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6 ELECTRICAL CONNECTIONS
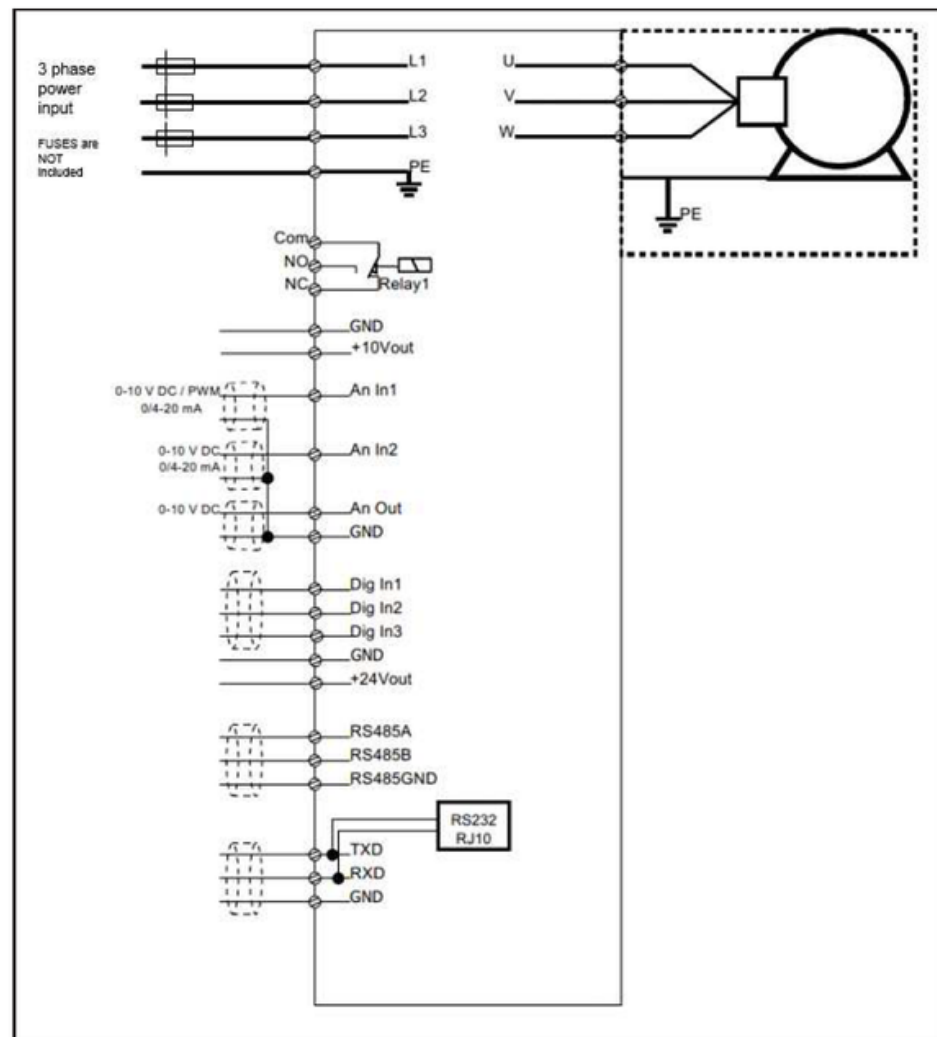
6.1 Overview electrical connections

Figure 4 Overview electric connections

6.2 Fuses

To protect the 3 phase mains, according to IEC 60364, a maximum 16A gG fuse (acc. IEC60269) or a C16A automatic circuit breaker with similar characteristic must be used.

NOTE! always check local legislation and regulations when defining the supply connection and line fuses in relation to the environment and ambient conditions..

6.3 Opening the terminal cover

Before opening the cover be aware that the unit has been safely disconnected from the mains supply, also be aware that the housing is cooled down.

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⚠	HOT SURFACE!	Be aware of that the housing of the unit is used as heat sink and therefore can have high temperature.

⚡	DANGER!	After switching off the mains supply, dangerous voltage can still be present in the AC drive. When opening the AC drive for installing and/or commissioning activities wait at least 3 minutes. In case of malfunction a qualified technician should check the DC-link or wait for one hour before dismantling the AC drive for repair..

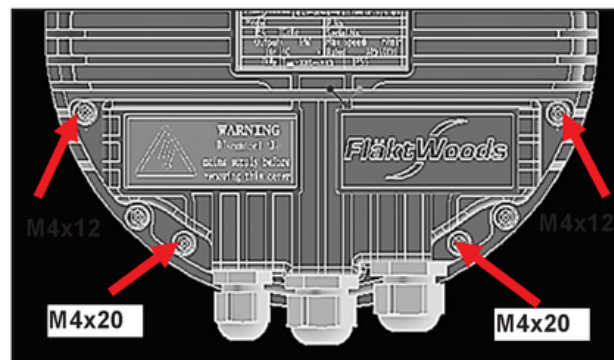1) Remove the 4 screws as indicated; 2 pieces M4x10 mm and 2 pieces M4x20 mm

Figure 5 Remove the terminal cover

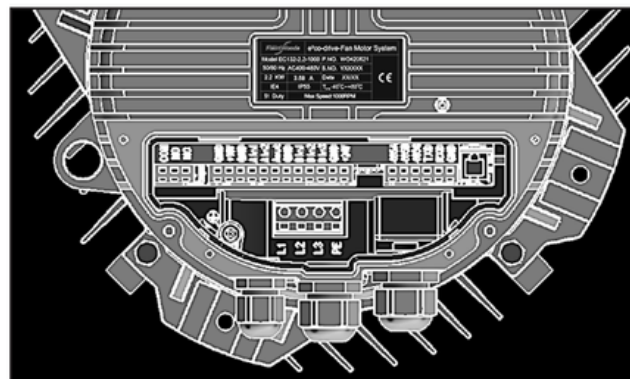2) Open the cover to access the POWER and the CONTROL terminals

Figure 6 Cover removed

3) When closing the cover take care that the sealing is in the correct position and use a torque wrench to tighten the screws with a torque of 1.6 ~2.4 Nm

6.4 Main supply connection

The terminals are all spring clip type and are made to use with or without ferrule. It is strongly advised to use ferrules, for a good and reliable connection.
- Massive or stranded wire: 2,5 mm^2
- Stranded wire with ferrule: 2,5 mm^2
- Stranded wire with isolated ferrule: 1,5 mm^2

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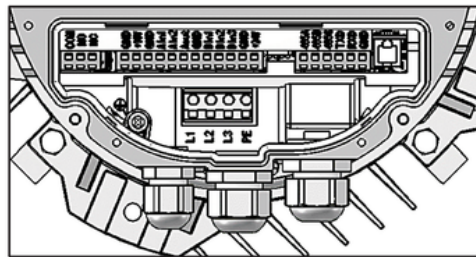| Name	Function
L1	Input phase 1
L2	Input phase 2
L3	Input phase 3
PE	Protective earth
PE SCREW	Protective earth on housing

Figure 7 Power terminal and location PE screw with marking

Use the middle cable gland for the mains supply cable. And secure it with a strain relief by using the cable gland.

	NOTE!	The mains supply cable can be a normal NON shielded cable. The EMC regulations do NOT demand a shielded input power cable. Armored cable can be used for mechanical protection if needed.

To maintain safety in case of damage to or disconnection of the protective earthing conductor in the PE terminal, and a touch current in the protective earthing conductor which can exceed 3,5mA AC. there is a PE SCREW implemented for the connection of a second protective earth conductor.

	DANGER!	The touch current in the protective earthing conductor can exceed 3,5mA AC.

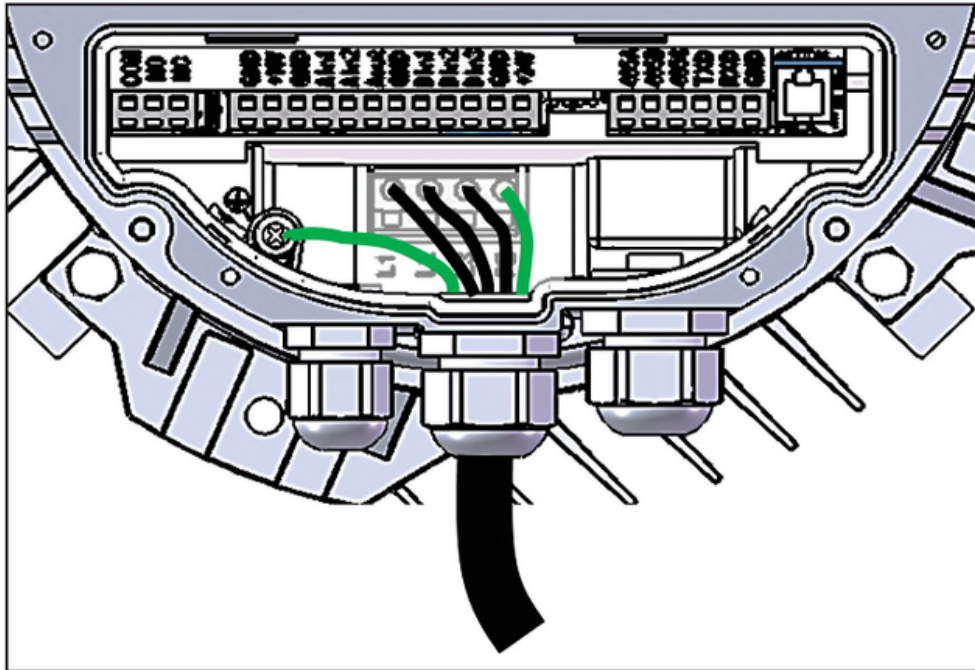|	NOTE!	The minimum size of the protective earthing conductor shall comply with the local safety regulations for high protective earthing conductor current equipment.

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Figure 8 Mains cable connected

6.5 Control Connections RCTS (Remote Control Terminal Strip)

Name	Function	Default	Remarks
COM	Output Relay common contact	Fault (Trip)	Potential free contact
NO	Output relay N.O. contact		
NC	Output relay N.C. contact		
GND	Signal ground	common	
+10V	+10 VDC auxiliary supply max 10mA		
GND	Signal ground	common	
AIn1	Analog Input 1	Set reference 0-10 V	Programmable input
AIn2	Analog Input 2	Set reference 0-20 mA	Programmable input
AOut	Analog Output	Fan Speed	Programmable output
GND	Signal ground	common	
DIn1	Digital Input 1	Start Right	Programmable input
DIn2	Digital Input 2	Start Left	Programmable input
DIn3	Digital Input 3	Reset	Programmable input
GND	Signal ground	common	
+24V	+24 VDC auxiliary supply max 50mA		
485A	RS 485 data -	RS 485 serial port	Galvanic isolated
485B	RS 485 data +		
485G	RS 485 ground		
TXD	RS 232 Transmit data	RS 232 serial port	Non isolated, same port as Service port (RJ10)
RXD	RS 232 Receive data		
GND	Signal ground	common	

6.6 Service port RS 232 (RJ10)

This service RS 232 service port is parallel connected with the RS 232 port on the RCTS terminals TXD and RXD.

Name	Function	Default	Remarks
RJ10-1	+24 V RTX	RS 232 communication port (service)	Non isolated, same port as TXD/RXD port.
RJ10-2	RS 232 Transmit data		
RJ10-3	RS 232 Receive data		
RJ10-4	Signal Ground		

NOTE!   Only one of the two RS 232 ports may be connected at the same instance.

CAUTION!   The RS 232 ports are not galvanic isolated this means that it is strongly recommended to use **ISOLATED RS232-USB** converters for connection to a PC or Laptop.

6.7 RS485 Termination/Biasing DIP switches

The 4 dip switches S1 to S4 have the following functions:

S1	S2	S3	S4	function
OFF	OFF	OFF	OFF	NO Termination NO Biasing (default)
ON	ON	OFF	OFF	Terminated
OFF	ON	ON	ON	Terminated and Biased
OFF	OFF	ON	ON	Biased

Figure 9 Default setting

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6.7.1 Termination

A properly selected RS485 bus uses a cable with a characteristic impedance of 120Ω. To minimize transmission line effects such as reflection the bus needs at the far-ends to be terminated with 120Ω. An optimal RS485 bus uses a topology where the far-end nodes are interconnected with a two line twisted pair cable. All other nodes are connected to the same twisted pair cable where the stubs are as short as possible. In practice the topology for RS485 wiring should be a chain of nodes with limited stub lengths preferably shorter as 3 meter.

6.7.2 Fail safe biasing

A RS485 receiver must detect a logic 1 or 0 depending on the difference of the A to B voltage. A small zone is undefined and can generate a 1 or a 0 for a positive or negative difference of e.g. 100mV. The RS485 standard states an undefined output at maximum difference of up to +/- 200mV. An undriven bus has a difference close to 0 volt which can cause side effects which disturb proper communication. The biasing fail safe circuitry takes care that at open bus the input difference is always more as 250mV. This value is based on the previously mentioned 200mV plus an additional 50mV noise margin. Every AC drive has such on-board fail safe biasing circuitry. On an RS485 bus however only one such circuit should be activated. In general, this is done at one of the far-ends of the bus.
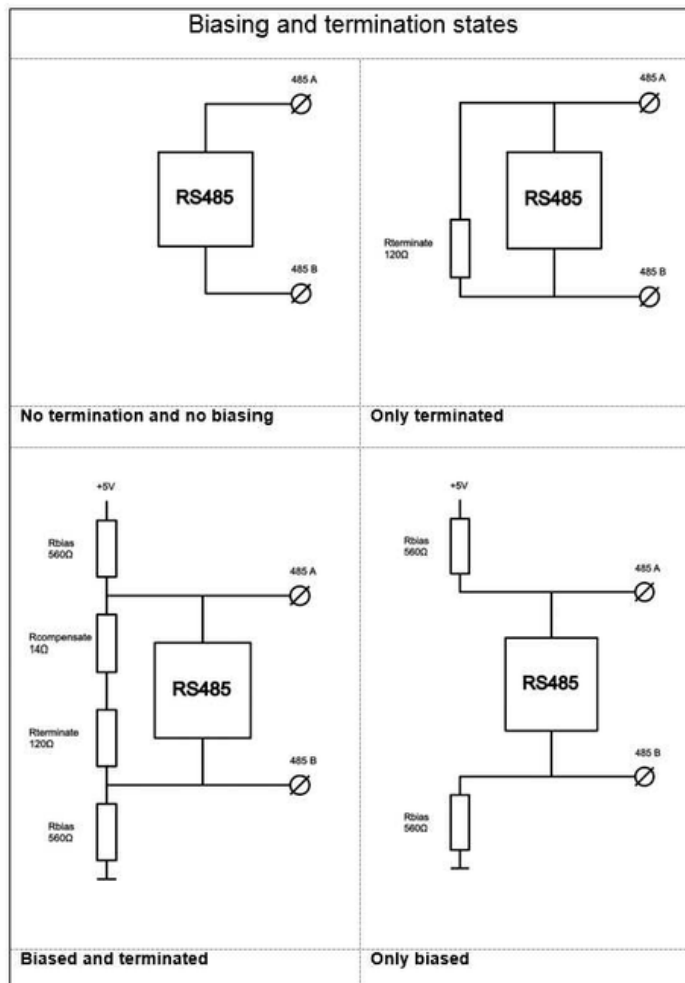
Figure 10 Termination and Biasing

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6.8 Terminal strip RCTS layout
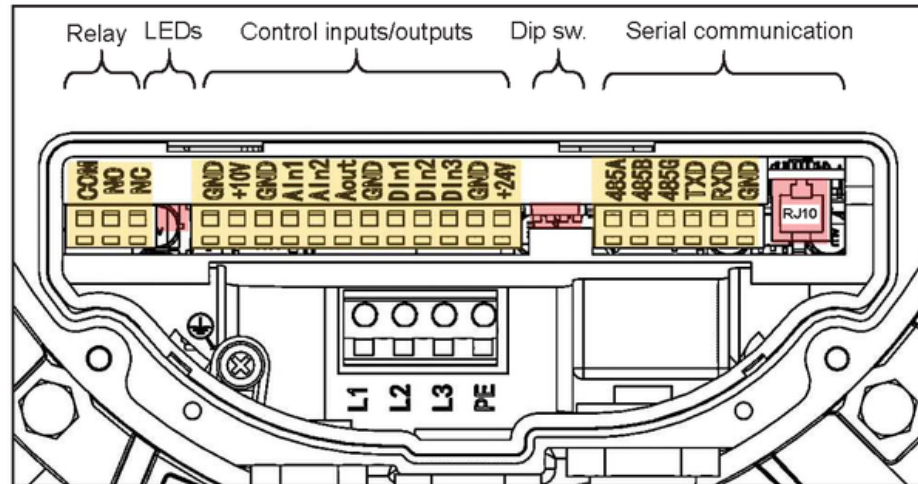
Figure 11 Remote Control Terminal Strip RCTS

6.8 EMC cable gland for control and communication cables

For all control signals including the serial communication ports there is a special EMC gland fitted which can fit maximum 3 cables with EMC screening. The screens of the cables must be connected inside the gland and not to PE connections.

> **NOTE!** For all control signals including the serial communication ports it is mandatory to use the special EMC cable gland, to fulfil the EMC regulations.

Figure 12 Control gland

Figure 13 EMC cable connection

6.9 Output relay connection

For the relay cable it is NOT necessary to use screened EMC cable.

Figure 14 Relay cable connection

7 PARAMETER SELECTION AND SETUP

The control Parameters can only be set with help of the Fläkt Woods EC Technology Control Software. This PC tool is described in chapter 9
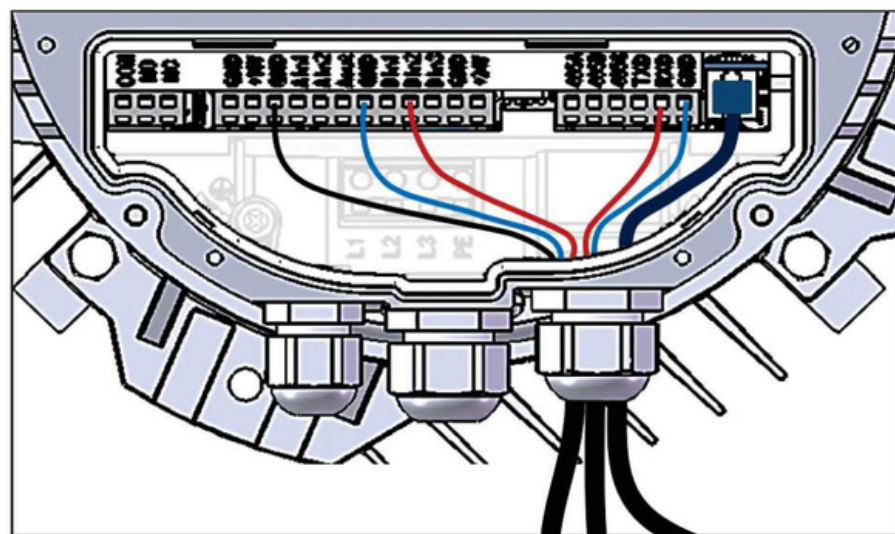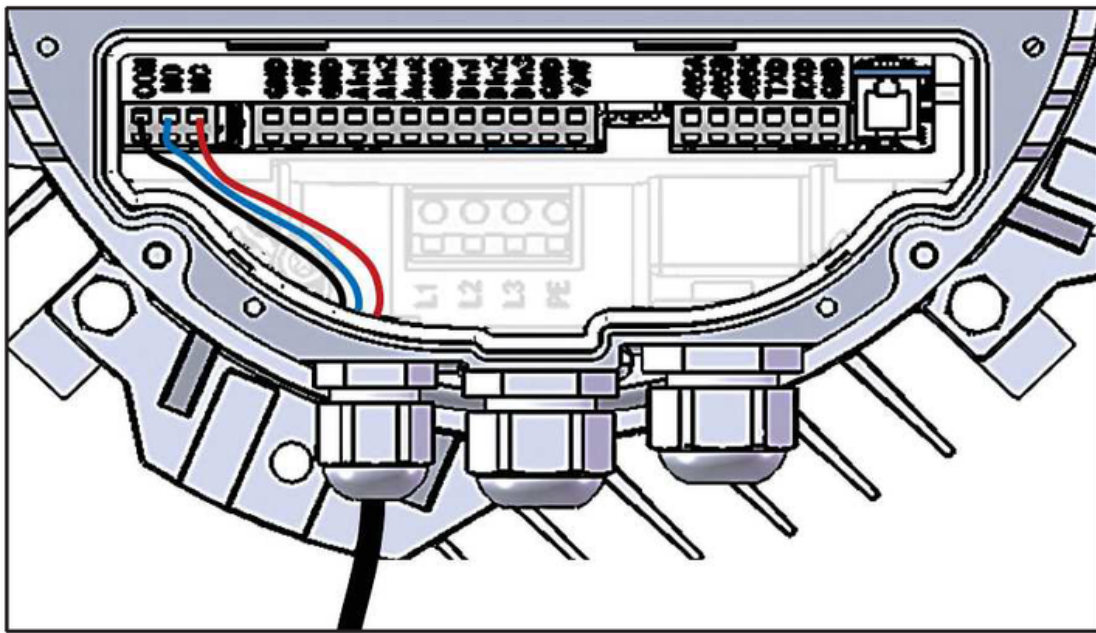
The parameters as described in the Instruction manual are grouped in 3 USER levels.

- ALL   : no code, standard mode
- USER   : code needed
- M-USER   : code needed, In this mode the USER password can be changed

7.1 Parameter Groups functions

- Group 0, Control   : Modbus enable selection, Start/Stop and reference control via MODBUS communication
- Group 5, RCTS Setup   : Programming of the inputs and outputs
- Group 10, Speed-Ramp   : Speed Limits, Skip speeds and Acceleration and Deceleration ramps
- Group 20, Motor Monitor   : Read out of Motor values
- Group 30, Condition Monitor   : Read out of Error codes (trips) and Warnings
- Group 40, Software Conf.   : Firmware version
- Group 90, IO Monitor   : Analog and digital input/output status
- Group 175, Assembly   : Fan and Motor identification
- Group 180, Clock   : Hour counters
- Group 190, Error Log   : Trip history
- Group 200, Authentication   : Passwords settings

Parameter group		Parameter address		Format	Read and/or write	Available in			Param name	Parameter description	Range		Default
		Dec	Hex			M_user	User	All					
0	Control	7	7	uint16	R/W	Y	Y	Y	Enable	Enable drive	0	Disabled	0
											1	Enabled	
		8	8	uint16	R/W	Y	Y	Y	Start	Start drive	0	Stop	0
											1	Start	
		9	9	uint16	R/W	Y	Y	Y	CWRota	Rotation direction	0	CCW	1
											1	CW	
		10	A	uint32	R/W	Y	Y	Y	SetSpd	Speed setpoint	0-1250	rpm	0
		16	10	uint16	R/W	Y	Y	Y	Reset	Trip reset	0	Inactive	0
											1	Active	
		8194	2002	uint16	R/W	Y	Y	Y	MbOver	Modbus override	0	No (use RCTS)	0
											1	Yes (override RCTS)	
		19	13	uint16	R/W		Y		Heatin	Drive heating	0	Disabled	1
											1	Enabled	
		20	14	uint16	R/W		Y		SkipSp	Enable skip speeds	0	Disabled	0
											1	Enabled	
5	RCTS Setup	37	25	uint16	R/W		Y		AoSel	Analog output function	0	Motor speed	0
											1	Motor power	
											2	Motor current	
											3	Motor torque	
											4	Mirror of "set reference" for master/slave	
											5	Motor voltage	
											6	Mirror of Analog input 1	
											7	Mirror of Analog input 2	
		38	26	uint16	R/W		Y		RelSel	Relay function	0	Fault (Trip)	0
											1	Warning	
		32	20	uint16	R/W		Y		Ai1Sel	Analog Input 1 function	0	Off	1
											1	Set reference 0-10V	
											2	Set reference 0-20mA	
											3	Set reference 4-20mA	
		33	21	uint16	R/W		Y		Ai2sel	Analog Input 2 function	0	Off	2
											1	Set reference 0-10V	
											2	Set reference 0-20mA	
											3	Set reference 4-20mA	
		34	22	uint16	R/W		Y		Di1Sel	Digital Input 1 function	0	Off	1
											1	Start CW	
											2	Start CCW	
											3	Trip Reset	
											4	Analog input selection ("0"= Ain1, "1"= Ain2)	
		35	23	uint16	R/W		Y		Di2Sel	Digital Input 2 function	0	Off	2
											1	Start CW	
											2	Start CCW	
											3	Trip Reset	
											4	Analog input selection ("0"= Ain1, "1"= Ain2)	
		36	24	uint16	R/W		Y		Di3Sel	Digital Input 3 function	0	Off	3
											1	Start CW	
											2	Start CCW	
											3	Trip Reset	
											4	Analog input selection ("0"= Ain1, "1"= Ain2)	