TLDE-MDC/DC900 Series Digital DC Motor Driver

Product Manual
V3.6

NOTE.These instructions do not purport to cover all details or variations in equipment, or to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Supplier sales office. The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment, or relationship.

The sales contract contains the entire obligation of Code Automation (WuXi) Co., Ltd.

2. Warnings

2.1 General Warnings

Important:

READ AND UNDERSTAND THIS MANUAL BEFORE APPLYING POWER TO THE CODE-MDC/DC900 SERIES DIGITAL DC MOTOR DRIVE UNIT

Be careful

MDC/DC900 DC MotorDriver is high voltage electrical equipment.

Always use qualified personnel to design, construct and operate your systems.

If you have any doubts about the SAFETY of your systems , consult an expert immediately. Do not proceed without doing so.

MDC/DC900DC Motor Driver may constitute a safety hazard. It is the responsibility of the user to ensure the compliance of the installation with any acts or bylaws in force. Only skilled personnel should install and maintain this equipment after reading and understanding this instruction manual.

No liability is accepted for the installation or fitness for purpose or application of the DC00 series DC motor driver.

2.2 Warnings and Instructions

Only qualified personnel who thoroughly understand the operation of this equipment and any associated machinery should install, start-up or attempt maintenance of this equipment,otherwise it will cause injury to personnel or damage to equipment.

The driver and motor must be connected to an appropriate safety earth , otherwise there will be an electrical shock hazard.

Safe earthing takes precedence over EMC grounding. 

The equipment has been tested before left our factory. But before installation and use. inspect all equipment for transit damage, loose parts, packing materials etc.

During handling, installation and maintenance of the equipment.Please observe the electrostatic control precautions.

APPLICATION AREA

Industrial (non-consumer) "Motor speed control utilising DC motors".

2.3 Risks

INSTALLATION：The product is classified as a component and must be used in a suitable enclosure.
The cooling airflow around the equipment must comply with the specification.
Choose suitable cables and wires, and clamped to required torque.

Ensure that the rated armature current of the motor does not exceed the rated current of the equipment.

APPLICATION RISK: Electromechanical safety is the responsibility of users.

The integration of this product into other apparatus or systems is not the responsibility of the manufacturer or distributor of the product.

Because of the high earth leakage current.The driver and motor must be permanently connected to an appropriate safety earth.

Before running this equipment, ensure that the main power supply is isolated from terminals L1, L2 and L3.

Users should consider the following risk assessment according to the actual situation:
*Motor speed may be out of control.
*The motor speed may be excessive.

*The direction of rotation may be wrong.
*The motor may be charged.

Protection of insulation:

All bare metal parts in the driver are protected by basic insulation.and connected to an safety earth.

All signal terminals are protected by basic insulation.

Users must provide protective devices or safety systems. Prevent danger of injury or electric shock.

3. Product introduction

3.1 Brief introduction

DC motor has good starting and braking performance. It is suitable for occasions requiring smooth speed adjustment in a wide range. It has been widely applied in many areas of electric drive which require speed regulation or fast forward / reverse operation. From the control point of view.DC speed control system is the foundation of AC speed control system.

The system consists of a current regulator and a speed regulator. The speed and current double closed loop speed regulating system is formed. The current loop maintains current stability through current feedback. The speed loop maintains steady speed by speed feedback. Finally eliminate speed deviation.This enables the system to adjust the current and speed.
When the system starts.Because the speed loop is in saturation. Regulation by current loop .Keep armature current output maximum.Increase the speed rapidly to the set value of speed..When the system is running steadily.The motor speed changes with the speed setting by speed loop adjustment. The current loop follows the speed loop to adjust the armature current of the motor to balance the load current.

According to the above principles.We have designed three phase AC voltage suitable for vari ous national standards,Applied to separately excited,Shunt and permanent magnet digital DC motor driver.

In addition to the thyristor bridge. DC900 series driver of various specifications have the same power boards and CPU boards.

The MDC/DC900 series DC motor driver control circuit is completely isolated from the power circuit.

The coding circuit is automatically adjusted and applied to the power frequency between 45-60HZ. It has strong anti-interference ability.

This driver is an advanced, fast and high precision control algorithm based on 32 bit CPU.
Complex control algorithm.

Special application modules that can be configured by software.

The MDC/DC900 series DC motor driver includes two ways: regeneration and non- regeneration.

Regeneration: It includes two fully controlled thyristor armature bridges and a field excitation bridge. Includes acceleration and deceleration functions of ramps,speed and torque direct / reverse rotation of DC motor control system.

non- regeneration:It includes one fully controlled thyristor armature bridge and a field excitation bridge. Includes acceleration and deceleration functions of ramps,speed and torque direct / reverse rotation of DC motor control system. Rotate in one direction and provide precise speed and torque control.

3.2 How do they work?

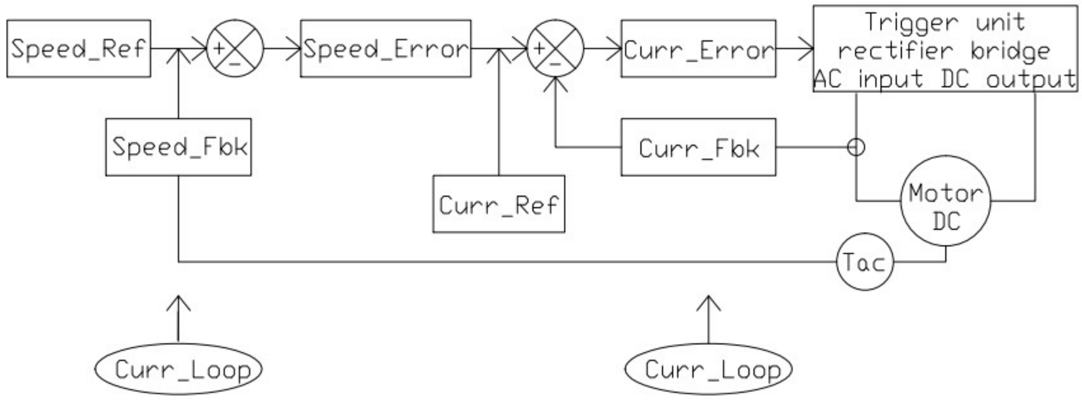


Figure 1

Figure 1 is the basic configuration of the MDC/DC900 series DC motor driver control loop.

3.2.1 Basic principle

The motor is in the start-up stage.The actual speed (speed feedback) of the motor is lower than the set speed. There is a deviation signal in the input of the speed loop regulator (speed error amplifier). The amplified output voltage is kept at the limit. The speed loop regulator works in an open loop state.

The output voltage of the speed loop adjuster is the input of the current loop regulator (the current error signal amplifier). The maximum output current requirement of the regulator is used as the phase shifted signal of the rectifier bridge. DC voltage rises rapidly. The motor starts with the maximum constant current. The maximum current (stall current) of the motor can be calibrated by changing the output limit of the speed loop regulator.

After the motor speed rises to the required speed. The input deviation signal of the speed loop adjuster is reduced to nearly zero. The speed loop regulator and the current loop regulator exit from saturation. The closed-loop regulation is starting to work. Speed disturbance caused by load changes.The speed deviation signal will pass through the speed loop regulator, the current loop regulator corrections the phase shift voltage of the trigger. DC voltage corresponding to output of rectifier bridge.Thus, the speed deviation of the motor is corrected and compensated.

3.2.2 Static characteristic analysis of double closed loop DC drive system.

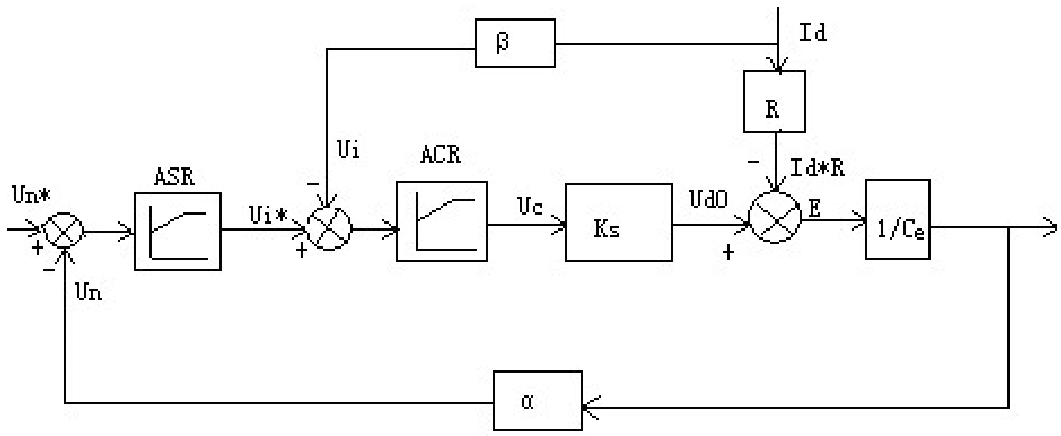


Figure 2

The key to analyze the static characteristics is to understand the steady state characteristics of the PI regulatorThere are generally two situations. saturated —Output reached limit amplitude.

Unsaturated —Output does not reach the limit amplitude.

When the regulator is saturated, the output is constant..Input changes no longer affect output unless a reverse input signal causes the regulator to exit saturation. That is, the saturated regulator temporarily prevents the connection between input and output. The regulator is in the open loop.When the regulator is not saturated, the regulator PI always causes the input bias voltage △ Uto be zero at steady state.

Actually. When the driver is running, the current loop will not be saturated. Therefore,For static characteristics.Speed loop are only two cases of saturation and unsaturated.

1) speed regulator (ASR) unsaturation

In this case, the two regulators are not saturated. Their input voltage deviation is zero at steady state.so,

$$U_n \quad U_n \quad n \quad n_0 \qquad (2\text{-}1)$$

$$U_i \quad U_i \quad I_d \qquad (2\text{-}2)$$

From the first equation relation：

$$n \quad U_n \quad n_0 \qquad (2\text{-}3)$$

The CA section of the static characteristic curve shown in Figure 3 is obtained. At the same time, ASR is not saturated. U_i U_{im} obtain I_d I_{dm}, That is to say, the CA segment characteristic extends from the limit no load state I_d=0 to I_{dm} I_d. This is the running section of static characteristics.

2) speed regulator (ASR) saturation

In this case, the ASR output reaches the limit. U_{im}^{*}. The speed loop operates in an open loop state. The system has become a closed loop current regulation system without static error:

$$I_d \quad \frac{U_{im}}{} \quad I_{dm} \qquad (2\text{-}4)$$

The maximum current depends on the overload tolerance of the motor and the maximum acceleration permitted by the drive system. The AB segment that obtains the static characteristic from the equation. It is a vertical straight line. This characteristic is only suitable for $n \quad n_0$. If

$n \quad n_0$, so $U_n \quad U_n$, ASR will exit saturation.

If the load current is less than Idm*. Speed loop adjustment without static error. Speed loop system is the main regulator. But when the load current reaches Idm*. Current loop system is the main regulator.Used for overload current protection.In fact, the open-loop amplification factor of the operational amplifier is not infinite. Therefore,there is a certain static error in static characteristics. See the dotted line in Figure 3.

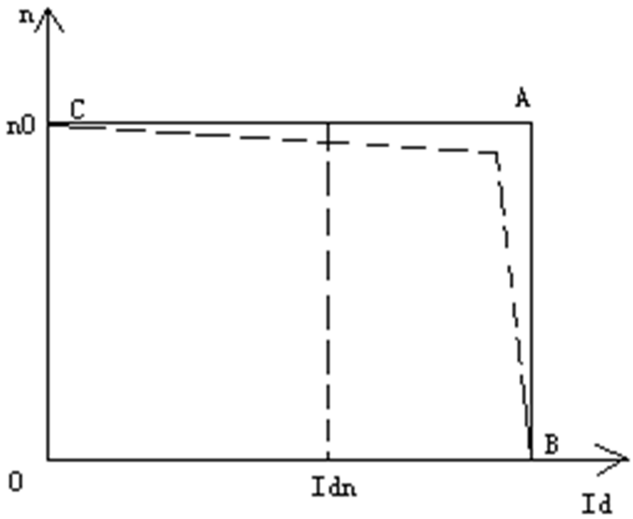


Figure 3

3.3 General technical data of products

INPUT VOLTAGE RANGE：
Main 3 phase 50 - 60Hz.
Any supply from 12 to 100VAC， 100 to 500VAC（±10%）for armature power. Supply Current:(0.9 x Idc) Amps ac

Note： Main power supply voltage can be from 500 to 690VAC（±10%）.50-60（±10%）HZ. Please specify voltage range when ordering..

Auxiliary Single-phase 50 - 60Hz
Single-phase 110VAC（±10%）or 220VAC（±10%）(Related to drive cooling fan voltage.）
Auxiliary Supply Current： 3A AC maximum. Nominal current used for power supplies: 0.5A at 115V AC ,0.25A at 230V AC.
DC24V Maximum output curren： 400mA

Driver output range：

Armature voltage: 0 to +1.15 times AC supply.
Field voltage： 0 to 0.9 times AC supply.
Armature current： The output current figures are given at 100% Continuous (no overload), and with overloads of 150% for 30 seconds or 200% for 10 seconds.

Control Action:

Fully digital.
Advanced PI with fully adaptive current loops for optimum dynamic performance.
Self tuning armature and field current loop using "auto tuning" algorithm
Adjustable speed PI with integral defeat.

Speed Control:

By Armature Voltage feedback with IR compensation
By Encoder feedback or analog tachogenerator
Speed Range 100 to 1 typical with tachogenerator feedback

Steady State Accuracy:

2 % Armature Voltage Feedback.
0.1 % Analog Tach Feedback.
0.01 % Encoder Feedback with Digital setpoint.
Maximum encoder frequency 100KHz

Control Circuits : Fully isolated from power circuit.

Protection:：

device networks.	Overcurrent (instantaneous).
Field failure.	Tacho failure.
Thyristor Stack overtemperature.	Motor over-temperature.

Stall protection. Zero-speed detection.
Standstill logic. Thyristor "Trigger" failure.

Alarms monitor： Fully computerised with first fault latch, automatic display and power off memory.

Rated temperature:： 0-50℃.
If the temperature exceeds the rated temperature, the driver needs to reduce the capacity. Output current values should be derated at 1% per degree Centigrade above rated temperature.
-25℃- +55℃storage.
Protect from direct sunlight.
Ensure dry, corrosive free environment.

Altitude： Output current values should be derated at an altitude of 500 metres above sea level at a rate of 1% per 200 metres to a maximum of 5000 metres.

Humidity： 85% Relative humidity maximum. Do not allow condensation.

Atmosphere: Non-flammable, non-condensing. Pollution Degree: 2

Field output: Constant current, Constant voltage, Automatic weakening.
Delayed quenching after stop command to allow dynamic braking.

Special features: Field weakening. digital pot.
PC configuration and monitoring tool.

SPEC.APP BLOCKS： PID,TAPER TENS,DIAMETER CALC,SUMMER,MULTI SPDS.CTRL.

Serial comms: RS232 port,DP ,DEVICENET etc.

Basic rating table

CODE-MDC/DC900 Series Digital DC Motor Driver				
Model	Regen Mode	Rated Armature I	Rated Field I	Motor(KW) 440V DC
DC900-2-500-40-10-1-0-0	2Q	40A	10A	7.5KW-15KW
DC900-4-500-40-10-1-0-0	4Q	20A	10A	7.5KW-15KW
DC900-2-500-80-10-1-0-0	2Q	80A	10A	18.5KW-30KW
DC900-4-500-80-10-1-0-0	4Q	80A	10A	18.5KW-30KW
DC900-2-500-120-20-1-0-0	2Q	120A	20A	37KW-45KW
DC900-4-500-120-10-1-0-0	4Q	120A	20A	37KW-45KW

DC900-2-500-160-20-1-0-0	2Q	160A	20A	55KW
DC900-4-500-160-20-1-0-0	4Q	160A	20A	55KW
DC900-2-500-200-20-1-0-0	2Q	200A	20A	75KW
DC900-4-500-200-20-1-0-0	4Q	200A	20A	75KW
DC900-2-500-280-20-1-0-0	2Q	280A	20A	90KW-110KW
DC900-4-500-280-20-1-0-0	4Q	280A	20A	90KW-110KW
DC900-2-500-400-30-1-0-0	2Q	400A	30A	132KW-160KW
DC900-4-500-400-30-1-0-0	4Q	400A	30A	132KW-160KW
DC900-2-500-550-30-1-0-0	2Q	550A	30A	180KW-220KW
DC900-4-500-550-30-1-0-0	4Q	550A	30A	180KW-220KW
DC900-2-500-700-30-1-0-0	2Q	700A	30A	250KW-280KW
DC900-4-500-700-30-1-0-0	4Q	700A	30A	250KW-280KW
DC900-2-500-850-30-1-0-0	2Q	850A	30A	315KW
DC900-4-500-850-30-1-0-0	4Q	850A	30A	315KW
DC900-2-500-900-30-1-0-0	2Q	850A	30A	355KW
DC900-4-500-900-30-1-0-0	4Q	850A	30A	355KW
DC900-2-500-1200-40-1-0-0	2Q	1200A	40A	400KW-450KW
DC900-4-500-1200-40-1-0-0	4Q	1200A	40A	400KW-450KW
DC900-2-500-1600-50-1-0-0	2Q	1600A	50A	500KW-550KW
DC900-4-500-1600-50-1-0-0	4Q	1600A	50A	500KW-550KW
DC900-2-500-2000-50-1-0-0	2Q	2000A	50A	600KW-750KW
DC900-4-500-2000-50-1-0-0	4Q	2000A	50A	600KW-750KW
DC900-2-500-2600-60-1-0-0	2Q	2600A	60A	800KW-1000KW
DC900-4-500-2600-60-1-0-0	4Q	2600A	60A	800KW-1000KW

3.4 Model code description :

CODE-MDC/DC900—口—口—口—口—口—口—口-口

1 2 3 4 5 6 7 8

MDC:Motor Drive Controller

DC900：DC 1000 Series

NO 1: 2 = non-regeneration mode（2Q). 4 = regeneration mode（4Q）.

NO 2：500 = the main power, supply voltage can be from 100VAC to 500VAC（±10%），50/60HZ.
690 =the main power, supply voltage can be from 600VAC to 690VAC（±10%），50/60HZ.

NO 3：Rated armature current. For example, 400 represents 400A.

No 4：Rated field current. For example, 10 represents 10A.

NO 5: 0= auxiliary supply 110VAC (±10%), Single-phase 50 - 60Hz.
1= auxiliary supply 220VAC (±10%), Single-phase 50 - 60Hz.

NO 6：0 = No Comms option fitted RS=485/422(EI ASCII or MODBUS RTU,EI BINARY)
PRO=PROFBUS DP, PRT=PROFINET

NO 7：specifying the user interface language: 0=CHINESE ； 1=ENGLISH

NO 8：Special code

3.5 Terminal Information of drive

CODE-MDC/DC900 Series Digital DC Motor Driver
—Control Board
(Terminal Number=TN, Ditital Input=DI, Ditital Output=DO)

TN	Terminal Description	**Terminal default function** **Note**：+24V=True，0V=False	Signal Level	Configurable
		DI>+16V=True.Input impedance 10KΩ. DO=+24V， maximum total to the +24V output of 400mA.		
X1	0V	Zero Volt Reference		No
X2	AI 1	SUMMER 1 input 1. ±10V=±100% speed setpoint	±10V=±100%	Yes

X3	AI 2	Aux. Speed Setpoint/ Current Demand The function of this input is determined by DI 3 at terminal Y8. Y8 open circuit = Speed Setpoint ,Y8 at +24V = Current Demand. X3 is a direct input into the speed loop/current loop and is scanned synchronously with the current loop (typically every 3.33ms) rather than every micro cycle time (typically 7ms). Therefore it should be used for any signal whose response is critical e.g. a trim input from a digital speed and position locking system.	±10V=±100%	No
X4	AI 3	Ramped Speed Setpoin ±10V=±100% speed setpoint	±10V=±100%	Yes
X5	AI 4	Lower I Clamp ±10V=±200% current clamp	±10V=±200%	Yes
X6	AI 5	Y6=True， X6 is Upper I Clamp. X5 is Lower I Clamp. X6 is always greater than X5， and can be positive or negative at the same time. Y6=False ,X6=Main Current Limit.	±10V=±200%	Yes
X7	Current Meter Output	Buffered Armature Current Output Bipolar Mode ±10V= ±200% output current Unipolar Mode +10V= 200% output current Output current ±5mA maximum	±10V=±200%	No
X8	AO 1	Speed Feedback output ±10V= ±100% speed feedback Output current ±5mA maximum	±10V=±100%	Yes

X9	AO 2	Total Speed Setpoint output ±10V= ±100% speed setpoint Output current ±5mA maximum	±10V=±100%	Yes
Y1	0V	Zero Volt Reference		No

Y2	Thermistor Input	Motor temperature thermistor. If unused then connect to 0V. OK<200Ω, Overtemp >22KΩ.Connect from THM to 0V.		No
Y3	Start/Run Input	The driver has no alarm, and Y5, Z6 and Z7 =true.When an input is applied to this terminal, the main contactor will close and the controller will operate. When the input is removed the controller will perform a regenerative stop to 0 speed. A regenerative stop can only be achieved by a 4 Q controller; the 2Q non-regenerative controller will coast to 0 speed.	+24V=Run, 0V = Normal Stop	No
Y4	Jog Input	When Y3=false and Y4=true, the drive jogs.When the Jog Input is removed the drive will ramp down to zero obeying the Jog Ramp Rate.	+24V = Jog	Yes
Y5	Enable Input	If the enable input is not true all control loops will be inhibited and the controller will not function.	+24V = Enable, 0V =Inhibit	No
Y6	DI 1	This input alters the configuration of the current clamps. When Y6=False, Analogue input X6 provides a symmetric bi-polar current limit. When high, analogue inputX6 is the upper current clamp and analogue input X5 is the lower current clamp.	+24V =Bipolar Clamp, 0V =Unipolar Clamp	Yes
Y7	DI 2	Ramp Hold If Y7=true, the ramp output is held at the last value irrespective of the Ramped Reference Input. When Y7=false, the output follows the ramped reference input with a ramp time determined by the ramp up/down time parameters.	+24V=True 0V=False	Yes
Y8	DI 3	Current Demand Isolate This input alters the drive operation from Speed Control to Current Control. When DI 3(Y8) is true, AI 2(X3) provides the current demand and	+24V = Current, 0V = Speed	Yes

		the speed loop is disconnected. When false the speed loop is in control and AI 2(X3) is an auxiliary speed setpoint. See SPEED LOOP,SPEED SUMMER,SPD.INPUT2/X3		
Y9	+24V Supply	For all 3 DO together there is a maximum allowable limit of 350mA.		No
Z1	0V	Zero Volt Reference		No
Z2	+24V Supply	For all 3 DO together there is a maximum allowable limit of 350mA.		No
Z3	DO 1	Zero Speed Output The operating level of this output can be modified by ZERO SPD FLAG to give the desired speed threshold of operation. Z3=True indicates Zero speed.	+24V=True, At 0 speed. (100mA maximum)	Yes
Z4	DO 2	Drive healthy Z4=true, when the driver is healthy.	+24V=Healthy（100mA maximum)	Yes
Z5	DO 3	Drive ready Z5=true when the driver is ready to function, i.e., “locked” into the mains.	+24V=Ready（100mA maximum）	Yes
Z6	Program Stop	When Z6=true, the driver operates as required by the inputs. When Z6=0v or open circuit, the controller provides a controlled or ramp stop as defined by the STOP SET parameters.	+24V=drive run, 0V(o/c)= Program Stop	No
Z7	Coast Stop Input	Coast Stop When z7= +24V, the controller operates normally. When z7=0V or open circuit, the main contactor is open and the drive no longer operates. The motor coasts to rest.	+24V = run, 0V (o/c)coast stop	No
Z8	+10V DC Reference	+10V at 10mA short circuit protected.	+10VDC	No

Z9	-10V DC Reference	-10V at 10mA short circuit protected.	-10VDC	No

V1-V2	Tacho input	MDC/DC900 DC Driver built-in Analog Tacho feedback.This input is intended solely for the connection of an analogue bi-polar DC tachogenerator.An AC tachogenerator with a rectified output may also be used with MDC/DC900 series drives. A DC voltage of up to +/-200V DC maximum can be applied directly to V2 with respect to V1. V1: 0V V2: DC+	Maximum voltage:±200VDC	No
V3		0V=X1=Y1=Z1		NO
V4-V9	Encoder input	Encoder feedback is connected to the driver using shielded cable. The encoder is an upper frequency limit of 100 kHz.Therefore, for the 1000 L / r encoder, the encoder speed should not exceed 6000 rpm.		No
CODE-MDC/DC900 Series Digital DC Motor Driver Terminal Information—Power				
TN	Terminal Description	**Terminal default function**	Signal Level	Configurable
L1 L2 L3	Mains Supply	Three phase mains power input.Phase reference Line 1-3.	3phase: 12-100VAC, 100-500VAC, 600-690VAC	No
A+ A-	Dc power output	Dc power output connection to dc motor.	0 to +1.15 times AC supply.	No

W5+	Field Output	The DC output voltage at these terminals will depend upon the AC supply voltage and the mode of field control. Voltage Ctrl：This is an open loop setting of the field bridge-firing angle allowing the DC output voltage to be set between 0 to 90% of the	0 to 0.9 times AC supply	No
W6-		incoming supply voltage. E. g. for an AC supply of 400V the 90% output voltage is 360V DC. Note if the AC supply varies, then the field output voltage will vary in proportion. Also if the field resistance changes then the resulting output current will change. Current Ctrl：The range of output voltage is the same in this mode as in the voltage ctrl mode, however the control loop operates on the actual current flowing in the field and works to maintain this at the desired value. Providing that the output voltage is not clamped by the 90% natural limit, then the current delivered will always be controlled irrespective of supply and resistance changes. This is the preferred control strategy.		
W3/N W4/L	Main contactor	W4/L:This terminal is the switched output from the contactor control relay and is derived from the auxiliary supply at terminal W1. The output is internally fused at 3A hence contactor coils having a high pick-up current must be operated via a slave relay. Note: The contacts of the Contactor Control Relay are suppressed by a series connected resistor (680 Ohms) and capacitor (22nF) to protect the relay contacts. Users should be aware that when the contactor Control Relay is “De-energised”, a leakage current of approximately 2mA can be expected and this should be considered when interfacing to these terminals. Typically, there could be the energisation of very sensitive relays. W3/N:Neutral This terminal is internally connected to the auxiliary supply neutral and provides a convenient connection point for the contactor coil neutral connection.	Reference auxiliary Supply	No

W1/L W2/N	Auxiliary supply	W1：Line　W2：Neutral The mains input connections for the switch mode power supply and contactor control relay supply.	Single-phase: 110VAC （±10%） or 220VAC （±10%）	No
PE	Protective ground	PE：　incoming ground	Bolt connection	No
		PE：　motor ground PE：Protective ground		

3.6 Control terminals overview.

3.6.1 General requirements

The general requirements of industrial process equipment are that apart from performing their intrinsic function, they must interface with external systems. Four interfaces(AI,AO,DI,DO) are provided according to general requirements.

3.6.2 Analogue inputs (AI)

Analogue inputs, able to accept linear bi-polar(±) reference or feedback signals. The AI are required to accurately measure±10V sign.The resolution (minimum recognisable steps) must be as small as possible and the conversion to a number must be as fast as possible to give good response times. The MDC/DC00 series not only possesses 5 analogue inputs, but also measures all of these with up to 5mV plus sign resolution and with excellent response time. All the AI voltages can be monitored using the built in menus.

Analogue tachogenerator input： This input is intended solely for the connection of an analogue bi-polar DC tachogenerator.An AC tachogenerator with a rectified output may also be used with MDC/DC900 series drives. A DC voltage of up to +/-200V DC maximum can be applied directly to V2 with respect to V1.

3.6.3 Analogue inputs (AO)

Analogue outputs, able to provide linear bi-polar signals. The analogue outputs do not usually need to be so numerous, as software connections can be made by the user. Even so 3 AO are available of which 2 are programmable. The analogue outputs are individually short circuit protected to 0V. However they are not protected for simultaneous shorts. Output current ±5mA maximum.

3.6.4 Digital inputs and outputs（DI and DO)

Digital inputs able, to recognise logic levels using 24V logic.Digital outputs able, to drive 24V relays, lamps, sensors etc. An important consideration is the ability of the equipment to survive a harsh environment.The most frequent types of problem are short circuits and excessive voltages being applied to the digital inputs and outputs.

* All the digital inputs and outputs of MDC/DC900 seriesDC Drivers can withstand up to +50V applied continuously.

*All DI terminals are overvoltage protected to +50V.. Input impedance 10KΩ。

* All digital outputs, including the 24V customer supply have been designed to withstand a direct short circuit to 0V.

*If a short circuit or overload occurs on one or more of the digital outputs, then all digital outputs are disabled and the short circuit condition is flagged.

*Digital outputs able, to drive 24V relays, lamps, sensors etc. Any one output is allowed to output up to 100mA. For MDC/DC900 seriesDC Drivers, all 3 outputs together there is a maximum allowable limit of 300mA. （ maximum total to the +24V output of 400mA ）。

4. Basic application

4.1 Minimum connection requirement

Basic speed or torque control of CODE-MDC/DC900 series DC motor driver 。

4.1 Minimum connection requirement

Basic speed or torque control of CODE-MDC/DC900 series DC motor driver 。

The essential elements of controlling the contactor are as follows.

1） The purpose of the main contactor is to provide mechanical isolation of the motor armature from the power supply. In the event of an emergency it must be possible for the supply to be removed electromechanically (without the aid of semiconductor electronics). This requirement is usually mandated by safety codes.

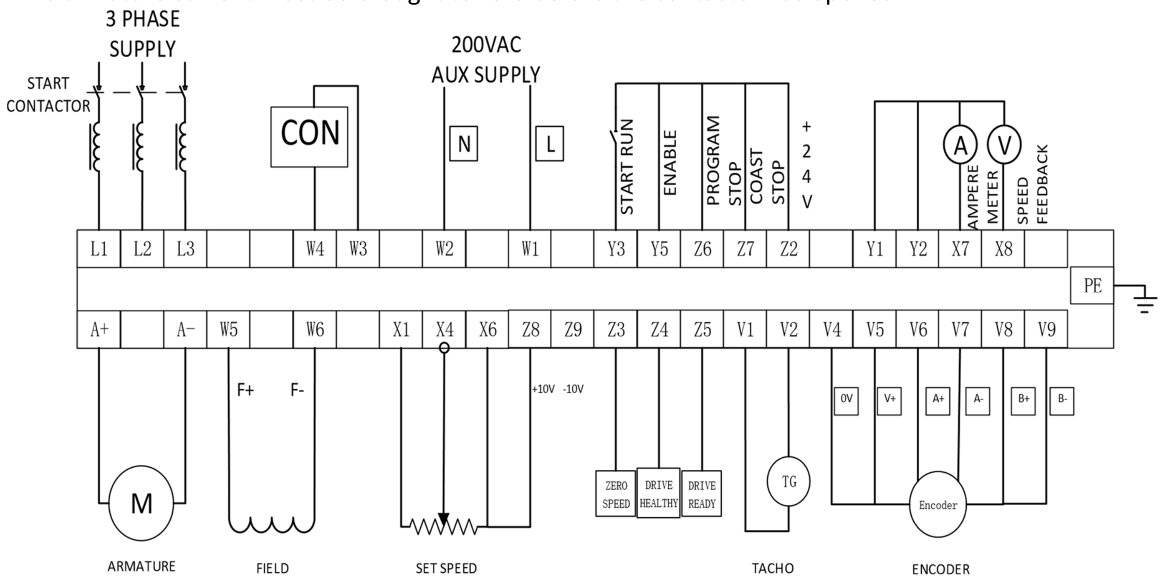
2） Under normal operation condition，The user sets the control contactor condition according to the MDC/DC900 Series DC drives instructions.

3） There is a capacitor across the relay coil which causes it to have a defined drop out time of approx. 100mS. This ensures that the MDC/DC900 Series DC drives has time to commutate the armature current to zero before the contacts open.

4） The contactor must not break current. To obey this rule the following applies:

a) The MDC/DC900 Series DC drives must not attempt to deliver armature current until after thecontactor has closed.

b) The armature current must be brought to zero before the contactor has opened.



Note： About DI 3(Y8)

This input alters the drive operation from Speed Control to Current Control. When DI 3(Y8) is true, AI 2(X3) provides the current demand and the speed loop is disconnected. When false the speed loop is in control and AI 2(X3) is an auxiliary speed setpoint.

4.2 Essential pre-start checks

1） All external fuses must be of the correct rating and type. The I^2t rating must be less than the rating specified in the rating tables. This includes main and auxiliary fuses. （Reference f**use selection table** ）。

2） Check that the motor armature resistance is about 1-3Ω over 360 deg rotation. Check that the field resistance in Ω = (field rated volts) / (fieldrated current).

3） Look inside the motor terminal box to verify correct wiring.

4） The cables and termination should be rated to carry the rated current with no more than a 25C temperature rise, and all terminations should be tightened to the correct torque. See 7.5.1 Terminal tightening torques.

5） Check that the motor vent blower is free to rotate, and remember to re-check the airflow when the blower is operating.

6） is the connection between the motor and the load properly.

7） Mains power supply voltage is correct.Auxiliary power supply voltage is correct.

8） Check carefully whether the DC drive wiring is correct according to the drawing.

9） For systems employing torque control it is recommended to set up in basic speed mode first in order toestablish correct speed loop functioning and calibration.

10） Check whether the basic parameters of the motor are set correctly（Armature voltage,Armature current， Field voltage,Field current etc.).

11） The speed feedback is always present, and in the correct polarity.

12） Armature current loop autotune：Set the AUTOTUNE parameter to ARMATURE.Close the main contactor, i.e. Start/Run signal to terminal Y3 and Energise the Enable terminal Y5.The Autotune sequence is initiated. When complete (after approximately 10 seconds), the maincontactor is opened automatically signalling the end of the sequence and the AUTOTUNE parameter is reset to OFF.

4.3 Starting driver

1） After the **4.2 Essential pre-start checks.**Start/Run signal to terminal Y3 （Y5,Z6,Z7=True=+24VDC).

Close the main contactor.

2） Check whether the field voltage is in normal range.

3） Activate the Start controls. Slowly increase the speed control potentiometer whilst observing the shaft rotation.If the driver has an alarm after starting, the alarm must be released according to the alarm instructions.

Note it may be necessary to reduce the speed loop gain for smooth running.

5. Menu operation

5.1 Operation key function

“↑” （UP or INCREASE）:

Navigation - Moves upwards through the list of parameters.

Command Acknowledge - Confirms action when in a command menu.

Parameter - Increments the value of the displayed parameter.

“↓” （DOWN or DECREASE）:

Navigation - Moves downwards through the list of parameters.

Parameter - Decrements the value of the displayed parameter.

“M” （MENU）:

Navigation - Displays the next Menu level, or the first parameter of the current Menu.

Parameter - Holding M down when a parameter is displayed shows that parameter's Tag No.

Repeated pressing at a writable parameter moves a cursor across the value to allow rapid increment/decrement of the parameter value.

“**E**” （ESC）:

Navigation - Displays the previous level's Menu.

Parameter - Returns to the parameter list.

Trip Acknowledge - Acknowledges displayed Trip or Error message.

5.2 Parameter save

Storing the altered values in the drive so that they are retained when the control supply is removed. This is achieved by travelling to the PARAMETER SAVE location in the main menu. Then press the “M” key to display "UP TO SAVE". Once there, using the “↑” key saves all the presently prevailing parameter values. The bottom line of the display will read SAVING and then FINISHED. Back to show that"UP TO SAVE" indicates that the parameter has been saved.

5.3 Restoring the drive parameters to the default condition

If all 4 keys are held down during the application of the control supply,then the MDC/DC900 series DC drives will automatically display the default parameters and connections.

6 Display and monitor

6.1 Display

1 LCD, which can monitor the working status of the driver.

6.2 6 LED functions

HEALTH

RUN

START CONTACTOR

OVER CURRENT TRIP

PROGRAM STOP

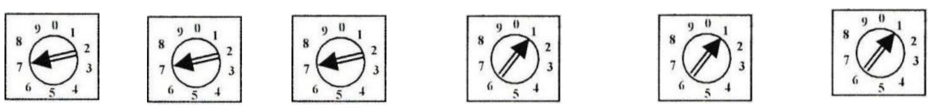
COAST STOP

7 Function module and parameter specification

7.1 Panel settings

7.1.1 Current setting

1. Armature current setting 2. Field current setting



X100 X10 X1 X10 X1 X0.1

7.1.2 Armature voltage

SW	Armature voltage setting （V）															
	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
3	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0
4	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0

7.1.3 Analog tachogenerator feedback seting

Voltage range of analog tachogenerator (DC10V-210V)

OFF	1V	2V	2V	5V	10V	20V	20V	50V	50V	50V
ON	1	2	3	4	5	6	7	8	9	10

7.2 MONITOR

MONITOR This function block is used to monitor the status of the drive, internal variables, and its inputs and outputs.				
Menu / Description	Default	Range	Mode	PIN
SPD DEMAND Speed loop total setpoint after the ramp-to-zero block.	0.00%	±105%	R	
SPD.FBK. Shows the value of the speed feedback as a % of full scale.	0.00%	±150%	R	
SPD.ERROR Shows the value of the speed error as a % of full scale.	0.00%	±150%	R	
ARM.I DEM. Shows the value of the total armature current demand as a % of full scale（Current loop demand (speed error PI output or external current demand clamped by all the current limits）	0.00%	±200%	R	
ARM.I FBK Shows the value of armature current as a % of full scale.	0.00%	±200%	R	

I CLAMP + Shows the % value of the scaled upper current limit in the current clamp block.	0.0%	±200%	R	

I CLAMP - Shows the % value of the scaled lower current limit in the current clamp block	0.0%	±200%	R	
TOTAL I LIM + Shows the % value of the prevailing upper limit in the current clamp block.	0.0%	±200%	R	
TOTAL I LIM - Shows the % value of the prevailing lower limit in the current clamp block.	0.0%	±200%	R	
AT ARM I LIMIT Shows if the armature current has reached the prevailing current limit clamp.	FALSE	TRUE/FALSE	R	
AT 0 SPD FBK Allows the zero speed status to be monitored.	TRUE	TRUE/FALSE	R	
AT 0 SETPOINT At zero speed demand.	TRUE	TRUE/FALSE	R	
AT STANDSTILL AT ZERO SPD.FBK and AT ZERO REF.	TRUE	TRUE/FALSE	R	
STALL TRIP	FALSE	TRUE/FALSE	R	
FIELD ENABLE Shows whether the field output is active (ENABLED) or inactive (DISABLED).	DISABLE D	ENABLED/ DISABLED	R	
FLD DEMAND The meaning of field demand depends upon which mode of field control is in force; in CURRENT CTRL. FLD.DEM is the current setpoint to the field loop, in VOLTAGE CTRL. modeFLD.DEM is the voltage ratio to the field controller.	0.00%	0 to+100%	R	

FLD I FBK. Shows the value of the average DC motor field current as a % of rated field amps.	0.00%	0 to+125%	R	
FLD FIRING ANGLE Shows the value of the field bridge firing angle.Field firing angle in degrees: 155 degrees is the value for back stop (min field) and 5 degrees is the value for front stop (max field).Field volts=0.9* AC supply volts*(1+cosa）/2。	0.00	5-155DEG	R	
ANIN 1 (X2) Analog Input 1： Aux. Speed Setpoint/ Current Demand.See 3.5 Terminal Information of drive.	0.00	±10V	R	
ANIN 2 (X3) Analog Input 2： SUMMER 1 input 1.See 3.5 Terminal Information of drive.	0.00	±10V	R	
ANIN 3 (X4) Analog Input 3： Ramped Speed Setpoin.See 3.5 Terminal Information of drive.	0.00	±10V	R	
ANIN 4 (X5) Analog Input 4： Lower I Clamp.See 3.5 Terminal Information of drive.	0.00	±10V	R	
ANIN 5 (X6) Analog Input 5： Y6=True， X6 is Upper I Clamp. See 3.5 Terminal Information of drive.	0.00	±10V	R	
ANOUT 1 (X8) Analog output 1 : Speed Feedback output.See 3.5 Terminal Information of drive.	0.0	±10V	R	
ANOUT 2 (X9) Analog output 2 : Total Speed Setpoint output.See 3.5 Terminal Information of drive.	0.0	±10V	R	

START (Y3) Start/Run Input.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGITAL INPUT Y4 Digital Input : Jog Input.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGITAL INPUT Y5 Digital Input :Enable Input.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGIN 1 (Y6) Digital Input 1 : This input alters the configuration of the current clamps.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGIN 2 (Y7) Digital Input 2: Ramp Hold.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGIN 3 (Y8) Digital Input 3: Current Demand Isolate.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGOUT 1 (Z3) Digital output 1: Zero Speed Output.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGOUT 2 (Z4) Digital output 2: Drive Healthy.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGOUT 3 (Z5) Digital output 3: Drive Ready.See 3.5 Terminal Information of drive.	OFF	ON/OFF	R	
DIGITAL POT O/P Allows the output value of the digital pot to be monitored.	0.00%	±300%	R	

PID OTPUT PID block output.	0.00%	±315%	R	
PID CLAMPED Logic output indicating whether the PID limits are active.	FALSE	TRUE/FALSE	R	
PID ERROR PID error = Input 1 - Input 2.	0.00%	±105%	R	
SUMMER1 OP	0.00%	±200%	R	
SPD. TOT.STP. Shows the % value of the total speed demand after the STOP MODE/RAMP BLOCK（Speed loop total setpoint including the ramp output before the ramp-to-zero function）.	0.00%	±150%	R	
ARMATURE VOLTS	0.00%	±125%	R	
Shows the value of the average DC arm voltage as a % of desired max arm volts.				
BACK EMF Shows the value of the average DC back emf as a % of the desired max back emf（Back EMF = ARM.V FBK. - IR drop）	0V	0-rated	R	
TACH INPUT Shows the average DC tachogenerator voltage% independently of feedback type.	0.0%	±110%	R	
ENCODER Shows the value of the encoder revs per minute independently of feedback type.	0RPM	0 to± 6000RPM	R	

7.3CONFIG. DRIVER（Basic parameter config.）

When using the operation panel to configure the basic parameters.The “CONFIGU. DRIVER” menu contains a variety of important motor parameters settings.

CONFIGURATION This menu contains many of the parameters required for configuring the drive.				
Menu / Description	Default	Range	Mode	PIN

FLD CTRL MODE You can choose either voltage control or current control.	VOLTAGE CTRL.	VOLTAGE CTRL./CURREN T CTRL.	R/W	
FLD VOLTS RATION This is an open loop setting of the field bridge-firing angle allowing the DC output voltage to be set between 0 to 90% of the incoming supply voltage. E. g. for an AC supply of 400V the 90% output voltage is 360V DC.FLD.V%=Rated field voltage/supply voltage.	40.0%	0.0-90.0%	R/W	
FLD WEAK ENABLE This allows the field weakening to be enabled or disabled.Activates the additional motor back emf PID loop for field weakening (field spillover) control.	ENABLED	ENABLED/ DISABLED	R/W	
MAIN I LIMIT Main current limit parameter which is independent of current limit scaler and in series with the other three current limit blocks.	105.00%	200.00%	R/W	
AUTOTUNE Armature current loop autotune： Set the AUTOTUNE parameter to ARMATURE.Close the main contactor, i.e. Start/Run signal to terminal Y3 and Energise the Enable terminal Y5.The Autotune sequence is initiated. When complete (after approximately 10 seconds), the maincontactor is opened automatically signalling the end of the sequence and the AUTOTUNE parameter is reset to OFF.	OFF	OFF/ARMATUR E	R/W	

SPEED FBK SELECT ARM VOLTS.：In this mode,motor speed is calculated from the internal feedback of arm voltage. The volts for 100% speed feedback must be calculated and set into the parameter of RATED ARM.V.WARNING. This feedback mode is prohibited in field weakening operation. ANALOG TACH:Tachogenerator output a proportional DC voltage to speed.Setting details see 7.6.8 ANALOG TACHO(V1，V2). ENCODER:This shaft-mounted transducer provides frequency signals proportional to speed. The speed information is be expressed by the output pulses signals. /ENCODER+ANALOG:In this mode the tachogenerator provides a raw speed feedback and the encoder generate a fine feedback. With the combination of two feedback informations,the motor control could behave an improved perfomance with higher resolution and keep dynastability degrades at low speeds.	ARM VOLTS	ARM VOLTS/ENCODER+ANALOG//ENCODER/ANALOG TACH	R/W	
ENCODER LINES The number of lines on the encoder dataplate should be entered. Alternatively enter the number of cycles of high/low for one pulse train during one revolution.	1000	10-6000	R/W	
ENCODER RPM Motor top speed setting when using encoder feedback.	1500	0-6000	R/W	
ENCODER SIGN Use this to invert the encoder feedback sign if needed.	POSITIVE	POSITIVE/NEGATIVE	R/W	
SPD INT TIME	1.000s	0.001-30.000s	R/W	
Sets the integral time constant of the speed loop error amplifier.Generally an increased integral time will slow the response.				
SPEED P GAIN Sets the proportional gain of the speed loop error amplifier.Increase to improve response time, excessive values may cause instability.	15.00	0.00-200.00	R/W	

7.4 PARAMETER SETUP

7.4.1 RAMPS

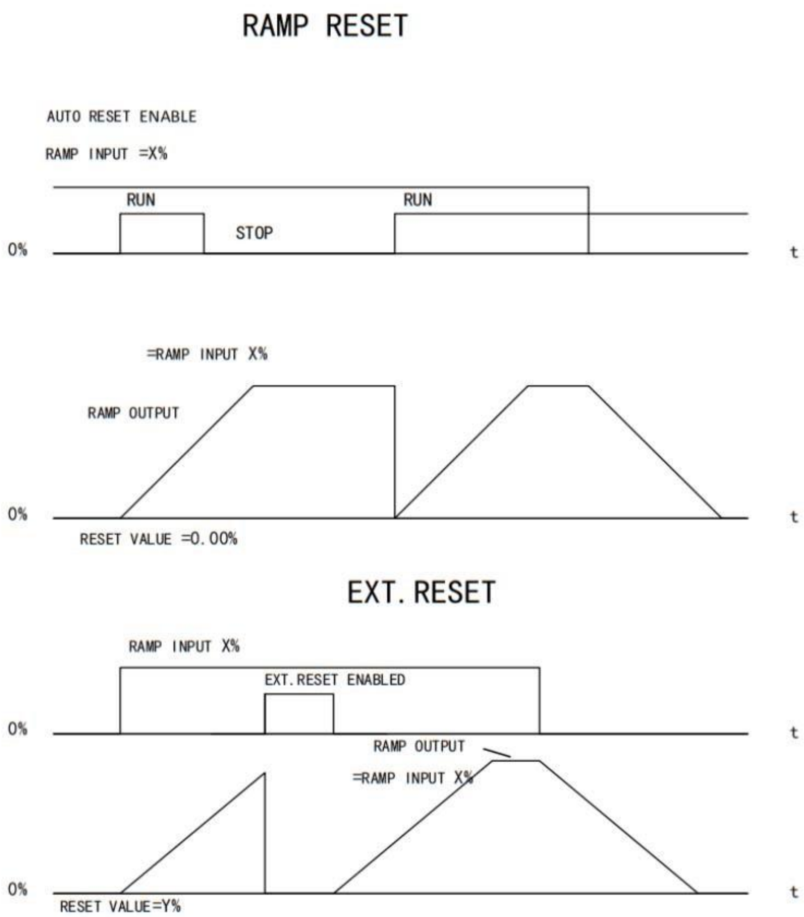
RAMPS

This block(Run mode RAMPS) sets the rate of acceleration and deceleration of the motor independantly of the incoming reference.

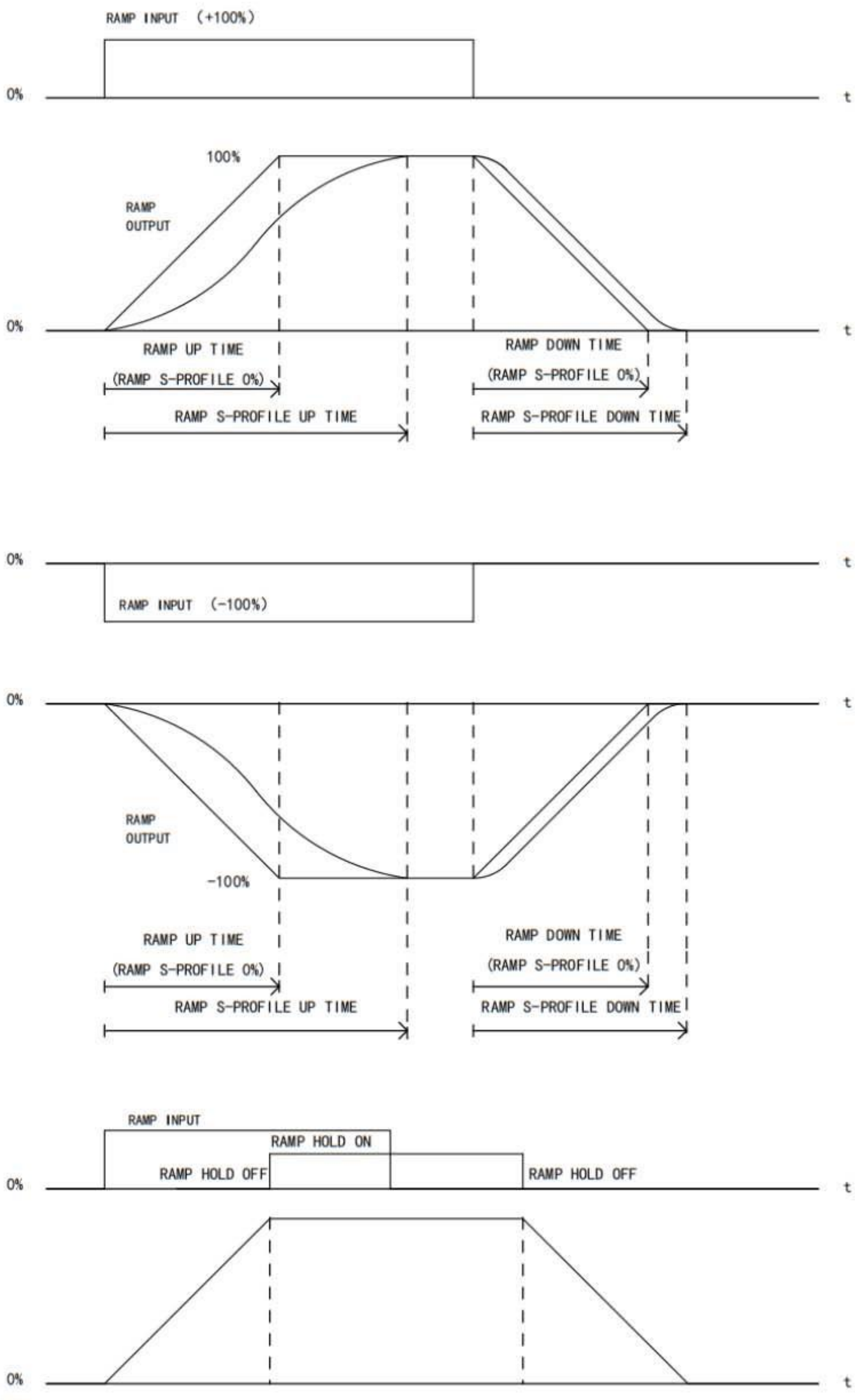
Menu / Description	Default	Range	Mode	PIN
RAMP UP TIME Sets the ramp up time for 0-100% or0--100% of the±ve reference.	10.0s	0.1-600.0s	R/W	
RAMP DOWN TIME Sets the ramp down time for 100%-0 or-100%-0of the±ve reference.	10.0s	0.1-600.0s	R/W	
RAMP HOLD When ON the ramp is held at the present value.	OFF	ON/OFF	R/W	
RAMPS INVERT Ramp input reverse.	FALSE	TRUE/FALSE	R/W	
RAMP INPUT Sets the run mode ramp input value.	0.00%	±100%	R/W	
RAMP S-PROFILE% This value sets the % of the S ramp shape at each end. A value of 0.00% will produce a linear ramp. The ramp time will be become longer when the S shape % is increased. This is because the rate of change in the remaining linear portion is maintained.	2.00%	0.00-100%	R/W	
RAMPING THRESH Sets the operating threshold for AT RAMPING output.	0.50%	0.00-100%	R/W	
AUTO RESET When enabled, the system reset also presets the ramp.The SYSTEM RESET produces a logic pulse (5mS) each time the MAIN CONTACTOR is energised.	ENABLED	ENABLED/ DISABLED	R/W	

EXT RESET When enabled the ramp is held in preset mode. EXTERNAL RESET does not depend on AUTO RESET for its operation.	DISABLED	ENABLED/ DISABLED	R/W	
RESET VALUE When the RAMP RESET is true,this value is pre-loaded into the output of ramp.	0.00%	±300%	R/W	
MIN SPD Supports the f ±ve ramp output at a minimum level.Note that when this parameter is set between 0 and 0.5%, then the ramp output follows the input at the desired ramp rates through zero, i.e. there are no min speeds operating and there is no hysterisis around zero.	0.00%	0.00-100%	R/W	

Functional Description



RAMP UP/DOWN TIME



Ramp Reset Description（RUN/JOG MODE）

MODE	AUTO RESET	EXT.RESET	RUN MODE RAMP	JOG MODE RAMP
1	DISABLED	DISABLED	Held at zero when stopped. Starts from zero.	Held at zero when stopped. Starts from zero.
2	DISABLED	ENABLED	Held at RESET VALUE permanently.	Held at RESET VALUE when stopped. Starts from RESET VALUE
3	ENABLED	DISABLED	Ramp continues to follow input reference when stopped. Starts from RESET VALUE	Ramp continues to follow input reference when stopped. Starts from PRESET VALUE
4	ENABLED	ENABLED	Held at RESET VALUE permanently.	Held at RESET VALUE when stopped. Starts from RESET VALUE

7.4.2 INT.SOFTWARE I/O

INT.SOFTWARE I/O The 3(ANDED INT.START,ANDED INT.JOG,ANDED INT.ENABLE.)drive control functions are **ANDED** with their respective hardware equivalent input terminal and the resulting output controls the drive. This allows the local terminal function to be over-ridden by a remote command, **OR** a remote command to be over-ridden by a local terminal.				
Menu / Description	Default	Range	Mode	PIN
ANDED INT START Sets a logic input to an internal AND gate to control START.	ON	ON/OFF	R/W	
ANDED INT JOG Sets a logic input to an internal AND gate to control JOG.	ON	ON/OFF	R/W	
ANDED INT ENABLE Sets a logic input to an internal AND gate to control ENABLE.	ON	ON/OFF	R/W	
INT DIGOUT 1 Allow external computers to directly control the output terminals.	OFF	ON/OFF	R/W	
INT DIGOUT 2 Allow external computers to directly control the output terminals.	OFF	ON/OFF	R/W	

INT DIGOUT 3 Allow external computers to directly control the output terminals.	OFF	ON/OFF	R/W	
INT ANOUT 1	0.00%	±100%	R/W	
INT ANOUT 2	0.00%	±100%	R/W	
INT JOG/SLACK	OFF	ON/OFF	R/W	

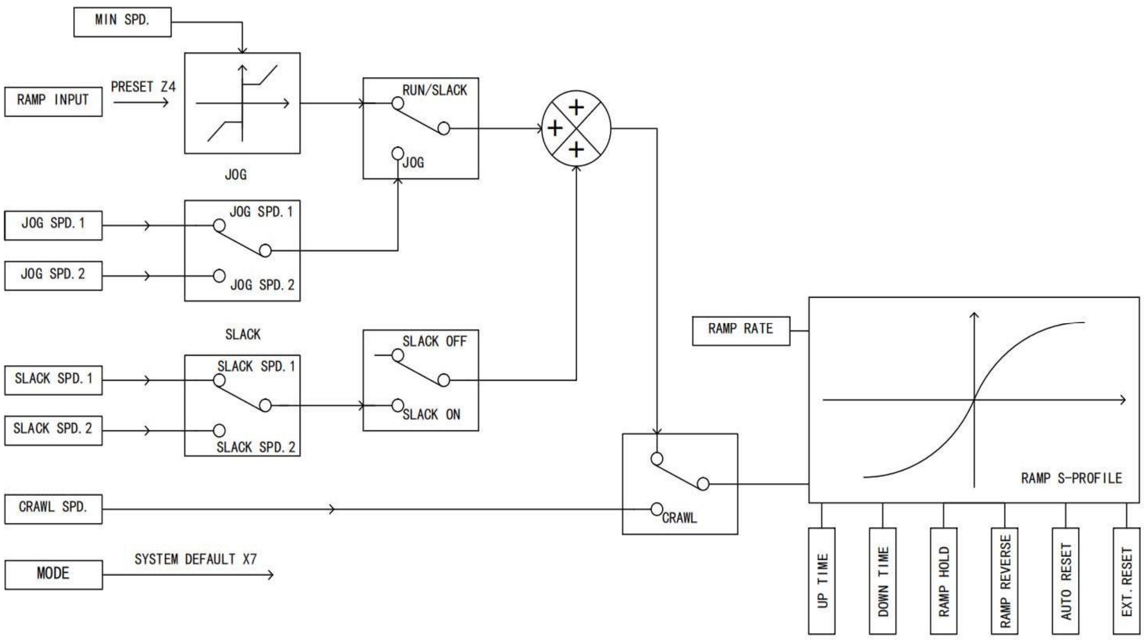
7.4.3 INT JOG/SLACK

INT JOG/SLACK This menu provides adjustment for parameters associated with jogging, slack take up and crawling.				
Menu / Description	Default	Range	Mode	PIN
JOG SPD 1 Sets the value of jog speed 1 .Usually used for forward jog.	5.00%	±100%	R/W	
JOG SPD 2 Sets the value of jog speed 2. Usually used for reverse jog.	-5.00%	±100%	R/W	
SLACK SPD 1 Sets the value of slack speed 1.Usually used for forward slack.	5.00%	±100%	R/W	
SLACK SPD 2 Sets the value of slack speed 2.Usually used for reverse slack.	-5.00%	±100%	R/W	
CRAWL SPD Sets the value of crawl speed.	10.00%	±100%	R/W	
MODE Combines with the START(Y3)/JOG(Y4) inputs for jog/crawl/slack mode.	FALSE	TRUE/FALSE	R/W	
RAMP RATE Jog mode has this ramp time which overides any others.The ramp time is the same for up/down and forward/reverse. It is the time taken to reach 100% speed.	1.0S	0.1-600.0S	R/W	

Run ModeDescription

Operating function	MODE	START (X3)	JOG (X5)	Ramp input Total value	Applied ramp time	Contactor state
Stopped	0V	0V	0V	Setpoint	Default	OFF
Stopped	+24V	0V	0V	Setpoint	Default	OF
Running	0V	+24V	0V	Setpoint	Default	ON
SLACK SPD 1	0V	+24V	+24V	Setpoint+SLACK SPD 1	Default	ON
SLACK SPD 2	+24V	+24V	0V	Setpoint+SLACK SPD 1	Default	ON
JOG SPD 1	0V	0V	+24V	JOG SPD 1	RAMP RATE	ON
JOG SPD 2	+24V	0V	+24V	JOG SPD 2	RAMP RATE	ON
CRAWL SPD	+24V	+24V	+24V	CRAWL SPD	Default	ON

Functional Description

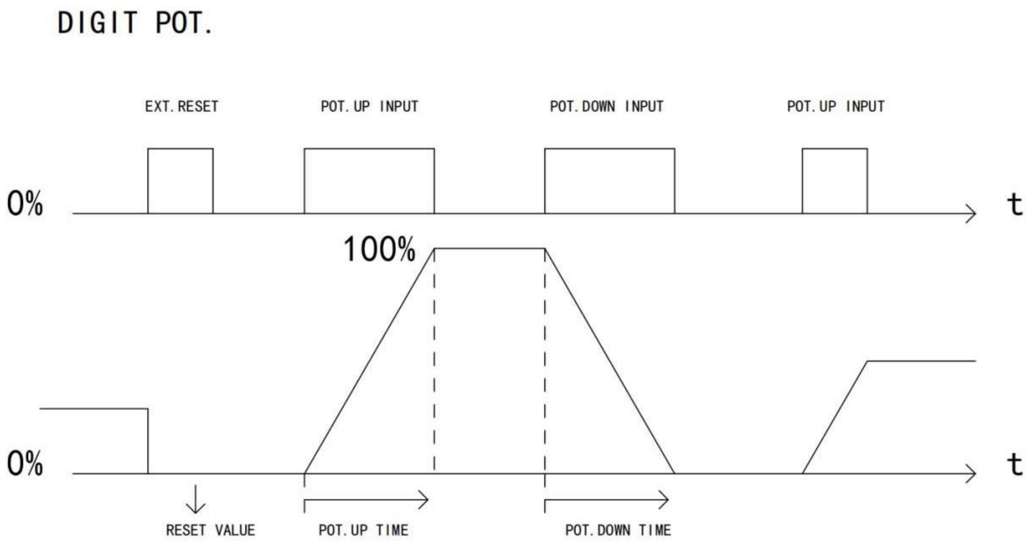


7.4.4 DIGIT POT.

DIGIT POT.
The digitai pot is a ramp facility in addition to the normal reference ramp.It may also be used to ramp a parameter other than the speed reference by re-configuring its output connection.

Menu / Description	Default	Range	Mode	PIN
RESET VALUE If EXTERNAL RESET(EXT.RESET) is TRUE, the output of the DIGIT POT. block is set to the RESET VALUE. This reset value is pre-loaded directly into the output when EXT.RESET is TRUE, or at power-up. It will be clamped by min and max clamp.	0.00%	±300%	R/W	
INCREASE RATE Sets the ramp up time from 0 to ±100% speed.	10.0S	0.1-600.0S	R/W	
DECREASE RATE Sets the ramp down time from ±100% speed to 0.	10.0S	0.1-600.0S	R/W	
RAISE INPUT Command to up output.	FALSE	TRUE/FALSE	R/W	
LOWER INPUT Command to down output.	FALSE	TRUE/FALSE	R/W	
MIN VALUE Sets the limit of negative (acw) rotation of the digital pot.	-100%	±300%	R/W	
MAX VALUE Sets the limit of positive (cw) rotation of the digital pot.	+100%	±300%	R/W	
EXT RESET If EXT.RESET is TRUE, the output is set to the RESET VALUE.	FALSE	TRUE/FALSE	R/W	

Functional Description



7.4.5 PRESETSPEEDS

PRESET SPEEDS The speed preset block allows you to select one of preset inputs,it may be connected to other blocks of inputs.				
Menu / Description	Default	Range	Mode	PIN
SELECT1	FALSE	TRUE/FALSE	R/W	
SELECT2	FALSE	TRUE/FALSE	R/W	
SELECT3	FALSE	TRUE/FALSE	R/W	
INVERT O/P Change the sign of the output.	FALSE	TRUE/FALSE	R/W	
INPUT 0-7	0.0	±3000.0	R/W	
PRE.SPD O/P	0.00%	±300.00%	R	
PRESET SPD OP	0.0	0.0-10.00	R	

Selection Table

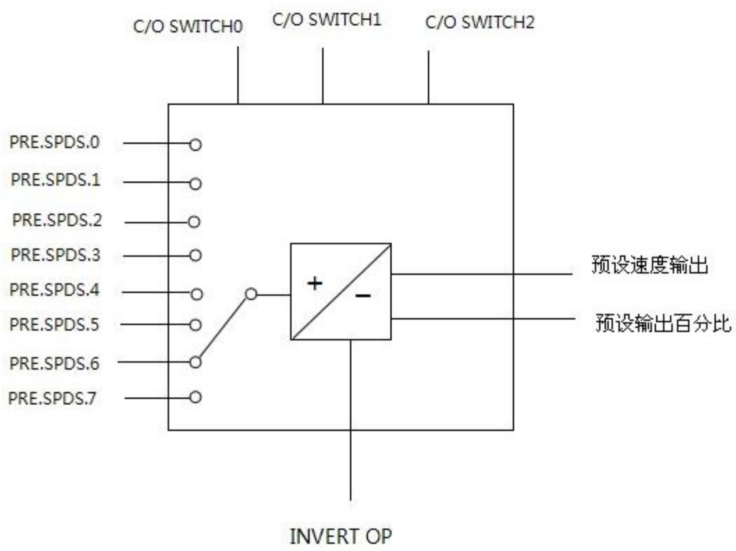
Three Boolean variables used to select between one of the 8 preset values.

SELECT3	SELECT2	SELECT1	PRE.SPD
FALSE	FALSE	FALSE	0

FALSE	FALSE	TRUE	1
FALSE	TRUE	FALSE	2
FALSE	TRUE	TRUE	3
TRUE	FALSE	FALSE	4
TRUE	FALSE	TRUE	5
TRUE	TRUE	FALSE	6
TRUE	TRUE	TRUE	7

Functional Description

PRE.SPDS.0-7 corresponding to NPUT 0-7；C/OSWITCH0-2 corresponding to SELECT1-3



7.4.6 SPEC.APP BLOCKS

1）PID

PID

This is a general purpose PID block which can be used for many different closed loop control applications. The PID feedback can be loadcell tension, dancer position or any other transducer feedback such as pressure, flow etc.

Features:

*Independent adjustment of gain and time constants.

*Additional first-order filter (F).

*Functions P, PI, PD, PID with/without F individually selected.

*Ratio and divider for scaling each input.

*Independent positive and negative limits.

*Output scaler (Trim).

*Gain profiled by diameter for centre-driven winder control.

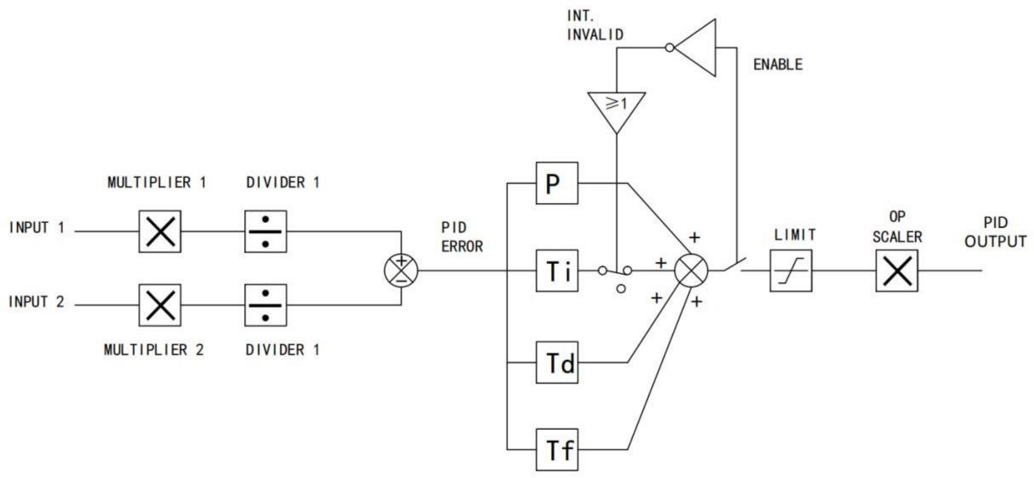
Menu / Description TC=TIME CONSTANT	Default	Range	Mode	PIN
PROFILE P GAIN The maximum limit of the proportional gain.	1.0	0.0-100.0	R/W	
INT.TIME.CONST The integrator time constant of PID.	5.00s	0.01-100s	R/W	
DERIVATIVE TC The differentiator time constant (Td). When Td = 0 the transfer function of the block becomes a P+I.	0.000s	0.000-10.000s	R/W	
POSITIVE LIMIT The upper limit of the PID algorithm.	+100.00%	0.00-105%	R/W	
NEGATIVE LIMIT The lower limit of the PID algorithm.	-100.00%	-105.00%-0.00	R/W	

O/P SCALER （TRIM)) The ratio which the limited PID output is multiplied by in order to give the final PID Output.	0.2000	±3.0000	R/W	

INPUT 1 This can be either a position/tension feedback or a reference/offset.	0.00%	±300.00%	R/W	
INPUT 2 This can be either a position/tension feedback or a reference/offset.	0.00%	±300.00%	R/W	
RATION 1 This multiplies Input 1 by a factor.	1.0000	±3.0000	R/W	
RATION 2 This multiplies Input 2 by a factor.	1.0000	±3.0000	R/W	
DIVIDER 1 This divides Input 1 by a factor.	1.0000	±3.0000	R/W	
DIVIDER 2 This divides Input 2 by a factor.	1.0000	±3.0000	R/W	
ENABLE A digital input which resets the (total) PID Output as well as the integral term when FALSE.	ENABLED	ENABLED/ DISABLED	R/W	
INT.DEFEAT A digital input which resets the integral term when ON. The block transfer function then becomes P+D only.	OFF	ON/OFF	R/W	
FILTER T.C. In order to attenuate high-frequency noise a first order filter is added in conjunction with the differentiator.	0.200S	0-10.000S	R/W	

MODE	0	0-4	R/W	
MIN PROFILE GAIN This expresses the minimum gain required at min diameter (core) as a percentage of the (max) P gain at full diameter (100%).	20.00%	0-100.00%	R/W	

Functional Description

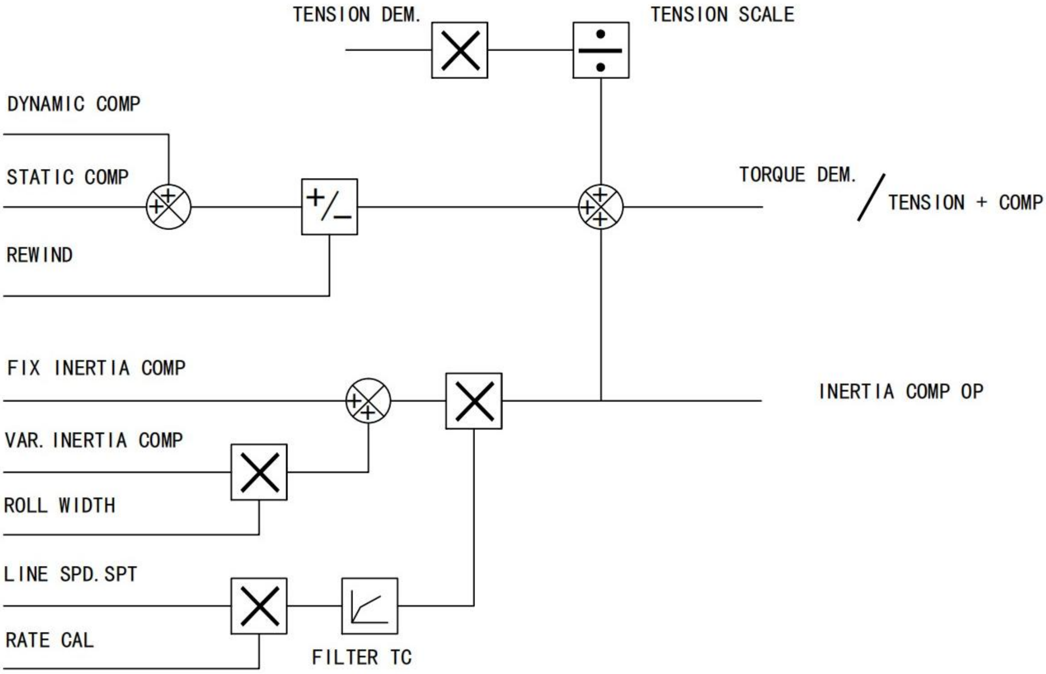


2）TENS + COMP CALC.

TENS + COMP CALC. This block, Tension + Compensation Calculator, compensates for static anddynamic friction, as well as the load inertia.It achieves this by profiling the motor torque demand as a function of speed and acceleration.				
Menu / Description	Default	Range	Mode	PIN
STATIC COMP Static friction compensation set-up parameter.	0.00%	±300.00%	R/W	
DYNAMIC COMP Variable friction compensation set-up parameter.	0.00%	±300.00%	R/W	

REWIND Switches the sign of the friction compensations when the motor changes direction.. Only when the winder reverses, it is set to DISABLED.	ENABLED	ENABLED/ DISABLED	R/W	
FIX.INERTIA COMP Fixed inertia compensation set-up parameter.	0.00%	±300.00%	R/W	
VAR INERTIA COMP Variable inertia compensation set-up parameter.	0.00%	±300.00%	R/W	
ROLL WIDTH/MASS Scales the inertia compensations dependant on roll width. 100% is maximum roll width.	100.00%	0-100.00%	读写	
LINE SPD SPT Used to calculate the line speed acceleration rate value for the inertia compensations.	0.00%	±105.00%	R/W	
FILTER T.C. The calculated rate value may have a large ripple content which will disturb the motor torque. The rate signal is therefore filtered, and this filter has a time constant given by this parameter.	10	0-20000	R/W	
RATE CAL Scales the inertia compensation acceleration rate value to 100% for the maximum line ramp rate. This parameter should be set to the maximum line full speed ramp rate in Seconds.	10.00	±100.0	R/W	
INERTIA COMP O/P Monitor inertial compensation output value.	0.00%	±300.00%	R	
TENSION SCALER Scales the Tension Demand which is directly connected from the TAPER TENS.	1.0000	±3.0000	R/W	

Functional Description



3）DIAMETER CALC.

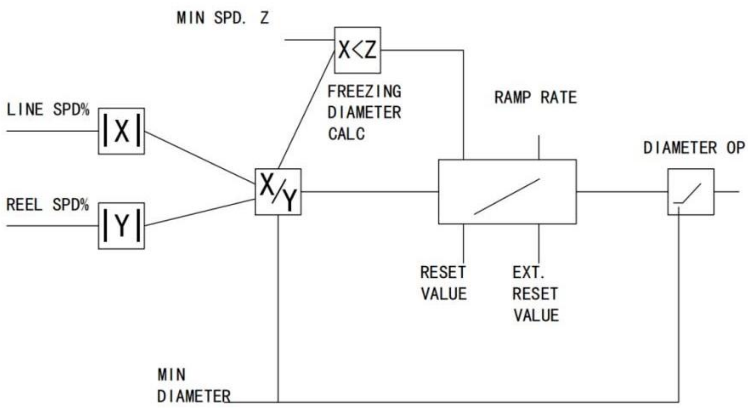
DIAMETER CALC. This block calculates the diameter of a reel as a function of the reel speed and the line speed.				
Menu / Description	Default	Range	Mode	PIN
LINE SPD% This will usually be configured to be the analog tacho input.	0.00%	±105.00%	R/W	
REEL SPD% This will usually be configured to be the drive's own speed feedback, i.e. encoder or arm.volts feedback.	0.00%	±105.00%	R/W	
MIN DIAMETER This parameter is generally set to the diameter of the empty core.	10.00%	0-100.00%	R/W	

MIN SPD If the actual line speed is lower than this set point, the diameter calculator(DIAMETER CALC) will stop working.	5.0%	0-100.00%	R/W	
RESET VALUE Normally for winders this will be set to the MIN DIAMETER value. This value will be preloaded into the ramp (filter) output when EXT.RESET is enabled.	10.00%	0-100.00%	R/W	
EXT RESET When the input is enabled, the diameter ramp output is kept at the reset value.	DISABLED	ENABLED/ DISABLED	R/W	
RAMP RATE This is used to filter the output of the diameter calculator.	5.0S	0.1-600.00S	R/W	
DIAMETER OP This is the output of the block and it can be connected to the appropriate points in the winder block.	10.00%	0-100.00%	R	

Circumference= π D， Line Speed=Reel SpeedxD=   rXd.

D(DIAMETER)=S/   r=Line Speed/Reel Speed.

Functional Description

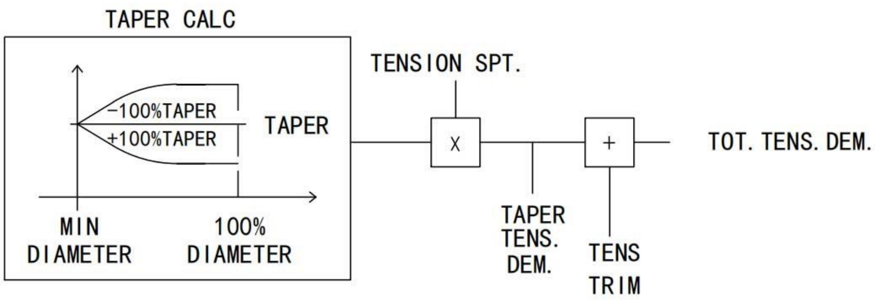


4）TAPER CALC.

TAPER CALC. The purpose of this block is to profile the tension demand with diameter.				
Menu / Description	Default	Range	Mode	PIN
TAPER This defines the amount of tapering in the tension demand with diameter variation. When TAPER is positive, the tension demand is hyperbolically decreased as diameter increases.	0.00%	±100.00%	R/W	
TENSION SPT. Required tension setting value.	0.00%	+100.00%	R/W	
TAPERED DEMAND This is the output of the TAPER calculation on the TENSION SPT.	0.00%	+100.00%	R/W	
TENS TRIM	0.00%	±100.00%	R/W	
TOT.TENS.DEMAND	0.00%	±100.00%	R/W	

TAPER TENS.DEM.=TENSION SPT.**x(1 -** TAPER**x(1-**MIN DIAMETER**/**DIAMETER))

Functional Description

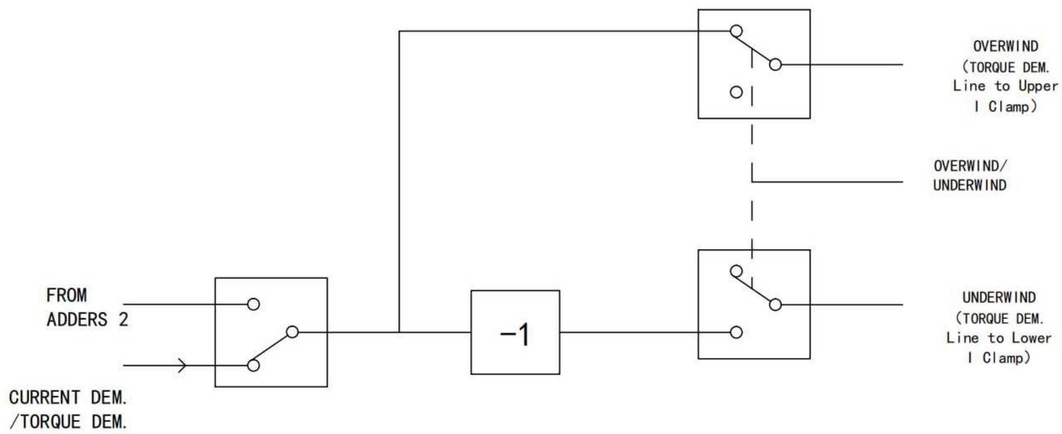


5）TORQUE CALC

TORQUE CALC. This block is used to split the motor current demand and use the appropriate current limit clamp dependant on winding roll direction.				
Menu / Description	Default	Range	Mode	PIN

TORQUE DEMAND This is the torque/current demand input of the block.	0.00%	±200.00%	R/W	
TENSION ENABLE Set to ENABLED ,torque demand is applied. Set to DISABLED, torque demandt is zero.	ENABLED	ENABLED/ DISABLED	R/W	
OVERWIND Set to ENABLED ,Over Wind is selected which means the torque demand is applied in the positive quadrant (UPPER I CLAMP IN). Set to DISABLED, Under Wind is selected which means the torque demand is applied in the negative quadrant(LOWER I CLAMP IN).	ENABLED	ENABLED/ DISABLED	R/W	

Functional Description



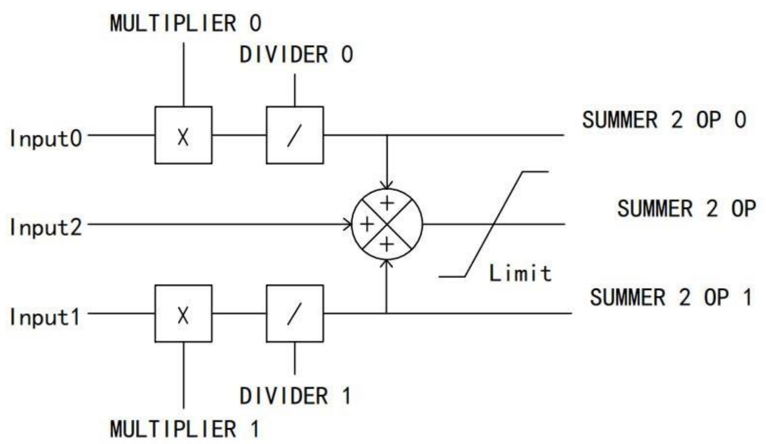
6）SUMMER 2

SUMMER 2 Summer 2 is a general purpose summing and ratio block. Additional outputs are provided to gai access to each of Input 0 and Input 1 channel sub-calculations.				
INPUT 2 Input 2 is not connected to any analog input by default.	0.00%	±300.00%	R/W	
INPUT 1 Input 1is not connected to any analog input by	0.00%	±300.00%	R/W	

n

default.				
INPUT 0 Input 2 is not connected to any analog input by default.	0.00%	±300.00%	R/W	
RATION 1 This multiplies Input 1 by a factor.	1.0000	±3.0000	读写	
RATION 0 This multiplies Input 0 by a factor.	1.0000	±3.0000	读写	
DIVIDER 1 This divides Input 1 by a factor.Dividing by 0 (zero) results in a zero output.	1.0000	±3.0000	R/W	
DIVIDER 0 This divides Input 0 by a factor.Dividing by 0 (zero) results in a zero output.	1.0000	±3.0000	R/W	
LIMIT The symmetric limit of the output of the SUMMER 2.	105.00%	0-200.00%	R/W	
SUMMER2 OP Main output of the SUMMER 2.	0.00%	±200.00%	R	

Functional Description MULTIPLIER=RATION



7.4.7 FIELD CONTROL

FIELD CONTROL This function block contains all the parameters for the field operating mode.				
Menu / Description	Default	Range	Mode	PIN
FIELD ENABLE This allows the field output to be enabled or disabled.If used to drive permanent magnet motors, this parameter should be set to disabled.	ENABLED	ENABLED/ DISABLED	R/W	

FLD CTRL MODE 1) VOLTAGE CTRL. This is an open loop setting of the field bridge-firing angle allowing the DC output voltage to be set between 0 to 90% of the incoming supply voltage.E. g. for an AC supply of 400V the 90% output voltage is 360V DC. Note if the AC supply varies, then the field output voltage will vary in proportion. Also if the field resistance changes then the resulting output current will change. 2)CURRENT CTRL. The range of output voltage is the same in this mode as in the voltage control mode, however the control loop operates on the actual current flowing in the field and works to maintain this at the desired value.the current delivered will always be controlled irrespective of supply and resistance changes. This is the preferred control strategy.	CURRENT CONTROL	CURRENT/VOLTAGE CONTROL		

FIELD VOLTAGE VARS FLD VOLTS RATION Sets the DC field voltage output as a % of the AC supply volts. It may be necessary to set the field voltage instead of the field current. E. g. There may only be a volts rating on the dataplate.	42.00%	0-90.00%		
FIELD CURRENT VARS Contains the parameters for the closed loop current control mode.				
SETPOINT Field current setpoint.	100.00%	0-100.00%		
PROP. GAIN Sets the proportional gain of the field current control loop.Increase to improve response, too much may cause instability in the field current.	0.10	0-100.00		
INT.GAIN Sets the integral gain of the field current control loop.Increase to improve response, too much may cause overshoot.	1.28	0-100.00		
FLD.WEAK VARS Contains the parameters for the closed loop current control mode.In certain applications of a D motor controller, high speeds can only be achieved by reducing the field current and therefore th resultant torque. This is termed as the Constant-Horsepower region or Field-Weakening region, an the speed at which it begins is known as the Base Speed.				
FLD WEAK ENABLE This allows the field weakening to be enabled or disabled.Activates the additional motor back emf PID loop for field weakening (field spillover) control.	ENABLED	ENABLED/ DISABLED	R/W	
EMF LEAD With field weakening control enabled, a PID loop is brought into operation. This is the lead time constant adjustment of the field weakening PID loop.This gives good attenuation to the response of the weakening loop at high frequencies. A higher setting may cause instability of the armature voltage and possible over-volting of the commutator.	2.00	0.10-50.00		

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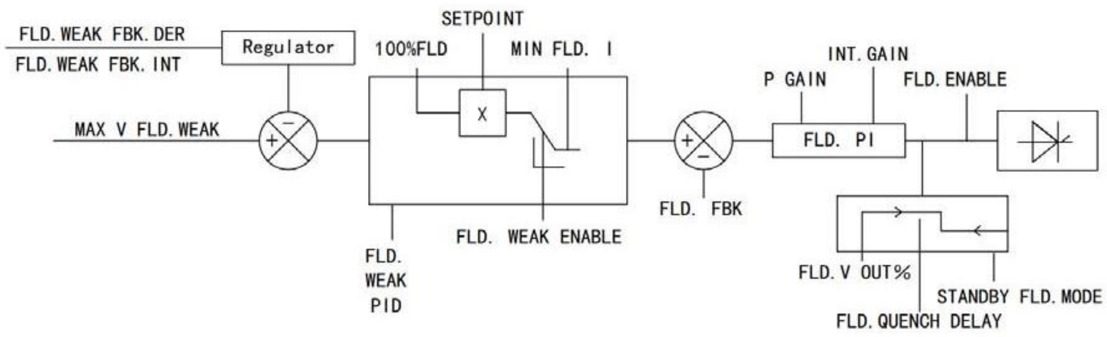
EMF LAG This is the lag time constant adjustment of the field weakening PID loop.Generally an increased integral time constant will slow the response of the armature voltage when operating around the spillover voltage point, and a decrease will improve the response. Decreasing the value too far may cause instability of the armature voltage and possible over-volting of the commutator.	40.00	0.00-200.00		
EMF GAIN This is the gain adjustment of the field weakening PID loop.Generally an increased proportional value will speed up the response of the armature voltage when operating around the spillover voltage point, and a decrease will slow the response. Increasing the value too far may cause instability of the armature voltage and possible over-volting of the commutator.	0.3	0.00-100.00		
MIN FLD.CURRENT Sets the minimum field current as a % of the rated field amps. When setting the minimum % allow an extra 5% margin below the desired minimum to accommodate a response transient. Do not set the minimum below 5% otherwise there may be a field failure alarm.	20.00%	0.00-100.00%		
MAX VOLTS Sets armature voltage % at which field weakening begins.	88.00%	0.00-100.00%		
BEMF FBK LEAD Sets the feedback derivative time constant in milliseconds.This affects the armature voltage overshoot when accelerating rapidly through base speed. An increasing ratio of FLD.WEAK FBK.DER ms parameter to FLD.WEAK FBK.INT ms parameter (D/I) tends to reduce overshoots. A ratio of unity has no affect and a ratio of 3 or more tends to instability.	100	10-5000		

FLD.WEAK FBK.INT Sets the feedback integral time constant in	100	10-5000		
milliseconds.This affects the armature voltage overshoot when accelerating rapidly through base speed. An increasing ratio of FLD.WEAK FBK.DER ms parameter to FLD.WEAK FBK.INT ms parameter (D/I) tends to reduce overshoots. A ratio of unity has no affect and a ratio of 3 or more tends to instability.				
FLD QUENCH DELAY Set the field quench delay time after main contactor drop out.Used to ensure the motor can generate into a dynamic braking resistor after the main contactor drops out.A run condition is enabled by (START or JOG) . This delay activates upon commencement of a non running condition.	0.0	0.0-600.0S		
FLD QUENCH MODE Set standby field.After the field quench delay has expired, the field can be entirely quenched or put into a standby mode at 50% of rated current or volts depending whether in current or voltage control mode respectively. Used to keep motor warm during off periods to prevent condensation in cold climates.	QUENCH	QUENCH/STANDBY	R/W	

Functional Description



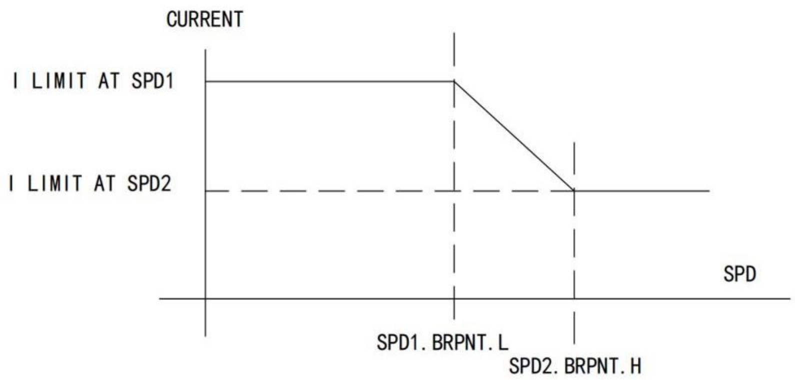
7.4.8 CURRENT PROFILE

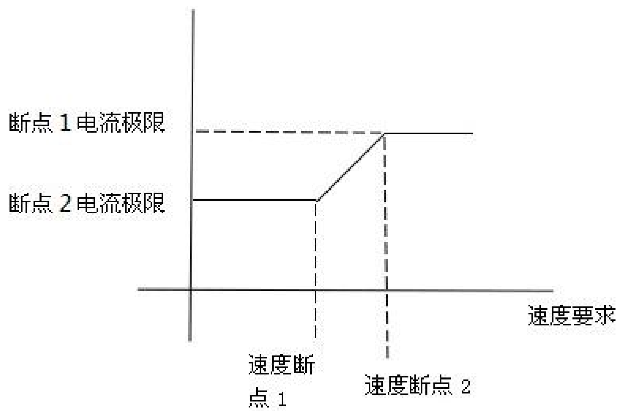
CURRENT PROFILE
I dynamic profile(I DYN.PROFILE) .This clamp is used to change the current limit according to speed. E.g. 1) To prevent motors overheating at low speeds.

2)To protect motors that have problems commutating current at high speeds in field weakening mode of operation.
This function works for both directions of rotation

Menu / Description	Default	Range	Mode	PIN
SPD BRK1 L This is the motor speed at which current limit profiling begins.	100.00%	0-100.00%	R/W	
SPD BRK2 H This is the upper speed limit at which current limit profiling ends.	100.00%	0-100.00%	R/W	
IMAX BRK1（SPD1) This sets the current limit value at or below speed break-point 1, provided the other current limits are greater than this setting.	200.00%	0.00-200.00%	R/W	
IMAX BRK2（SPD2） This sets the current limit value at or above speed break-point 2, provided the other current limits are greater than this setting.	200.00%	0.00-200.00%	R/W	

Functional Description



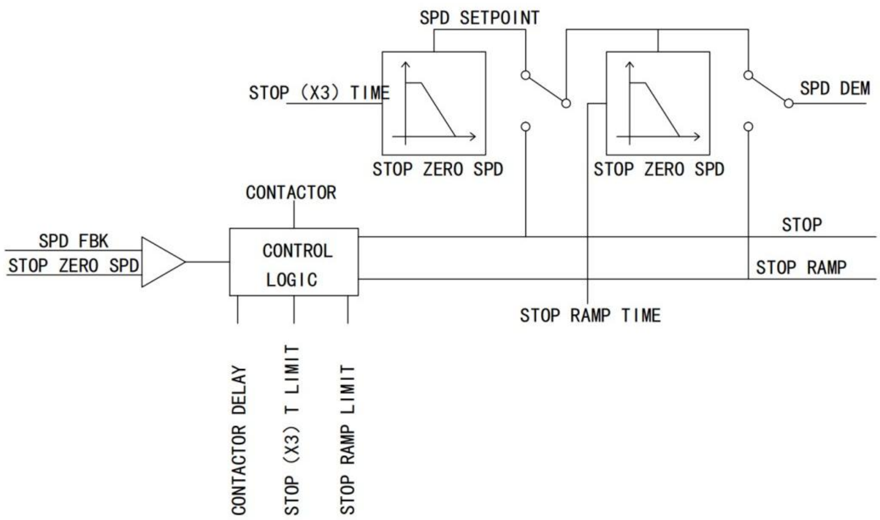


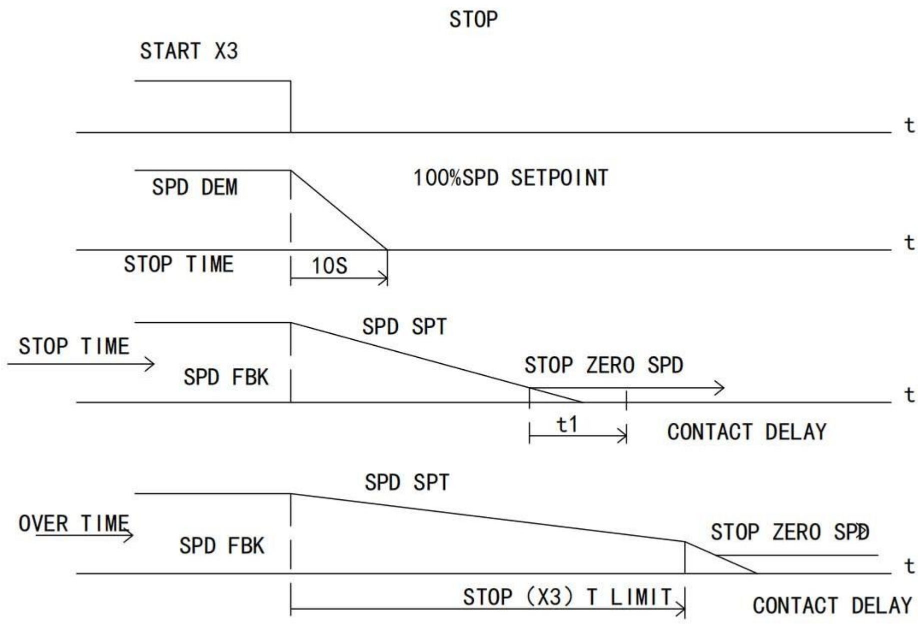
7.4.9 STOP SET

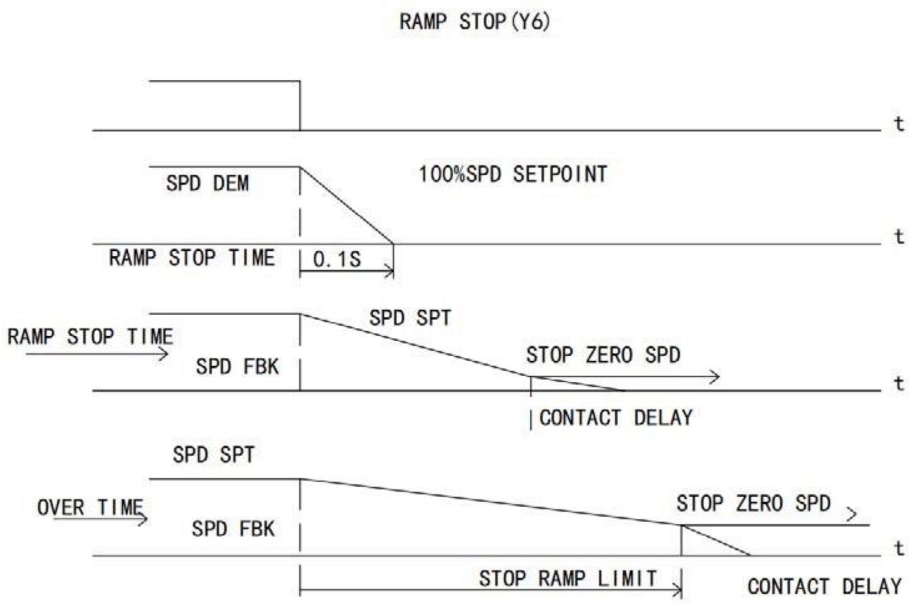
STOP SET This function block holds all the parameters concerning the stopping method of the converter.				
Menu / Description	Default	Range	Mode	PIN
STOP TIME （Y3） Time to reach zero speed from 100% set speed in normal stop mode (Y3 OFF).	10..0S	0.1-600.0S	R/W	
STOP LIMIT（Y3） Sets the max time limit before contactor drop out in stop mode.The timer is triggered by Stop command (Y3) going low.	60.0S	0.1-600.0S	R/W	
CONTACTOR DELAY Adds a time delay to the contactor drop out command.	1.0S	0.1-600.0S	R/W	
PROG STOP T Z6 Time to reach zero speed from 100% set speed in ramp stop mode(Z6 OFF).	0.1S	0.1-600.0S	R/W	

PROG STOP LIMIT Delay time limit to allow ramp stop action (regenerative breaking) to achieve zero speed before drive quench and coast stop. The timer is triggered by ramp Stop command (Z6) going low.	60.0S	0.1-600.0S	R/W	
PROG STOP I LIM Main current limit level in ramp stop mode assuming current limit not overridden by I DYN.PROFILE.	100.00%	0.00-200.00%	R/W	
STOP ZERO SPD. Sets the speed level at which the contactor drop out delay（CONTACTOR DELAY）timer starts.If this parameter is set to 100% then the contactor drop out delay timer will commence with the STOP command rather than waiting to reach a low speed. The level is symmetrical for forward and reverse rotation.	2.00%	0-100.00%	R/W	

Functional Description







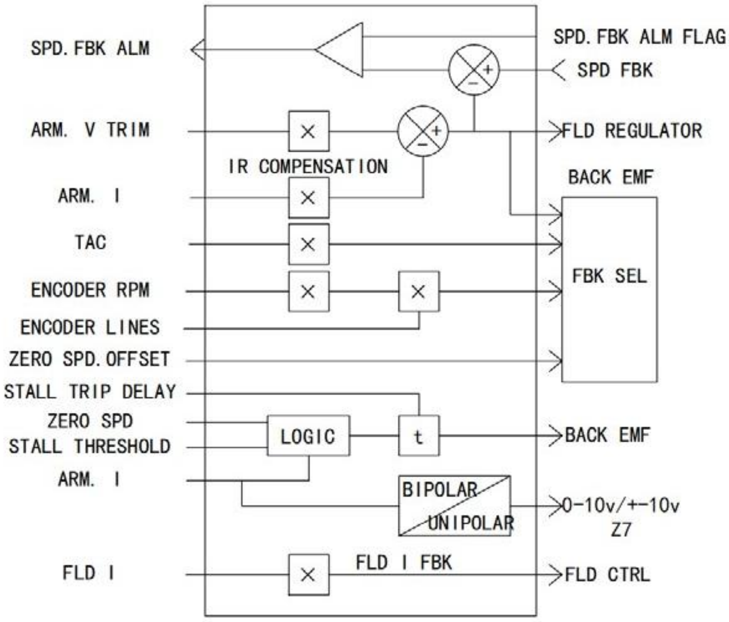
7.4.10 CALIBRATION

CALIBRATION				
Menu / Description	Default	Range	Mode	PIN

ARM VOLTS CAL	1.0000	0.9800-1.1000		
IR COMPENSATION Sets % compensation of the AVF signal due to IR drop. Speed is proportional to the back EMF of the motor. Excessive compensation may lead to instability.	0.00%	0.00-100.00%		
ENCODER RPM	1000	0-6000		
ENCODER LINES	1000	10-5000		
ANALOG TACH CAL Sets a trim factor for the analog tacho feedback.This trim factor may be applied during drive running.	1.0000	0.98-1.10000		
ZERO SPD OFFSET Used to correct any offset from the speed feedback source.If the speed feedback is not zero when the drive is stationary (possibly due to hardware offsets etc.) the setting of this parameter to the value of the offset will result in a zero reading from the speed feedback.	0.00%	±5.00%		
ARMATURE I(X7) Selects operation of the current meter output , either bipolar or unipolar.	BIPOLAR	UNIPOLAR/BIPOLAR	R/W	
SPDFBK ALM LEVEL Sets the speed feedback mismatch trip tolerance.The speed feedback alarm compares speed feedback to armature voltage. The alarm level is the threshold which the difference between the two signals should exceed for the alarm to activate.	50.0%	0.0-100.0%		
STALL THRESHOLD Sets the stall alarm trip LEVEL as a % of rated motor amps.	95.00%	0.00-200.00%		

STALL TRIP DELAY Sets the delay time between stall start and alarm trigger.	30.0S	0.1-600.0S		
FLD I CAL Sets a positive trim factor for the field current feedback.	1.0000	0.98-1.10000		

Functional Description



7.4.11 DRIVE ALARMS

DRIVE ALARMS This function block is used to prohibit part of the alarm.				
Menu / Description	Default	Range	Mode	PIN

FLD. LOSS TRIP Allows the field failure alarm trip to be disabled.This alarm will normally trigger if the field current drops below 20% of rated current (5% in field weakening mode). Faulty operation of the field controller may also cause a motor field fail alarm. The most usual cause for the motor field alarm is an open circuit motor field. If this alarm occurs, the motor field connections should be checked and the field resistance measured. The resistance of the field = dataplate field volts / dataplate field current.	ENABLED	ENABLED/ DISABLED	R/W	
STALL TRIP Allows the motor stall alarm trip to be enabled. A DC motor is generally not capable of carrying large amounts of current when stationary. If the current exceeds a certain limit and the motor is stationary, then the MDC/DC900 series driver can provide a stall trip alarm.	ENABLED	ENABLED/ DISABLED	R/W	
EXT.TRIP RESET Set to false can prevent restart after tripping. Do not rely on this menu to improve driver safety.	TRUE	TRUE/FALSE	R/W	
SPEED FBK ALARM See Note.Alarm description.	ENABLED	ENABLED/ DISABLED	R/W	
ENCODER ALARM Inhibits the encoder option board alarm.	ENABLED	ENABLED/ DISABLED	R/W	

Note.Alarm description

Fault alarm	Fault description
OVERSPEED	If the speed feedback signal exceeds 110% of rated speed for longer than the alarm delay time, then the overspeed alarm is activated. This alarm is likely to be caused by a badly adjusted speed loop.

MISSING PULSE	The driver continuously monitors the armature current waveform. If a fault develops within the driver or the armature bridge, it is possible that one or more pulses may be missing from the normal 6-pulse armature current waveform. Although the controller may appear to function normally, the motor will experience excess heating due to the distorted current waveform. If at least one of the 6 current pulses is missing from the feedback waveform and the current demand is above 10% then the system will start counting missing pulses. The alarm will trigger after a sequential series of missing pulses lasting approximately 30 seconds.
HEATSINK TRIP	The driver heatsink temperature is too high.The ambient air temperature is too high.Poor ventilation,Fan failure, Blocked ventilation slots,Clogged air filters etc.

FLD. OVER I	This alarm could become active due to regulator failure or a badly tuned control loop causing overshoots. Alarm delay time: 15 secs. The motor field current has exceeded 120% of the calibrated value.
MOTOR OVER T	Check for blower failure, wrong rotation of the blower, blocked ventilation slots and clogged air filters. Other causes of overheating relate to excessive armature current. The nominal armature current on the motor nameplate should be checked against the CONFIG. DRIVER for the MDC/DC900.
OVER VOLTS	If the motor armature voltage feedback exceeds RATED ARM.V by more than 20% then this alarm will operate. The alarm can be caused by a badly adjusted field voltage setting, field current loop, field-weakening back emf loop or speed loop overshooting.Alarm delay time: 1.5 secs.。
SPD FEEDBACK	The difference between speed feedback and armature voltage feedback is greater than the SPD.FBK ALM FLAG parameter value.If FLD. WEAK ENABLE parameter is enabled, speed feedback is less than 10% when in the field weakening region.Most of the reasons for the alarm are connection faults, polarity errors, parameter configuration errors, such as tachogenerator or encoders.
FLD. LOSS TRIP	This alarm will normally trigger if the field current drops below 20% of rated current (5% in field weakening mode). Faulty operation of the field controller may also cause a motor field fail alarm. The most usual cause for the motor field alarm is an open circuit motor field.To a permanent magnet motor, then FLD.ENABLE should be disabled. This automatically inhibits the field fail alarm.

3 PHASE FAILED	Check whether the three-phase power supply of the driver is normal.Check driver three-phase power fuse. Check the driver's internal field power supply fuse.
SYNCHRO LOSS	The MDC/DC900 series driver automatically "locks on" to any 3-phase supply within a frequency range of 45 to 65 Hertz. This allows the thyristors to be fired at the correct instant during each supply cycle. The synchronisation circuit can cope with a large level of supply distortion to ensure operation with very distorted supplies.
STALL TRIP	A DC motor is generally not capable of carrying large amounts of current when stationary. If the current exceeds a certain limit and the motor is stationary, then the MDC/DC900 series driver can provide a stall trip alarm.
OVER I TRIP	Current feedback value has exceeded 280% of rated currentand will trigger the alarm.Motor armature windings failure - check insulation
	resistance， Badly tuned current loop. Alarm delay time(Alarm will allow 300% loading for around 10 msecs and 400% for 5 msecs).
ACCTS FAILED	AC current transformer plug connection to Converter power board missing.Check armature current transformer plug for correct installation.
AUTOTUNE ERROR	Speed feedback has exceeded 20% of rated speed, or field current feedback has exceeded 6% of rated field current.
AUTOTUNE ABORTED	Coast Stop, Ramp Stop, Enable or Start/Run terminal(s) disabled during Autotune sequence.The AUTOTUNE parameter reset during the Autotune sequence.Autotune sequence has timed-out (approximately 2 minutes)

Viewing Trip Conditions	The following parameters in the ALARMS MONITOR menu can be viewed to investigate trip conditions. LAST ALARM ACTIVE TRIP STORED TRIP MOTOR T STATE SPD.FBK. STATE STALL TRIP REMOTE TRIP

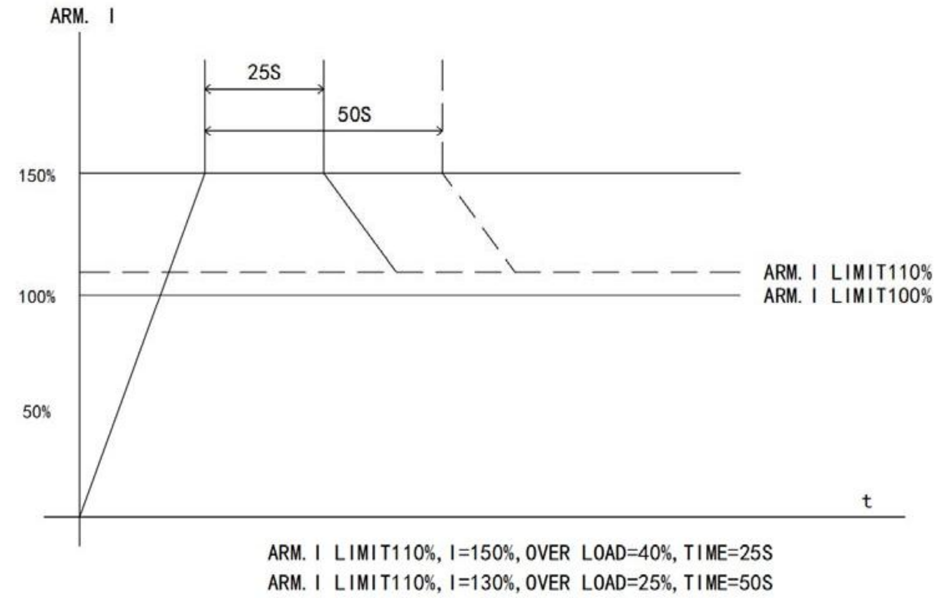
7.4.12 CURRENT LOOP

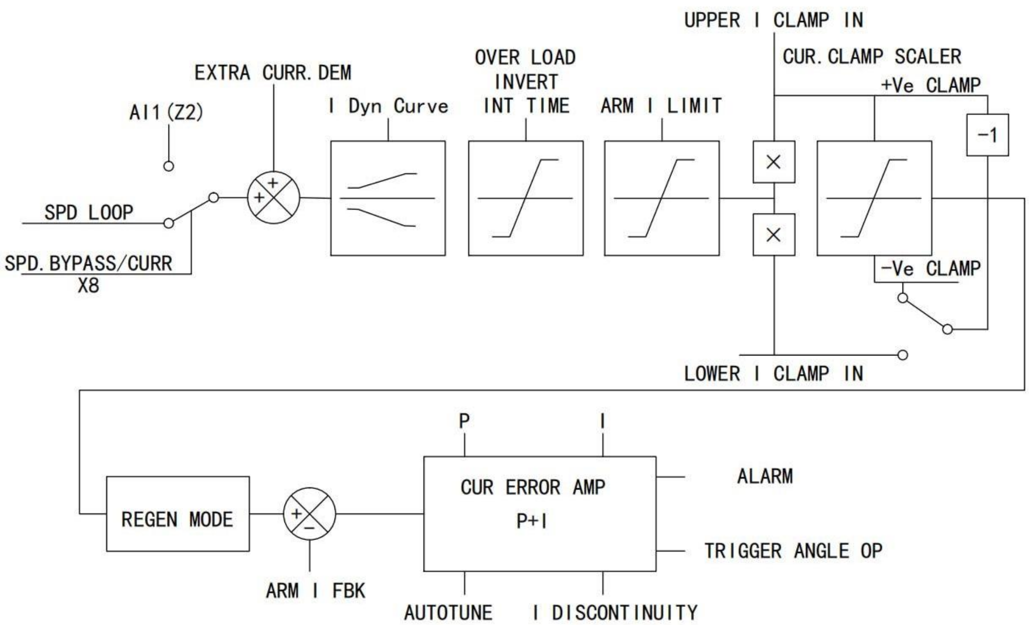
CURRENT LOOP				
CURRENT LOOP	CURRENT LOOP	CURRENT LOOP	CURRENT LOOP	CURRENT LOOP
MAIN I LIMIT Main current limit parameter which is independent of current limit scaler and in series with the other three current limit blocks.	110.00%	±200.00%	R/W	
PROP. GAIN Sets the proportional gain of the current error amplifier.This can be set by using the AUTOTUNE function. Increase to improve response, too much may cause instability. If you change your supply voltage, current calibration or motor type then re-adjust this parameter.	45.00	0.00-200.00	R/W	
INT.GAIN Sets the integral gain of the current error amplifier.This can be set by using the AUTOTUNE function. Increase to improve response, too much may cause instability. If you change your supply voltage, current calibration or motor type then re-adjust this parameter.	3.50	3.50-200.00	R/W	

AUTOTUNE S ee 4.2 Essential pre-start checks.11）Armature current loop autotune.	OFF	OFF/ARMATURE	R/W	
I DISCONTINUITY Set to the discontinuous current boundary level for your motor.This can be set by using the AUTOTUNE function.As the current increases there comes a point when the current stops appearing in 6 discrete lumps per cycle and just starts going continuous. At this point the natural gain of the system changes dramatically.If the unit knows this point, it can automatically compensate for the gain change and produce an optimum response. The current level % of rated motor current at which it occurs is entered here. Suggested value I DISCONTINUITY P GAIN INT.GAIN 10.00% 40.00 4.00 20.00% 20.00 2.00 40.00% 10.00 1.00	15.00%	0.00-200.00%	R/W	
ADDITIONAL DEM Sets the value of an extra current reference input.	0.00%	±200.00%	R/W	
BIPOLAR CLAMPS Select input for bipolar (asymmetric) or unipolar (symmetric) current clamps for the 4 quadrants of operation. Default setting of DISABLED means UNIPOLAR clamps selected.	DISABLED	ENABLED/ DISABLED	R/W	
REGEN ENABLE Select input for regenerative (4-quadrant) or non-regenerative (2-quadrant) mode of operation.	2Q(NON-REGEN) or 4Q(REGEN)	2Q(NON-REGEN) /4Q(REGEN)	R/W	

POS. I CLAMP IN Modifies the upper current limit %. If the upper clamp is set negative and the lower clamp set positive than the result is 0.00%. If the lower clamp is more +ve than the upper in the +ve region, the upper behaves as a current demand.	0.00%	±200.00%	R/W	
NEG. I CLAMP IN Modifies the lower current limit %. If the upper clamp is set negative and the lower clamp set positive than the result is 0.00%. If the upper clamp is more -ve than the lower in the -ve region, the lower behaves as a current demand.	0.00%	±200.00%	R/W	
SPD.BYPASS/CURR. This input alters the drive operation from Speed Control to Current Control. When DI 3(Y8) is true, AI 2(X3) provides the current demand and the speed loop is disconnected. When false the speed loop is in control and AI 2(X3) is an auxiliary speed setpoint. See SPEED LOOP,SPEED SUMMER,SPD.INPUT2/X3.	DISABLED	ENABLED/ DISABLED	R/W	
CUR.CLAMP SCALER Sets the clamp scaling value for the upper/lower clamps.It scales bipolar/unipolar clamps.	100.00%	0.00-200.00%	R/W	

Functional Description





7.4.13 SPEED LOOP

SPEED LOOP This function block contains parameters for setting-up the speed loop.				
Menu / Description	Default	Range	Mode	PIN

SPEED P GAIN Sets the proportional gain of the speed loop error amplifier.Increase to improve response time, excessive values may cause instability.	5.00	0.00-200.00	R/W	
SPD INT TIME Sets the integral time constant of the speed loop error amplifier.This should be matched with the mechanical time constant of the motor/load combination. Generally an increased integral time will slow the response.	0.500S	0.001-30.000	R/W	
INT.DEFEAT Inhibits the integral part of the speed loop PI control to give proportional only control.	OFF	ON/OFF	R/W	
ENCODER SIGN Use this to invert the encoder feedback sign if needed.	POSITIVE	POSITIVE/NEGATIVE	R/W	
SPEED FBK SELECT ARM VOLTS.： In this mode,motor speed is calculated from the internal feedback of arm voltage. The volts for 100% speed feedback must be calculated and set into the parameter of RATED ARM.V.WARNING. This feedback mode is prohibited in field weakening operation. ANALOG TACH:Tachogenerator output a proportional DC voltage to speed.Setting details see 7.6.8 ANALOG TACHO(V1，V2). ENCODER:This shaft-mounted transducer provides frequency signals proportional to speed. The speed information is be expressed by the output pulses signals. /ENCODER+ANALOG:In this mode the tachogenerator provides a raw speed feedback and the encoder generate a fine feedback. With the combination of two feedback informations,the motor control could behave an improved perfomance with higher resolution and keep dynastability degrades at low speeds.	ARM VOLTS	ARM VOLTS/ENCODER+ANALOG//ENCODER/ANALOG TACH	R/W	

ADVANCED Advanced speed loop

SPD.PI ADAPTION Speed PI adaption

This menu allows sophisticated modification of the speed loop error amplifier. It can provide modified gains of the proportional and integral terms with the gains changing linearly.

MODE Choose the mode correspond to the speed breakpoints.	DISABLED	DISABLED/CUR DMD DEP/SPD FBK DEP/SPD ERR DEP	R/W	
SPD BRK1 L Sets the low break point for commencement of gain change.	1.00%	0.00-100.00%	R/W	
SPD BRK2 H Sets the high break point for end of linear gain change.	5.00%	0.00-100.00%	R/W	
PROP. GAIN When the function is effective the default values of prop gain are 5 for errors below 1.00%, and 15 for errors above 5.00% with a linear change from 5 to 15 between 1.00% and 5.00%.	5.00	0.00-200.00	R/W	
INT.TIME .CONST Sets the integral time constant below the low breakpoint.	0.500s	0.000-30.000	R/W	
I GAIN IN RAMP While the RAMPING flag is TRUE the integral gain is scaled by I GAIN IN RAMP. This can be used to help prevent integral wind-up while the drive is ramping (particularly high inertia loads).	1.0000	0-2.0000	R/W	

ZERO SPD.QUENCH

Similar to SET STANDSTILL (i.e. it stops making current but keeps the contactor in) except that the speed loop remains enabled and will cause the current loop to unquench very quickly.

Whether the function is started depends on the following two parameters.

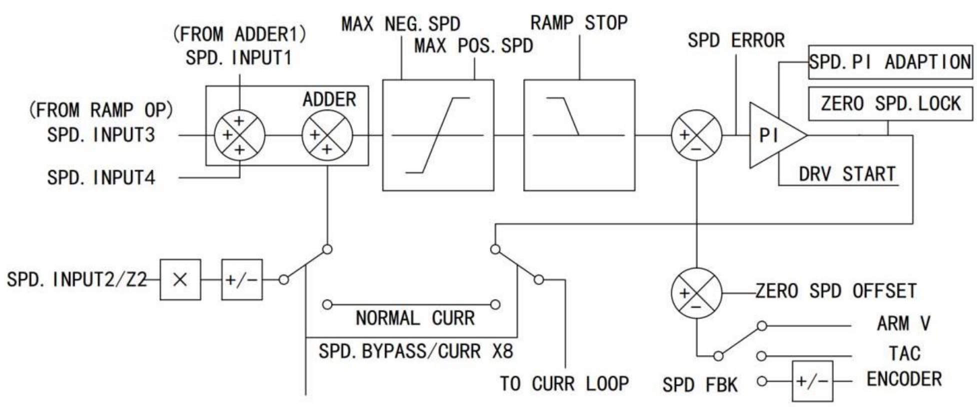
ZERO SPD.LEVEL Sets the threshold of speed feedback below which zero speed lock is active.	0.50%	0.00-200.00%	R/W	

ZERO IAD LEVEL	1.50%	0.00-200.00%	R/W	

Sets the threshold of current feedback below which Zero Speed Quench is active.				
INERTIA COMP It can be used in high precision applications such as positioning systems or elevators.				
INERTIA The current value necessary for the load to accelerate to 100% speed within 1 second.	0.00	0.00-200.00%	R/W	
FILTER Low pass filter for delta parameters.	0	0-20000	R/W	
RATE CAL Inertia compensation calibration factor.	0.00	0.00-200.00	R/W	
DELTA Rate of change required for speed.	0.00%	0.00-X.XX%	R/W	
UNSCALED OUTPUT Uncalibrated inertia compensation.	0.00%	0.00-X.XX%	R/W	
INERTIA COM OUTPUT It is directly added to the inertia compensation of the speed loop output.	0.00%	0.00-X.XX%	R/W	
SPEED SUMMER				
SPD.INPUT1 Speed Setpoint 1 (Default Summer 1 output).	0.00%	±100.00%	R/W	
SIGN2 （X3)） Speed setpoint 2 Sign.	POSITIVE	POSITIVE/ NEGATIVE	R/W	
RATION 2 （X3） Speed setpoint 2 ratio.	1.0000	±3.0000	R/W	

SPD.INPUT2 (X3) This input alters the drive operation from Speed Control to Current Control. When DI 3(Y8) is true, AI 2(X3) provides the current demand and the speed loop is disconnected. When false the speed loop is in control and AI 2(X3) is an auxiliary speed setpoint.	0.00%	0-100.00%	R/W	
SPD.INPUT3 Speed setpoint 3 (Default Ramp O/P).	0.00%	0-100.00%	R/W	
SPD.INPUT4 Default this is not connected to any analog input.	0.00%	0-100.00%	R/W	
MAX POS.SPD Sets positive (forward) limit level of total speed reference.	105.00%	0-105.00%	R/W	
MAX NEG.SPD Sets negative (reverse) limit level of total speed reference.	-105.00%	-105.00%-0	R/W	

Functional Descriptio

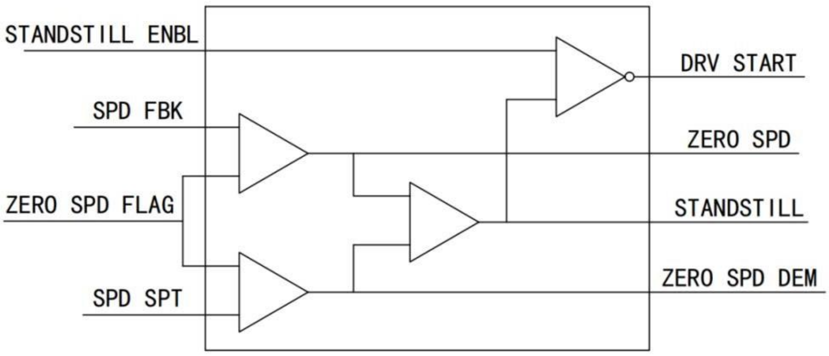


7.4.14 STANDSTILL SET

STANDSTILL SET Standstill logic is used to inhibit rotation.when operating with zero speed demand.If the drive is below the zero speed flag and STANDSTILL ENBL is enabled, then the speed and current loops are quenched.This prevents shaft oscillation around zero speed.It is useful in preventing gearbox wear due to “chattering” .

Menu / Description	Default	Range	Mode	PIN
STANDSTILL ENBL If TRUE, the Converter is quenched (although the contactor remains in) when the Speed Feedback and Speed Setpoint values are less than ZERO THRESHOLD.	DISABLED	ENABLED/ DISABLED	R/W	
零速阈值（ZERO THRESHOLD	2.00%	0-100.00%	R/W	
Threshold level which defines zero setpoint and zero speed diagnostic outputs and also controls the zero speed relay output.				

Functional Description

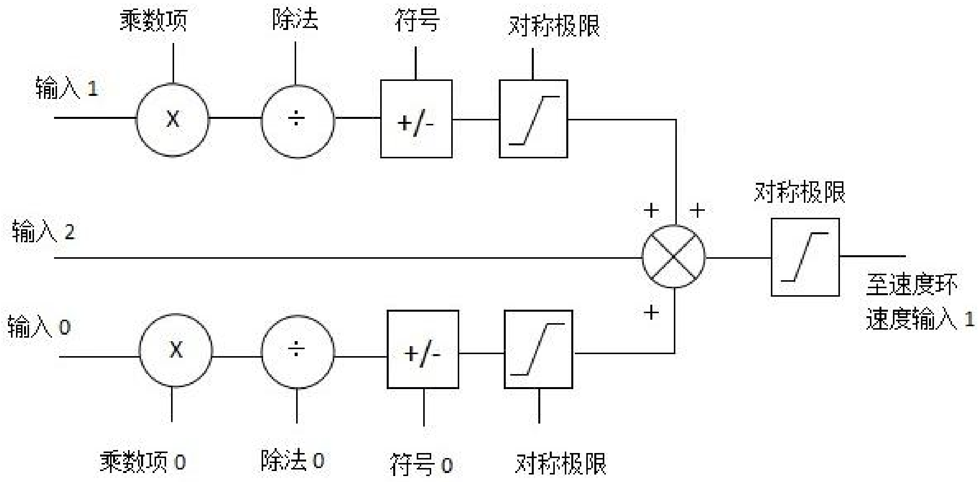


7.4.15 SETPOINT SUM1

SETPOINT SUM 1 This can be configured to perform one of a number of functions upon a fixed number of inputs.				
Menu / Description	Default	Range	Mode	PIN
RATIO 1 This multiplies Input 1 by a factor.	1.0000	±3.0000	R/W	
RATIO 0 This multiplies Input 0 by a factor.	1.0000	±3.0000	R/W	
SIGN 1 Inverts the analog input 1.	POSITIVE	POSITIVE/ NEGATIVE	R/W	

SIGN 0 Inverts the analog input 0.	POSITIVE	POSITIVE/ NEGATIVE	R/W	
DIVIDER 1 This divides Input 1 by a factor.Dividing by 0 (zero) results in a zero output.	1.0000	±3.0000	R/W	
DIVIDER 0 This divides Input 0 by a factor.Dividing by 0 (zero)	1.0000	±3.0000	R/W	
results in a zero output.				
DEADBAND WIDTH Analog input 1 deadband width.	0.00%	0.00-100.00%	R/W	
LIMIT The Setpoint Sum programmable limit is symmetrical and has the range 0.00% to 200.00%. The limit is applied both to the intermediate results of the RATIO calculation and the total output.	105.00%	0-200.00%	R/W	
INPUT 2 Input 2 value. By default this is not connected to any analog input.	0.00%	±200.00%	R/W	
INPUT 1 Input 1 value. By default this is connected to Analog Input 1 (X2).	0.00%	±200.00%	R/W	
INPUT 0 Input 0 value. By default this is not connected to any analog input.	0.00%	±200.00%	R/W	

Functional Description



7.5 LANGUAGE MENUS

LANGUAGE MENUS It selects the display language for the MMI.				
Menu / Description	Default	Range	Mode	PIN
LANGUAGE	CHINESE	CHINESE/ENGLISH	R/W	

7.6 PARAMETER SAVE

Refer to 5.2 parameter saving instructions.

7.7 SERIAL COMMS

Refer to communication manual.

7.8 ALARMS MONITOR

Refer to 6.3.11 driver alarms.

7.9 SYSTEM CONFIGURATION

SYSTEM CONFIG				
Menu / Description	Default	Range	Mode	PIN
SOFTWARE	ISSUE			
VIEW LEVEL STANDARD BASIC ADVANCED	STANDARD	STANDARD/ BASIC /ADVANCED	R/W	

CONFIGURE I/O Input and output function configuration.				
CONFIGURE ENABLE Parameterisation Mode (CONFIGURE ENABLE = DISABLED) *Function block output parameter values cannot be changed *Function block input parameter values that receive their values from a link cannot be changed	DISABLED	ENABLED/ DISABLED	R/W	

Configuration Mode (CONFIGURE ENABLE = ENABLED) *A link' s destination tag must be set to an input paramete				
*A link' s source tag may be set to any parameter. Both input and output parameters can be used as a source. *Disable a link/function block by setting the "destination" and "source" tag to zero. If parameter values or links have been modified, the new settings must be saved. Ensure that CONFIGURE ENABLE = DISABLED before performing a PARAMETER SAVE.				
ANALOG INPUTS Analog input 1(X2) to analog input 5(X6）.The analog input block is used to scale and clamp th inputs for terminals X2 to X6. ANIN 2 (X3) is not reconfigurable.It is a direct input into the speed loop/current loop.				
CALIBRATION The analog input scaling ratio.	1.0000	±3.0000	R/W	
MAX VALUE The maximum value of the scaled analog input.	100.00%	±300.00%	R/W	
MIN VALUE The minimum value of the scaled analog input.	-100.00%	±300.00%	R/W	
DESTINATION TAG The destination Tag No. of the scaled analog input value.		0-XXX	R/W	
ANOUT 1,2(X8,X9) Analog output 1(X8) and analog output 2(X9).This function block converts the demand percentag into a form suitable for driving the analog output electronics of the Converter.				
% TO GET TO 10V Conversion value (percentage) to produce 10V output.	100.00%	±300.00%	R/W	

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MODULUS FALSE: Analog output is bipolar. TRUE： Analog output is positive voltage.	FALSE	TRUE/FALSE	R/W	
OFFSET Sets the level of bi-polar offset to be added to the final signal.	0.00%	±100.00%	R/W	
SOURCE TAG		0-XXX	R/W	
DIGITAL INPUTS				
DIGITAL INPUT(Y4) and DIGITAL INPUT (Y5)				
DESTINATION TAG/Y4	496		R	
DESTINATION TAG/Y5	497		R	
Digital input 1 (Y6) to digital input 3 (Y8). With regard to destinations expecting logic parameters, 0.00% is regarded as Logic 0 and any other value is regarded as Logic 1. This refers to the values set in both VALUE HIGH and VALUE LOW. Inverting the digital input is therefore simple; set VALUE HIGH to 0.00% and VALUE LOW to 0.01% o any other non-zero number.				
VALUE FOR TRUE Sets the level of the value selected by a high DI input.	0.01%	±300.00%	R/W	
VALUE FOR FALSE Sets the level of the value selected by a low DI input.	0.00%	±300.00%	R/W	
DESTINATIONL TAG This function block allows the user to control the digital operating parameters of the software. The digital input can be configured to point to a destination location and to set that destination TRUE or FALSE depending upon programmable values.		0-XXX	R/W	
DIGITAL OUTPUTS				
Digital output 1 (Z3) to digital ouput 3 (Z5).				

THRESHOLD Sets the comparator threshold for the DO OP	0.00%	±300.00%	R/W	

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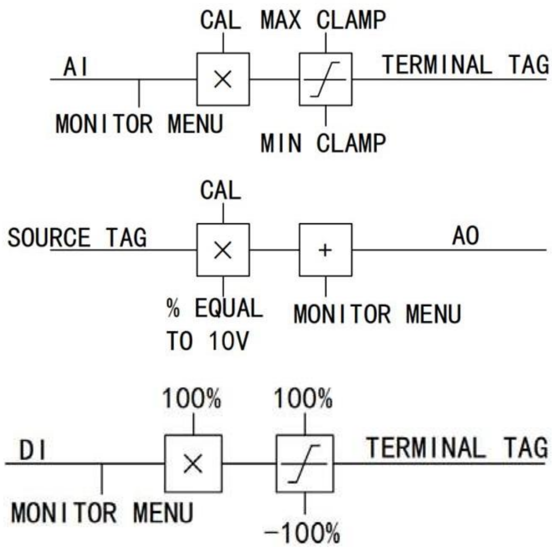
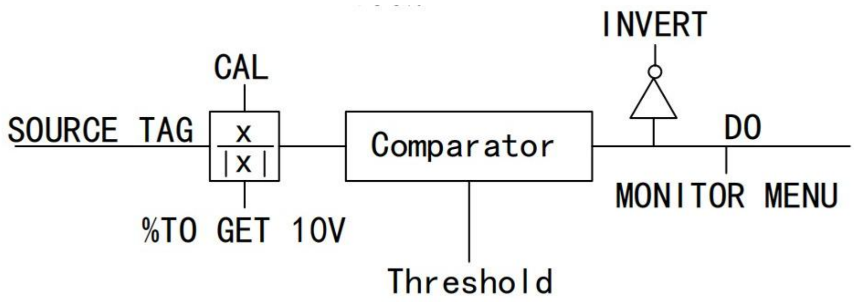
generator. The output of the comparator will be high when the signal from the rectifier mode box exceeds the threshold. The comparator output is low for identical inputs. For comparing logic values always put 0.00% in the threshold window.				
MODULUS FALSE: Analog output is bipolar. TRUE： Analog output is positive voltage.	TRUE	TRUE/FALSE	R/W	TRUE
SOURCE TAG		0-XXX		
INVERT Allows the comparator output logic to be inverted for DO.	FALSE	TRUE/FALSE		
APP BLOCK OP CODE-MDC/DC900 series contains a comprehensive range of extra system application blocks. Sets the output destination of the application blocks diagram.				
RAMP OP DEST Destination tag of ramp output.	291	0-XXX	R/W	
SUMMER1 OP TRML Destination tag of summer 1 output.	289	0-XXX	R/W	
PID OP DEST Destination tag of PID output.	0	0-XXX	R/W	
DIAMETER OP Destination tag of diameter output.	0	0-XXX	R/W	
TAPER Destination tag of taper output.	0	0-XXX	R/W	
SUMMER 2 Destination tag of summer 2 output.	0	0-XXX	R/W	

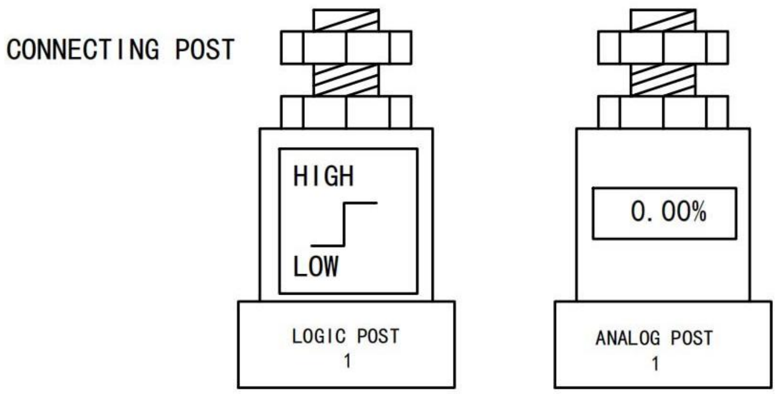
I CLAMP+ Destination tag of upper current clamp output.	0	0-XXX	R/W	
I CLAMP- Destination tag of lower current clamp output.	0	0-XXX	R/W	
TENSION+COMP CACL. Destination of Tension + Compensation output.	0	0-XXX	R/W	
DIGIT POT.TRML Destination tag of digital pot output.	0	0-XXX	R/W	
PREST DEST Destination tag of multiple speeds output.	0	0-XXX	R/W	
INTERNAL LINKS You can connect internal output to internal input. Connect an input as a condition to control several different targets.				
LINK1-12				
SOURCE TAG Defines the source tag for connection using link(x)	0	0-XXX	R/W	
DESTUINATION TAG Defines the destination tag for connection using link(x)	0	0-XXX	R/W	
STAGING POST These staging posts are like virtual wire wrap posts.				
ANALOG POST1-14 The digital and analogue posts are allocated tag numbers and are used as virtual wiring nodes. They can contain a value or act as constants for setting a value.See NOTE.	0.00%	±300.00%	R/W	

LOGIC POST1-8 The digital posts are used for logic values, a zero value is a logic low, a non zero +/- value is a logic high.See NOTE.	OFF	ON/OFF	R/W	

Functional Description

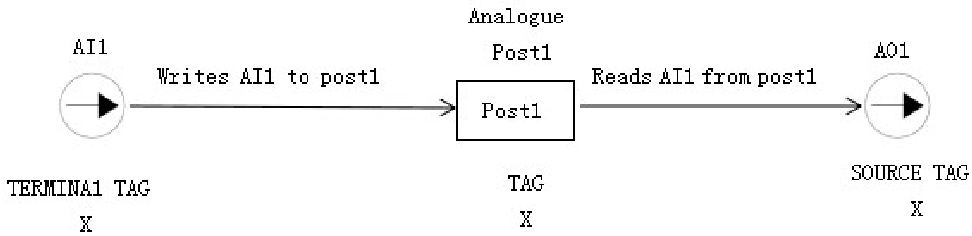






NOTE：1）When receiving values via a serial link, the posts can store the data and are then connected by the user to the desired destinations.

2）Using a software post is extremely useful during system commissioning if a block output needs to be examined prior to incorporation into a system.The block output will be activated by connecting it to one of these postsIt may then be monitored via the display.When satisfied with the output functionality, you can then connect it to the final system destination.The analogue posts are used for linear values.



7.10 PASSWORD

PASSWORD CTRL. When in force, the password prevents unauthorised parameter modification by making all parameters “read-only”. Activated: ENTER PASSWORD and CHANGE PASSWORD values are different. Deactivated: ENTER PASSWORD and CHANGE PASSWORD values are the same.				
Menu / Description	Default	Range	Mode	PIN
ENTER PASSWORD When password protection activated, you need to enter the correct password to modify the parameters. By default, the password feature is disabled, i.e. both parameters have the same value, 0x0000.	0X0000	0X0000-0XFFFF	R/W	
CHANGE PASSWORD Password protection is activated after new password is set.	0X0000	0X0000-0XFFFF	R/W	

8 Installation of the DC drives and technical specifications

*Refer to 8.5“Product dimensions and installation drawings” for further information.

8.1 Selection of ac line reactor

To correctly isolate the 590+ drive from the ac power system, and to protect other equipment from transients on the power system, always use the recommended external ac line reactor (or alternatively a transformer may achieve the necessary isolation).

CODE ac line reactor（For use without filters）				
Armature current rating (A)	AC rating (A)	Reactor voltage drop	AC input voltage)	CODE reactor type
40	36	3V	500V	CODE-SCK-40-500-3
80	72	3V	500V	CODE-SCK-80-500-3
120	110	3V	500V	CODE-SCK-110-500-3
160	145	3V	500V	CODE-SCK-150-500-3
200	180	3V	500V	CODE-SCK-180-500-3

280	250	5V	500V	CODE-SCK-250-500-5
400	360	5V	500V	CODE-SCK-360-500-5
550	495	5V	500V	CODE-SCK-500-500-5
700	630	5V	500V	CODE-SCK-650-500-5
850	765	5V	500V	CODE-SCK-800-500-5
900	810	5V	500V	CODE-SCK-850-500-5
1200	1080	5V	500V	CODE-SCK-1100-500-5
1600	1440	5V	500V	CODE-SCK-1500-500-5
2000	1800	5V	500V	CODE-SCK-1800-500-5
2600	2340	5V	500V	CODE-SCK-2400-500-5

8.2 Fuse selection table

Selection of fuse for CODE DC Driver				
Armature current rating (A)	Max cont AC current (A)	Main fast fuse $I^2 t$	Field fuse	Power supply fuses
40	50	1000	10A	3A
80	90	5000	10A	3A
120	130	10000	20A	3A
160	180	20000	20A	3A
200	220	20000	20A	3A
280	300	60000	20A	3A
400	420	110000	30A	3A
550	600	300000	30A	3A
700	800	450000	30A	3A
850	1000	945000	30A	3A
900	1000	945000	30A	3A
1200	500x2		40A	3A

1600	800x2		50A	3A
2000	900x2		50A	3A
2600	1200x2		60A	3A

8.3 CODE DC Driver cooling fans

CODE DC Driver cooling fans				
Armature Current Rating (A)	Maximum rating ambient (° C)	Cooling method	Number of fans	Fan voltage
20	50	no fan	0	-
40	50	no fan	0	-
80	50	no fan	0	-
120	50	Integral Fan	2	110 or 220VAC
160	50	Integral Fan	2	110 or 220VAC
200	50	Integral Fan	2	110 or 220VAC
280	50	Integral Fan	2	110 or 220VAC
400	45	Forced Vent	1	110 or 220VAC
550	45	Forced Vent	1	110 or 220VAC
700	45	Forced Vent	1	110 or 220VAC
850	45	Forced Vent	1	110 or 220VAC
1200	45	Integral Fan	3 or 6	110 or 220VAC
1600	45	Integral Fan	3 or 6	110 or 220VAC
2000	45	Separate Fan	2	110 or 220VAC
2600	45	Separate Fan	2	110 or 220VAC

8.4 Unpacking and lifting the DC driver

Caution The packaging is combustible and, if disposed of in this manner incorrectly, may lead to the generation of lethal toxic fumes.

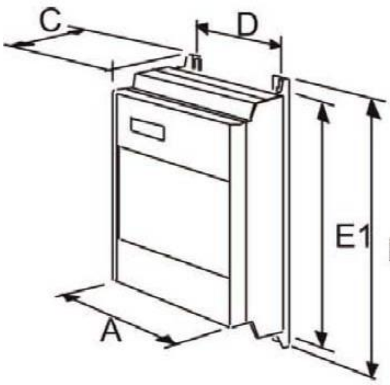
Save the packaging in case of return. Improper packaging can result in transit damage.

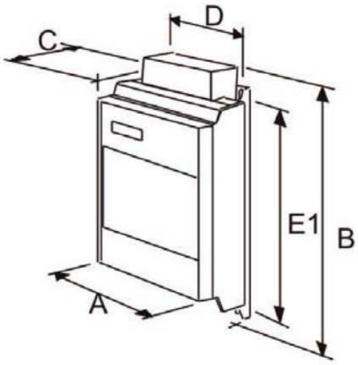
The larger DC drivers are supplied in special packaging to protect the drive whilst in transit.

Use a safe and suitable lifting procedure when moving the DC drive. Never lift the DC drive by its terminal connections.

Prepare a clear, flat surface to receive the DC drive before attempting to move it. Do not damage any terminal connections when putting the DC drive down.

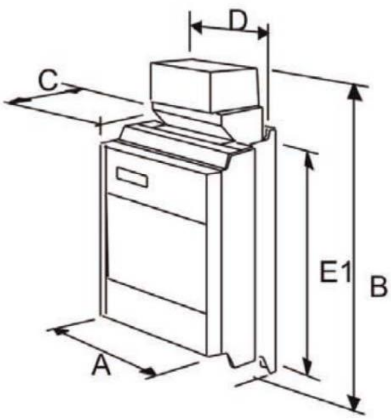
8.5 Product dimensions and installation drawings

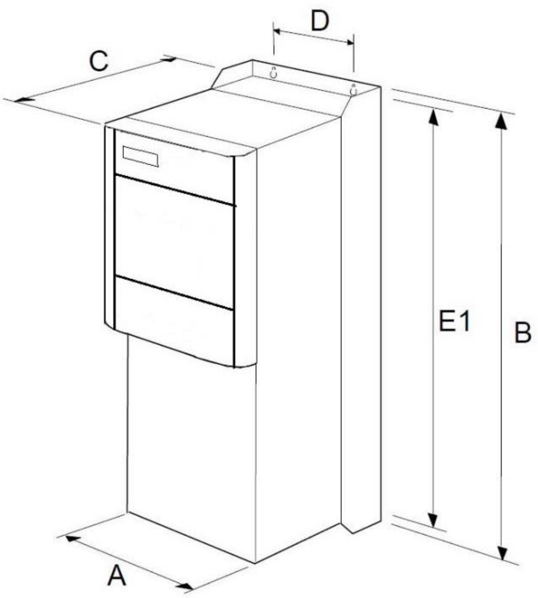




40-80A

120-160A





200-280A

400-900A

Rated current（A）	Outline size （mm)	Installation dimension (mm)

	A	B	C	D	E1
40-80	250mm	415mm	171mm	200mm	400mm
120-160	250mm	451mm	171mm	200mm	400mm
200	250mm	485mm	213mm	200mm	400mm
280	297mm	485mm	213mm	200mm	400mm
400-900	253mm	700mm	235mm	150mm	680mm

8.6 Installation details

8.6.1 Terminal tightening torques

Terminations	Armature current rating (A)	Maximum Tightening Torque
X1-9,Y1-9,Z1-9,V1-8	20A-2600A	0.5Nm
W1-W4 and Fan connection terminals	20A-2600A	1.0Nm
W5， W6	20A-280A	1.0Nm
	400A-2600A	3.0Nm
L1-L3， A+,A-	20A-160A	5.0Nm
	200A-280A	10.0Nm
	400A-1600A	25.0Nm
	2000A-2600A	29.0Nm
PE（Grounding terminal）	20A-160A	5.0Nm
	200A-2600A	7.0Nm

8.6.2General mounting hints

Mount the unit vertically on a solid, flat, vertical surface. It is mounted using bolts or screws into four fixing points (keyhole slots). The design allows the use of 100mm grid fixing.

Insert the mounting studs from the rear of the panel. Attach lock washers and nuts part way on to the lower mounting studs; these will help to keep the drive in place when mounting.

Note: Holes for the mounting bolts or screws must be placed accurately.

8.6.3Caution

Lift the DC driver and engage the bottom slots safely on to the studs between the panel and lock washers/nuts you have just fitted. Engage the top slots with the remaining mounting studs and finger tighten the drive to the panel with lock washers and nuts. Finally, use the socket wrench to tighten all nuts securely.

8.6.4 Ventilation and cooling requirements

The DC driver gives off heat in normal operation and must therefore be mounted to allow the free flow of air through the air entries and exits. Maintain the minimum air clearances given on the drawings to ensure that heat generated by other adjacent equipment is not transmitted to the Dc driver, be aware that other equipment may have its own clearance requirements. When mounting two or more DC900 DC driver together, these clearances are cumulative.

8.6.5 ac line reactor

We recommend that you always use the specified ac line reactor with the DC driver to provide a known supply impedance for effective operation of the thyristor transient suppression circuits. At least 1% line impedance should be provided in the supply side of the DC driver.
See 8.1 Selection of ac line reactor.

8.6.6 Installing the fan（2000-2600）

The fan unit supplied should be installed on the cubicle, with or without ducting . The DC900 series drive is force-cooled using the fan units supplied with the drive. As a general rule allow at least 180mm of clear space above and below the DC drive for free air flow. We suggest the cubicle has an air inlet at the base of the cubicle equivalent to 0.4 ㎡, variable depending upon the filter type used, to allow the maximum throughput of air.

8.7 Electrical installation（See4.1 Minimum connection requirement）

WARNING!

Ensure that all wiring is electrically isolated!

8.7.1 Recommended wire size

Selection of cables with good electrical conductivity.Power wiring should utilise cables with a minimum rating of 1.25 X full load current. Control wiring should have a minimum cross-section of $0.75mm^2$. Copper conductors must be rated 60C° , or 75C° over 100 Amps.

Reference for CODE DC Driver cable selection
Note：The following table is copper wire specification, aluminum wire is used in a large specification. *2 Representing 2 cables.

Armature Current Rating (A)	AC rating (A)	Input wire size (mm^2)	Input wire size (mm^2)	Control wiring（mm^2）
20	18	4	4	0.75
40	36	6	6	0.75
80	72	16	16	0.75
120	110	25	25	0.75
160	145	50	50	0.75
200	180	70	70	0.75
280	250	120	120	0.75
400	360	120	120	0.75
550	495	185	185	0.75
700	630	240	240	0.75
850	765	300	300	0.75
1200	1080	240*2	240*2	0.75
1600	1440	300*2	300*2	0.75
2000	1800	300*4	300*4	0.75
2600	2340	300*4	300*4	0.75

*Caution

Make sure all wiring connections meet or exceed applicable local and National Electrical Codes. Be sure to fit branch circuit and motor overload protection.

*IMPORTANT：

- All incoming main AC power supply connections must be protected with high speed fuses. See 7.2 Fuse selection table.
- The External AC Supply EMC Filter must only be fitted on the mains side of the contactor. *Important connections
- Terminal Y5 must be connected to Y9 for the drive to run.

- Terminals Y1 and Y2 must be linked if a thermostat is not fitted.

8.7.2 Protective earth connections (PE)

- For permanent earthing, the CODE DC driver requires either two individual incoming protective earth conductors (<10mm^2 cross-section), or one conductor (≥10mm^2 cross-section) connected to an independent protective earth/ground point near the drive.

- Run the motor protective earth/ground connection in parallel with the motor supply conductors, ideally in the same conduit/screen/armour, and connect to an independent protective earth/ground point near the drive.

- Connect the drive to the independent earth/ground point.

8.7.3 3-Phase External Contactor

A 3-phase external contactor should be connected in the main ac power supply connections with a rating suitable (AC1) for the DC driver concerned.The contactor does not switch current and is primarily for disconnection and sequencing of the power bridge. The main contactor must be energised directly from the controller by connecting the coil to terminals W3 (Line) and W4 (Neutral). If the 3-phase contactor has a coil with an inrush greater than 3A, a slave relay must be used to drive the contactor coil.The contactor and slave relay (if required) must have coil voltages compatible with the controller auxiliary supply voltage.

8.7.4 3-Phase Supply, AC line reactor

See 8.1 Selection of ac line reactor.
The main ac power is connected to busbar terminals L1, L2 and L3, there is no specific phase connection to these three terminals as the controller is phase rotation independent.

8.7.5 Auxiliary supply（W1，W2）

The steady state current absorbed by the controller is nominal, the external fuse is determined chiefly by considering the contactor holding VA and the controller cooling fans.

8.7.6 Field（W5+,W6-）

Connect the motor field (-) to terminal F- and field (+) to terminal F+.

Note If the motor has no field connections, is a permanent magnet motor, or if the field is derived externally, you must inhibit the FIELD ENABLE parameter.

8.7.7 Motor armature（A+,A-）

The motor armature is connected to terminals A+ and A-.

8.7.8 Analog tachometer (V1，V2)

The DC driver is equipped with analog tachometer feedback.An Analog Tachometer is connected to the DC driver using a screened twisted pair cable throughout its entire length to provide speed feedback via terminal V1&V2 .The screen is grounded or earthed only at the drive end, any other grounding arrangement may cause problems.If AC analog tachometer machine needs rectification, output is used as driver speed feedback input.

Calculate the tacho voltage by multiplying the required maximum speed by the tacho calibration factor, e.g. motor speed 1500 rpm and tacho calibration factor 60V per 1000 rpm is 90V.

The tacho calibration volts are set using the 1 in-line switches (10-way).When all switch positions are set to the left (ON)， tacho calibration voltage =10VDC.Each switch to the right represents tacho calibration voltage. For example, tacho voltage is rated as 82.5VDC,the tacho calibration are set to 82.5-10=72.5VDC.Just select a switch which represents 50, a representative 20 and a representative 2 to the left position.

8.7.9 ENCODER(V4-V9)

The wire-ended encoder is connected to the DC driver using a screened cable throughout its entire length to provide speed feedback.Terminals V4 (0V) and V5(+24V dc) are the return and supply respectively.

The maximum allowable encoder frequency is 100kHz, thus with a standard 1000 lines per revolution encoder the motor speed cannot exceed 6000 rpm.

Encoder connection: See 4.1 Minimum connection requirement.

8.7.10 Control wiring connections

Note: See 3.5 Terminal Information of drive