the AMC are implemented by setting the DIP switches located on the main control PCB. We recommend that you use a ball point pen or a small screwdriver to make these adjustments.

CONTROL VOLTAGE

The controller is shipped with a multi-tapped control voltage transformer. Care should be taken to ensure that the correct voltage is selected and applied to the control voltage terminals otherwise permanent damage will result.

For 110V AC control use terminal 10.

For 230V AC control use terminal 20.

3 WIRE CONNECTED MOTORS

This configuration allows the AMC to operate on a motor connected in the popular 3 wire circuit. The AMC automatically adjusts to suit both A-B-C and C-B-A phase rotation. Refer to Section 9 for complete electrical connection details.

6 WIRE CONNECTED MOTORS

This feature allows the AMC to operate on a motor connected in a 6 wire configuration. As a result, the soft starter can be resized allowing the selection of a much smaller starter for the same motor size. As with 3 wire connection the AMC automatically adjusts to suit both A-B-C and C-B-A phase rotation. Refer to Section 2 Specifications for the kW (HP) resizing figures and Section 9 for complete electrical connection details.

SWITCH NUMBER	OPTIONAL FEATURE SELECTION	
	DISABLED	ENABLED
B3	OFF	ON
		6 WIRE CONNECTION

BREAKAWAY

To achieve the smoothest possible start the breakaway adjustment should be set as low as possible while still allowing reliable starting under maximum load conditions.

For voltage? →

SWITCH NUMBER	BREAKAWAY LEVEL		
	LOW	NORMAL	
A8	OFF	OFF	
A7	OFF	OFF	
A6	OFF	ON	

Example: For normal breakaway starting set DIP switches A6=ON, A7=OFF, A8=OFF.

START TIME

The DIP switches A1, A2 and A3 should be set to the desired start time as shown in the table below.

SWITCH NUMBER	ACCELERATION TIME (SECONDS)							
	1	2	5	10	15	20	30	60
A3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
A2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
A1	OFF	ON	OFF	ON	OFF	ON	OFF	ON

Example: For a 10 second start time set DIP switches A1=ON, A2=ON, A3=OFF.

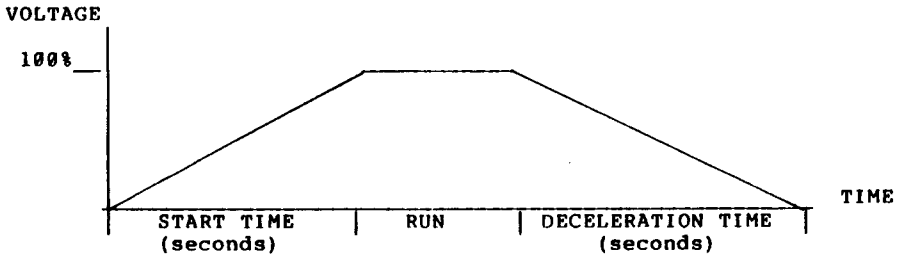
DECELERATION TIME

The DIP switches A4 and A5 control the deceleration or stopping time of the AMC. To use this feature the control wiring must include a deceleration stop switch (see applications circuits). Deceleration time is a multiple of the previously set acceleration time.

SWITCH NUMBER	DECELERATION TIME (MULTIPLES OF ACCEL)			
	0.5	1	2	4
A5	OFF	OFF	ON	ON
A4	OFF	ON	OFF	ON

Example: For a start time of 10 seconds and a deceleration time of 20 seconds set DIP switches (A1=ON, A2=ON, A3=OFF,) A4=OFF, A5=ON.

NOTE: The times quoted are for times taken for a motor without the energy saving feature selected. If the energy saving feature is selected the actual time for deceleration may vary according to motor load conditions.



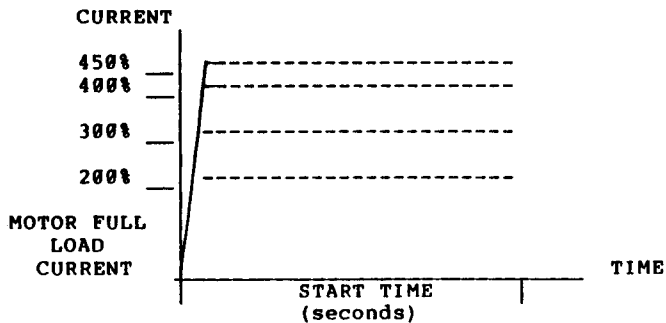
CURRENT LIMIT

The current limit adjustment allows the user to restrict the starting current to the motor with 4 predetermined settings.

* →
FLC Current Comp

SWITCH NUMBER	CURRENT LIMIT (% MOTOR FLC)			
	200%	300%	400%	450%
A8	ON	ON	ON	ON
A7	OFF	OFF	ON	ON
A6	OFF	ON	OFF	ON

Example: For a current limit setting of 300% motor FLC set DIP switches A6=ON, A7=OFF, A8=ON.



5.0 OPTIONS

OPTION PACK

The option pack provides additional features that can be switch selected by the customer. It is supplied in a convenient plug-in form which can be installed in a few minutes. Features available with the option pack are marked thus (*).

MOTOR STALL (*)

This feature allows the AMC to trip due to a motor stall or motor underspeed condition in either the starting or running modes.

ENERGY SAVE (*)

This feature reduces the applied voltage to the motor under no-load or lightly loaded conditions which may reduce the energy consumption of the motor.

AUTO RESTART (*)

This feature allows the AMC to attempt a sequence of 3 automatic restarts following a fault condition. This feature may be especially useful in unmanned, remote installations where nuisance tripping becomes a problem.

SWITCH NUMBER	OPTIONAL FEATURE SELECTION		
	DISABLED	ENABLED	FEATURE
B4	OFF	ON	AUTO RESTART
B3	OFF	ON	6 WIRE CONNECTION
B2	OFF	ON	MOTOR STALL TRIP
B1	OFF	ON	ENERGY SAVE

START TIME (SEC)	MAX STALL TIME (SEC)
RUNNING	5
1	5
2	5
5	10
10	15
15	20
20	25
30	30
60	60

OVERTEMPERATURE TRIP

This option provides a bimetallic thermal overload switch which attaches to the heatsink to prevent the SCRs from operating in excessive temperatures.

ALTERNATE CONTROL VOLTAGE

This option provides an interface transformer to allow the control voltage supply to be powered from an external source of 380V AC, 415V AC or 460V AC.

6.0 OPERATING SEQUENCES

START SEQUENCE

Application of voltage between terminals 10 and 50 (110V AC), or 20 and 50 (230V AC) will initiate a start sequence. The start relay will be energised closing the circuit between terminals 70 and 80 and the ON LED will light.

If the 3 phase motor supply voltage is present the AMC will start the motor by slowly increasing the applied voltage to the motor terminals. If current limit has been selected the starter will limit the inrush current to the motor at the required level. On completion of the start time, the AMC will apply full line voltage to the motor.

However, if the 3 phase motor supply is not available the AMC will wait in standby. When the supply is connected, the AMC will continue its normal start sequence.

RUNNING SEQUENCE

At all times during the running sequence the ON LED will be alight. If the energy saving option has been selected and energy saving is possible the AMC will reduce the applied voltage to the motor. If however, the motor is fully loaded the microprocessor will not allow energy saving to take effect.

STOP SEQUENCE

Opening of contacts between terminal 10 and 50 (110V AC) or 20 and 50 (230V AC) will initiate a stop sequence. The start relay will de-energise, opening the circuit between terminals 70 and 80 and the ON LED will go out.

DECELERATION SEQUENCE

Opening the contacts between terminals 90 and 100 will initiate a deceleration stop sequence. The start relay will remain energised allowing the circuit between terminals 70 and 80 to remain closed. The ON LED will remain alight indicating that a controlled deceleration is under way and will continue to glow until the start command contact is released.

If during the deceleration sequence the start command is removed from the starter, the AMC will shut down immediately following the normal stop command rather than the deceleration command.

BYPASS SEQUENCE

The AMC has been designed to interface with a bypass contactor without any additional adjustments or settings. To achieve bypass operation the customer must provide external to the AMC an auxiliary timer and a contactor suitable for bypass duty. The bypass contactor should be fitted with a N/O auxiliary contact for connection to the AMC.

Since the timer is used to initiate the bypass contactor directly without any reference to the AMC, care should be taken in selecting the correct time setting. The timer should be adjusted to be at least 10 seconds longer than the AMC acceleration time.

Example: For an acceleration time of 20 seconds set the timer to at least 30 seconds duration.

NOTE: Failure to set the timer correctly may result in a DOL (Direct on Line) start without warning.

BYPASS SEQUENCE WITH DECELERATION

The AMC has been designed to interface with a bypass contactor without any additional adjustments or settings. To achieve bypass operation the customer must provide external to the AMC an auxiliary timer and a contactor suitable for bypass duty. The bypass contactor should be fitted with a N/O auxiliary contact for connection to the AMC.

Since the timer is used to initiate the bypass contactor directly without any reference to the AMC, care should be taken in selecting the correct time setting. The timer should be adjusted to be at least 10 seconds longer than the AMC acceleration time or deceleration time - whichever is the longest.

Example: For an acceleration time of 20 seconds and a deceleration of 40 seconds set the timer to at least 50 seconds duration.

NOTE: Failure to set the timer correctly may result in a DOL (Direct on Line) start without warning.

IMPORTANT:

When using the AMC with 6 wire connected motors with a bypass contactor and deceleration selected it may only be operated in one direction of phase rotation.

The FAULT LED will flicker quickly if the rotation is incorrect.

FAULT SEQUENCE

If at any time a fault occurs during the starting, running or stopping sequences, the AMC will immediately shut down. The advanced nature of the AMC provides protection against the following fault conditions:

- * Line fault / Shorted SCR / Open circuit output lead
- * Motor stall or underspeed (customer selected option)
- * Start timeout (customer selected)

NOTES:

7.0 FAULT FINDING

The following troubleshooting information is provided as a guide to locating possible faults within the starter system.

The Zener AMC has been engineered to ensure a compact design which is easy to install. Furthermore, because of its complex design the unit is NOT intended to be field serviceable.

Should the controller fail during service, Zener recommends that it be returned to the nearest Zener Service Centre for repair or exchange. A complete list of Zener Service Centres is provided in section 11 of this manual.

MOTOR DOES NOT START

PROBLEM CATEGORY	POSSIBLE CAUSES
SUPPLY PROBLEM	Control supply not present Control supply intermittent Control fuse blown Open line supply Phase loss condition Motor not connected properly Shorted SCR
START COMMAND PROBLEM	Start signal not present External overload relay open Customer interlock open Pilot devices open
OVERTEMPERATURE PROBLEM	Thermoswitch wire open Controller ventilation not working Fan failure Ambient temperature limit exceeded Controller duty cycle exceeded
MOTOR OVERLOAD	Motor rotor locked or jammed
AMC FAULT	Failed AMC controller

MOTOR STARTS BUT DOES NOT GET TO FULL SPEED

PROBLEM CATEGORY

POSSIBLE CAUSES

SUPPLY PROBLEM

Control supply intermittent
Phase loss condition
Motor not connected properly

START COMMAND PROBLEM

External overload relay
Customer interlock open
Pilot devices

OVERTEMPERATURE PROBLEM

Thermoswitch wire open
Controller ventilation not working
Fan failure
Ambient temperature limit exceeded
Controller duty cycle exceeded

MOTOR OVERLOAD PROBLEM

Motor rotor locked or jammed
Acceleration time too short

AMC FAULT

Failed AMC controller

OTHER FAULT CONDITIONS

SYMPTOMS

POSSIBLE CAUSES

ERRATIC OPERATION

Loose connections

ACCELERATES TOO FAST

Acceleration time too short
Current limit setting too high

ACCELERATES TOO SLOW

Acceleration time too long
Current limit setting too low

CURRENT PEAK AT FULL SPEED

Acceleration time too short, in
current limit mode

FAULT LED FLICKERS

Phase rotation is incorrect for 6
wire operation. Refer to Section 4
for setup details.

8.0 GLOSSARY OF TERMS

AUTO RESTART (customer selectable option)	This feature allows the AMC to continue operating by clearing trip conditions caused by external faults. To achieve this the AMC attempts a sequence of 3 automatic starts before latching out and shutting down.
BREAKAWAY (customer adjustable)	This adjustment controls the initial applied voltage and hence the initial torque applied to the motor.
BYPASS CONTACTOR (customer supply)	This is a contactor used to bypass or bridge out the AMC when the motor is at full speed. This mode of operation is useful in reducing the heat losses of the soft start system.
CURRENT LIMIT (customer adjustable)	This feature allows a maximum limit of current to be preset and this limit will not be exceeded during the start time selected.
ENERGY SAVING (customer selectable option)	This feature reduces the applied voltage to the motor in order to electrically re-size the motor to the load. This can achieve a reduction in motor running current and an improved power factor in some cases.
LINE FAULT (standard feature)	This feature shuts down the starter if a line fault or phase loss occurs.
MOTOR STALL/UNDERSPEED TRIP (customer selectable option)	This feature senses when the motor is operating in either a stalled or underspeed condition caused by a mechanical overload and trips the starter after a predetermined time delay.
OPEN CIRCUIT OUTPUT TRIP (standard feature)	This feature shuts down the starter if an output lead goes open circuit.

OVERTEMPERATURE TRIP
(customer option)

This bimetallic thermal overload switch is attached to the heatsink and prevents the SCRs from operating in excessive temperatures.

RUN RELAY
(standard feature)

This feature provides a set of contacts that change state when the AMC is operating.

SHORTED SCR DETECTOR
(standard feature)

This feature tests the SCRs for fault condition and immediately shuts down the starter.

SOFT STOP
(standard feature)

Controls the starter to soft stop.

START STOP CONTROL
(standard feature)

Controls the starter to start and stop.

3 WIRE OPERATION

This mode allows the AMC to be operated with a motor connected in the standard 3 wire connected form bringing 3 cables from the motor back to the AMC.

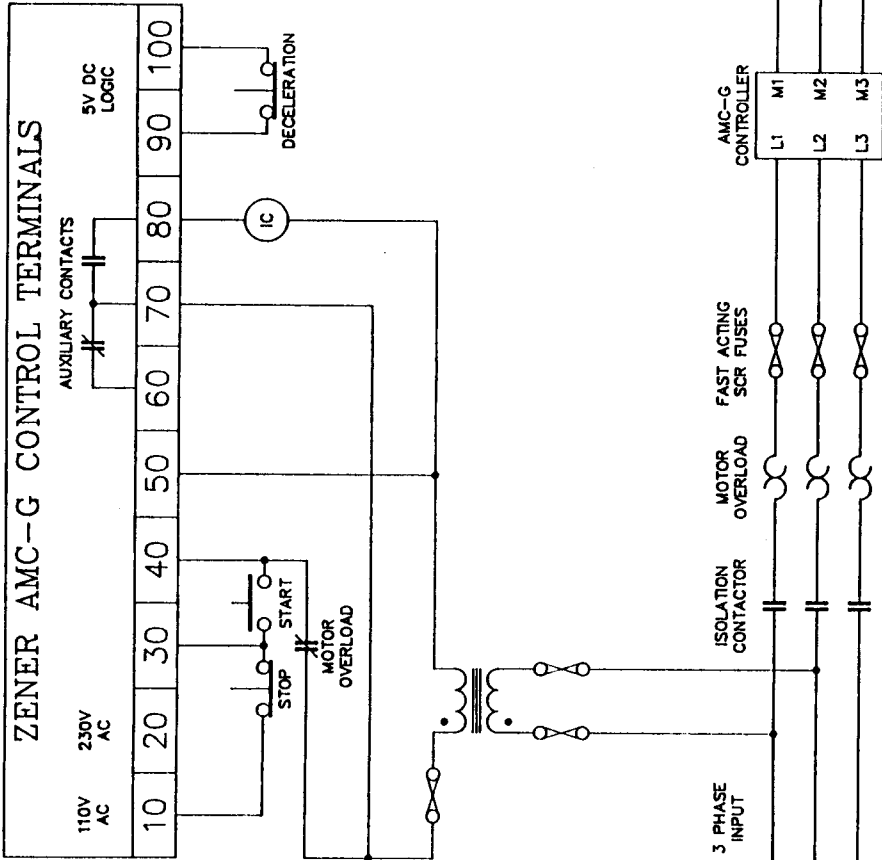
6 WIRE OPERATION

This mode allows the AMC to be operated with the motor connected in open delta or 6 wire connection bringing all 6 motor cables from the motor back to the AMC.

NOTES

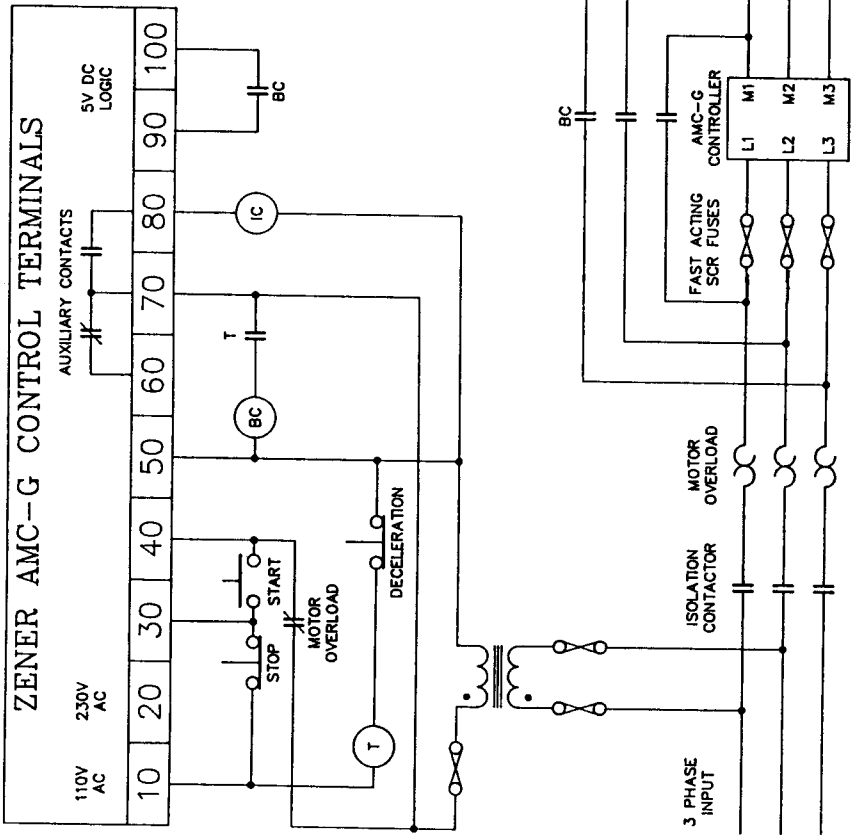
9.0 CONNECTION DIAGRAMS

KEY	
IC	ISOLATION CONTACTOR



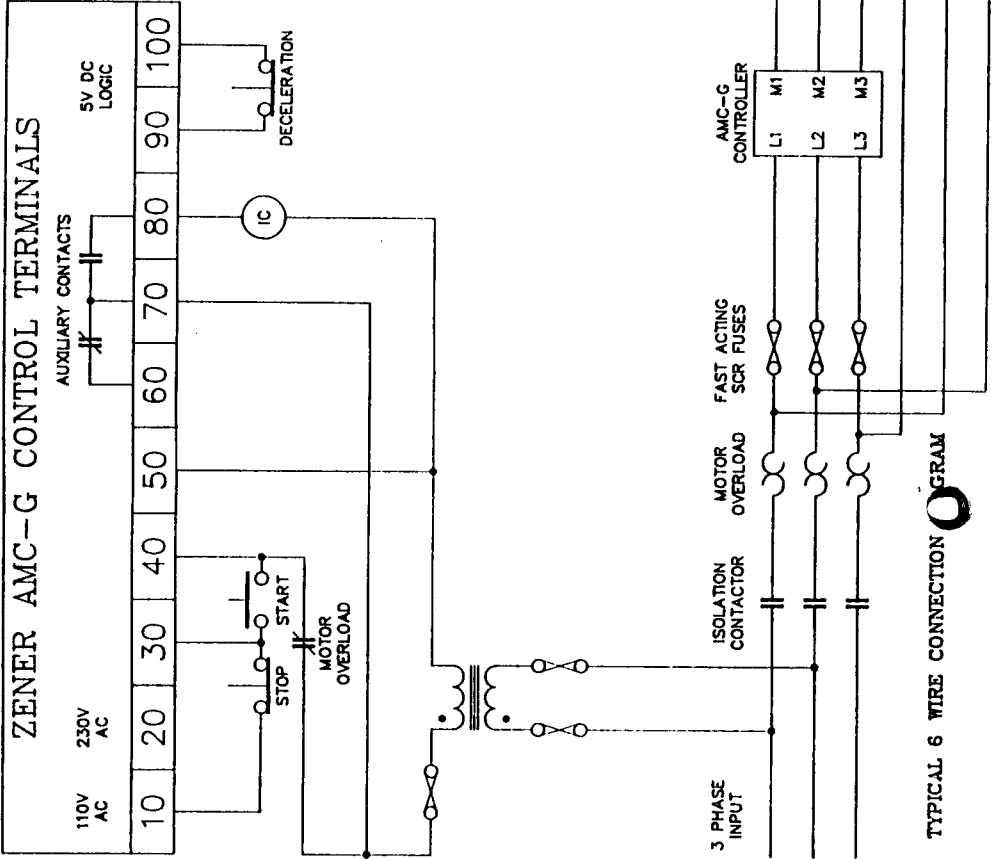
TYPICAL 3 WIRE CONNECTION DIAGRAM

KEY	
IC	ISOLATION CONTACTOR
BC	BYPASS CONTACTOR
T	TIMER (TIMED OPERATE)



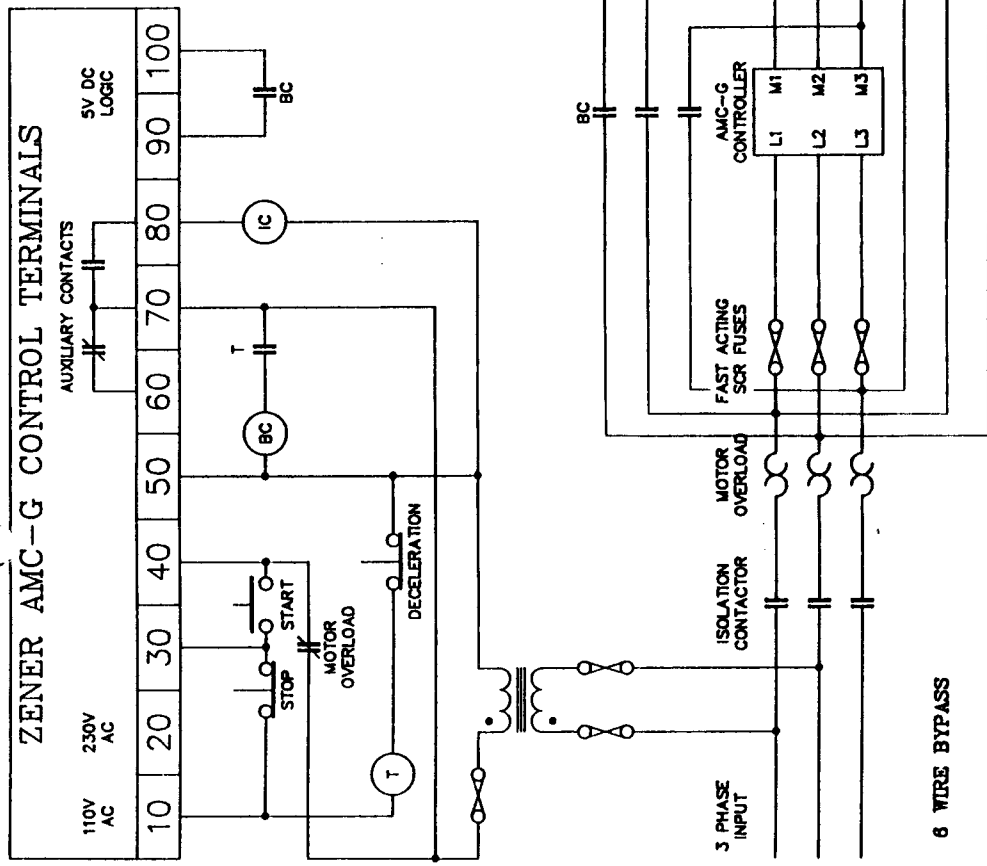
3 WIRE BYPASS CONFIGURATION

KEY	
IC	ISOLATION CONTACTOR



TYPICAL 6 WIRE CONNECTION GRAM

KEY	
IC	ISOLATION CONTACTOR
BC	BYPASS CONTACTOR
T	TIMER (TIMED OPERATE)



10.0 AMC PRODUCT WARRANTY

ZENER TECHNOLOGY AND QUALITY ASSURANCE

Since 1978 Zener Electric has supplied many thousands of AC motor control products to Australian industry. These drives have been installed in numerous applications resulting in a wealth of in-house experience.

The Zener AMC soft starter range is the culmination of this expertise, modern technology and our industrial applications experience. The Zener Quality Assurance Programme ensures that every AMC manufactured has proven to operate correctly in production tests before despatch.

AMC PRODUCT WARRANTY

Zener Electric warrants the AMC against defective workmanship materials for a period of 24 months from the date of despatch. Such defects will be rectified free of charge for both labour and material at Zener Electric's manufacturing premises subject to;

1. Zener Electric's customer raising an order upon Zener for service and/or repairs, subject to a warranty claim. The order is to state particulars of the model and serial number, the date of the original purchase and the invoice/delivery docket number.
2. All damage resulting from incorrect installation or use other than in accordance with the instruction manual issued by Zener Electric is excluded from this warranty.
3. The warranty being rendered invalid if the product is misused or if any unauthorised alteration, modification or substitution of any part of the product be made or the serial number of the product is defaced or altered.
4. The cost of transportation (both ways) to be met by the owner if it is necessary to return the product, or any part of it, to Zener Electric's manufacturing premises.
5. A charge being accepted by the owner for travelling time and expenses incurred in connection with warranty service at the user's site as requested by the owner.
6. If the product was not purchased from Zener Electric directly, then a warranty claim must be lodged with the original supplier in the first instance. Repairs will not be effected by Zener Electric unless approved by the original supplier.
7. Goods not of our own manufacture incorporated in our supply distributed by us, carry their maker's warranty only.
8. Goods returned for claim under warranty will be accepted on the condition that should the claim be rejected then all costs, including inspection, will be charged to the customer's account.

SAFETY

Your AMC-G must be applied, installed and operated in a safe manner. It is the responsibility of the user to ensure compliance with all regulations and practices covering the installation and wiring of your AMC-G. This instruction manual should be read and understood completely before attempting to connect or operate the AMC-G. Installation should be limited to skilled personell only.