560 PRODUCT MANUAL

Servo-controllers for DC and AC (Brushless DC) Servo drives

240V Ranges

HA058297

Issue 1

WARNING

NEVER WORK ON THE CONTROLLER, MOTOR,
OR AUXILIARY EQUIPMENT WITHOUT FIRST
ISOLATING ALL SUPPLIES TO THE SYSTEM.

CONTROLLER WARRANTY

For further details on SSD Controller Warranty and Repair refer to the Standard Conditions of Sale IA058393C

CONTENTS

1 INTRODUCTION

The 560 range of compact servo-controllers is designed to control all available 3-phase AC servo-motors fitted with brushless tachogenerator and devices for sensing the rotor position, up to a maximum rating of 15A continuous. By internal change-over of a DIP-switch the servo-controllers of the 560 range can also be used with DC servo-motors. In both cases, the 560 drive may be used for torque and speed control in a 4 quadrant mode (fully reversing and braking) and satisfies the highest demands on dynamic control response and control accuracy.

Compared with DC servo-drives, brushless servo-drives have a number of advantages:-

- low maintenance due to absence of brush wear,
- lowest rotor inertia and highest power density of all electrical drives, resulting in high acceleration ability,
- as a result of the permanent magnet excitation of the rotor there is no heating effect due to current losses in the rotor, which results in positive thermal performance and allows very high protection classes, typically IP65,
- no commutation limits, i.e. high acceleration torques can be obtained even at very high speeds.

The two models of the 560 range (5A and 15A models) are outwardly identical and differ only in the size of the power output stage.

Standard features of all models of the range are:

- Electrical supply is 220V or 240V single phase or three phase, supply frequency in the range 45 to 65Hz,
- Mains connection is independent of phase rotation,
- All models have isolated transistor power devices mounted on a common heat fin at earth potential,
- Overload capability 200% nominal current,
- All models are short-circuit proof line to line and between lines and earth,
- Control circuits are fully isolated from power circuits,
- All units are self-contained and incorporate internal power supply and DC link circuit, making the controllers particularly well suited to single drive applications,
- All units contain an internal resistive-braking circuit,
- Plug-on control connections for rapid wiring and maintenance,
- Controller may be changed over from DC control to brushless DC control via a single DIP switch,
- All potentiometers, selectable components DIP switches and calibration resistors are mounted on a plug-on "identity" board. The identity board determines all user adjustments and can be interchanged without further commissioning in the event that a controller must be replaced,
- 10 Diagnostic LED's are provided on the control board for rapid status recognition,
- All models have a socket for the SSD diagnostic unit type 5570 allowing monitoring of 27 circuit points for easy commissioning. The diagnostic unit contains an accurate digital voltmeter as well as LED display and sockets for connection of a recorder or oscilloscope to the diagnostic unit,
- The control circuits feature 2 direct speed setpoint inputs and a ramp input. These inputs may be inverted using DIP switches on the identity board for maximum flexibility.
- All models provide unsupervised indications of motor thermal switches to the user control terminals.

2 TECHNICAL DETAILS

2.1 General

Control circuits fully isolated from power circuits.

Speed Control:	Full PID control with user selectable components on the Identity Board. 2 Direct setpoint inputs plus one ramped input.
Control Range:	1:10000 (depending on feedback quality).
Steady State Accuracy:	0.1 % typical.
Torque Control:	1 Direct setpoint input 0 - 200 % nominal current. User adjustable current limit.
Protection:	Internal power supply supervision Short-circuit protection (line-line and line-neutral) Overvoltage protection Missing phase detection Overload protection (current reduction in inverse-time) Internal braking-resistor fusing

The following signals are provided for external monitoring:

Motor overtemperature
Drive overtemperature
Drive health
Motor standstill

Diagnostics:	LED diagnostics for:	Current demand (forward and reverse) Standstill Drive Enable Drive Alarms

2.2 Electrical Ratings - Power Circuit

		560 5 Amp Build	560 15 Amp Build
Power supply voltage (max.)	[V]	240 + 10 %	240 + 10 %
Power supply voltage (min.)	[V]	100 - 10 %	100 - 10 %
Auxiliary supply voltage	[V]	220/240 ± 10 %	220/240 ± 10 %
Auxiliary supply frequency	[Hz]	50 - 60	50 - 60
Max. recommended motor volts	[V]	200/220†	155/220†
DC link voltage	[V]	340 *	340 *
Peak current (approx. 400 ms)	[A]	10	30
Continuous current	[A]	5	15 (derate 0.2A/°C above 25°C)
Electrical continuous max. power rating	[W]	900/1000† *	2100/3000†*

† Lower value for 1-phase operation, higher value for 3-phase operation.

* Values refer to 240V mains on 220V mains, these values must be reduced by 10 %.

2.3 Electrical Ratings - Control Circuit

	All 560 Controller Types
Reference supplies (for speed and current setpoints.	+ 10V ± 0.1V 20mA max. - 10V ± 0.1V 20mA max.
Unregulated supply (+ 24V nominal)	22V to 30V 50mA max.
Relay contacts (terminals 21 - 25)	30V DC 1.0 A

2.4 Mechanical Details

	560 5 A Build	560 15A Build
Dimensions H x W x D [mm]	265 x 222 x 155	265 x 222 x 155
Mounting holes diameter [mm]	4.5	4.5
Mounting holes centres H x W [mm]	245 x 178	245 x 178
Cooling	Naturally ventilated	Naturally ventilated
Maximum ambient temperature [°C]	40	40 (derate 0.2A/°C above 25°C)
Storage temperature range [°C]	- 25 to + 80	- 25 to + 80

* * NOT SUITABLE FOR CONNECTION TO 380 / 415V SUPPLY * *

3 PRODUCT CODE

All 560 units can be fully specified using a nine block numeric code which detail the drive calibration and settings on despatch from the factory. This product code appears as the model number on the rating label on the front of the unit. A detailed description of each block of the code is given below:-

BLOCK 1 560

3 digits identifying basic product
560 has 2 builds (5 Amp nominal and 15 Amp nominal)
The appropriate build is determined by the current rating in Block 2

BLOCK 2 XXXX

4 digits specifying continuous output current ('XXXX' = XXX.X A)
The current rating is set using resistors R5, 6, 7 on the ID board.

BLOCK 3 X

1 digit specifying supply voltage
'3' = 220V
'4' = 240V
Note: Control voltage is always 220/240V

BLOCK 4 X

1 digit specifying single/3-phase connection of mains
'1' = Single phase connection
'3' = 3-phase connection
Note: Above 10A output current the supply must be 3-phase. This block affects setting of switch 3 on the ID board.

BLOCK 5 X

1 digit identifying motor type
'0' = 3-phase brushless motor
'1' = DC commutator motor

BLOCK 6 X

1 digit identifying speed feedback source
'0' = 3-phase brushless tacho
['1' = Resolver - not available initially]
'2' = Conventional DC tacho
'3' = Brushless tacho with built-in scaling (± 10V)

BLOCK 7 XXX

3 digits specifying full speed tacho voltage ('060' = 60 V)
Note: Maximum allowable voltage depends on feedback source.

BLOCK 8 XX

2 digit code specifying standard options:
'00' = no option fitted.

BLOCK 9 XX

2 digit code specifying special options:
'00' = No special options
'01' - '99' = Documented special options

4 BASIC INSTALLATION AND WIRING INSTRUCTIONS

4.1 Installation

The 560 series servo-controllers have been designed as completely self-contained drives with the power circuit, power supplies and control electronics all inside a single unit. The unit should be mounted vertically and fixed by means of bolts or screws through the fixing points at each corner. These points are in the form of keyholes and slots to simplifying fastening and removal. Mounting dimensions and positions of the fixing points are given in Section 2.4 (Technical Details).

4.2 Ventilation and Cooling

In normal operation the drive unit needs to dissipate heat and must, therefore, be mounted to permit the free flow of air vertically over the heatsink and circuit board areas.

Care should be taken to ensure that the mounting surface is cool and that any heat generated by adjacent equipment is not transmitted to the drive unit.

As a general rule allow about 150mm (6 inches) of clear space above and below the drive for free air flow.

4.3 Basic Wiring Instructions

The following set of instructions describes the wiring requirements for operation of the 560 servo-controller as a basic speed controller. The variety of specific drive application precludes the inclusion of diagrams showing all wiring options. In all applications the notes of chapters 5 and 6 must be observed.

All relevant national standards and local electricity board regulations of installations must be observed.

1. To avoid damaging the drive, never carry out high voltage resistance checks on the wiring without first completely disconnecting the drive from the circuit being tested.
2. Power cables must have a minimum rating of 1.1 x full load current.
3. Power cables (particularly the 3-phase motor cables) must be routed well away from cables carrying setpoints, feedback signals and from the screened motor feedback cables, as well as cables from other electronic equipment in the same plant.
4. A substantial ground or earth connection should be made to the earth terminal (terminal 29) of the drive.
5. For reduction of conducted interference from the drive back onto the mains, a substantial earth connection should be made to the power earth (terminal 30) of the drive. THE EARTH CURRENT FLOWING THROUGH THIS CONNECTION MAY BE 1 TO 2mA. If this is considered too large then terminal 30 may be connected to the neutral of the incoming mains supply.
6. The ground connection from a NC, CNC or PLC to the 560 drive should be as short as possible and have diameter at least 2.5 mm^2. The terminal for this ground connection on the drive is terminal 24. If no NC, CNC or PLC control is used, terminal 24 must be connected to earth.
7. The motor must be earthed.
8. In applications where feedback signals (e.g. rotor position, motor thermistor and tacho signals) are taken from the motor to the drive, multi-core screened cable should be used to carry these signals from the motor to the 15 way 'D' - type plug on the 560 control board.

The cable must be screened over the entire length and the screen must be connected to earth only at the controller end. The total cable length should not exceed 50 metres. This cable MUST be wired according to an approved SSD wiring diagram for the motor concerned.

9. For 3-phase brushless motors, the 3 motor cables (as well as feedback such as rotor signals and tacho feedback) MUST be wired according to an SSD approved wiring diagram for the type of motor concerned. The motor cables are not interchangeable and may only be connected in one way to terminals 37, 38 and 39. Wiring diagrams for a large number of motors are given in the Appendix to this manual. For connection to motor types not listed in the Appendix, refer to SSD Engineering Department.

10. For DC brushed motors, the motor armature should be connected between terminals 37 and 38 of the 560 drive and Switch 2 on the identity board should be set to the ON position.

11. The main power supply should be single phase or three phase 240V maximum and should be connected to terminals 31, 32 and 33 of the 560 drive (terminals 31 and 32 for single phase input).

The incoming mains supply should be protected by the correct fuses as shown below:

Controller Type	Fuse	Cable Diameter (mm^2)	Connection
560-0050-4	6.3A	1.5	1 or 3 phase
560-0150-4	16A	2.5	1 or 3 phase

The fuses may be standard type fuses with slow characteristic.

NOTE:

These values are typical values. If in doubt please observe your national standards or local electricity supply regulations.

If a mains transformer is used the fuses should be put in series with the primary of the transformer.

12. The 560 drives do not feature internal inrush current limitation on mains connection. On poor mains supplies it may be necessary to provide current limiting resistors in series with the supply to terminals 31, 32, 33 when the supply is first connected to the drive.

Resistor values $RL = \frac{U_N}{2}$ 0hms, where UN = nominal AC mains voltage [V]

The power rating of the resistors should be at least 11W.

The resistors may be short-circuited after approximately 0.5s and MUST be short-circuited before the drive is started.

13. The 560 drives feature internal resistive braking which allows the energy of the load to be dissipated in fast braking applications. The internal braking resistor is located on the heatsink and is protected by internal fuse F1.

If the drive is to be used to decelerate the load for longer periods, an external ballast resistor may be required. This is done by removing internal fuse F1 (located at the top left of the power board) and connecting the ballast resistor between terminals 34 and 35 via an external 6.3A 250V AC slow blow fuse. This resistor should have a minimum value of 20 0hm and approximately 300W power rating.

NOTE:

The 560 range has not been designed for continuous energy regeneration, e.g. for applications such as unwinders. For such applications refer to SSD Engineering Department.

14. The auxiliary or control power supply (220/240V single phase) should be connected to terminals 40 (Neutral) and 41 (Live).

15. For normal speed control operation, the speed demand signal is connected to one of the three speed inputs provided (terminals 5 to 7). Terminal 3 may be used for the 0 volt connection of the setpoint signal. The maximum speed is ± 10V = full speed when terminal 6 or 7 is used and is variable by P5 on the ID board when terminal 5 is used.

16. The enable signal to the 560 drive is provided by connecting a single holding contact between terminal 11 (enable) and terminal 14 (+24V).

    Open contact to STOP
    Close contact to START

17. Relay contacts indicating motor overtemperature and drive overtemperature are provided on terminals 25 to 28 of the 560 control board. These contacts may be interlocked with the enable circuit to disable the drive if either motor or drive reach excessive temperatures.

    IMPORTANT NOTES:

    17.1 The motor and drive overtemperature signals are NOT monitored inside the drive, therefore no action will be taken to disable the drive on overtemperature unless external wiring has been provided for this purpose.

    17.2 Both motor and drive temperature alarms are only active where a fault exists. If the motor cools down for example, the motor overtemperature contact will be reset and the drive will re-start automatically unless the signal has been latched using external circuitry.

18. A relay change-over contact indicating drive healthy/alarm is provided on terminals 21 to 23 of the 560 drive. Any alarm which causes the drive healthy relay to de-activate is internally latched by the drive and the source of the alarm is indicated by LEDS 5 to 10 on the 560 control board. Once latched, such an alarm can only be cleared by removing and re-applying the auxiliary supply to the drive.

5 CONTROLLER TERMINAL DESCRIPTIONS

5.1 Power Board

Terminal Number	Terminal Description
29	EARTH This terminal should be connected to earth via a substantial ground or earth connection.
30	POWER EARTH This terminal is the earth connection point for internal capacitive filtering. For reduction of conducted interference from the drive to the mains, a substantial earth connection should be made to Terminal 30.
31, 32, 33	MAINS SUPPLY L1, L2, L3 These terminals are the mains supply input which may be in the range 100 - 240V AC line to line. DO NOT USE 380V / 415V For 3-phase supplies use Terminals 31, 32, 33. For single phase supplies use Terminals 31 and 32.
34	+ DC LINK This terminal carries the positive DC link voltage (typically 340V referred to Terminal 36)
35	EXTERNAL BRAKE RESISTOR Used in special applications involving external resistive braking.
36	- DC LINK This terminal carries the negative DC link voltage.
37, 38, 39	MOTOR CONNECTIONS M1, M2, M3 These terminals must be wired according to a SSD approved wiring diagram for the type of motor concerned.
40	NEUTRAL Neutral connection for auxiliary supply voltage for the electronics
41	LIVE 220 / 240V AC Live connection for auxiliary supply voltage for the electronics. This input is internally fused.

5.2 Control Board

Terminal Number	Terminal Description
1	0V (SIGNAL) Zero volt reference for signal current only. NOTE: The 0V terminals 1, 3, 8, 24 are internally connected.
2	DC TACHO INPUT Input from DC tachogenerators with brushes (if used) should be connected between Terminal 2 and 0V (signal). The maximum voltage on Terminal 2 must not exceed 100V. The tacho calibration is done by resistor R3 on the identity board using the following formula: R3 [k 0hms] = (Full Speed Tacho Voltage [V] - 10)
3	0V (SIGNAL)
4	ACTUAL SPEED OUTPUT Output 0 to ± 10V corresponding to 0 to ± 100% full speed for speed meter. The output impedance at this terminal is approximately 1k 0hm.
5	SPEED SETPOINT 1 (VARIABLE RANGE) The signal applied top this input may be connected to the input of the speed loop by either switch 4 (non-inverting) or switch 5 (inverting). The signal range may deviate from the normal 0 - 10V range as follows: Minimum range: 0 to ± 5V corresponding to 0 to ± 100% full speed Maximum range: 0 to ± 12V corresponding to 0 to ± 100% full speed Adjustment of the setpoint range using this input is made using potentiometer P5. (Clockwise rotation of P5 = larger range).
6	SPEED SETPOINT 2 (FIXED RANGE) The signal applied to this input may be connected to the input of the speed loop by either switch 6 (non-inverting) or switch 7 (inverting). It should be in the range 0 to ± 10V corresponding to 0 to ± 100% full speed.
7	SPEED SETPOINT 3 (RAMP) The signal applied to this input is connected to an internal ramp generator which may be connected to the input of the speed loop by either switch 8 (non-inverting) or switch 9 (inverting). It should be in the range 0 to ± 10V corresponding to 0 to ± 100% full speed.

Terminal Number	Terminal Description
7	Continued/..... Alternatively the ramp function may be completely disconnected from the speed loop. The ramp output appears on Terminal 9. The ramp time from 0 to ± 10V is adjustable from 0.1 to 10 seconds using P6 on the identity board. (Clockwise rotation of P6 = longer ramp time).

NOTE: Terminals 5, 6 and 7 provide for 3 different setpoint inputs each of which has a corresponding pair of switches on the identity board.

For each setpoint input, only one switch per input is allowed to be in the ON position, the other switch must be in the OFF position. Of course, both may be in the OFF position.

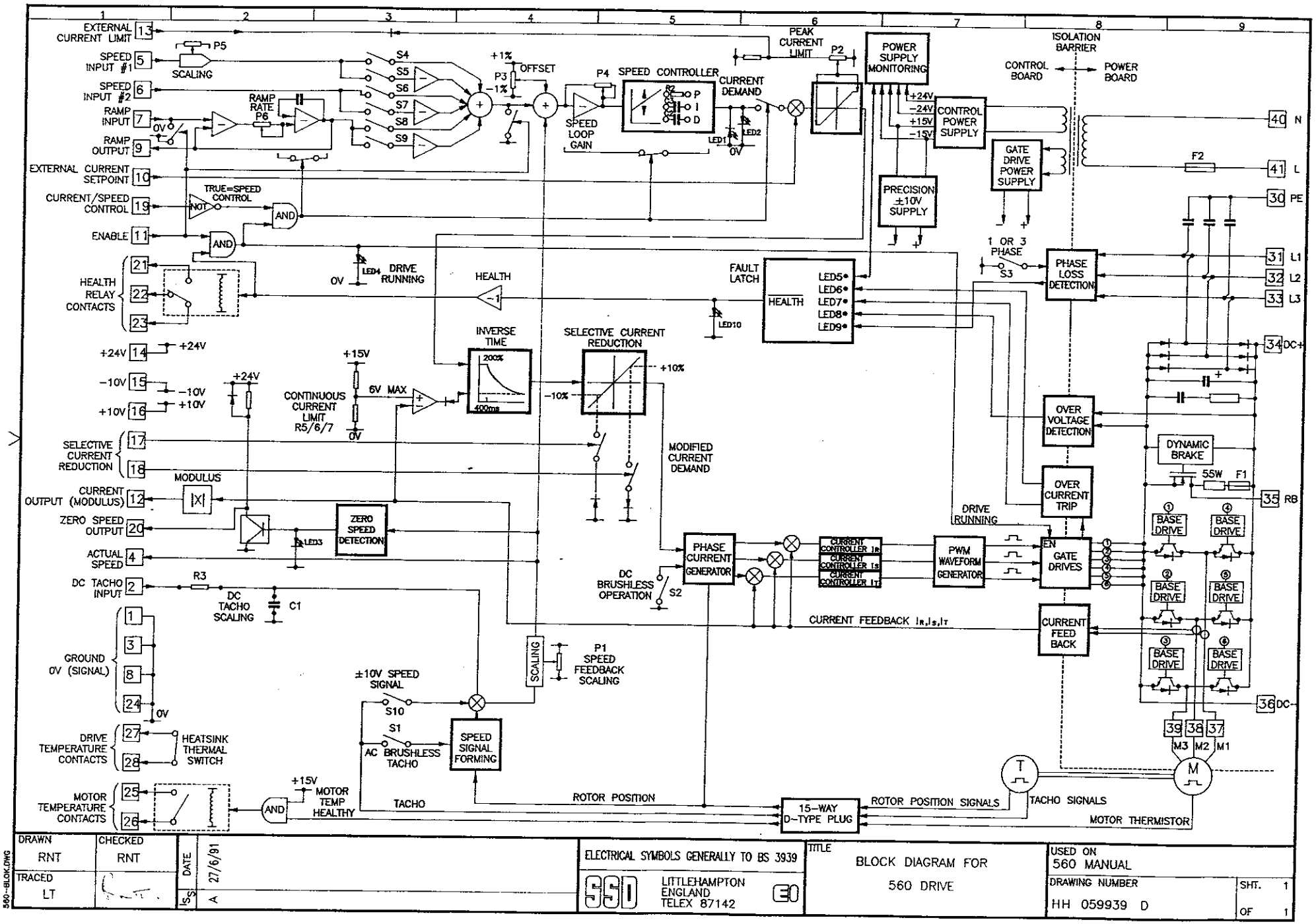
Example:

SWITCH 4	SWITCH 5	
ON	ON	Not allowed
OFF	OFF	allowed
ON	OFF	allowed
OFF	ON	allowed

8	0V (SIGNAL)
9	RAMP OUTPUT This signal is the output of the ramp function with input on Terminal 7. When the input on Terminal 7 is altered, the output will follow at a constant rate depending on the setting of potentiometer P6 (clockwise rotation of P6 = longer ramp rate).
10	EXTERNAL CURRENT SETPOINT This terminal allows direct access to the input of the current loop in torque control applications. For this purpose the speed controller can be quenched by connecting Terminal 19 (Speed Controller Quench) to + 24V. This terminal accepts a voltage in the range of 0 to ± 10V corresponding to ± 200% nominal current of the controller. It should be left open circuit if not used.
11	ENABLE The controller is enabled via Terminal 11. On connection of Terminal 11 to Terminal 14 (+24V) the controller is enabled and starts operation. On opening the enable signal between Terminal 11 and Terminal 14, the drive is quenched and does not supply any torque (no braking !) In some special applications, torque can be sustained for a short time after the enable signal has been removed from the controller. For this purpose an electrolytic capacitor C4 may be inserted on the identity board. The value of C4 depends on the desired delay time t_d as follows: C4 [uFarad] = 10 x t_d [second]

Terminal Number	Terminal Description
11	Continued/..... NOTE: The enable signal should not be given until the DC link is charged and any external inrush limiting resistors have been short-circuited.
12	ACTUAL CURRENT OUTPUT (MODULUS) This output gives a signal in the range 0 to 10V corresponding to 0 to 200% nominal current of the controller.
13	EXTERNAL CURRENT LIMIT The peak current limit set by potentiometer P2 can be reduced externally by applying an external voltage to Terminal 13, for example by connecting a 10k 0hm potentiometer between 0V and Terminal 16 (+ 10V) with the wiper connected to Terminal 13. An input voltage in the range 0 to 9V corresponds to 10% - 200% nominal current. This terminal should be left open circuit if not used.
14	+ 24V (NOMINAL) This is an unregulated DC supply in the range 20V to 30V which may be used to supply the enable and quench inputs. The maximum load on this supply should not exceed 50mA.
15	- 10V PRECISION REFERENCE This - 10V regulated supply may be used as a source for the setpoint signals up to a maximum load of 20mA.
16	+ 10V PRECISION REFERENCE This + 10V regulated supply may be used as a source for the setpoint signals up to a maximum load of 20mA.
17	SELECTIVE ROTATION QUENCH (POSITIVE) This input may be used to reduce the current supplied in the positive direction of rotation to approximately 10% of the controller nominal current (= 5A or 15A). Connect to + 24V DC for current reduction, otherwise leave open circuit.
18	SELECTIVE ROTATION QUENCH (NEGATIVE) This input may be used to reduce the current supplied in the negative direction of rotation to approximately 10% of the controller nominal current (= 5A or 15A). Connect to +24V DC for current reduction, otherwise leave open circuit.

Terminal Number	Terminal Description
19	SPEED CONTROLLER QUENCH This terminal may be connected to + 24V for quench of the speed loop in applications requiring pure torque/current control. This terminal should be left open circuit if not used.
20	ZERO SPEED OUTPUT This terminal provides an open collector output which is switched to 0V as soon as the motor speed drops to 1/1000 = 0.1 % of the maximum speed. This output may be used to drive an external relay coil of 24V, 50mA maximum connected between Terminal 20 and Terminal 14 (+ 24V DC). An internal flywheel diode and pull-up resistor are integrated on the control board. Alternatively this output may be used to drive a NC, CNC or PLC input directly.
21	FAULT RELAY CONTACT (NC) This terminal is the normally closed contact of the fault relay whose change-over contact is Terminal 23. Maximum load 30V DC, 1.0A.
22	FAULT RELAY CONTACT (NO) This terminal is the normally open contact of the fault relay whose change-over contact is Terminal 23. Maximum load 30V DC, 1.0A.
23	FAULT RELAY CONTACT (COMMON) NOTE: Drive ready to operate → Terminals 22, 23 internally connected Drive NOT ready to operate → Terminals 21, 23 internally connected
24	0V (SIGNAL)
25, 26	MOTOR OVERTEMPERATURE CONTACT These outputs are the terminals of a normally closed relay contact which opens when the motor thermistor or thermal switch resistance connected via pins 7 and 8 on the 15 way D-type plug exceeds 3k 0hms. Thermistor resistance < 3k 0hms → Terminals 25, 26 internally connected Thermistor resistance > 3k 0hms → Terminals 25, 26 disconnected Maximum load 30V DC, 1.0A. See Section 4.3 note 17 for important notes.
27, 28	HEATSINK OVERTEMPERATURE CONTACT These outputs are the terminals of a normally closed thermal switch which opens when the controller internal temperature exceeds 80°C. Maximum load 30V DC, 1.0A. See section 4.3 note 17 for important notes.



DRAWN	CHECKED	DATE	ELECTRICAL SYMBOLS GENERALLY TO BS 3939	TITLE	USED ON
RNT	RNT	27/6/91	SSD LITTLEHAMPTON ENGLAND TELEX 87142	BLOCK DIAGRAM FOR 560 DRIVE	560 MANUAL
TRACED LT		IS A			DRAWING NUMBER HH 059939 D — SHT. 1 OF 1

560--BLOK.DWG

7 SETTING UP AND OPERATING INSTRUCTIONS

7.1 Getting Started

(A) CAREFULLY CHECK:

1. Auxiliary power supply voltage is correct.
2. Main power supply voltage is correct. Do not connect to 380/415V supply.
3. Motor voltage and current ratings.
4. All external wiring circuits - power connections / control connections.

   In particular check that the motor connections to the power board and to the 15 way D-type plug have been wired in accordance with a SSD approved wiring diagram.

   NOTE:

   Completely disconnect the controller before point to point checking with a buzzer or when checking insulation with a megger.
5. Check for damage to drive, motor and associated equipment and wiring.
6. Check for loose ends, clippings, drilling chips or any other extraneous material lodged in the drive or associated equipment.
7. If possible check that the motor can be turned freely by hand.

(B) ENSURE:

1. That rotation of the motor in either direction will not cause a hazard.
2. That nobody else is working on another part of the equipment that can be affected by powering up.
3. That other equipment will not be adversely affected by power up.

(C) PREPARATION:

1. Prevent application of the main power supply by removal of the supply fuses or isolate via supply circuit breaker.
2. Disconnect the load from the motor shaft if possible.
3. Check that external run contacts are open.
4. Check that the identity board is fitted on the left side of the control board.

   NOTE:

   The perspex cover of the controller is held on by an adhesion fastener. To remove the cover simply pull forwards.
5. On the identity board, check:
   a) That all DIP-switches have the correct setting according to Section 7.2.
   b) All resistors R1 - R3 have correct values according to Section 7.2.
   c) Two resistor arrays RN1 and RN2 have correct values according to Section 7.2.
   d) All capacitors C1 - C4 have correct values according to Section 7.2.

(D) POWER ON:

1. Once all the preceding steps are completed and understood, connect the auxiliary supply to terminals 40, 41. Do not connect the main power at this stage. Immediately check that the correct voltage appears between terminals 40 and 41.

2. Check the drive condition indicators LEDs 1 - 10. LED 3 (standstill) should be illuminated, all other LEDs should be off.

   If this is not the case, refer to the LED diagnosis chart.

3. Using the SSD diagnostic unit 5570, check that all diagnostic test points 1 - 27 are correct according to the diagnostic chart.

4. When the above checks have been satisfactorily completed, turn off all power supplies to the equipment and when the whole system is totally isolated and safe, re-connect the main supply.

5. Turn on the auxiliary supply (terminals 40, 41).

6. Turn on the main supply (terminals 31, 32, 33).

7. Set the speed setpoint to about 0.5V (diagnostic 17). Set the peak current limit potentiometer P2 to about 10% of peak controller current (i.e about 1.0V at diagnostic 3).

   Close the enable contact. The motor should rotate under control at up to 5% of full speed. The actual speed (diagnostic 24) should be equal in value and opposite sign to the setpoint (diagnostic 17). Do not proceed until this stage has been achieved successfully.

   NOTE:

   If the motor vibrates at standstill, the rotor field is moving in the opposite direction to the rotor position transducer. In general, two motor terminals must be exchanged.

   If the motor runs uncontrolled at high speed, the phases of the motor and rotor position transducer are shifted by one or two positions. In general, the three motor terminals must be moved in cyclic rotation (terminal 37 → 38, terminal 38 → 39, terminal 39 → 37).

   If one of the red LEDs is lit then a fault is present. This may be diagnosed using the LED diagnostic chart.

8. Set the speed setpoint to 0V (diagnostic 17) and set the zero speed potentiometer P3 so that the motor is at standstill.

9. Slowly increase the speed setpoint to maximum and check that the shaft speed is nominally correct. If the load is connected it may be necessary to increase the peak current limit by turning P2 clockwise.

   The maximum speed of the motor is adjustable using potentiometer P1. If P1 does not allow the required adjustment, check the value of resistor networks RN1 and RN2 (brushless motors) or the tacho scaling resistor R3 (motors with DC tacho).

   NOTE:

   On new AC servo motors, two effects may be observed due to the shaft sealing common to these motors with high isolation class:

   a) Heating up of the motor shaft even without load. This effect is normal and will gradually decrease.

   b) Strange mechanical noises; these will disappear after a few hours operation.

   These effects should be distinguished from the situation where the motor fails to rotate under control, which may indicate incorrect connection.

10. Disable the drive, ensure that the motor is still free to rotate in both directions and reverse the setpoint. Proceed as in step 9 to check the rotation in the reverse direction.

(E) RUNNING PERFORMANCE ADJUSTMENTS

1. Disconnect all supplies from the drive and re-connect the motor to its load. Set the speed setpoint to zero, re-connect the supplies and switch on.

2. Current Limit Adjustment:

   Adjust the peak current potentiometer P2 to the required setting (diagnostic 3). Depending on the controller nominal current (either 5A or 15A for 560 drives) the maximum peak current will be either 10A or 30A = 200% nominal current corresponding to 10V on diagnostic 3.

   Note that the peak current adjustment is completely independent of the continuous current set by calibration resistors R5 to R7, allowing great flexibility for different overload requirements.

   The continuous current limit is set by calibration resistors R5 to R7 on the identity board. These are normally set by SSD prior to despatch to match the motor current rating and should never be changed to increase the current above the factory set value without prior consultation with SSD Limited.

3. Speed Loop Adjustment:

   It is important that the speed control loop is optimised properly before the position loop is optimised.

   The speed loop with motor and load is optimised by adjustment of the PID controller components i.e.,

Potentiometer	P4	-	P term	(Proportional Gain)
Capacitor	C3	-	I term	(Integral)
Capacitor	C2	-	D term	(Derivative)

   When shipped, the 560 drive has a proportional gain of 0.5 to 20 and an integral time constant of 4.7ms. Capacitor C2 is not fitted ex-works. These values have been found to be suitable in a wide variety of applications.

4. Gain Adjustment:

   Apply a small step change (about 20 %) to the speed setpoint input and observe the speed response using an oscilloscope connected to the diagnostic unit, position 24.

   Gradually increase the proportional gain by turning potentiometer P4 anti-clockwise to obtain a Critically Damped performance, i.e. the fastest performance possible without overshoot, as shown in figure 1. Increasing the gain too far will introduce excessive overshoot and may induce instability.

5. Integral Action:

   The integral time constant is set by capacitor C3 = 0.1 μF to approximately 4.7 ms.

   On critical applications it may not be possible to achieve optimal response using P4 only. If the speed loop oscillates, capacitor C3 may be increased in value (= increased integral time constant). If the system is too slow to reach a new setpoint, decreasing C3 may help.

   The recommended range of values for C3 is 0.01 μF to 1.0 μF.

6. Derivative Action:

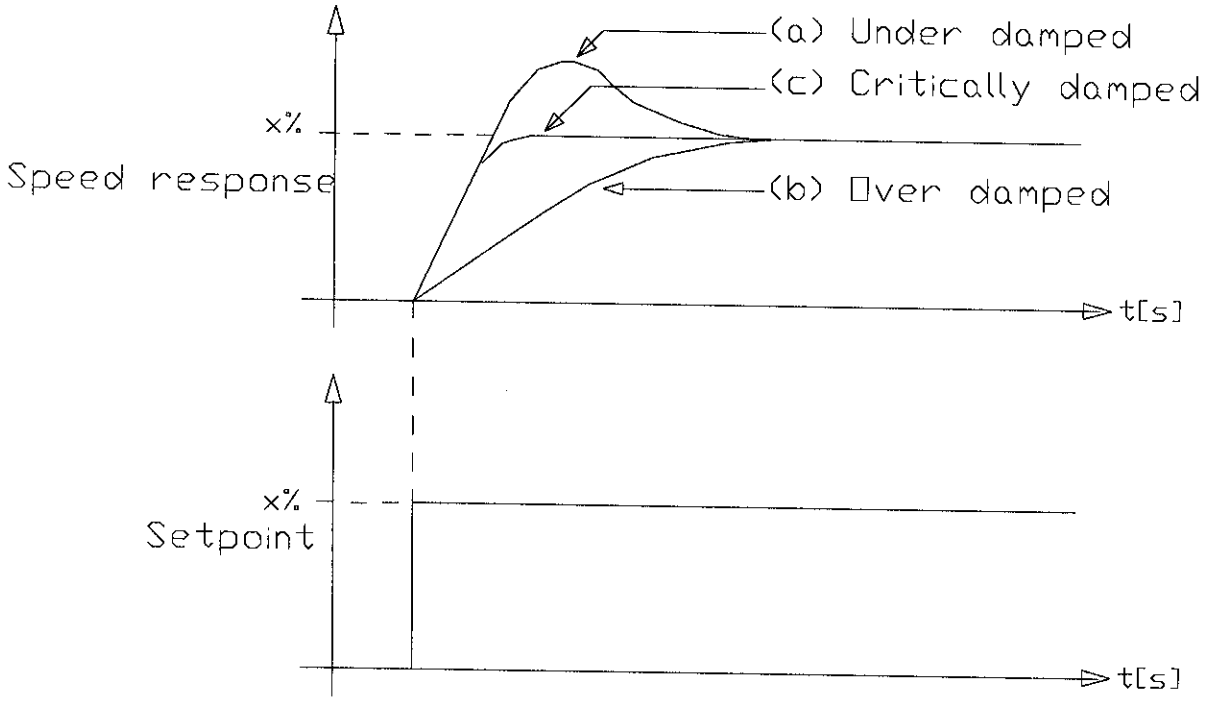
   If the setpoint for the speed loop derives from a position controller, it has proven unnecessary to provide derivative action.

   However, if manual operation is used or jumpy switching of the setpoint is likely to occur, derivative action may be necessary to reach the setpoint without overshooting.

As the derivative capacitor C2 increases the AC voltage gain, it should be kept as small as possible to keep the gain of the cable noise low.

C2 may be altered between values of 0.01 µF to 1.0 µF.

Figure 1. Typical speed response curves



7. Further Adjustments:

If further alteration of the PID controller terms is required, the following adjustments may be considered:

a) Alteration of R2 (Speed Loop Proportional). Increasing the value of R2 will increase the proportional gain.

b) In cases where no drift is permissible with zero setpoint, a value R1 = 10 M 0hm may be fitted. This limits the overall gain of the speed loop amplifier.

The drive is now ready to operate. It is now essential to check the rest of the control circuitry for correct operation.

It is advisable during the first hour of operation to monitor the drive and motor temperatures for evidence of overheating. In heavy duty braking applications, the appearance of fault LED 8 may indicate that the load energy is too high for the internal resistive brake. In this case
an external ballast resistor must be considered.

7.2 Identity Board

The identity board is fitted to the two 26-way connectors on the left side of the control board. The identity board carries all switches, selectable components and adjustable parameters of the drive.

The layout of the identity board is given over page.

NOTE:

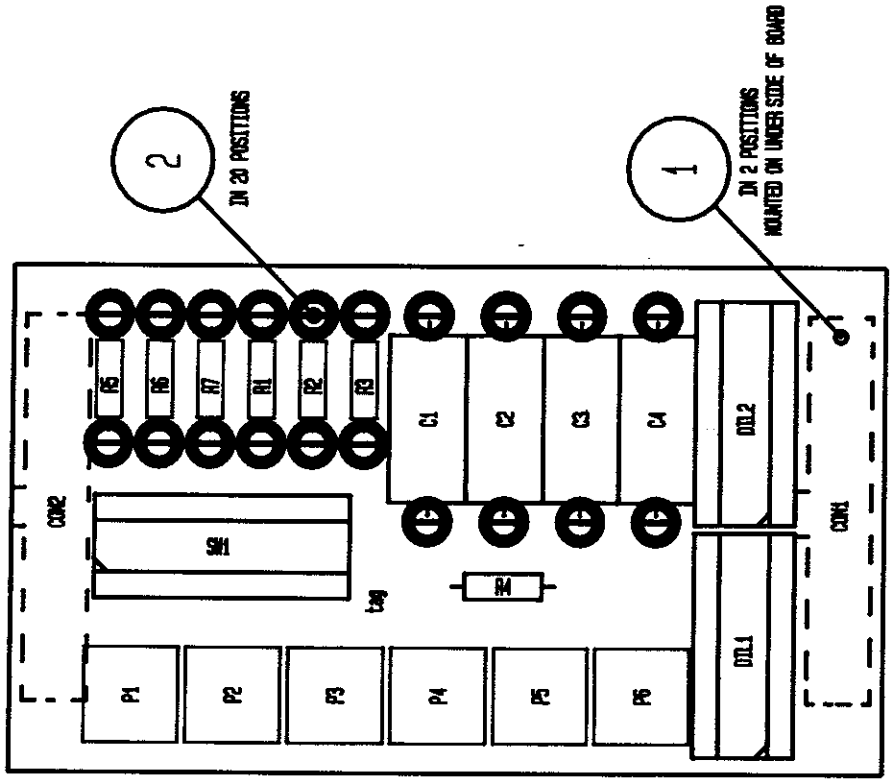
Previous versions of the identity board have a slightly different layout. These previous versions are completely compatible with the new layout.

(A) DIP-Switches

Switch	ON Position	OFF Position	Normal
S1	Brushless tacho without built-in electronics for ± 10V speed signal forming. (Tacho signals on pins 3, 4, 5, 6 of 15-pin plug).	No such tacho	ON
S2	DC motor with brushes used.	No such motor	OFF
S3	Mains supply single phase on terminals 31, 32	Mains supply 3-phase on terminals 31, 32, 33	OFF
S4	Setpoint 1 (terminal 5) used directly	Not used at all	OFF *
S5	Setpoint 1 (terminal 5) used inverted	Not used at all	OFF *
S6	Setpoint 2 (terminal 6) used directly	Not used at all	ON *
S7	Setpoint 2 (terminal 6) used inverted	Not used at all	OFF *
S8	Setpoint 3 (terminal 7) used directly	Not used at all	OFF *
S9	Setpoint 3 (terminal 7) used inverted	Not used at all	OFF *
S10	Brushless tacho with built-in electronics for ± 10V speed signal forming. (Tacho signals on pins 1 and 12 of 15-pin plug).	No such tacho	OFF

* For each setpoint input, only one switch per input is allowed to be in the ON position, the other switch must be in the OFF position.

DO NOT SCALE	THIRD ANGLE PROJECTION	GENERAL DRAWING PRACTICE TO BS 308/ BS 3939	I/S	DATE
			1	31.5.91



DRAWN E.J.T.	MATERIAL	DIMS. IN M.M. APPLY OVER FINISH (EXCEPT FOR PAINT AND LACQUER)	ASSEMBLED ON 560	SCALE 2:1	TITLE 560 IDENT BOARD P.C.B. ASSY.
CHECKED G.D.R.					
DESIGN APPROVAL	FINISH	GENERAL TOLERANCE X = ± 0·4, X.X = ± 0·2, X.XX = ± 0·1; HOLES <Ø7 mm −0.02 +0.07	SSD LITTLEHAMPTON, ENGLAND. TELEX 87142		DRAWING NUMBER AH059793D SHT. 1 OF 1
MANF. APPROVAL					

SRS LTD 19275/A/86 A3 (3/41)

(B) Selectable Resistors

Resistor	Function	Normally Ex-works	Selection
R1	Gain limit of Speed Controller	Not fitted	Minimum value = 10M 0hm
R2	Speed loop proportional gain	47k 0hm	Larger value = higher gain
R3	DC tacho scaling	Not fitted	Maximum value = 91k 0hm
R5, R6, R7	Continuous current limit	10k 0hm	Up to 3 resistors combined in parallel. Maximum value of combination R567 = 10k 0hm

The formula for calculating R3 and R567 are:

DC Tacho Scaling R3 [k 0hm] = (Full Speed Tacho Voltage [V] - 10)

Continuous Current (Percentage P % of nominal current I_N = 5A or 15A)

$$R567\ [k\ 0hm] = \frac{15 \times P\ [\%]}{250 - P\ [\%]}$$

Example:

Nominal Current I_N = 5A, Continuous current = 3.0 A, P = 60 %

$$R567\ [k\ 0hm] = \frac{15 \times 60}{250 - 60}\ [k\ 0hm] = 4.7\ k\ 0hm$$

Nominal Current I_N = 15A, Continuous current = 13.3 A, P = 89 %

$$R567\ [k\ 0hm] = \frac{15 \times 89}{250 - 89}\ [k\ 0hm] = 8.2\ k\ 0hm$$

(C) Resistor Networks RN1 and RN2

Resistor	Function	Normally Ex-works	Selection
RN1, RN2	Voltage scaling for brushless tachos without built in electronics for ± 10V speed signal forming.	To tacho specification	Select from 22k, 33k, 47k, 68k

The formula for calculating RN1 and RN2 is:
RN1 [k 0hm] = RN2 [k 0hm] = (Full Speed Tach Voltage [V] x 1.1) round up to nearest preferred value.

Example:
Maximum Speed 2000 rpm, Tacho 10V/1000 rpm.

RN1 [k 0hm] = (20 x 1.1) = 22
so choose RN1 = RN2 = 22k 0hm

RN1 and RN2 are 16-pin DIL networks consisting of 8 individual resistors.

(D) Selectable Capacitors

Resistor	Function	Normally Ex-works	Selection
C1	Filtering for DC tacho	10 nF	Application dependent
C2	Speed loop derivative	not fitted	0.01 µF
C3	Speed loop integral	0.1 µF	0.01 µF to 1 µF
C4	Delay time controller disable	not fitted	Special applications only

(E) Potentiometers

Pot	Function	Adjustment
P1	Tacho scaling (maximum speed)	Clockwise to reduce speed
P2	Peak current limit	0 to 200% I_N Clockwise to increase current
P3	Speed loop offset	± 1 % of full speed
P4	Speed loop gain	Clockwise to reduce gain
P5	Scaling of setpoint 1, terminal 5	Clockwise to reduce speed
P6	Ramp time adjustment	0.1s to 10s Clockwise to increase ramp time

8 DIAGNOSTICS

8.1 Description of Diagnostic Unit Type 5570

The drive is fitted with a multi-pin socket near the lower edge of the Main Control printed circuit board to allow connection of a type 5570 Diagnostic Test Unit.

The Diagnostic Test Unit is a small, portable, plug-in module which when connected to the drive provides access via a selector switch to 27 internal test points. The unit incorporates the following features.

1. A digital voltmeter to permit accurate measurement of steady state signals.
2. An analog voltage "Trend indicator" in the form of a row of LED displays which span signal levels in the ± 10V. This is a fast responding indicator which shows the magnitude of rapidly changing signals.
3. A pair of output sockets (standard 4mm) to enable signals to be monitored externally on an oscilloscope.

Under normal operating conditions, all signals which appear on the Diagnostic Test Unit are referred to the 0V of the control board.

8.2 Fault Finding

In attempting to determine the causes of fault conditions it is essential to follow the normal setting up procedure described in Section 7 of this manual.

If you reach a stage in the Set-up Procedure where the required conditions are not satisfied, the following possible causes of failure may exist:

a) failure of mechanics including electrical wiring

b) failure of the overriding control system including NC, CNC or PLC

c) failure of the motor

d) failure of the controller

Noises and oscillations proportional to motor speed are usually based on mechanical problems (discontinuous friction, backlash, etc.,). Noises and oscillations which are not proportional to motor speed are usually based on control problems (unstable speed or current loop).

If a fault on the controller is suspected:

FIRST Look at the drive condition LEDs and refer to the LED Description Chart (Table 8.1)

SECOND Look at the drive condition LEDs and refer to the Status Recognition Chart (Table 8.2)

THIRD Check the voltages at the test points of the 5570 Diagnostic Unit and compare with the Voltage Measurement Chart (Table 8.3)

The 5570 Diagnostic Unit must be plugged in the correct orientation (indicated by a tab on the socket and a slot on the plug). Always disconnect the auxiliary and power supplies before plugging and un-plugging the Diagnostic Unit.

Table 8.1 - LED Description Chart

LED	COLOUR	DESCRIPTION	STATUS ON	STATUS OFF
LED 1	Green	Indicates presence of a positive current demand for forward rotation/torque	Current demand positive	Current demand small or negative
LED 2	Green	Indicates presence of a negative current demand for reverse rotation/torque	Current demand negative	Current demand small or positive
LED 3	Green	Zero speed/rotation LED indicating motor speed < 0.1 % of full speed	Motor at standstill	Motor running
LED 4	Green	Drive running/not running	Drive running	Drive not running
LED 5	Red	Internal power supply monitoring	Internal supplies faulty	Internal supplies healthy
LED 6	Red	Short circuit in motor circuitry or output stage	Short circuit fault	No short circuit fault
LED 7	Red	Short circuit in motor circuitry	Short circuit fault	No short circuit fault
LED 8	Red	DC link voltage monitoring	Over voltage in DC link	DC link voltage healthy
LED 9	Red	Mains supply voltage and phase loss detection	Under voltage or missing phase	Mains supply healthy
LED 10	Red	Total alarm indication (together with any of LEDs 5 - 9)	Controller fault	Controller healthy

NOTE:

Basically, all green LEDs should or may be lit during normal operation.

All red or yellow LEDs indicate a fault condition when lit.

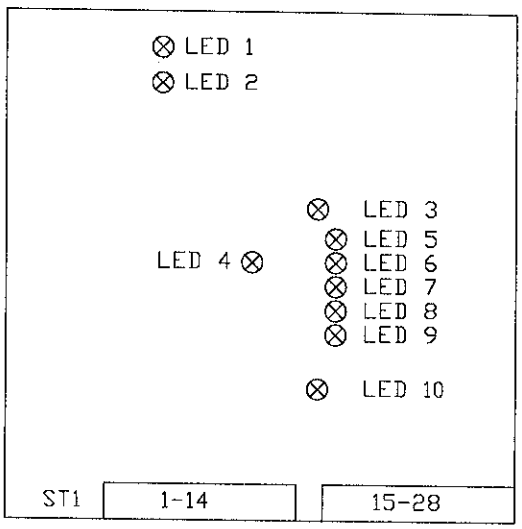


Figure 8.1 Layout of control board with LEDs

Table 8.2 - Status Recognition

CODE: O LED OFF
● LED ON
⊗ EITHER

LED	1	2	3	4	5	6	7	8	9	10	STATUS
	O	O	●	O	O	O	O	O	O	O	Normal stop condition
	O	O	O	O	O	O	O	O	O	O	1. NO AUXILIARY SUPPLY a) Check 220/240V on terminals 40, 41. b) Check auxiliary supply fuse F2. 2. DRIVE STOPPED BUT MOTOR ROTATING a) Check motor is stopped. b) Check for faulty speed feedback signal (Diagnostic 24) on terminals 1-28 or feedback plug ST1.
or	●	O	O	O	O	O	O	O	O	O	} IDENTITY BOARD NOT FITTED Check identity board inserted correctly
	O	●	O	O	O	O	O	O	O	O	
	⊗	O	O	●	O	O	O	O	O	O	} NORMAL RUN CONDITION LED 1 on → forward direction LED 2 on → reverse direction LED 1 and 2 both off → light load, current demand is nearly zero.
or	O	⊗	O	●	O	O	O	O	O	O	
	●		O	●	O	O	O	O	O	O	EXTREME INSTABILITY IN SPEED LOOP a) Check values of components on identity board. b) Check loop gains in NC, CNC or PLC outer loops. c) Follow drive setting-up procedure (Section 7.1).
	●	O	●	●	O	O	O	O	O	O	DRIVE ENABLED BUT MOTOR STATIONARY If increasing setpoint has no effect, then: FOR SPEED CONTROL APPLICATIONS, CHECK:- a) Total setpoint (Diagnostic 17) responds to the setpoint input. If not, check switches S4 to S9 on the identity board. b) Motor stalled. If motor current is flowing (Diagnostic 11) check for stalled shaft. Check motor is wired correctly according to wiring diagram (isolate supplies before working on the motor). c) Peak current limit (Diagnostic 3) is not zero. d) Continuous current limit (Diagnostic 2) is not zero. e) Tacho is wired correctly according to wiring diagram. f) Tacho scaling components (RN1 and 2 or R3 on identity board) fitted correctly. g) Switch settings for tacho feedback source (S1 or S10 on identity board) set correctly. h) For DC motors check switch S2 on identity board set to ON. For torque/current control applications, check points (a) - (d) above.
or	O	●	●	●	O	O	O	O	O	O	

CODE: O LED OFF
● LED ON
⊗ EITHER

LED	1	2	3	4	5	6	7	8	9	10	STATUS
	O	O	●	O	●	O	O	O	O	●	INTERNAL POWER SUPPLY VOLTAGE FAULT a) Check auxiliary supply voltage 220/240V AC on terminals 40,41. b) Check ± 15V supplies (Diagnostic 15 and 16). Check + 24V supply (Terminal 14).
	O	O	●	O	O	●	O	O	O	●	SHORT CIRCUIT IN MOTOR CIRCUIT OR OUTPUT STAGE
or	O	O	●	O	O	O	●	O	O	●	Check for short circuit between motor lines and line to ground.
	O	O	●	O	O	O	O	●	O	●	OVERVOLTAGE IN DC LINK **CAUTION:** The DC link circuit takes approximately 3 minutes to discharge after removal of the supply. a) Check main supply voltage on terminals 31, 32, 33. b) Disconnect supply and check fuse F1. c) Check ballast resistor value 25 0hm between terminals 34 and 35. If the resistor is faulty (visual inspection) the braking energy is too large. Extend deceleration ramp or fit external braking resistor.
	O	O	●	O	O	O	O	O	●	●	UNDERVOLTAGE/MISSING PHASE a) Check main supply voltage on terminals 31, 32, 33. b) For single phase main supply check switch S3 on identity board is set to ON. c) Check resistors used for inrush limitation are shorted before the drive is enabled.
	O	O	●	O	O	O	O	●	●	●	DC LINK VOLTAGE NOT PRESENT Check main supply voltage on terminals 31, 32, 33. NOTE: This fault status may occur if the drive is enable simultaneously with the main supply contactor closing, before the DC link voltage is established.

Table 8.3 - Diagnostic Test Unit - Voltage Measurements

Test Number	Function	Signal in Run Condition
0	not in use	
1	DC tacho (terminal 2)	depending on speed
2	continuous current limit	6V = nominal current demand
3	peak current limit for both directions	+10V max. for peak current
4	motor current in phase L3	+5V is max. peak current
5	motor current in phase L2	+5V is max. peak current
6	motor current in phase L1	+5V is max. peak current
7	current setpoint for phase L3	± 10V max.
8	current setpoint for phase L2	± 10V max.
9	speed controller output	± 13V max.
10	current setpoint for phase L1	± 10V max.
11	virtual current in motor which is the equivalent to the DC current in a DC motor	10V = max. peak current 5V = nominal unit current
12	current setpoint, which has not yet been related to the phases	10V = max. peak current 5V = nominal unit current
13	negative supply voltage for setpoint	-10V (on terminal 15)
14	positive supply voltage for setpoint	+10V (on terminal 16)
15	positive supply voltage	+15V
16	negative supply voltage	-15V
17	summing point of setpoints 1, 2 and 3	-10V to +10V
18	controller enable on terminal 11	+18 to +30V (typ. +24V)
19	ext. current setpoint on torque control	± 10V max.
20	output of setpoint ramp (terminal 9)	-10V to +10V
21	speed setpoint via ramp (terminal 7)	-10V to +10V
22	speed setpoint 2 (terminal 6)	-10V to +10V
23	speed setpoint 1 (terminal 5)	-10V to +10V
24	actual speed value	± 10V = ± max. speed
25	rotor position signal X (pin 15)	0 or 15V
26	rotor position signal Y (pin 14)	0 to 15V
27	rotor position signal Z (pin 13)	0 to 15V

9 OPTIONS

9.1 External Ballast Resistor

In applications where the drive is to be used to decelerate the load for a large proportion of the duty cycle, an external ballast resistor may be required. This is done by removing internal fuse F1 (located at the top left of the power board) and connecting the ballast resistor between terminals 34 and 35 via an external 6.3A 250V AC slow-blow fuse.

The external ballast resistor should have a minimum value of 20 0hm and approximately 300W power rating.

NOTE:

The 560 range has not been designed for continuous energy regeneration, e.g. for applications such as unwinders. For such applications refer to SSD Engineering Department.

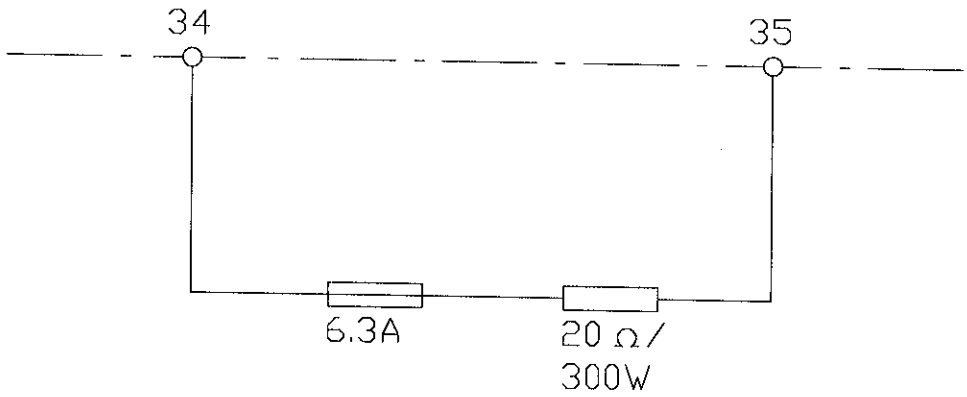


Figure 9.1 Connecting a ballast resistor to 560 servo-controllers.

9.2 Multiple Motor Applications

If several drives with the same d.c. link voltage are fed from the same mains supply (same phases is a must!) the d.c. link circuits of the individual units may be connected together by a resistor board, called the "energy sharing board". Refer to SSD Engineering Department.

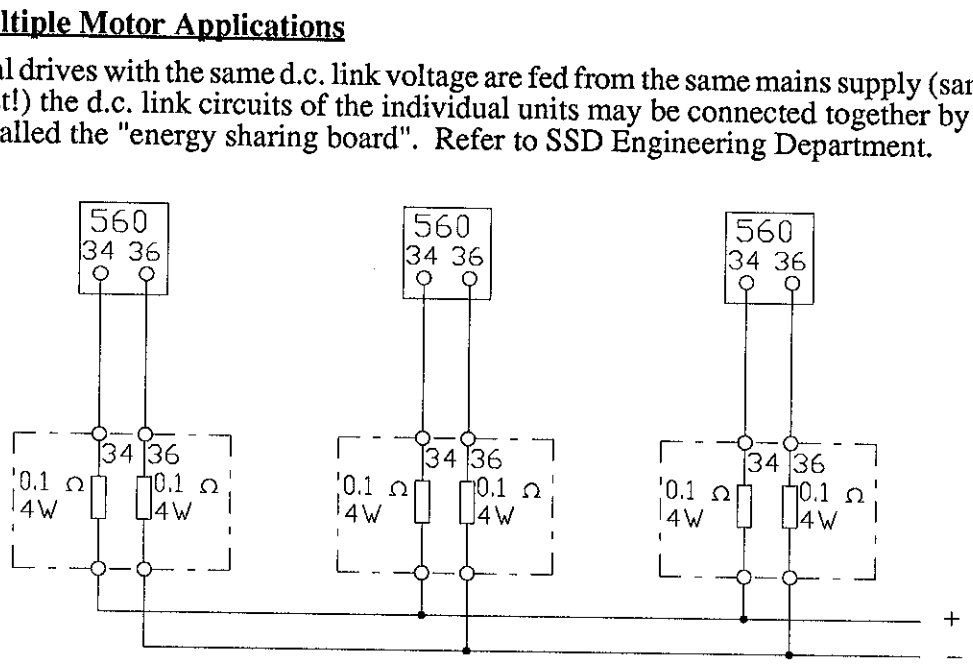


Figure 9.2 Connection of the energy sharing board.

9.3 Braking on Mains Failure

On mains failure or emergency off, a servo controller loses its supply power. As a result, the motor will come to a standstill without any braking. If fast braking of a motor is required in this case, normally closed contacts of the main contactor feeding that drive can switch on braking resistors. This causes braking with the power from the load being converted into thermal energy. The motor operates as a synchronous generator. The braking torque drops exponentially with dropping speed.

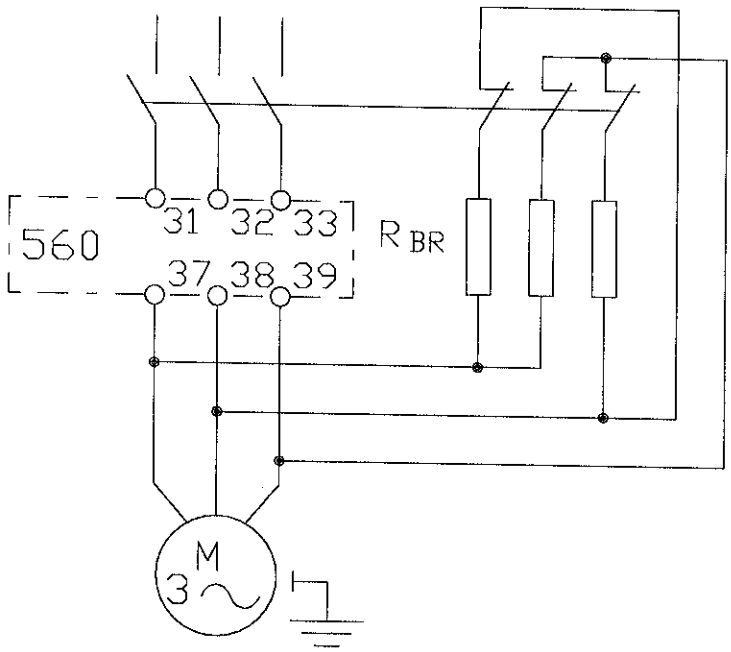


Figure 9.3 Dynamic Braking with braking resistors on mains failure.

The braking resistors are calculated as follows:

$$R_{BR} = \frac{U_{MN}}{I_{MN}}$$

U_{MN} nominal motor voltage

I_{MN} nominal motor current

The power rating of the resistors should be approximately 5 % of the motor rating.

9.4 Commutation Limit on DC Motors

In general dc servo motors require a reduction of the torque (= armature current) with increasing speed in order to avoid commutation problems. This problem varies with the make and type of motor to be used. This reduction can, therefore, be taken from the individual motor data sheets. Refer to SSD Engineering Department for details.

9.5 Speed Feedback with Resolver

Some motor manufacturers have started to use resolvers as the feedback system on brushless motors. The resolver serves as a transducer for the rotor position, the actual speed value and the position feedback for position controls. Refer to SSD Engineering Department for further details.

10 MAINTENANCE

10.1 General

Generally, brushless servo drives do not require any maintenance. The only components subject to wear are the bearings of the motors which should be checked after approximately 30,000 working hours.

DC servo motors with brushes are subject to brushwear. This brushwear largely depends on the application (duty cycle, current, speed etc.) Average brush life is around 5,000 to 12,000 hours. Therefore, it is recommended that the brushes are checked regularly.

Brushless tachos do not require any maintenance. DC tacho generators with brushes have a brush life time of approximately 20,000 hours.

The controllers do not require any maintenance. However, they should be checked from time to time to make sure they are not covered by layers of dust or other materials. This applies to the cooling fins in particular. If layers are found the dust or material should be removed using dry air.

10.2 Spare Parts Identification List

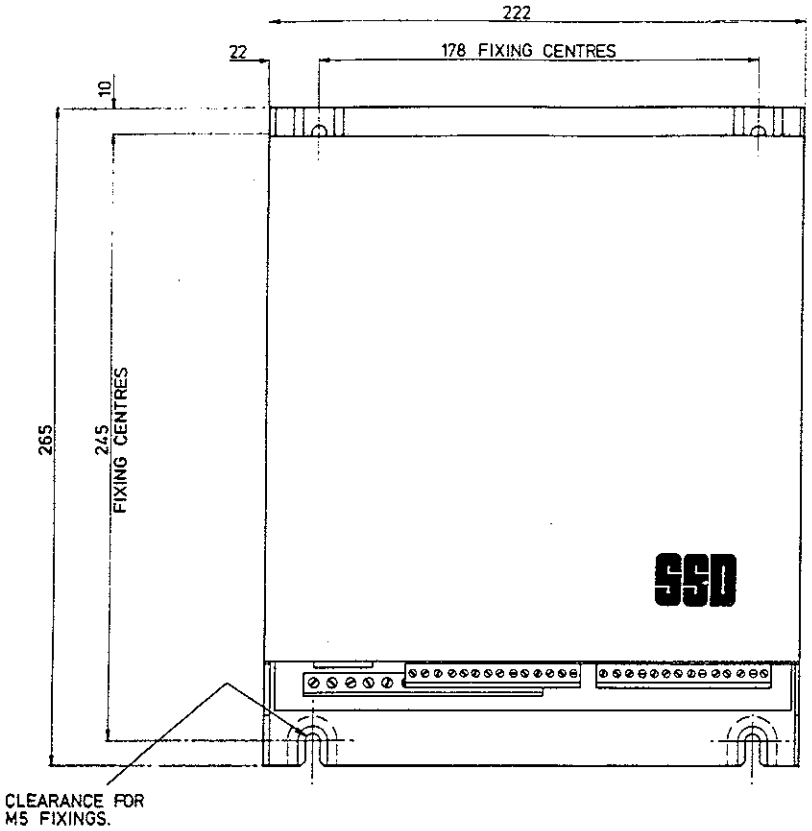
ITEM	SSD PART NUMBER
PRINTED CIRCUIT BOARDS (PCB's)	
560 CONTROL PCB	AH058501U001
560 IDENTITY PCB (UNCALIBRATED)	AH059793U001

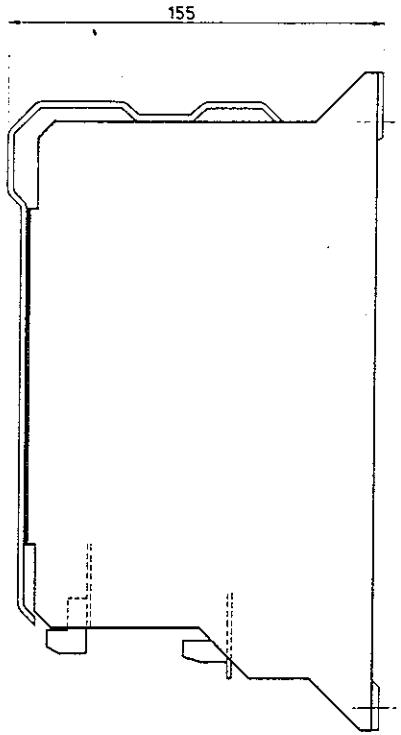
The power PCB assembly is not supplied as a separate spares item.

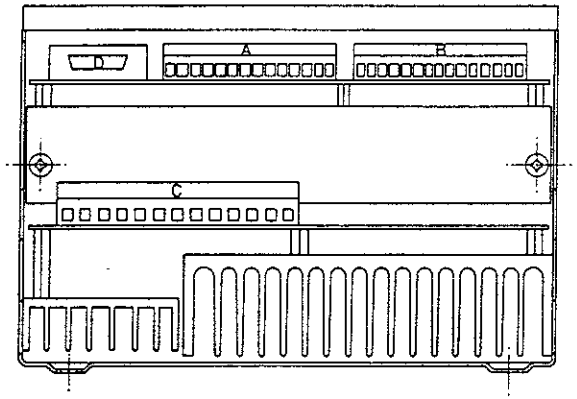
Complete spare drive units may be ordered by quoting the complete product code and order number of the original order.

FUSES	
DYNAMIC BRAKE FUSE (F1) 10A 250V	CH230014
AUXILIARY SUPPLY FUSE (F2) 315mA 250V	CH053150
MISCELLANEOUS	
PERSPEX COVER	BT059613
RICHO SPACERS	BG049350
DYNAMIC BRAKE RESISTOR	CZ059575
RESISTOR NETWORK - PART NUMBER DEPENDS ON VALUE:	
22K	CA13622K
33K	CA13633K
47K	CA13647K
15 WAY 'D' - TYPE PLUG ASSEMBLY	LA059752

DO NOT SCALE | THIRD ANGLE PROJECTION | GENERAL DRAWING PRACTICE TO BS 308 / BS 3939







NOTES.

1. CONNECTIONS A & B ARE PLUG IN STYLE TERMINALS CAPABLE OF ACCEPTING 1.5mm² CABLE INTO CLAMP STYLE LOOPS.
2. TERMINAL BLOCK C IS CAPABLE OF ACCEPTING 2.5mm² CABLE INTO CLAMP STYLE LOOPS.
3. FRONT COVER IS REMOVEABLE.
4. ALL NECESSARY FIXINGS FOR ELECTRICAL CONNECTIONS ARE SUPPLIED. MECHANICAL MOUNTING FIXINGS ARE NOT SUPPLIED.
5. CONNECTOR D IS 15 WAY 'D' TYPE CONNECTOR. SUITABLE MATING CONNECTOR SUPPLIED.

DATE A 22.5.91

DRAWN P.A.H. / P.B | CHECKED | MATERIAL | FINISH

DIMS. IN M.M. APPLY OVER FINISH (EXCEPT FOR PAINT AND LACQUER)
GENERAL X ± 0.4 | TOLERANCE 0.X ± 0.2 | 0.XX ± 0.1 | HOLES ± .07mm | ± 0.02 - 0.07

ASSEMBLED ON 560 | SCALE 1:1

SSD LITTLEHAMPTON ENGLAND TELEX 87142

TITLE 560 OUTLINE DRAWING

DRAWING NUMBER HG 059836 F | SHT 1 | SHTS 1

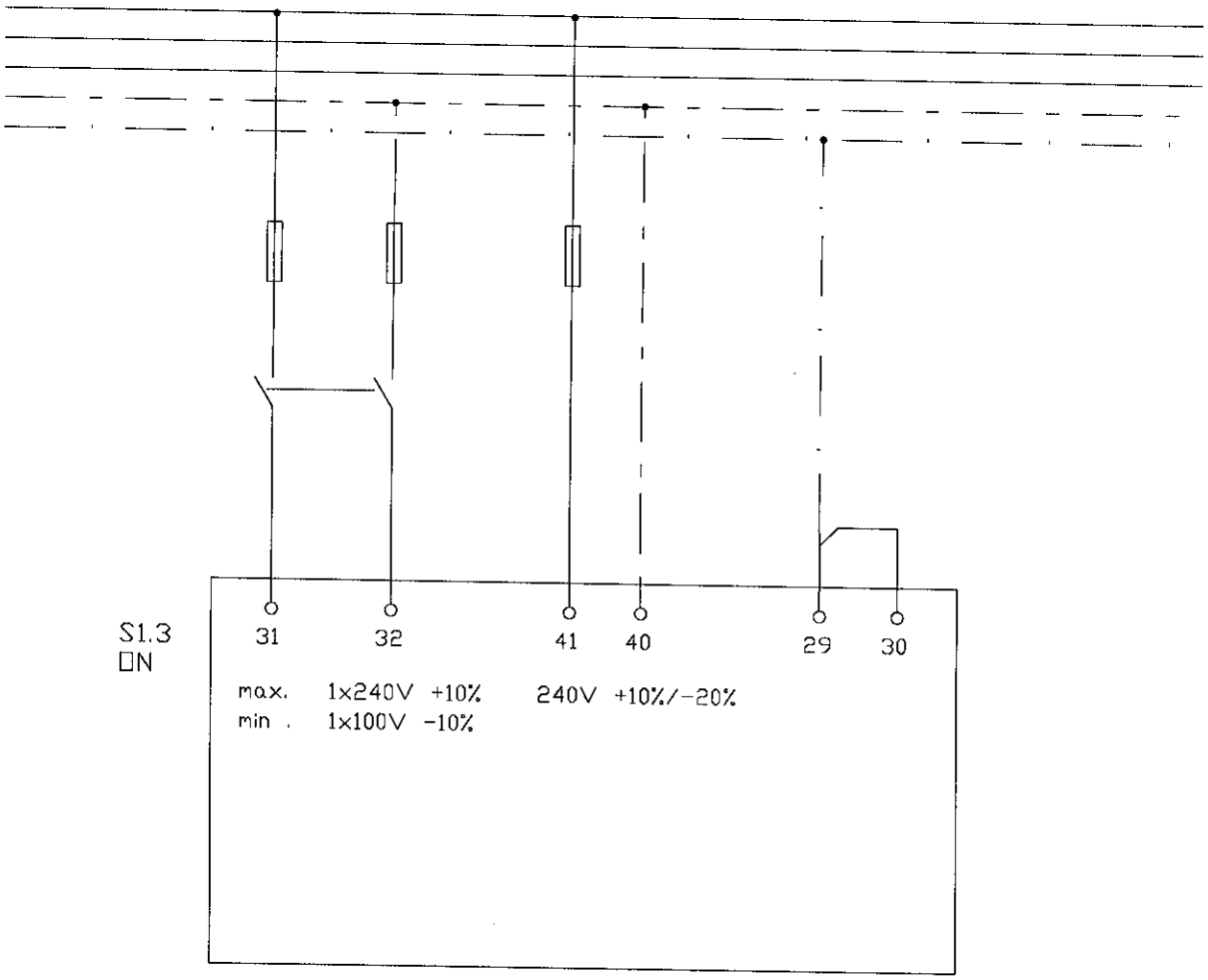
APPENDIX

This appendix contains the following information: Page

Pin Allocation of 15 Pin Plug (ST 1)

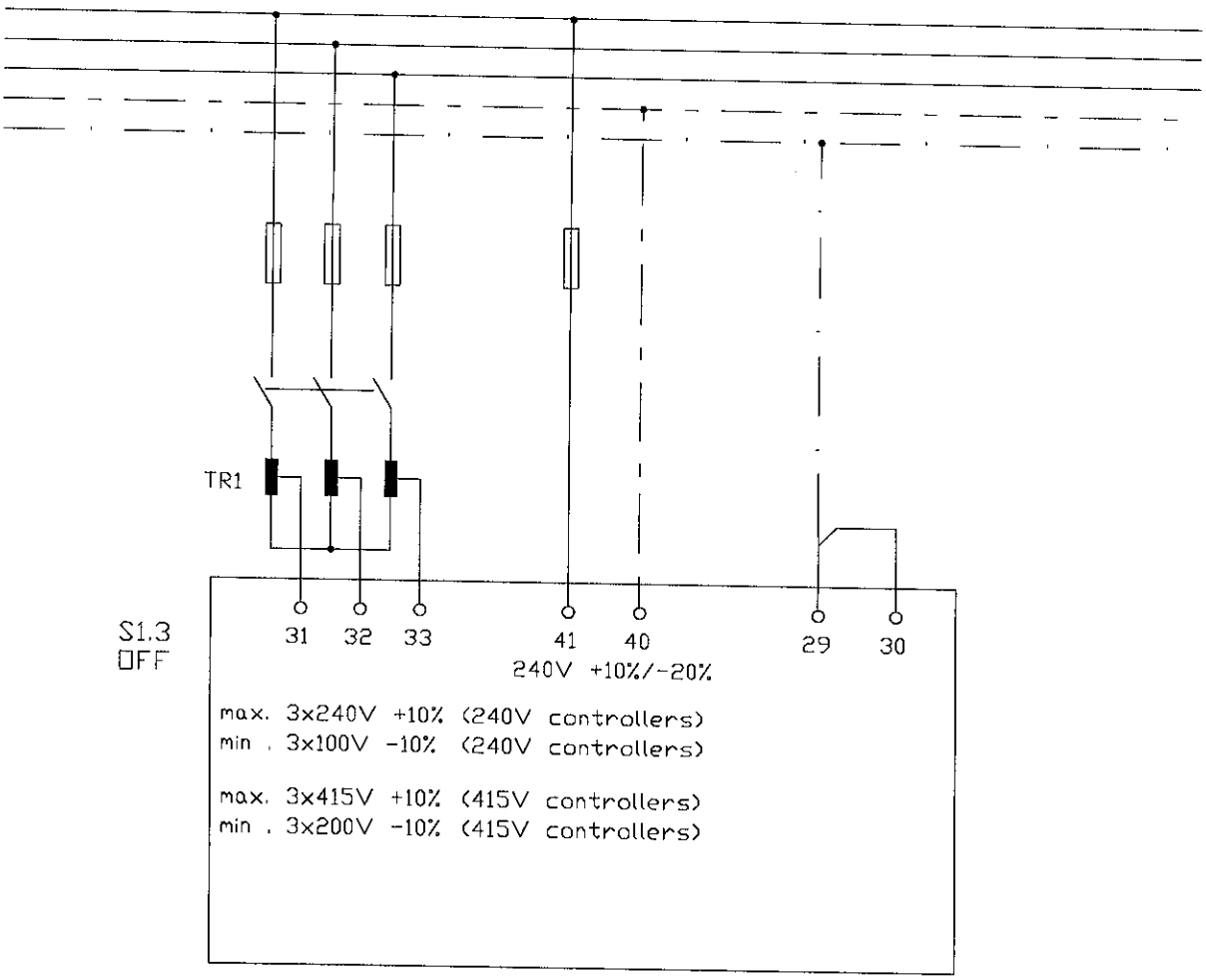
Pin	I/O*	Function
1	I	BL-tachosignal ± 10V from tachos with built in electronics for speed scaling
2	0	Pull up resistor versus + 15V DC
3	I	BL-tacho: center
4	I	BL-tacho: Phase U
5	I	BL-tacho: Phase V
6	I	BL-tacho: Phase W
		} Tacho scaling via RN1 and RN2 on the identity board.
7	I	Over temperature alarm in motor (PTC or thermal switch)
8	I	Over temperature alarm in motor (PTC or thermal switch)
9	0	-15V DC for supplying tacho with built in electronics for speed scaling
10	0	+15V DC for supplying tacho with built in electronics for speed scaling
11	0	0 V DC connection for screening
12	0	0 V DC
13	I	Rotor position transducer track Z
14	I	Rotor position transducer track Y
15	I	Rotor position transducer track X

* I = Input
0 = Output



Netzversorgung für SMR 240 mit
einphasiger Leistungseinspeisung direkt vom Netz

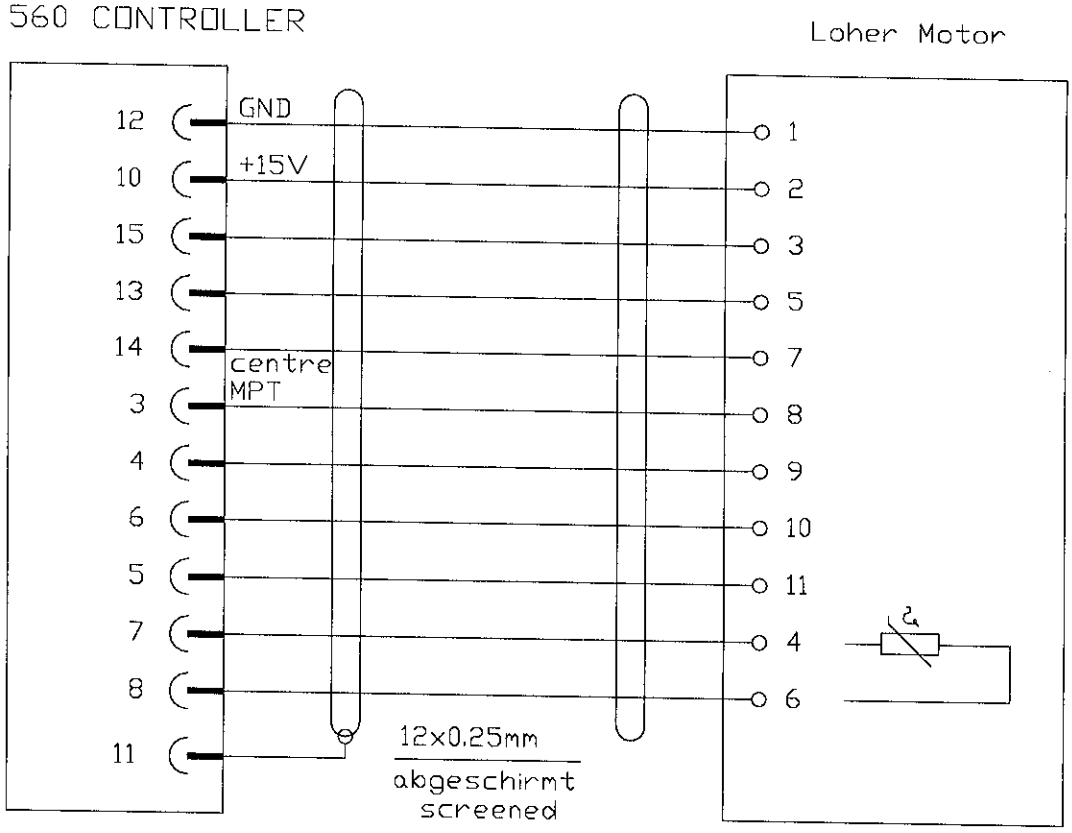
Connection to mains for 240v controller with
single phase feed without transformer

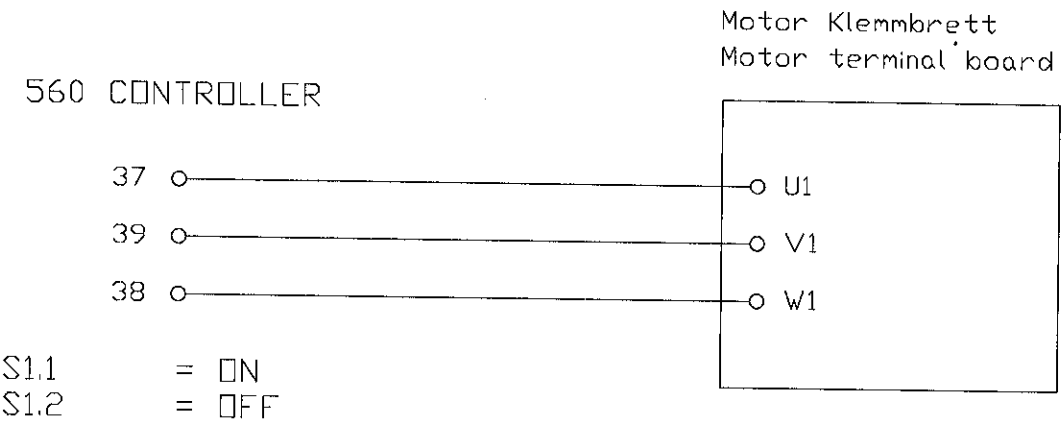


Netzversorgung für SMR mit
dreiphasiger Leistungseinspeisung
(über Vorschalttransformator falls erforderlich)

Connection to mains for 560 with
3 phase feed via transformer
(if necessary)

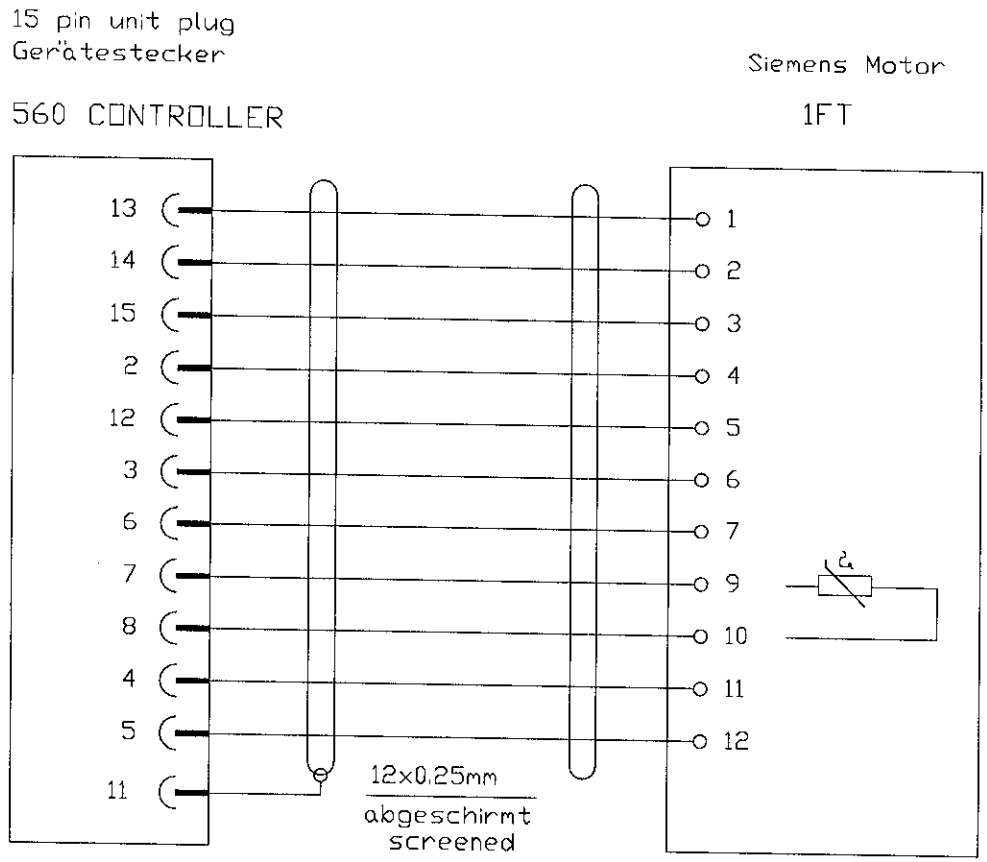
15 pin unit plug
Gerätestecker

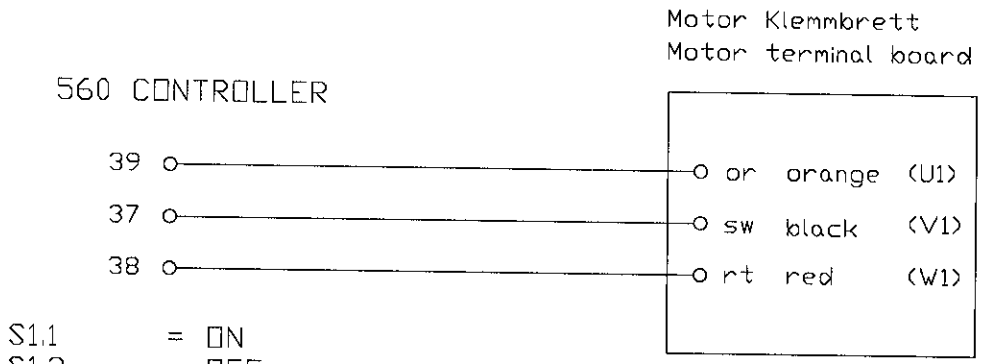




S1.1 = ON
S1.2 = OFF
S1.10 = OFF
RN1,RN2 = 27KOhm
Us = 220/380V

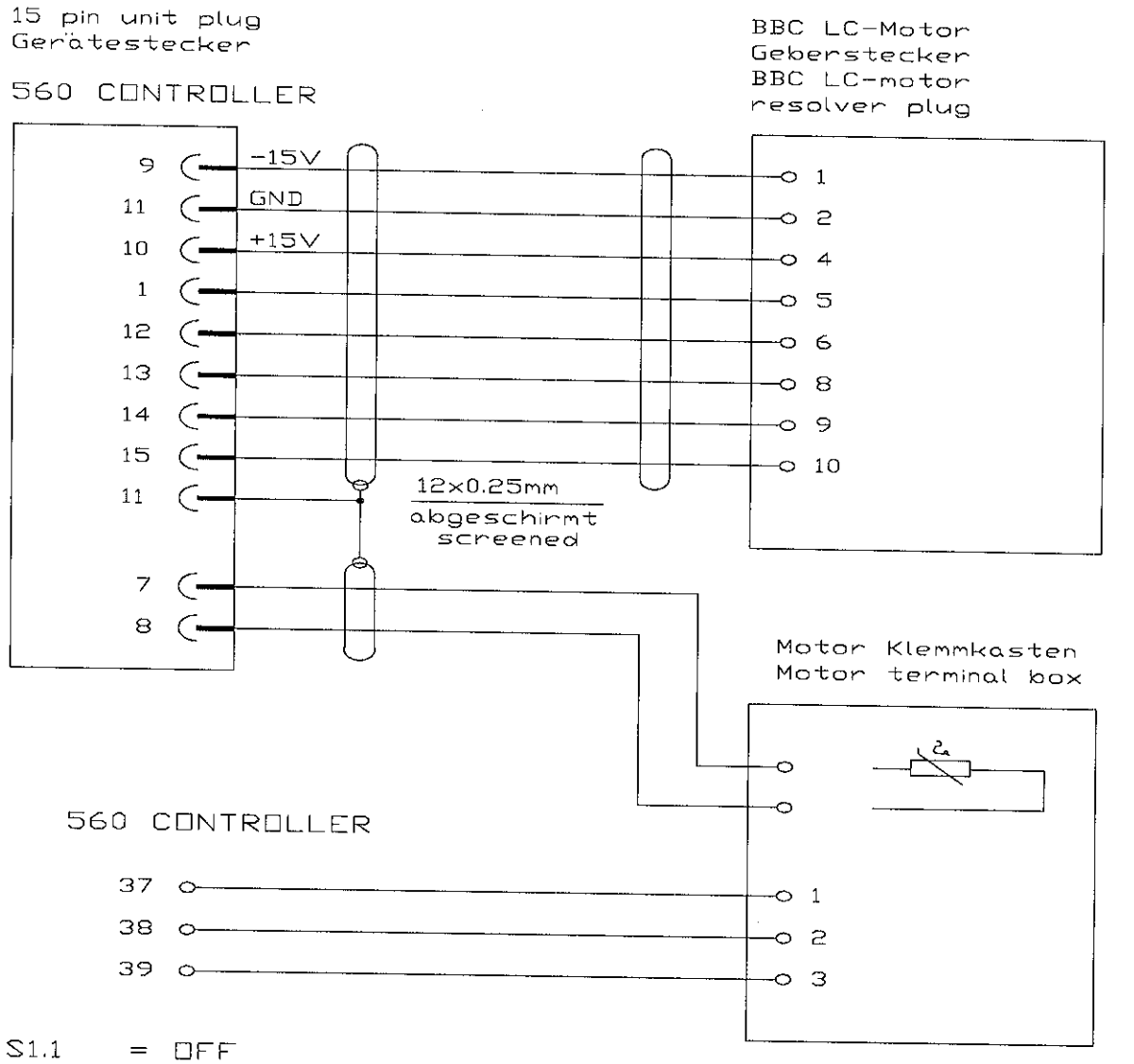
Anschlussschema für Loher Motore
Connection diagram for Loher motors





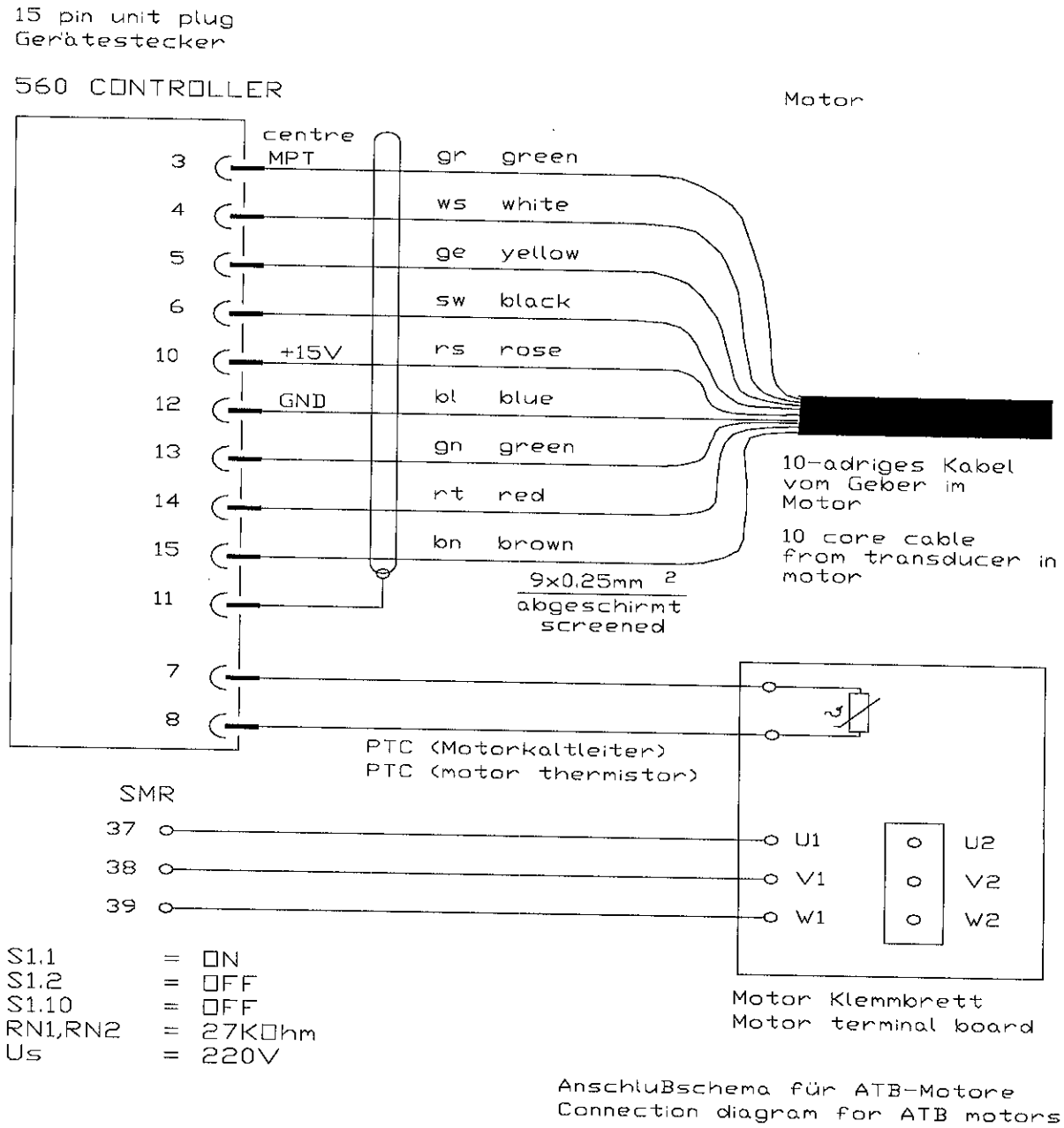
S1.1 = ON
S1.2 = OFF
S1.10 = OFF
RN1,RN2 = 68KOhm
Us = 220V

AnschluBschema für Siemens 1FT Motore
Connection diagram for Siemens 1FT motors



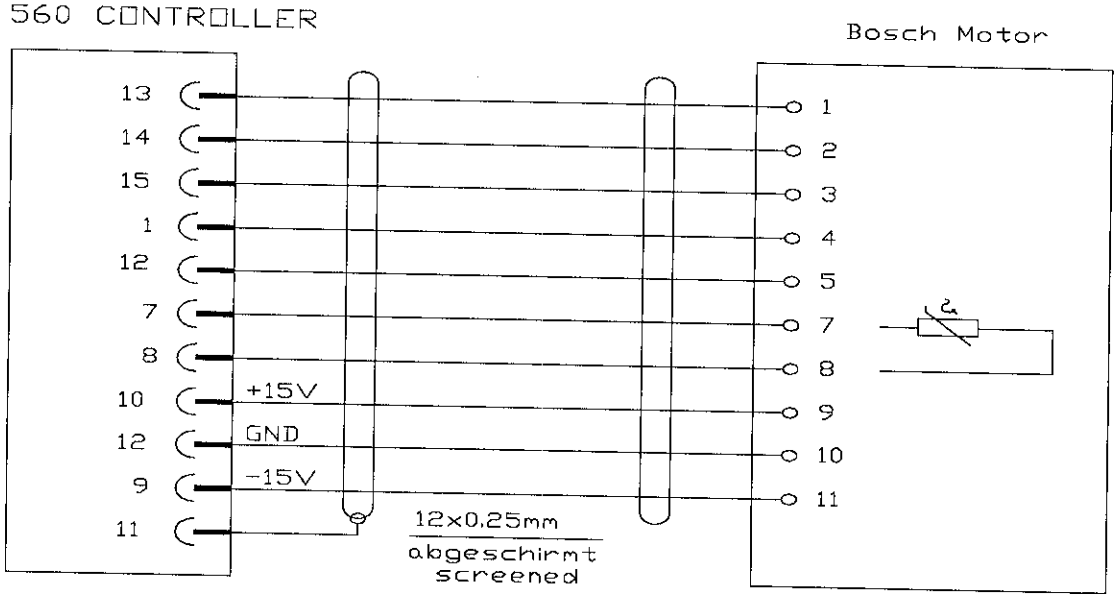
S1.1 = OFF
S1.2 = OFF
S1.10 = ON
Us = 220V

AnschluBschema für BBC LC-Motore
Connection diagram for BBC LC-motors


15 pin unit plug
Gerätestecker
560 CONTROLLER
Motor
centre
MPT
3
4
5
6
10
12
13
14
15
11
7
8
+15V
GND
gr green
ws white
ge yellow
sw black
rs rose
bl blue
gn green
rt red
bn brown
9x0.25mm 2
abgeschirmt
screened
10-adriges Kabel
vom Geber im
Motor
10 core cable
from transducer in
motor
PTC (Motorkaltleiter)
PTC (motor thermistor)
SMR
37
38
39
U1
V1
W1
U2
V2
W2
Motor Klemmbrett
Motor terminal board
S1.1 = ON
S1.2 = OFF
S1.10 = OFF
RN1,RN2 = 27KOhm
Us = 220V
Anschlußschema für ATB-Motore
Connection diagram for ATB motors

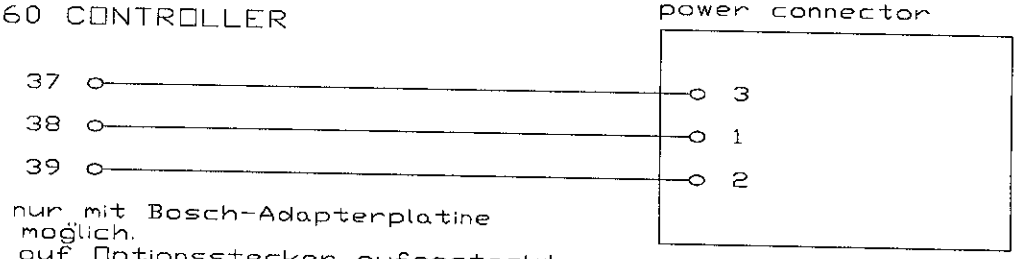
15 pin unit plug
Gerätestecker

560 CONTROLLER



Bosch Motor
Leistungsstecker
Bosch motor
power connector

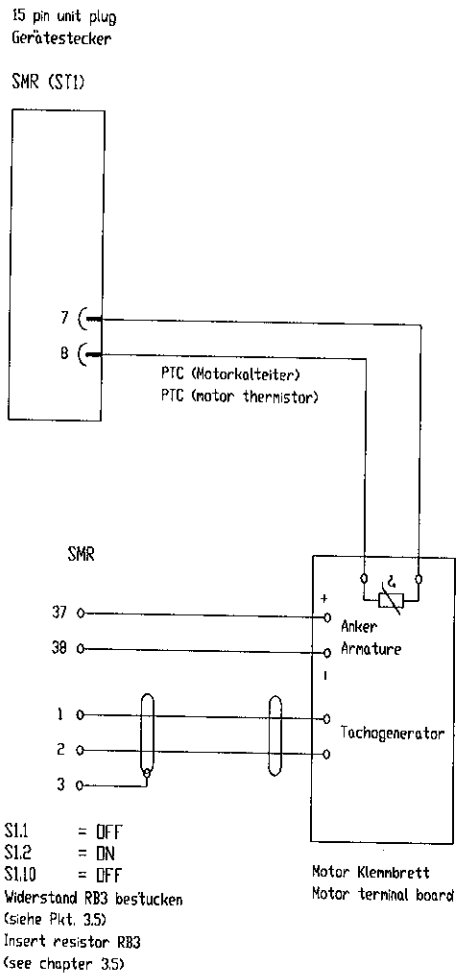
560 CONTROLLER



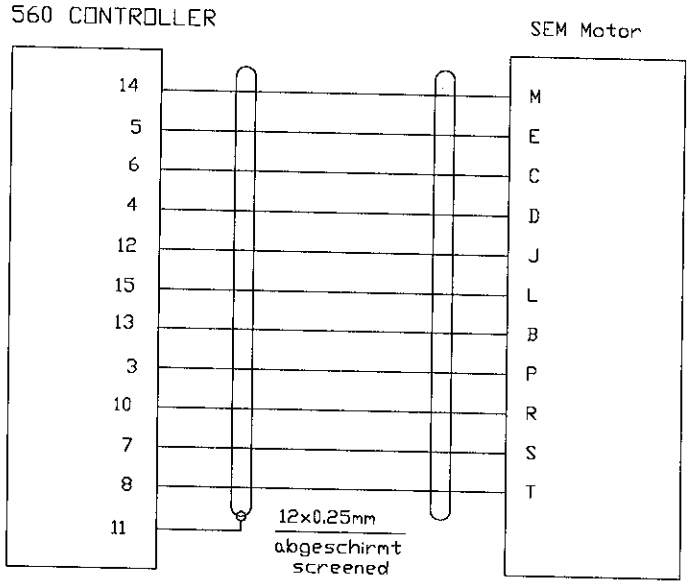
Betrieb nur mit Bosch-Adapterplatine
BO-AD1.0 möglich.
Sie wird auf Optionsstecker aufgesteckt.
For driving the Bosh motor
you need the option pc-board BO-AD1.0.
It has to be plugged in on the option-
connector of the electronic pc-board.

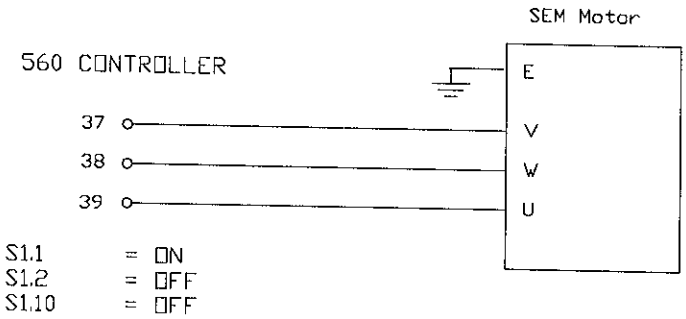
S1.1 = ON
S1.2 = OFF
S1.10 = OFF
Us = 380V

AnschluBschema für Bosch Motore
Connection diagram for Bosch motors



Anschlußschema für Gleichstrommotore
Connection diagram for D.C.-motors





Anschlussschema für SEM Motore
Connection diagram for SEM motors

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