



Electric Water Cannon RM65-E-360-C

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1. Water Cannon - Warning - Hazard to Health

Care needs to be taken operating a water cannon. Water from a cannon is capable of inflicting serious injury to a person in the path of the jet.

Primary injuries would be those from the direct hit to the body by the impact of the jet. These would include bruising of internal organs and damage to the eyes.

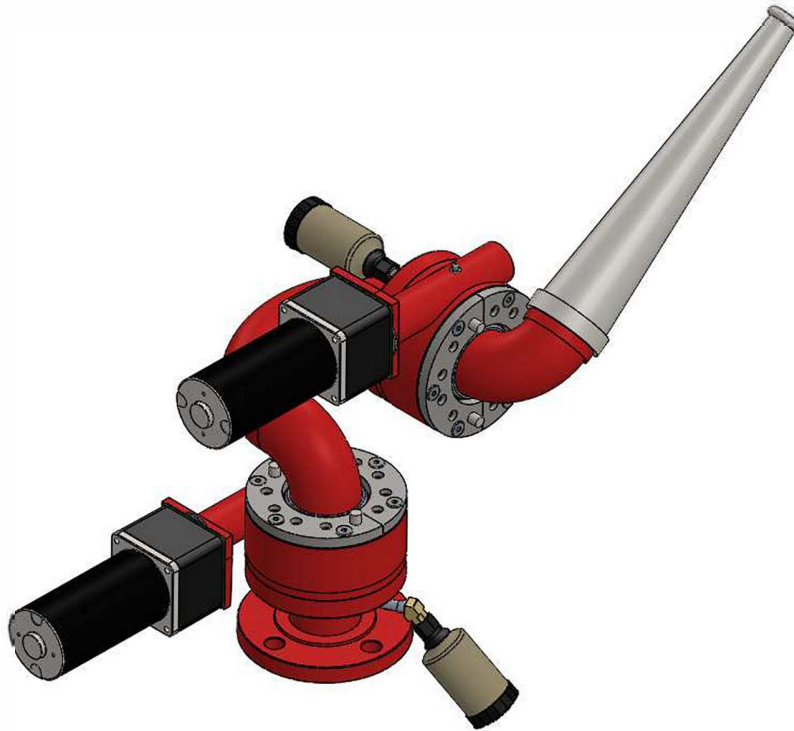
Secondary injuries can occur as a result of the acceleration of the body in collision with hard surfaces. These injuries would be largely skeletal, such as broken bone. Other injuries could be caused by debris, accelerated by the force of the water jet striking the person.

The following should be considered as a minimum level of care required when operating a water cannon:

- Know the direction that the cannon is aiming at. Aim the cannon in a safe direction before turning the water on.
- Keep all personal out of the front of the cannon. Dangerous flow velocities can cause serious injury for quite a distance in front of the cannon.
- The cannon contain moving parts. Keep hands, fingers, and objects away from pinch points when working close to the cannon.
- Do not attempt to modify the equipment in any way. Modifications of the equipment may result in damage and/or malfunction of the equipment which could cause injury to the operator or other. Also, the manufacturer's warranty will be void.
- Follow all the maintenance procedures in the documentation. Failure to do so, can result in damage and/or malfunction of the equipment which could cause injury to the operator or other.



2. RM65-E-360-C Brochure



- Electric driven slew and elevation
- Automatic grease lubrication
- Up to 345° slew (maximum)
- 70° elevation (as standard), 45° above horizontal, and 25° below horizontal
- Electric 4 ways joystick controller supplied
- Unit pre-set to correct settings and tested prior to final packaging and dispatch
- 12V or 24V available
- Mounting flange with fasteners included
- Option of electrically switched air butterfly valve or electric butterfly valve to turn water on/off
- Optional remote foam/fog nozzle available
- Optional radio frequency (RF) wireless control available
- 65mm (2 1/2") ANSI 150lb flanged inlet connection
- Director nozzle supplied as standard; 28mm (1 1/8" orifice) and 60 m water throw at 7 bar
- Power requirement; 24V 4A or 12V 8A

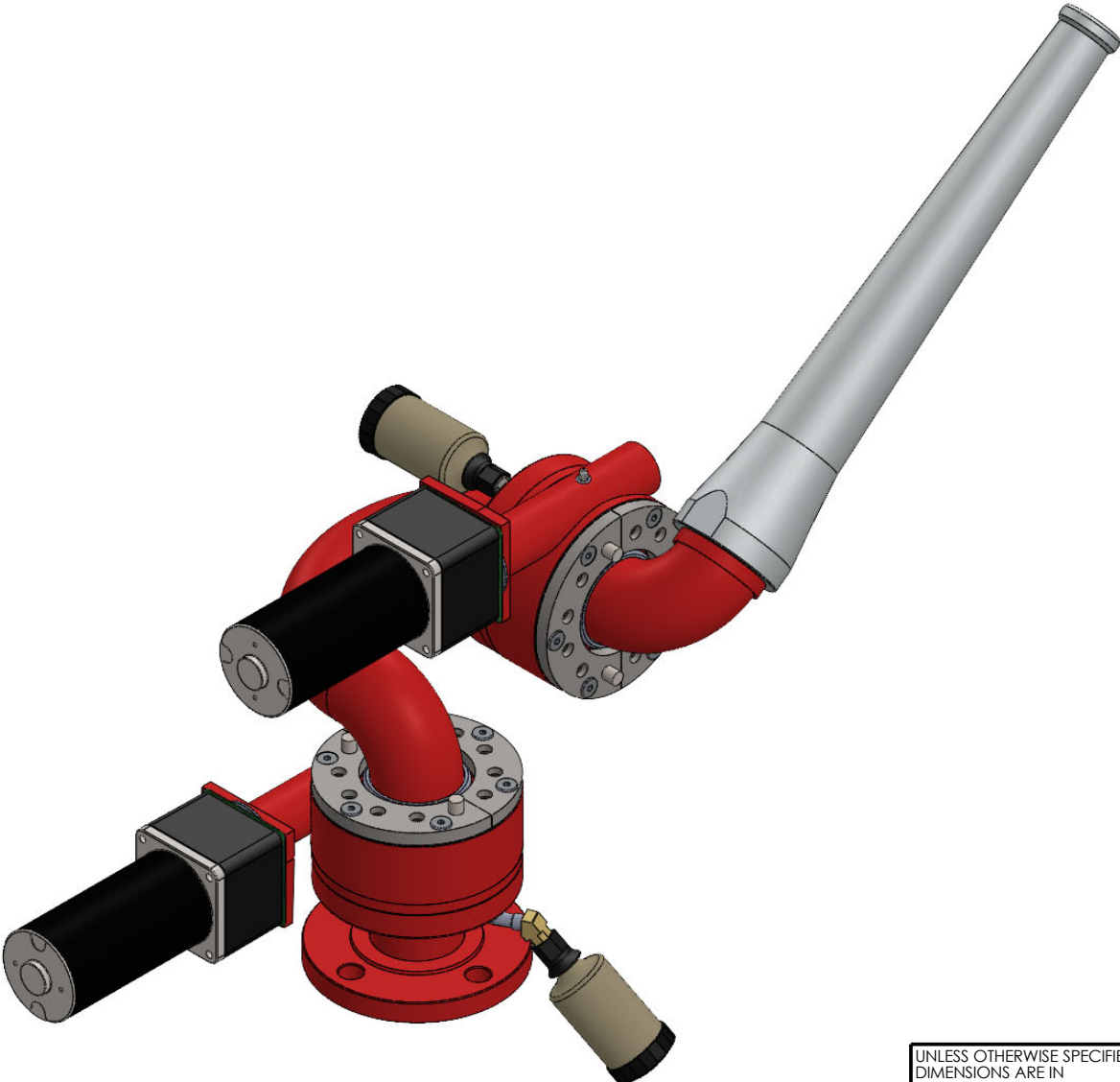





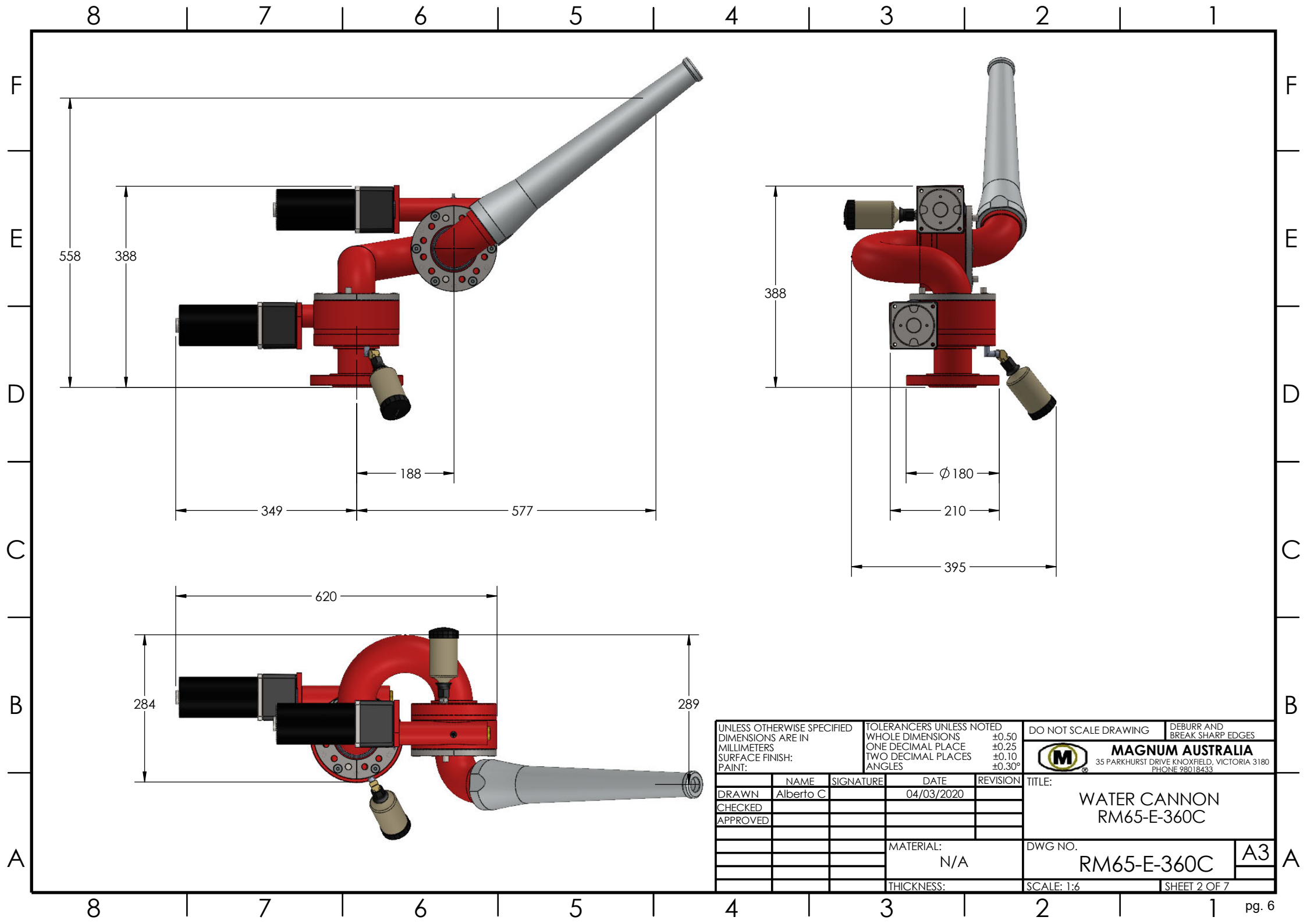
MAGNUM AUSTRALIA P/L

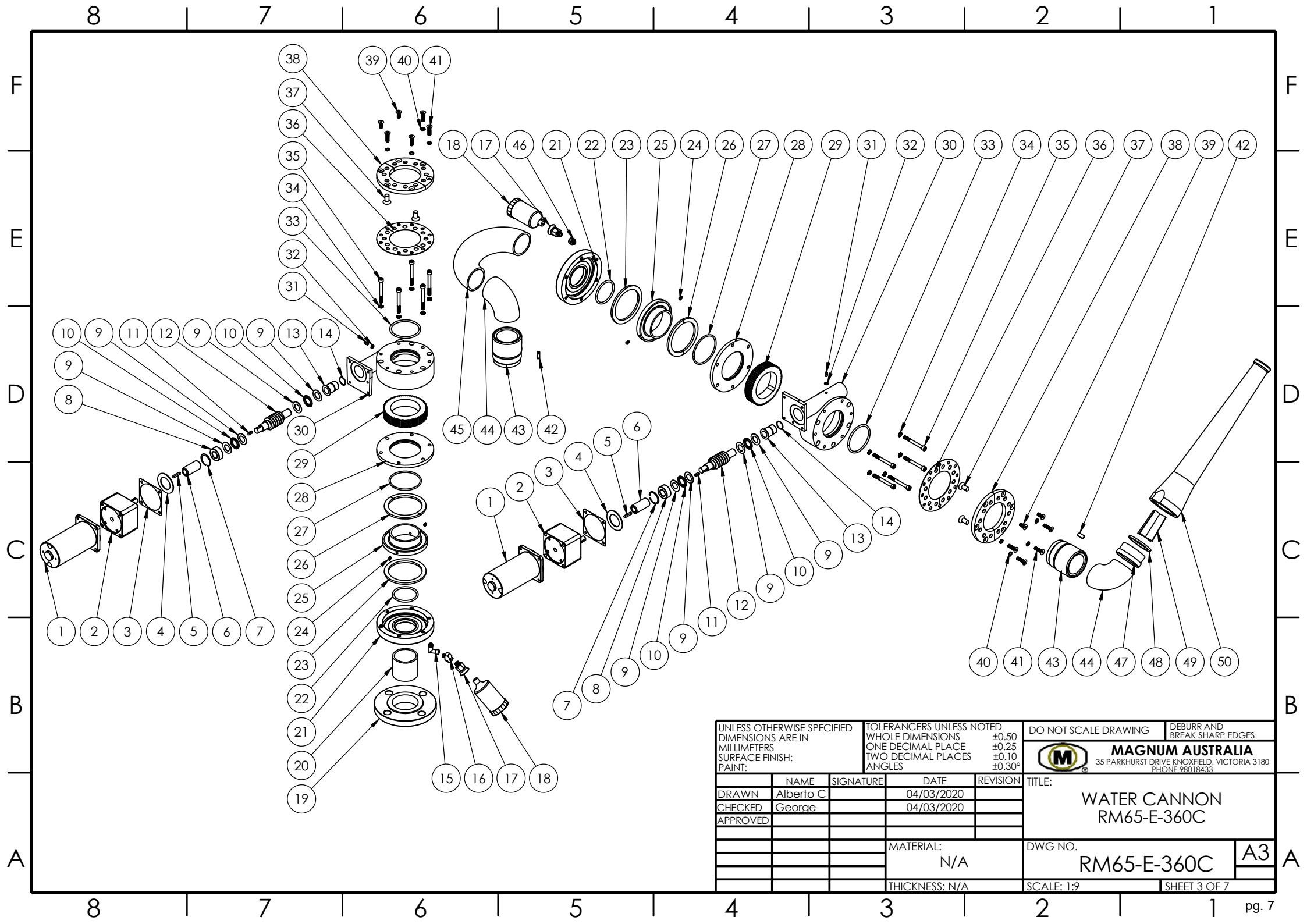
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3. Outline Drawing of Cannon & Exploded View / Spare Parts

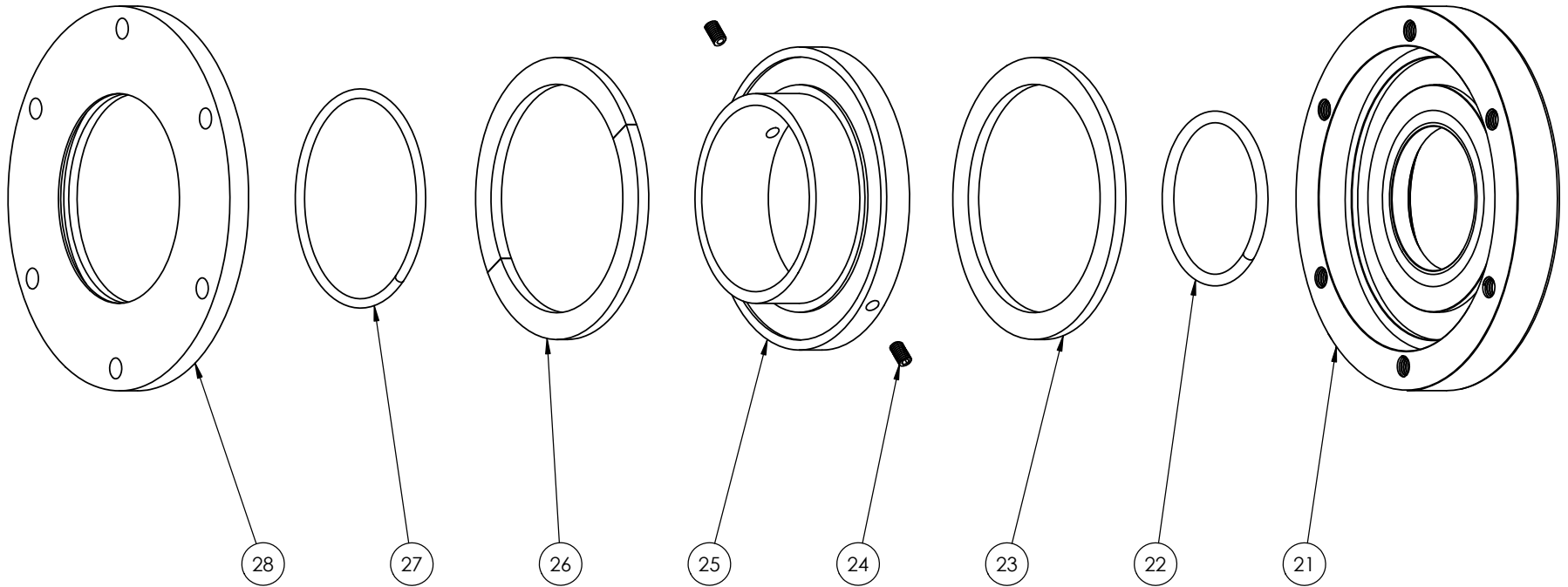


UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: PAINT:		TOLERANCERS UNLESS NOTED WHOLE DIMENSIONS ±0.50 ONE DECIMAL PLACE ±0.25 TWO DECIMAL PLACES ±0.10 ANGLES ±0.30°		DO NOT SCALE DRAWING		DEBURR AND BREAK SHARP EDGES		
				<div> MAGNUM AUSTRALIA 35 PARKHURST DRIVE KNOXFIELD, VICTORIA 3180 PHONE 98018433</div>				
	NAME	SIGNATURE	DATE	REVISION	TITLE: WATER CANNON RM65-E-360C			
DRAWN	Alberto C		04/03/2020					
CHECKED								
APPROVED								
					DWG NO. RM65-E-360C			
			MATERIAL:	A3				
			N/A					
			THICKNESS:	SCALE: 1:4		SHEET 1 OF 7		






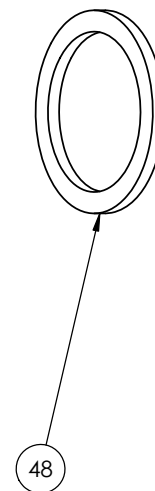
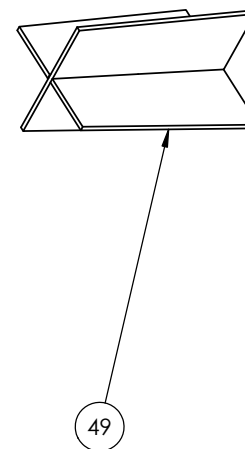
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: PAINT:			TOLERANCERS UNLESS NOTED WHOLE DIMENSIONS ±0.50 ONE DECIMAL PLACE ±0.25 TWO DECIMAL PLACES ±0.10 ANGLES ±0.30°			DO NOT SCALE DRAWING			DEBURR AND BREAK SHARP EDGES		
									MAGNUM AUSTRALIA 35 PARKHURST DRIVE KNOXFIELD, VICTORIA 3180 PHONE 98018433		
		NAME	SIGNATURE	DATE		REVISION		TITLE:			
DRAWN		Alberto C		04/03/2020				WATER CANNON RM65-E-360C			
CHECKED		George		04/03/2020							
APPROVED											
				MATERIAL:		DWG NO.		RM65-E-360C			
				N/A							
				THICKNESS: N/A		SCALE: 1:9		SHEET 3 OF 7			
								A3			



FOR CUSTOMER INFORMATION

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
21-22-23-24-25-26-27-28	BM0805-LP	COMPLETE BEARING FOR RM65-E-360C	2
22-23-26-27	WB-RK2	BEARING RECONDITIONING KIT FOR RM65-E-360C	2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: PAINT:		TOLERANCERS UNLESS NOTED WHOLE DIMENSIONS ±0.50 ONE DECIMAL PLACE ±0.25 TWO DECIMAL PLACES ±0.10 ANGLES ±0.30°		DO NOT SCALE DRAWING	DEBURR AND BREAK SHARP EDGES
				 MAGNUM AUSTRALIA 35 PARKHURST DRIVE KNOXFIELD, VICTORIA 3180 PHONE 98018433	
DRAWN Alberto C		DATE 22/05/2020		TITLE: COMPLETE BEARING FOR RM65-E-360C	
CHECKED				DWG NO. BM0805-LP	
APPROVED				A3	
		MATERIAL: N/A		SCALE: 1:2	
		THICKNESS: N/A		SHEET 4 OF 7	



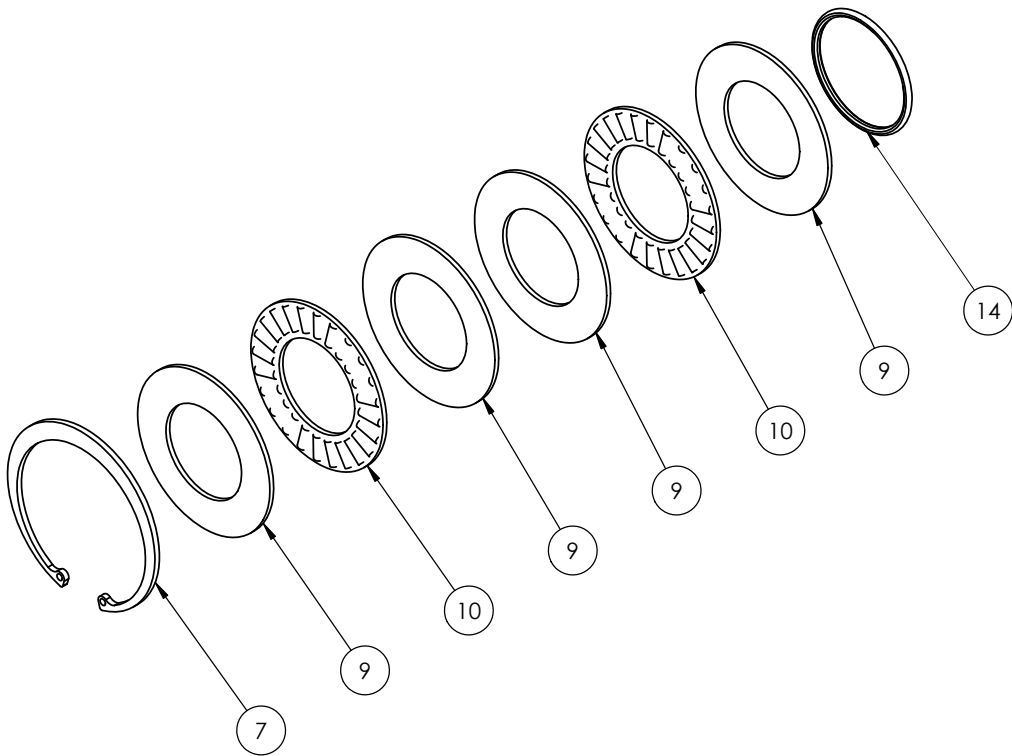
FOR CUSTOMER INFORMATION

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
48-49-50	BM0015	NOZZLE KIT FOR RM65-E-360C	1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: PAINT:		TOLERANCERS UNLESS NOTED WHOLE DIMENSIONS ±0.50 ONE DECIMAL PLACE ±0.25 TWO DECIMAL PLACES ±0.10 ANGLES ±0.30°		DO NOT SCALE DRAWING	DEBURR AND BREAK SHARP EDGES
DRAWN Alberto C		SIGNATURE		DATE 22/05/2020	
CHECKED		SIGNATURE		DATE	
APPROVED		SIGNATURE		DATE	
		MATERIAL:		TITLE:	
		N/A		NOZZLE KIT FOR RM65-E-360C	
		THICKNESS: N/A		DWG NO. BM0805	
				SCALE: 1:2	
				SHEET 5 OF 7	




MAGNUM AUSTRALIA
35 PARKHURST DRIVE KNOXFIELD, VICTORIA 3180
PHONE 98018433



FOR CUSTOMER INFORMATION

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
7-9-10-14	MAG-WDSKIT	WORM DRIVE SEAL KIT	2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: PAINT:		TOLERANCERS UNLESS NOTED WHOLE DIMENSIONS ±0.50 ONE DECIMAL PLACE ±0.25 TWO DECIMAL PLACES ±0.10 ANGLES ±0.30°		DO NOT SCALE DRAWING	DEBURR AND BREAK SHARP EDGES
				 MAGNUM AUSTRALIA 35 PARKHURST DRIVE KNOXFIELD, VICTORIA 3180 PHONE 98018433	
				TITLE: WORM DRIVE SEAL KIT	
				DWG NO. MAG-WDSKIT	
				A3	
				SCALE: 1:1	
				SHEET 6 OF 7	

8				7				6				5				4				3				2				1			
ITEM NO.				PART NUMBER				DESCRIPTION				QTY.				ITEM NO.				PART NUMBER				DESCRIPTION				QTY.			
1				MAG-S9D150-24CH				ELECTRIC MOTOR 150W DC 24V				2				29				MAG-W-04				MAGNUM GEAR				2			
2				MAG-S9KC30BH				GEAR BOX FOR ELECTRIC MOTOR				2				30				LLC-15-11-H				BEARING HOUSE				2			
3				RM65E-360-C-GBG				ELECTRIC MOTOR GASKET				2				31				NIP01				L161 M6 GREASE NIPPLE				2			
4				LLC-15-32				MOUNTAINING WASHER				2				32				M6FW				M6X12X1.2 GREASE NIPPLE WASHER				2			
5				N/A				COMES WITH GEAR BOX (ITEM 2)				2				33				WBR70-84X5				O-RING 84X5 (BEARING HOUSING)				2			
6				RM65C-005-E				DRIVE COUPLING				2				34				M8X13-TSWS				M8X13X1 HOUSING BOLT WASHER				10			
7				CIRC-001				CIRCLIP WORM GEAR				2				35				M8X70-CSK-SH				M8X70X1.25 HOUSING BOLT				10			
8				LLC-15-19				LOCATING BRASS BUSH				2				36				RM360-N-SL				GRIP SAND PAPER				4			
9				MAG-AS2035				THRUST BEARING WASHER				8				37				LLC-15-21				MECHANICAL STOP PLATE PIN				4			
10				MAG-AXK2035				THRUST BEARING				4				38				LLC-15-20				MECHANICAL STOP PLATE				4			
11				WKW-01				WORM KEY WAY				2				39				M8X20-CSK-FLAT				M8X20X1 STOP PLATE SCREW				4			
12				MAG-W-03				WORM				2				40				M8X13-ESW				M8X13X1 STOP PLATE STAR WASHER				8			
13				LLC-15-19-C				SHAFT END CAP				2				41				M8X30-CSK-FLAT				STOP PLATE SCREW M8X30X1				8			
14				WBR70-23X1.5				O-RING 23X1.5 (SHAFT END CAP)				2				42				GKW-01				GEAR KEY WAY (INTERNAL CASING)				2			
15				1/8-P-2020				90° GREASE ELBOW 1/8				1				43				LLC-200-65-102				BEARING INTERNAL CASING				2			
16				P-1-8451-4				45° LOWER PERMALUBLE SUPPORT FLANGE				1				44				WE65-SR				65 mm ELBOW 90°				2			
17				A620PFLEX				PERMALUBLE SUPPORT FLANGE				2				45				WE65U				65 mm ELBOW 180°				1			
18				BM0007				GREASE CAPSULE				2				46				1/8-1/4-P-2510				REDUCER UPPER PERMALUBLE				1			
19				PF65				65 mm ANSI FLANGE				1				47				MM65-009				THREADED MONITOR END				1			
20				MM65-STB-65L				65 mm STUB				1				48				BM-0015C				NOZZLE GASKET				1			
21				MM65-002-LP				BEARING BASE (BOTTOM RACE)				2				49				BM-0015B				FLIGHT SET				1			
22				WBR70-65X5				O-RING 65X5 (BEARING BASE)				2				50				BM0015				2-1/2 STANDARD DIRECTOR NOZZLE				1			
23				MB65-005				VESCO RING (1 PIECE)				2																			
24				M6-BILGS				BEARING INTERNAL LOCKING GRUB SCREW				4																			
25				MB65-003				BEARING (MIDDLE RACE)				2																			
26				MB65-006				VESCO RING (2 PIECES)				2																			
27				WBR70-90X4				O-RING 90X4 (TOP RACE)				2																			
28				MB65-004				BEARING LID (TOP RACE)				2																			



4. Installation Instructions

1. Weld the flange supplied in the kit to the water cannon supply pipe.
2. Mount the water cannon onto the flange using bolts and nuts supplied in the kit. Stabilisers and gussets may be required to ensure that the mounting is secure and rigid. The butterfly valve should be located between the flanges of the water cannon and the mounting flange welded to supply piping. Ensure the water cannon is correctly mounted, so it CANNOT direct water at the cabin of the vehicle.
3. Activate the auto lube grease capsule located on the water cannon bearings to 12 months grease injection setting.
4. Screw the nozzle to the threaded end of the water cannon. Director nozzle is standard supply. Foam induction fog nozzle (RFIN) is available as an option.
5. Mount the joystick cabin controller box (electric) in a position that is ergonomic for operator to use.
6. Run the electrical cable 8 m supplied as standard (optional extension cable is available if required) from the cabin control box to the main control box. Cut the cable to the desired length and connect up the plugs.
7. Connect the cable from the cannon control box to the joystick box by the plug and socket supplied. Ensure all plugs are properly sealed against moisture ingress.
8. Connect the power wire as per the electric schematic.
9. Connect up the air for the butterfly valve. In the case of an on-road type truck, it is strongly suggested a hold back valve and filter pressure regulator are fitted.
10. The remote control water cannon is now ready for operations.
11. Turn on the vehicle power and air to the unit (if air butterfly fitted).
12. Check that all air fittings are correctly fitted and there are no air leaks evident (if air butterfly fitted).
13. Check all bolts are securely tightened and no water leaks are evident.
14. Now test the unit with the water pump operating and passing water through the nozzle.
15. A comprehensive parts book has been supplied for your service assistance.



5. Maintenance Schedule

Initial Service

1. The upper and lower bearings have been filled with Multi-Purpose EP Type Grease in the factory at the time of assembly. 4 pumps of grease from a grease gun should be sufficient if a new bearing has been installed.
2. Set the automatic lubrication canister supplied with the cannon to 12 months. This activates the lubricator.
3. Lubricate the rod ends (mounting for cylinders) using Multi-Purpose EP Type Grease. 1 pump of grease from a grease gun should be sufficient.
4. Check the operation of the water cannon; slew and elevation.

Quarterly Service

1. Check the condition of the swivel bearings by holding the pipe firmly and shaking it vigorously. There should be no play in the swivel bearing. Replace the seals and wear rings in the swivel bearings if there is any play.
2. Check the waster cannon for leaks. If there is a leak, it will occur at the swivel bearings. Replace the seals and wear rings in the swivel bearings if there is a leak on the water cannon.
3. Lubricate the rod ends (mounting for cylinders) using Multi-Purpose EP Type Grease. 1 pump of grease from a grease gun should be sufficient.
4. Check the automatic lubrication canister. The canister has been initially set up for 12 months. If the ambient temperature is above 40 degrees centigrade, the life of the canister may be reduced. Replace the canister if there is no sign of grease in it. Set the automatic lubrication canister to 12 months. This activates the lubricator.
5. Check the operation of the water cannon; slew and elevation.

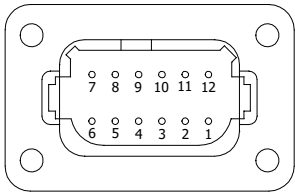
Annual Service

1. Strip and inspect the swivel bearing on the cannon. Replace the wear rings and the seals.
2. Install a new automatic lubrication canister as is indicated in quarterly service.



6. Electric Schematic / Electrical Information **(Electrical Butterfly Valve)**

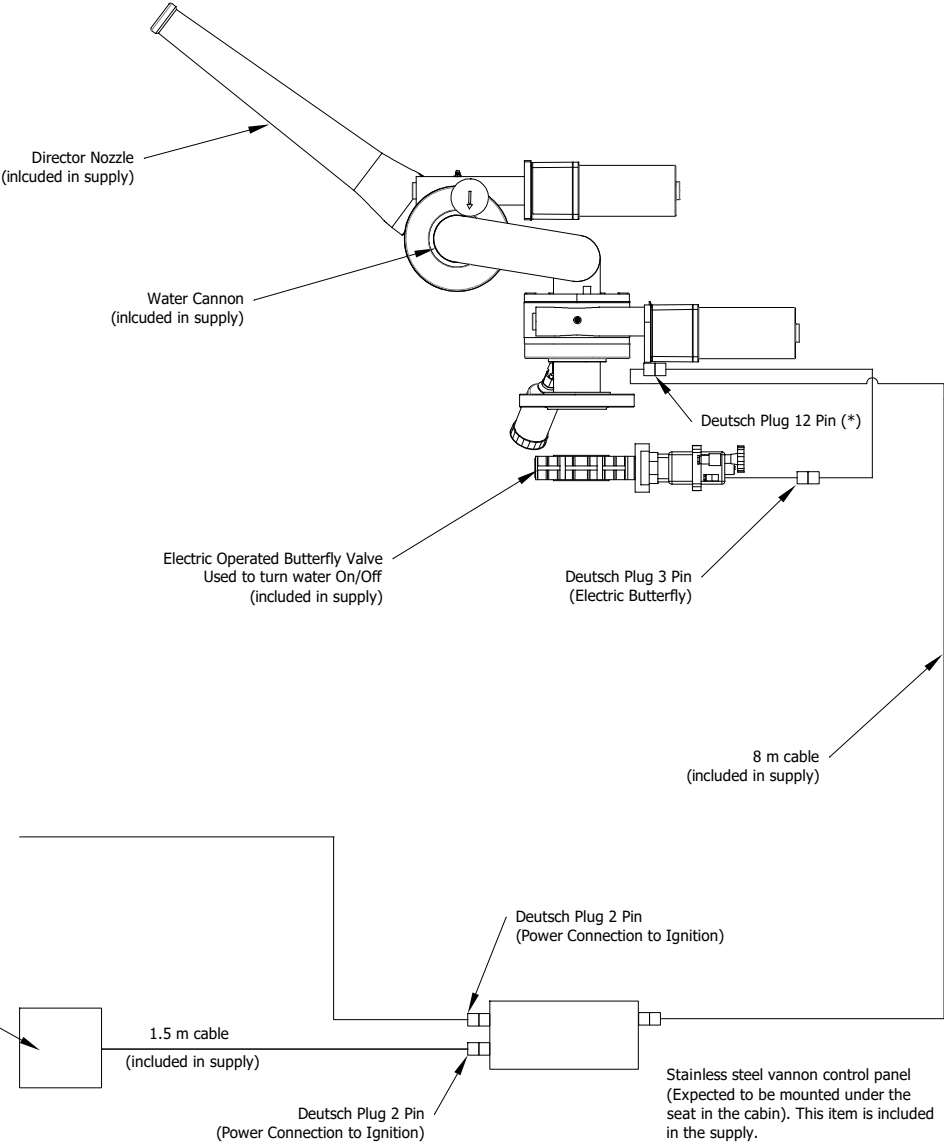
Deutsch Plug 12 Pin (*)



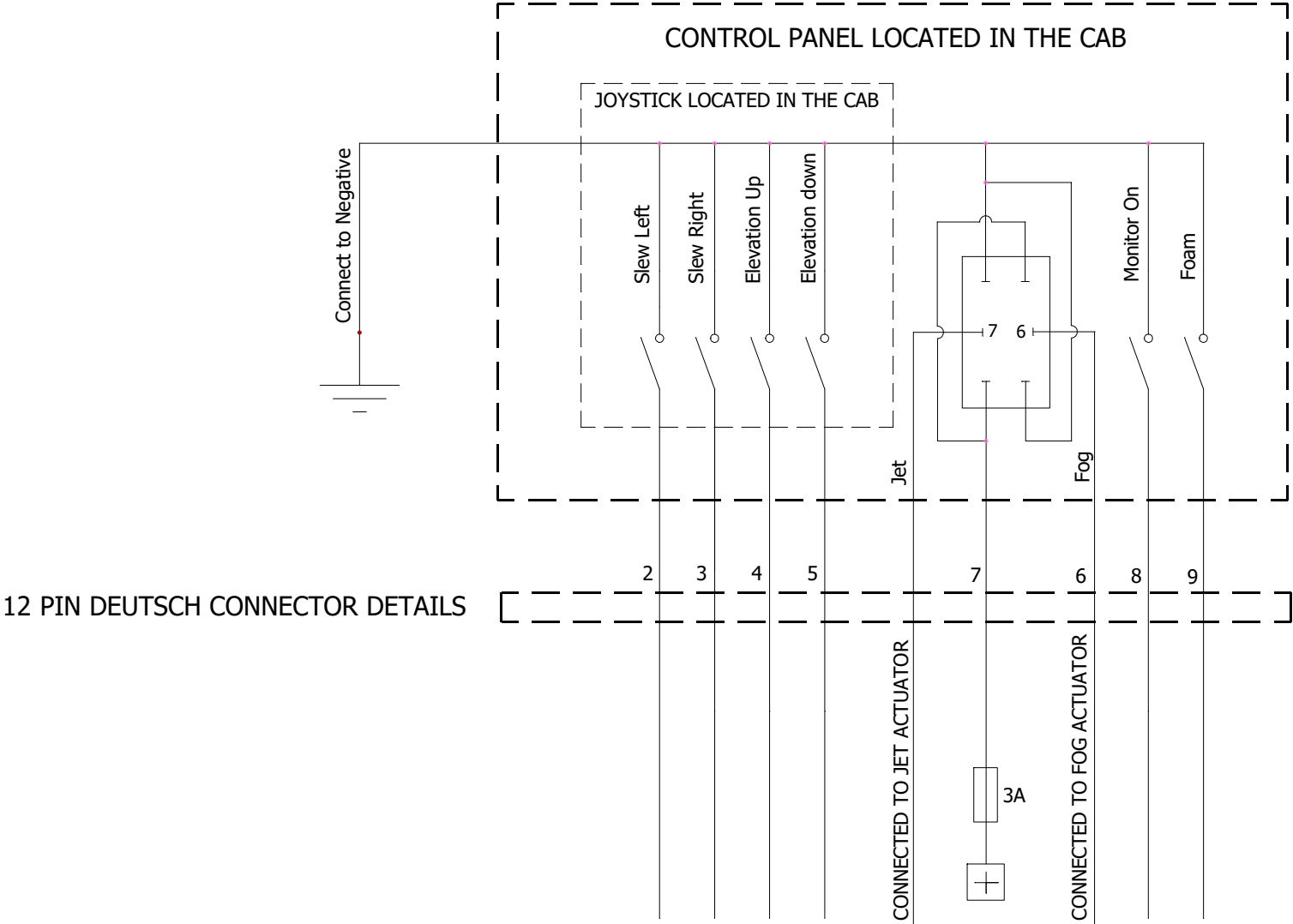
OUTPUTS

- Pin 1 (positive) to Butterfly Valve
- Pin 2 Cannon - Slew Left (Linak M+)
- Pin 3 Cannon - Slew Right (Linak M-)
- Pin 4 Cannon - Elevation Up (Linak M+)
- Pin 5 Cannon - Elevation Down (Linak M-)
- Pin 6 Fog (Optional)
- Pin 7 Jet (Optional)
- Pin 8 Monitor Open (Positive Signal to Butterfly Valve)
- Pin 9 Foam (-ve)
- Pin 10 Foam (+ve)
- Pin 11 Auxiliary
- Pin 12 Earth (Yellow / Green)

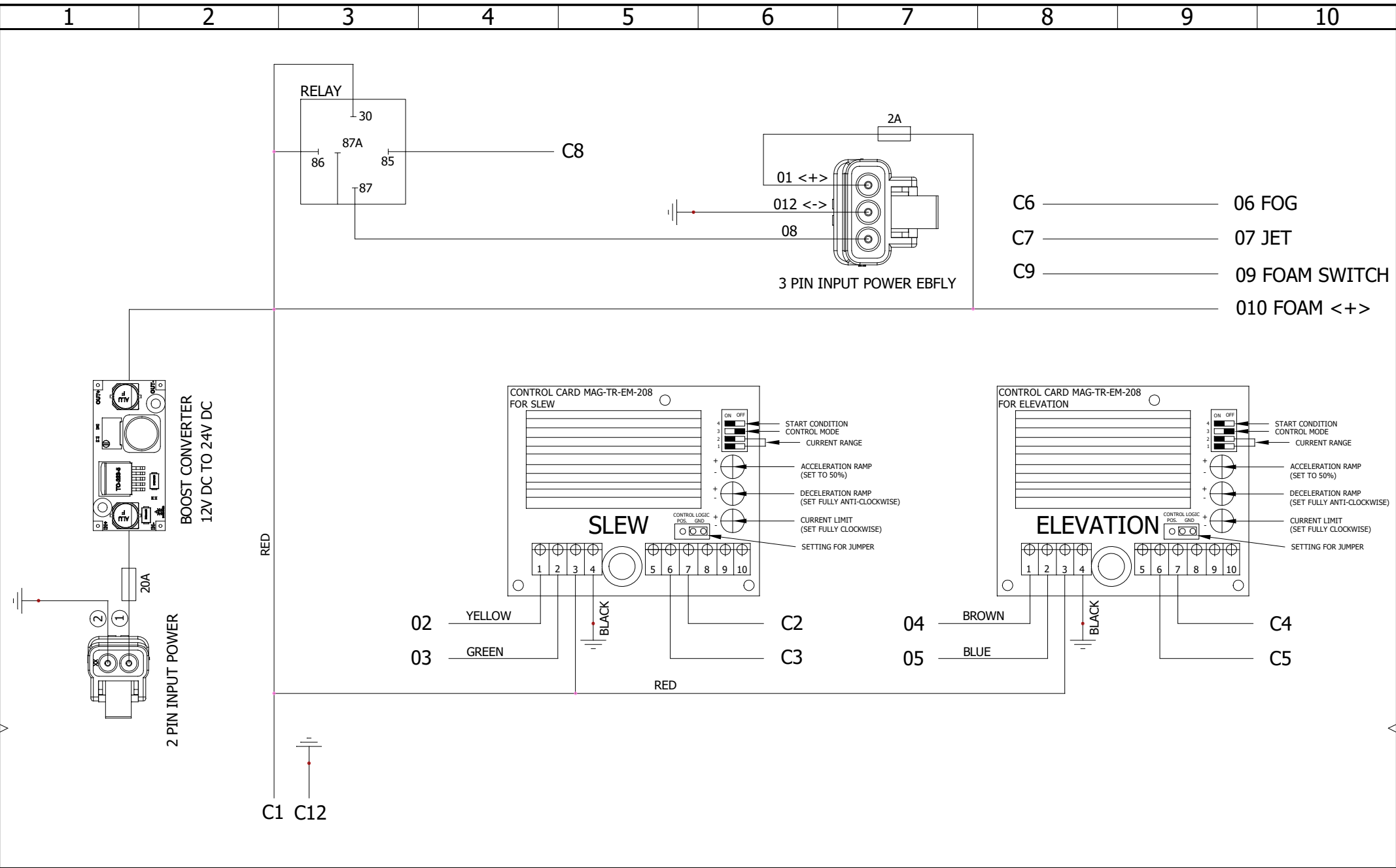
The water cannon is controlled through a Deutsch plug wired as above.
Wire numbers in the cable are connected
to Pin numbers in the Deutsch plug.
Typically connection; wire number 1 is connected to Pin number 1
in the Deutsch plug.



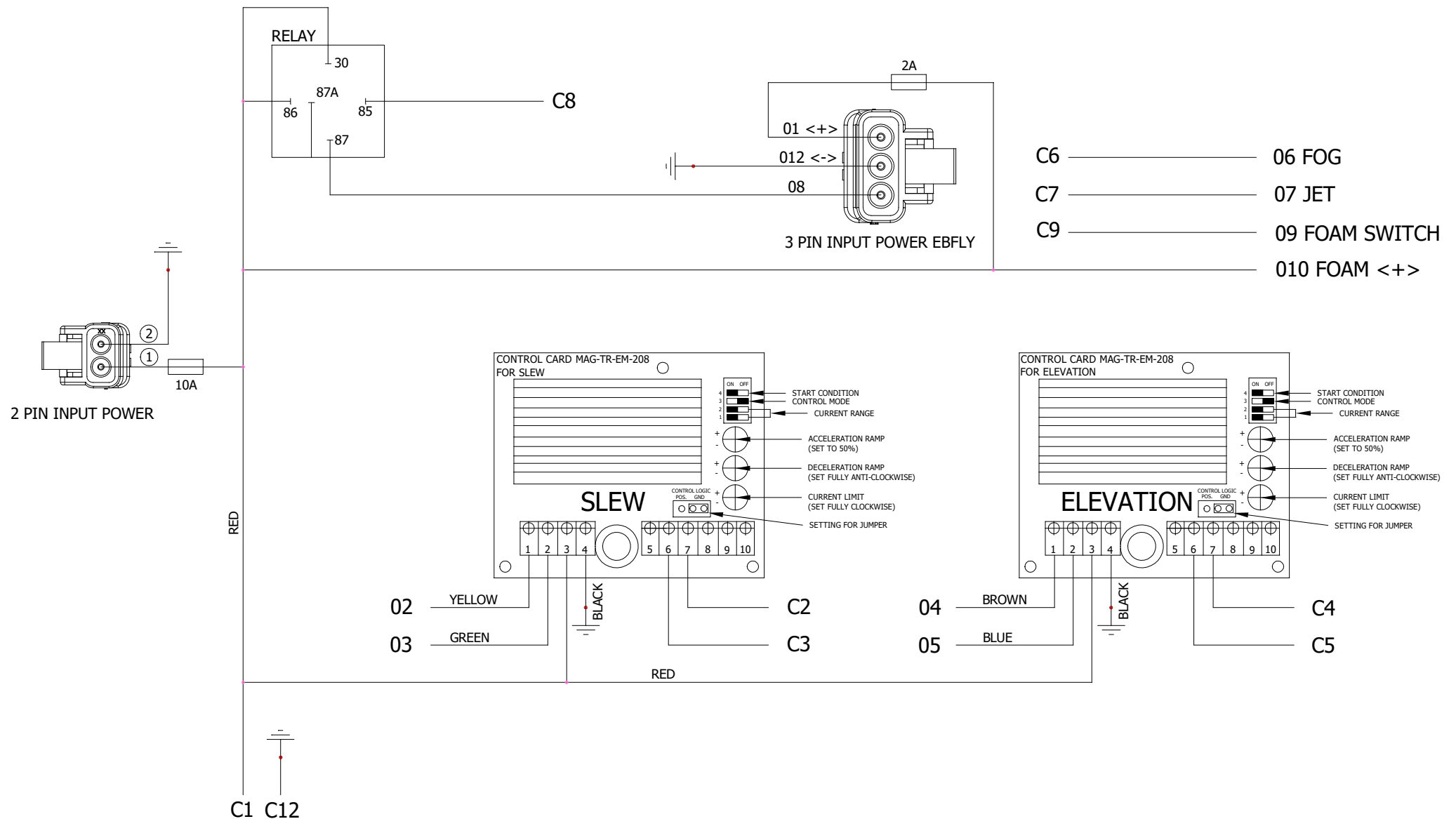
<div><div></div><div>CONNECTED TO 24V DC POSITIVE THROUGH IGNITION</div></div> <div><div></div><div>CONNECTED TO 24V DC NEGATIVE</div></div>	RM65-E-360-C DEUTSCH PLUG WIRING DETAILS ELECTRIC BUTTERFLY							REVISION
								0
					0	11/09/2020	AlbertoC	
					REV.	DATE	NAME	CHANGES
CONTRACT:	LOCATION:	+L1	Main electrical closet	User data 1			User data 2	SCHEME
								01



CONTRACT:	RM65-E-360-C CONTROL PANEL LOCATED IN THE CAB					REVISION
						0
			0	11/09/2020	AlbertoC	SCHEME
			REV.	DATE	NAME	
LOCATION: +L1		Main electrical closet		User data 1		02
				User data 2		



C = CONTROLLER INPUT 12 PIN 0 = OUTPUT CANNON SIDE	RM65-E-360-C ELECTRIC SCHEMATIC ELECTRIC BUTTERFLY VALVE 12V						REVISION		
							0		
			0	11/09/2020	AlbertoC				
			REV.	DATE	NAME	CHANGES	SCHEME		
CONTRACT:	LOCATION:	+L1	Main electrical closet			User data 1		User data 2	03



C = CONTROLLER INPUT 12 PIN
0 = OUTPUT CANNON SIDE

RM65-E-360-C
ELECTRIC SCHEMATIC
ELECTRIC BUTTERFLY VALVE 24V

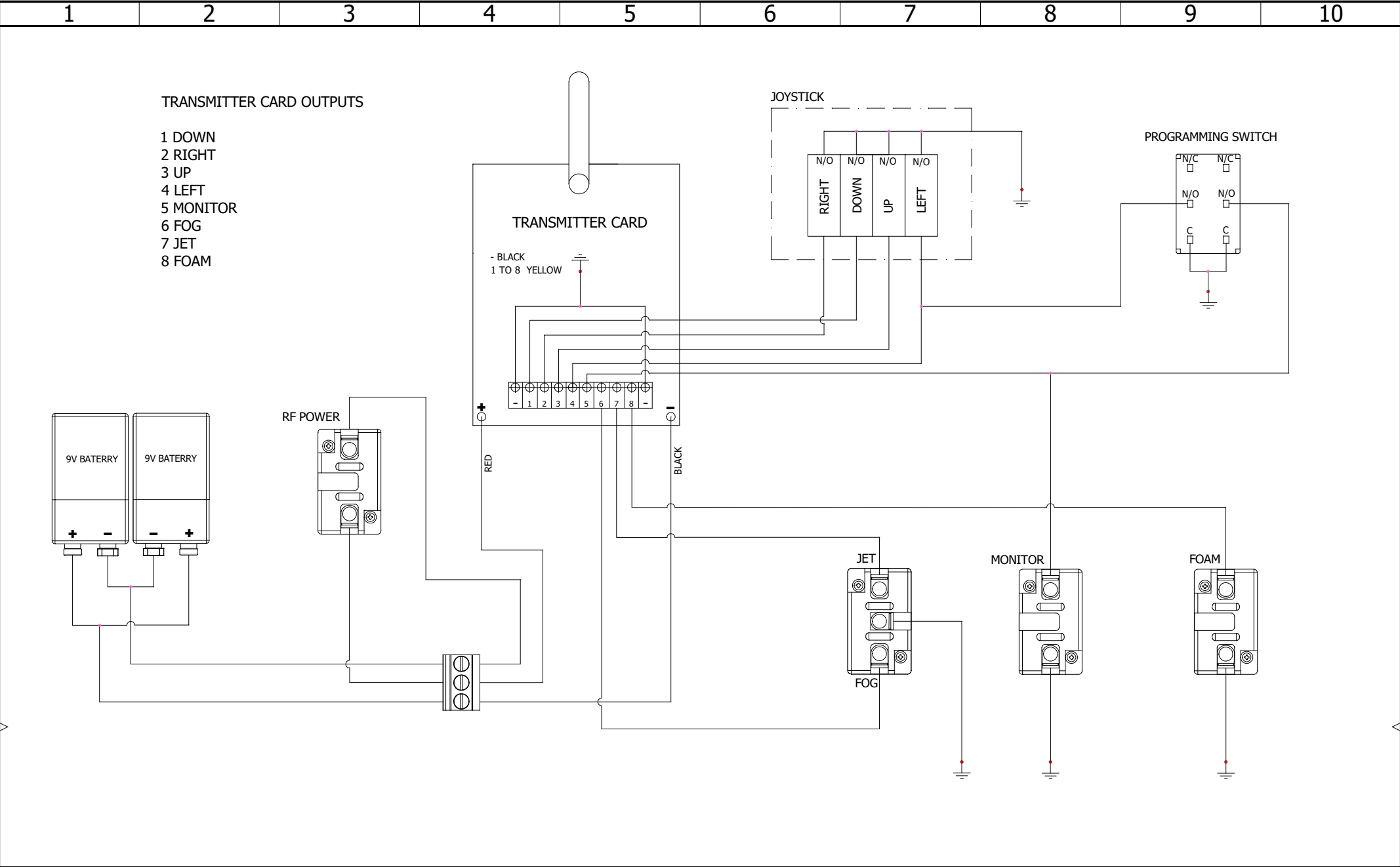
CONTRACT:

LOCATION:

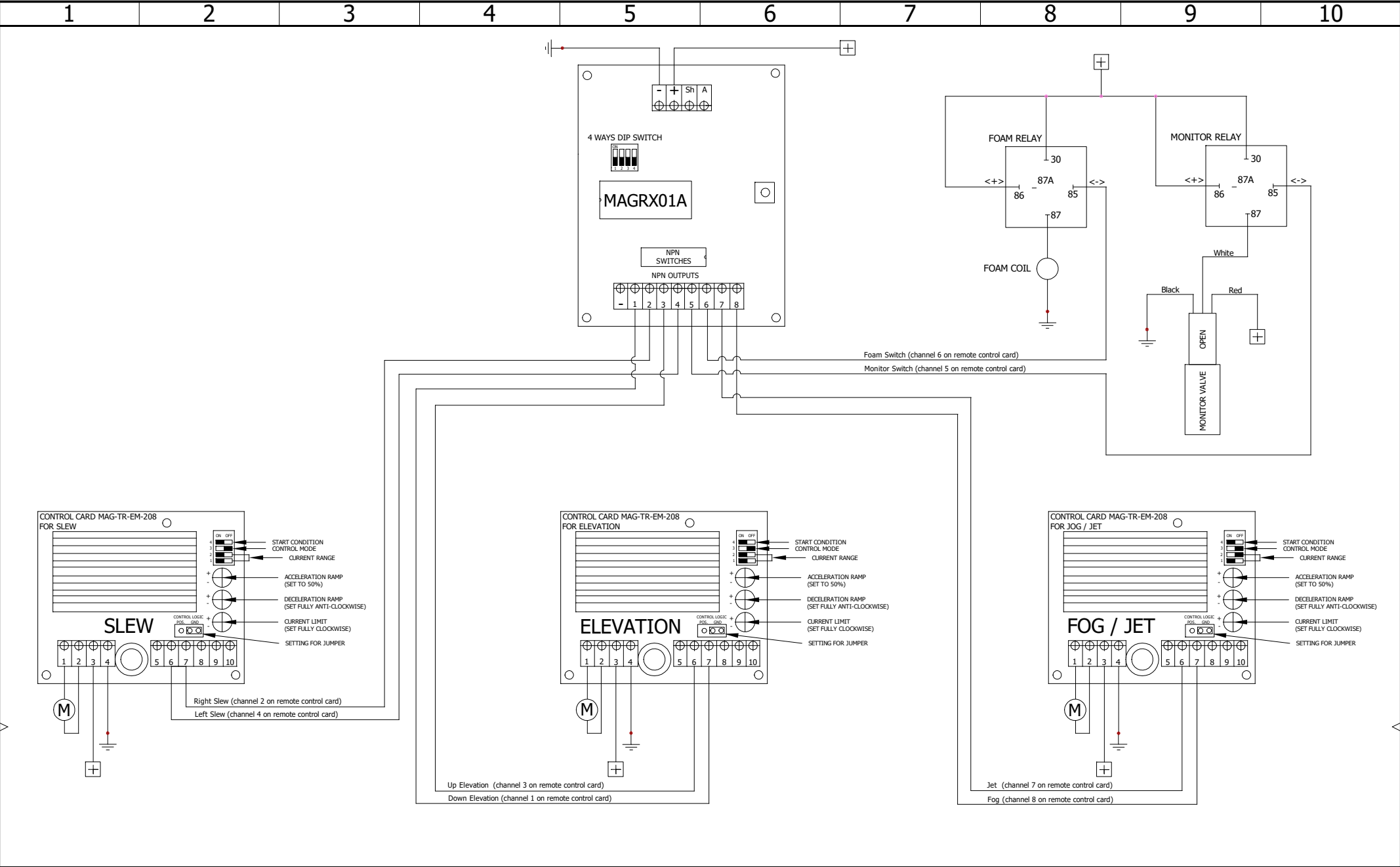
+L1

Main electrical closet

				REVISION
0	11/09/2020	AlbertoC		0
REV.	DATE	NAME	CHANGES	SCHEME
User data 1			User data 2	04



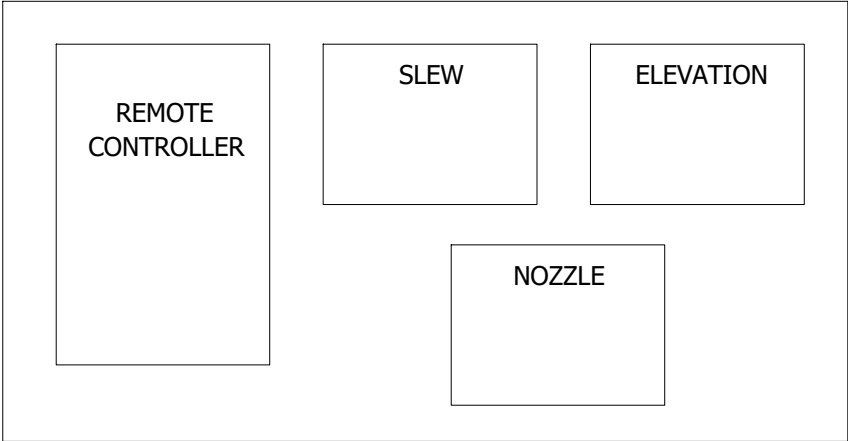
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		0	11/09/2020	AlbertoC		
		REV.	DATE	NAME	CHANGES	
CONTRACT:	LOCATION: +L1 Main electrical closet	User data 1			User data 2	SCHEME
						05



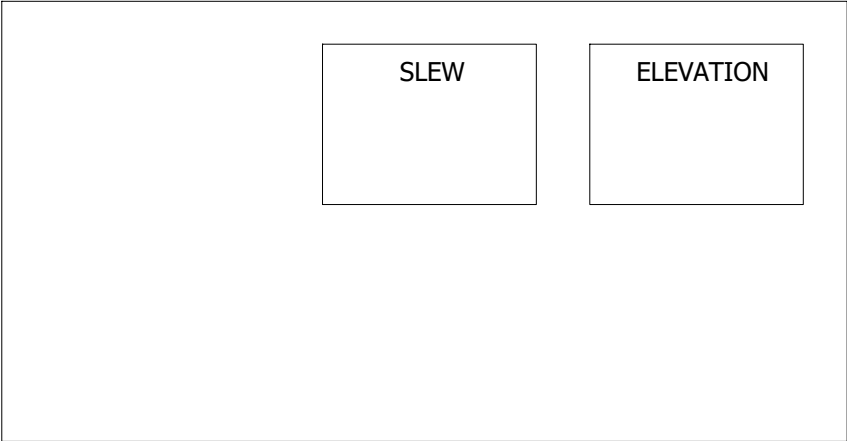
<div><div><div></div><div>CONNECTED TO 24V DC POSITIVE THROUGH IGNITION</div></div><div><div></div><div>CONNECTED TO 24V DC NEGATIVE</div></div></div>	RM65-E-360-C								REVISION		
									0		
			0		11/09/2020		AlbertoC				SCHEME
			REV.		DATE		NAME		CHANGES		
CONTRACT:	LOCATION:	+L1	Main electrical closet			User data 1			User data 2		

1	2	3	4	5	6	7	8	9	10
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RM65-E CONTROL PANEL LAYOUT WITH REMOTE CONTROL



RM65-E CONTROL PANEL LAYOUT WITH NO REMOTE CONTROL



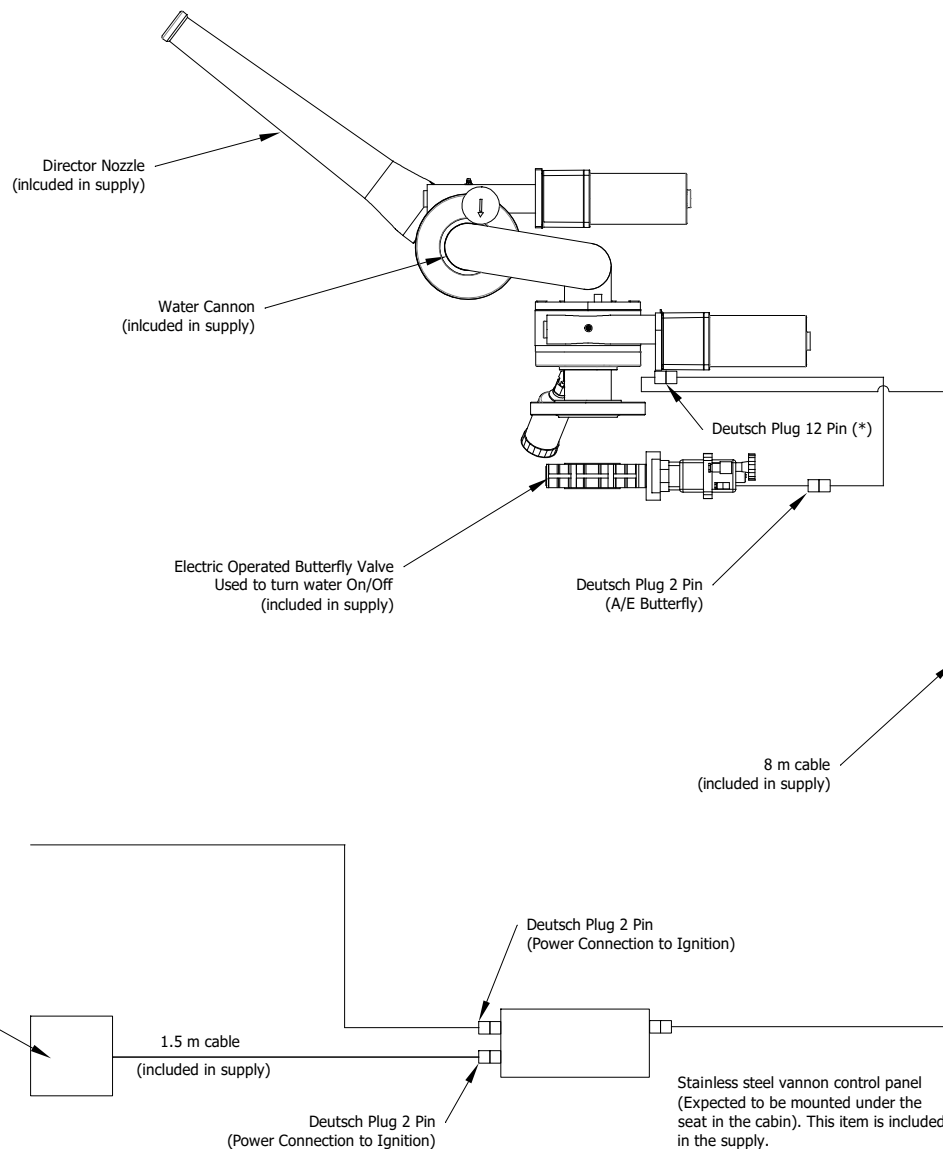
	RM65-E-360-C LAYOUT OF ELECTRICAL A/E PANEL				REVISION	
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		0	11/09/2020	AlbertoC		
		REV.	DATE	NAME	CHANGES	
CONTRACT:	LOCATION: +L1 Main electrical closet	User data 1			User data 2	SCHEME 07





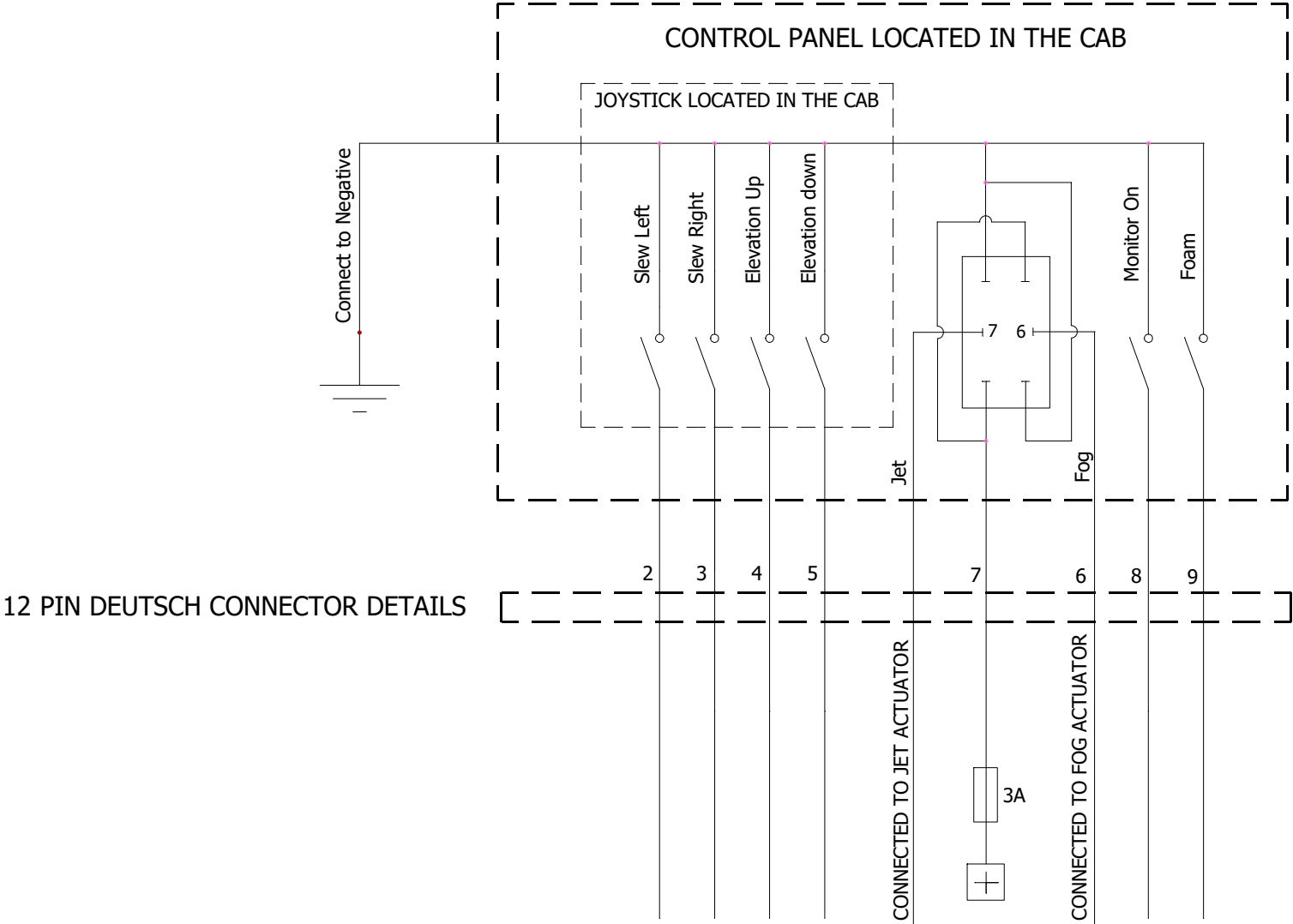
7. Electric Schematic / Electrical Information **(Air Butterfly Valve)**

- Pin 1 (positive) to Butterfly Valve
- Pin 2 Cannon - Slew Left (Linak M+)
- Pin 3 Cannon - Slew Right (Linak M-)
- Pin 4 Cannon - Elevation Up (Linak M+)
- Pin 5 Cannon - Elevation Down (Linak M-)
- Pin 6 Fog (Optional)
- Pin 7 Jet (Optional)
- Pin 8 Monitor Open (Positive Signal to Butterfly Valve)
- Pin 9 Foam (-ve)
- Pin 10 Foam (+ve)
- Pin 11 Auxiliary
- Pin 12 Earth (Yellow / Green)

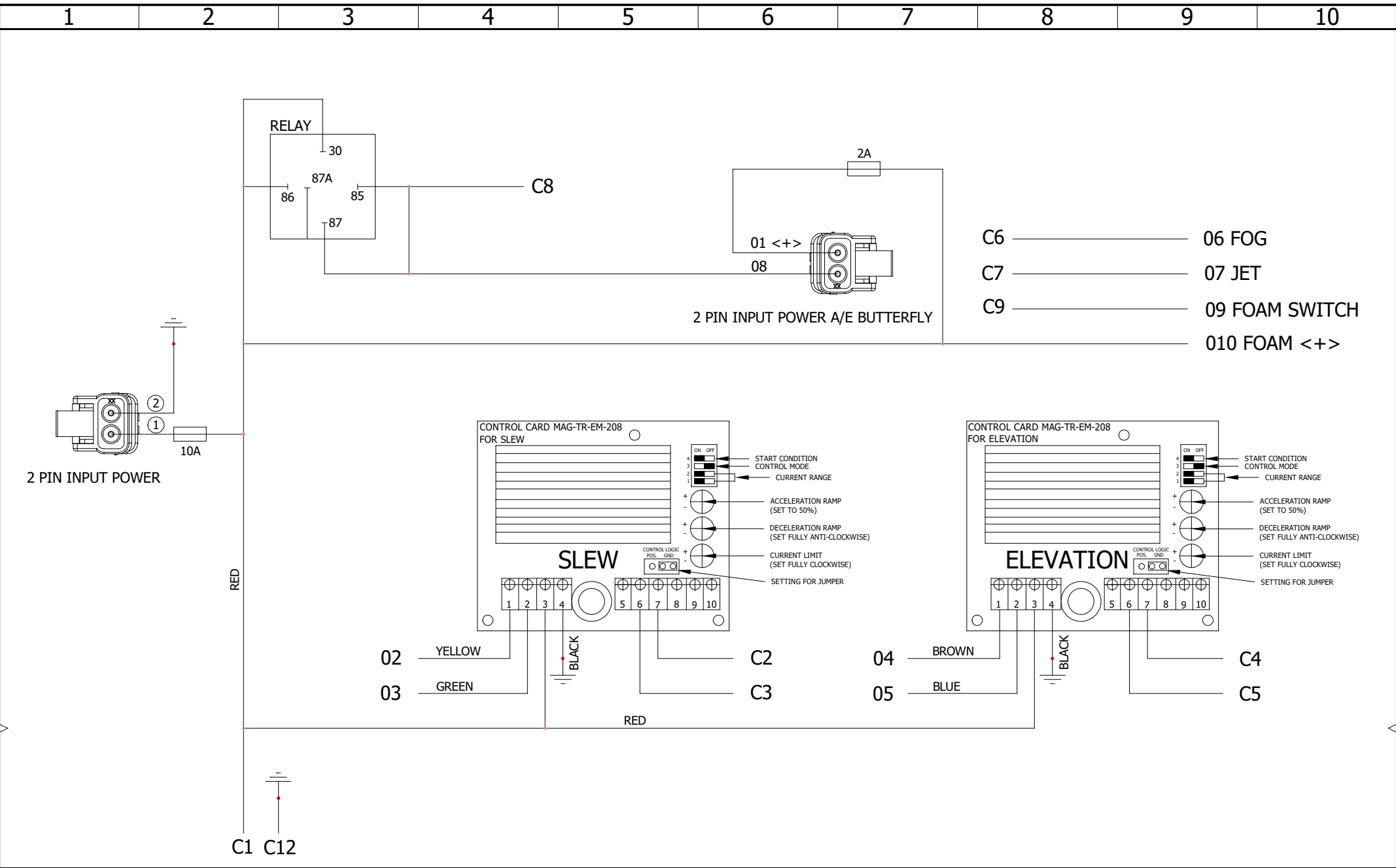
The water cannon is controlled through a Deutsch plug wired as above. Wire numbers in the cable are connected to Pin numbers in the Deutsch plug. Typically connection; wire number 1 is connected to Pin number 1 in the Deutsch plug.



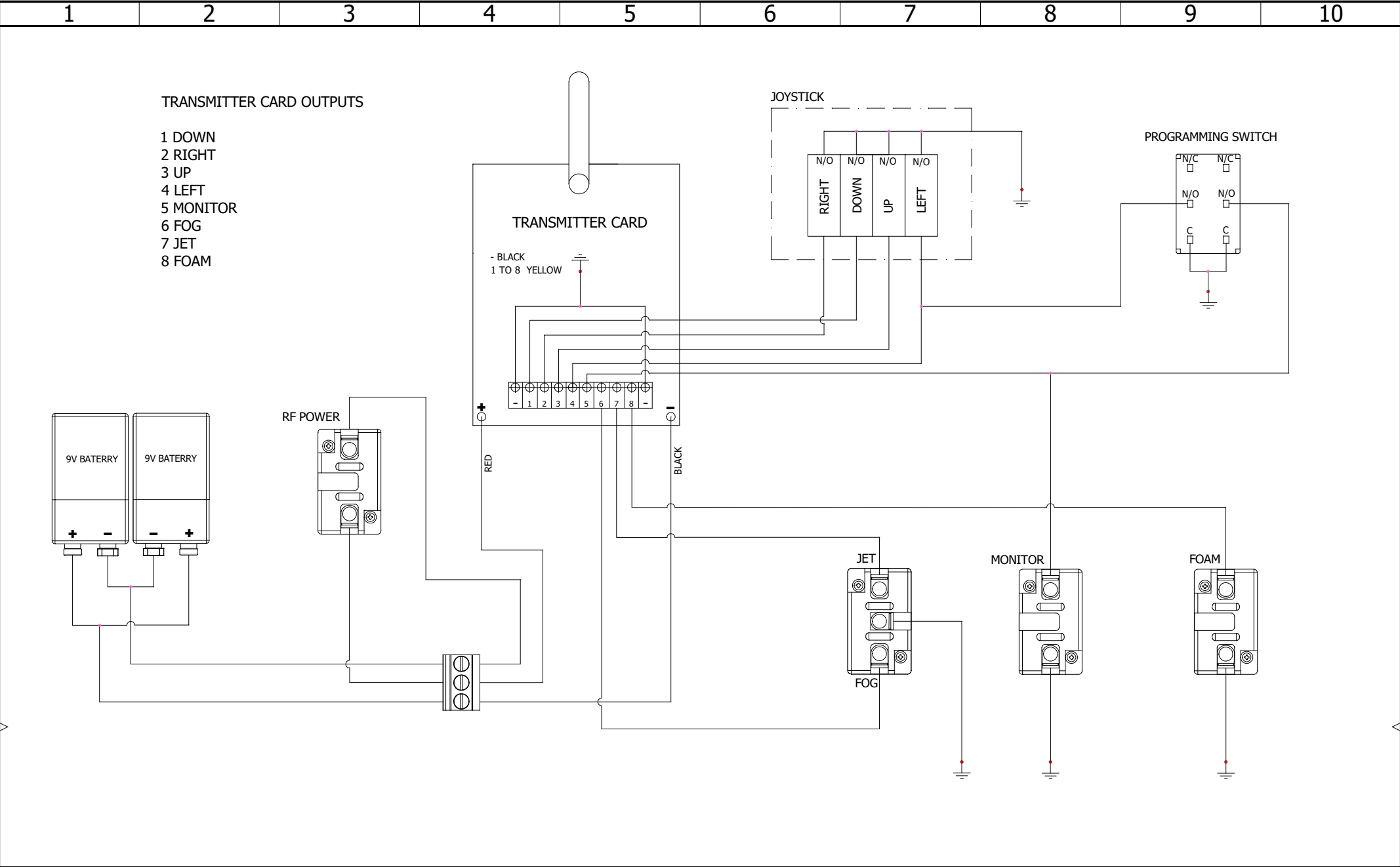
<div><div></div><div>CONNECTED TO 24V DC POSITIVE THROUGH IGNITION</div></div>	<div>RM65-E-360-C</div> <div>DEUTSCH PLUG WIRING DETAILS</div> <div>A/E</div>								REVISION
<div><div></div><div>CONNECTED TO 24V DC NEGATIVE</div></div>									0
				0	10/09/2020	AlbertoC			SCHEME
				REV.	DATE	NAME	CHANGES		
CONTRACT:				LOCATION: +L1		Main electrical closet		User data 1	User data 2
									01



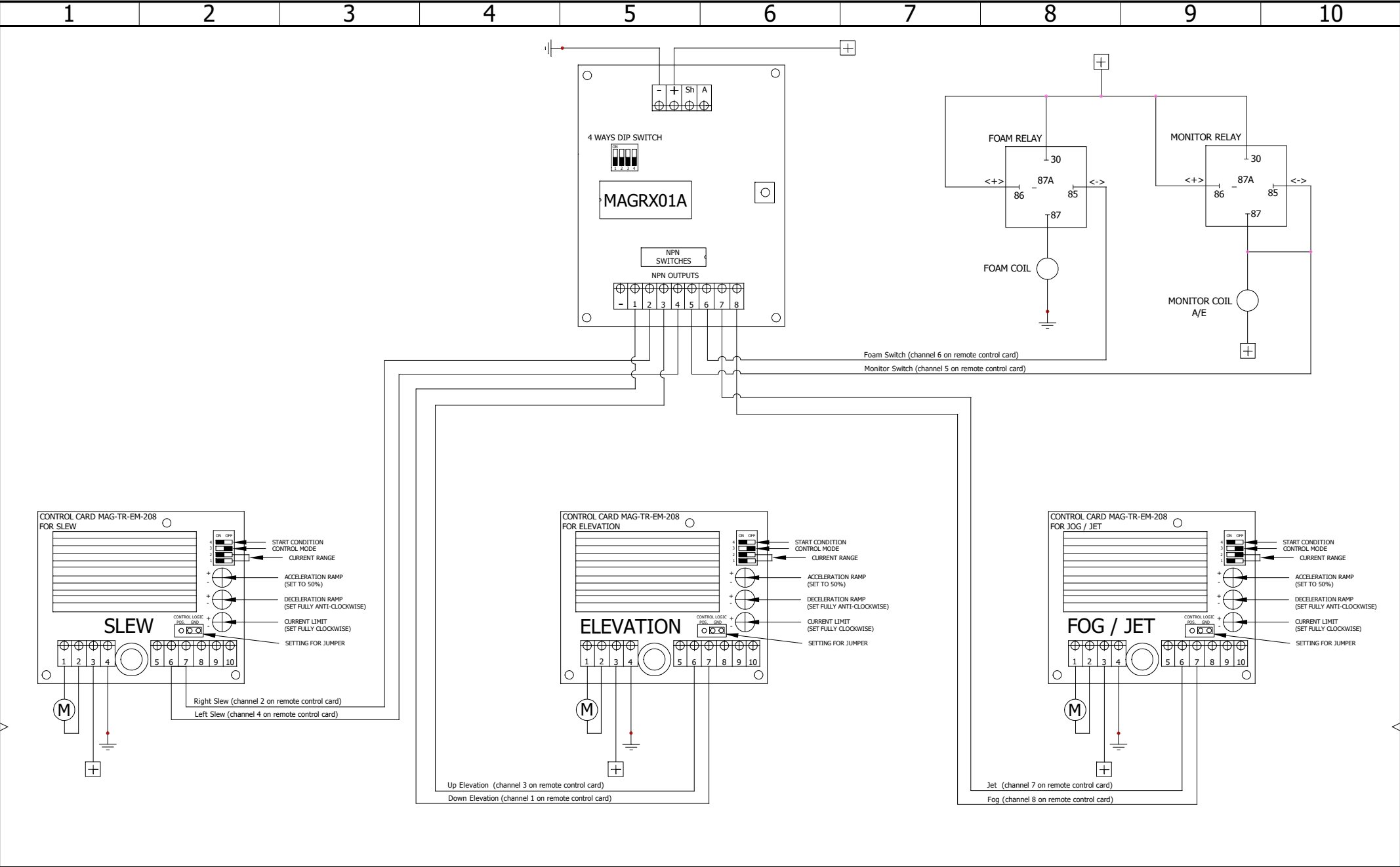
	RM65-E-360-C CONTROL PANEL LOCATED IN THE CAB				REVISION	
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		0	9/09/2020	AlbertoC		
		REV.	DATE	NAME	CHANGES	
CONTRACT:	LOCATION: +L1 Main electrical closet	User data 1			User data 2	SCHEME 02



C = CONTROLLER INPUT 12 PIN 0 = OUTPUT CANNON SIDE	RM65-E-360-C ELECTRICAL SCHEMATIC A/E 24V						REVISION
							0
			0	9/09/2020	AlbertoC		
			REV.	DATE	NAME	CHANGES	SCHEME
CONTRACT:	LOCATION: +L1	Main electrical closet	User data 1			User data 2	04



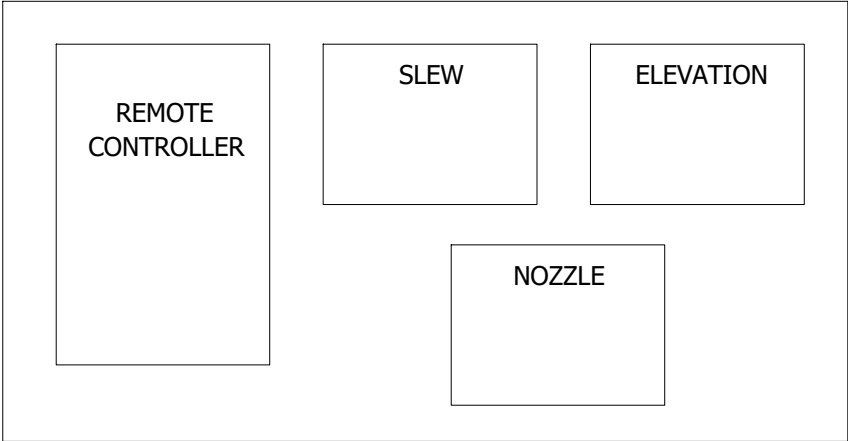
	RM65-E-360-C ELECTRICAL SCHEMATIC TRANSMITTER RF				REVISION	
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		REV.	DATE	NAME	CHANGES	
CONTRACT:	LOCATION: +L1 Main electrical closet	User data 1			User data 2	SCHEME
						05



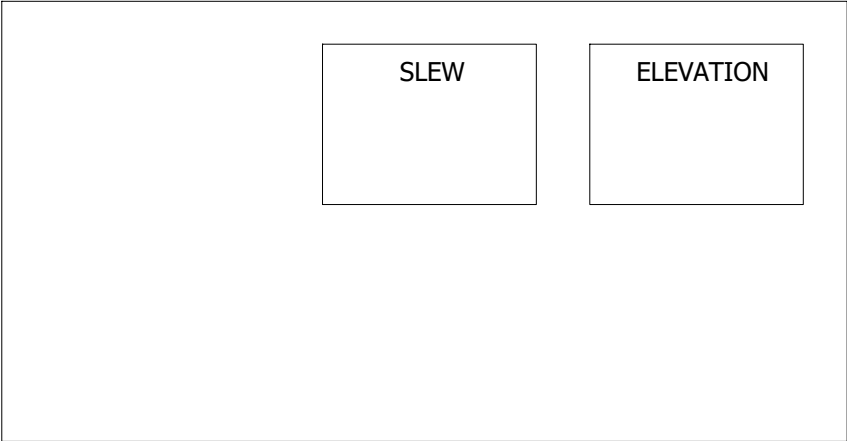
<div><div><div></div><div>CONNECTED TO 24V DC POSITIVE THROUGH IGNITION</div></div><div><div></div><div>CONNECTED TO 24V DC NEGATIVE</div></div></div>	RM65-E-360-C ELECTRICAL SCHEMATIC CONTROLLED BY RF A/E						REVISION 0		
			0	9/09/2020	AlbertoC			SCHEME 06	
			REV.	DATE	NAME	CHANGES			
CONTRACT:	LOCATION:	+L1	Main electrical closet			User data 1		User data 2	

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

RM65-E CONTROL PANEL LAYOUT WITH REMOTE CONTROL



RM65-E CONTROL PANEL LAYOUT WITH NO REMOTE CONTROL



	RM65-E-360-C LAYOUT OF ELECTRICAL A/E PANEL				REVISION	
					0	
		0	9/09/2020	AlbertoC		
		REV.	DATE	NAME	CHANGES	
CONTRACT:	LOCATION: +L1 Main electrical closet	User data 1			User data 2	SCHEME 07



8. Additional Technical Information

TR-EM-208 Starter and Current Limit for DC Motors 12-35V 1-20A

TR-EM-208 is designed specially for spindle motor use

Adjustable soft start, soft stop and current limit are main features of the card. Additionally, impulse or continuous type control can be selected as the control mode.

Control input can be set to positive or negative (gnd) logic.

Forward, reverse and stop can be set via control inputs.

Stop has highest priority and will be executed even if forward etc is on.

Restarting can be done either in both directions or only in reverse direction.

Current limit limits motor current during start to maximum 1.5 times adjusted current.

After acceleration ramp and settling time, exceeding current limit will stop motor immediately.

Current limit activation will always be indicated with error output and error led.

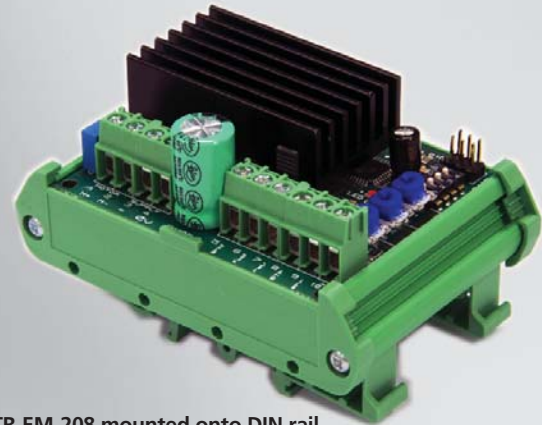
In overload situation the thermal protection will activate and switch off the control, and error output and led will start to blink.

ORDERING GUIDELINES:

TR-EM-208	PCB Only
TR-EM-208-R	PCB for DIN rail mounting
TR-EM-208-H	PCB in IP66 Enclosure
TR-EM-208-T-230	Power Supply with TR-EM-208 in enclosure



TR-EM-208 PCB Only



TR-EM-208 mounted onto DIN rail



TR-EM-208 in housing

FEATURES

- Soft start
- Soft stop
- Limit switch input (stop)
- Brake
- Adjustable current limit
- Impulse / continuous
- Pos. / gnd control logic
- Cmos / TTL / switch
- Thermal protection

Technical Data

Supply	12-35 V DC
Max. current	12A cont. 20A 30% on / 70% off
Idle current	10mA typically
Current limit	Range1 1-5A (start 1.5x) Range2 5-10A (start 1.5x) Range3 10-20A (start 1.5x)
Therm. protection	120°C
Start ramp	0-3s adjustable
Free deceleration	0-3s adjustable
Operating freq.	2kHz
Voltage loss	0.6V (Im 12A)
Control inputs	"1" = 4-30Vdc, "0" = 0-1V
Error output	NPN open-coll. 30V 50mA
Oper. temp.	-10...60°C
Weight	105g

TR-EM-208 Settings and Connections

- **START CONDITION switch 4**
"ON" = after STOP command or exceeding the current limit activation start only in reverse direction
"OFF" = after STOP command or exceeding the current limit activation start in either directions
- **CONTROL MODE switch 3**
"ON" = impulse control, start with FORWARD or REVERSE command, stop with STOP or FORWARD or REVERSE
"OFF" = continuous drive, motor will only run as long as there is active FORWARD or REVERSE command

- **CURRENT LIMIT RANGE switches 1 & 2**
First choose coarse current range (on + on = off + off)

1-5A	5-10A	10-20A
on off	on off	on off

- **ACCELERATION RAMP** set acceleration time 0-3s.
 - **DECELERATION RAMP** set free deceleration time 0-3s, before braking.
- NOTE: If D-ramp is set to 0 sec, the control commands will be executed immediately regardless of the previous command or the command under execution at the time.

- **CURRENT LIMIT**
Current limit fine adjustment.
- **CONTROL LOGIC switch gnd / pos-logic**
Select control as gnd(NPN) or positive (PNP) control. Gnd control is used in examples. If positive control is used, 5V reference output or external 4-30Vdc can be used.

New Settings will be loaded when card status is stop.

All control commands in figure (2) operate with so called positive logic (PNP-control, positive voltage commands). It is also possible to use GND controlling, in which all commands operate activate with zero voltage (NPN-control, inversely to positive control).

SPECIAL situation (Fig. 4) with thermal protection activated. When thermal protection activates ($t > 120^{\circ}\text{C}$), motor stops and error output starts to blink at 1Hz. The controller will execute new commands only when the temperature of the controller goes down to 115°C .

At this point also the error output will stop blinking. In order to execute a new command, command inputs must first be set to zero.

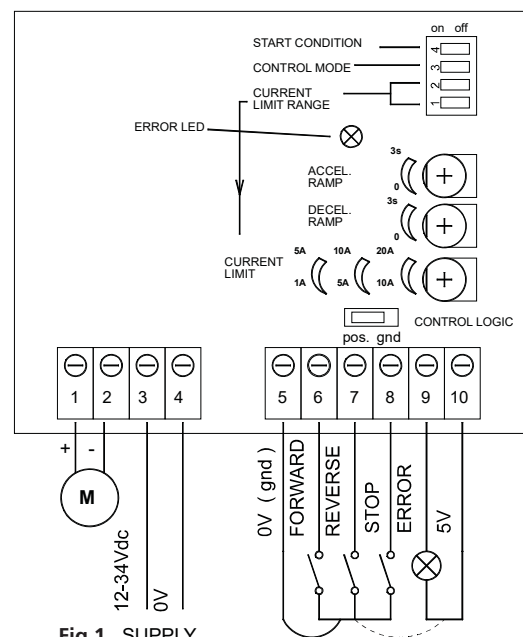
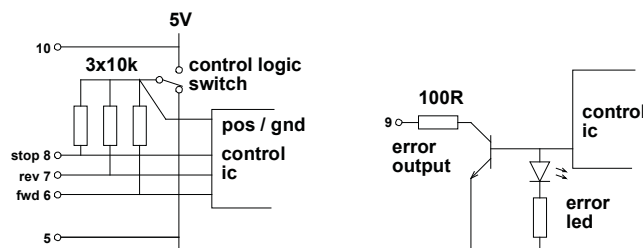
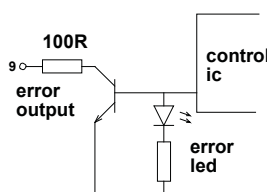


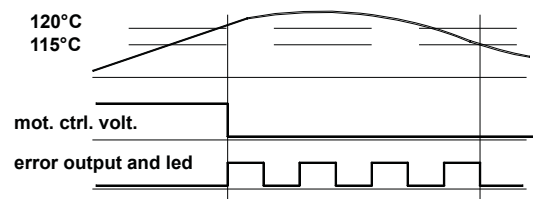
Fig 1. SUPPLY



forward, reverse and stop input
Fig 2.



error output and led
Fig 3.



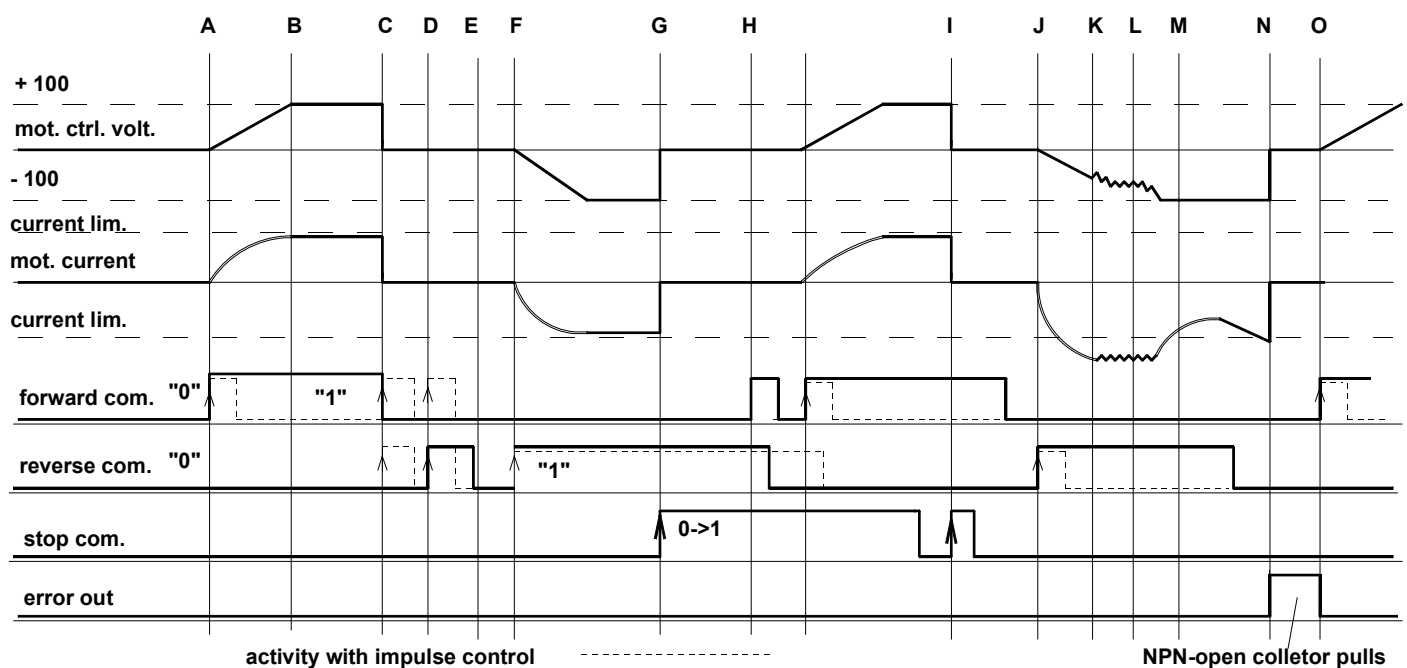
thermal protection
Fig 4.

TR-EM-208 Timing Chart

- A: Normal start with forward command. Motor voltage will rise along accel. ramp, ramp time A->B adjustable 0-3s.
- C: Command aborted, motor voltage drops, motor runs freely during free deceleration C->E, time adjustable 0-3s.
New commands (D) won't affect the operation. After free deceleration, the controller will switch to braking at point E, in other words motor poles will be short circuited (braking).
With impulse control either "new" command will stop. During C->E new impulses will not activate a start.
- F: Start with reverse command.
- G: Stop input changes 0->1 and stops the motor. Motor will remain in this condition until a new command is assigned.
- Start condition setting applies to this moment, restart can be activated in both directions or only in reverse direction.
- H: New start attempt, if old command is still on, new command will not be executed. When old command exits, new command must first be set to zero before it will be executed.
- Notice that new stop command will activate only after stop is first set to zero, in other words changed 0->1 at point I.
- J: Start, in which motor will exceed current limit already during acceleration ramp J->L, at point K current is 1.5 times adjusted current.
Controller starts to limit motor current by limiting control voltage.
- L: Settling time L->M (constant 0.5s), motor current is still being limited. During this time, if motor current will not decrease to current limit range, the controller will switch off motor voltage.
- N: If motor current exceeds set limit after acceleration and settling time, control will be switched off as in point N. Motor will be stopped and error output and led will be activated.
- O: After over current switch off, restart is possible either in both directions or with only reverse control, see start conditions on first page.
Restart resets error output and led.

! Activity with continuous control mode is illustrated with solid line.

! Activity with impulse control mode is illustrated with dashed line.





Control Card Function

It is possible to run the cannon with switches and relays only. The protection provided by the electronic control card makes the electric driven water cannon more reliable for our customer. It is not possible to burn the actuator out if it is operated at the level and it is sufficient for the application. The functions of the electronic control card used on the RM65 – E are as follows:

1. It limits the current that can be applied to the actuator; the result of this is it limits the force applied to moving the water cannon. The 24 Volt DC system is limited to 5 amps (Full load current for the 24 Volt DC actuator is 10.3 amps). The 12 Volt DC system is limited to 13 amps (Full load current for the 12 Volt DC actuator is 20.7 amps). In the event that the cannon becomes tighter. Perhaps because the bearing is not being lubricated, the current limiting function will protect the cannon structure and the actuator by stalling the cannon.
2. Turning an electrical motor in one direction and then rapidly commanding it to move in the opposite direction will result in very high surge currents. This will heat the motor, the current will blow fuses and the life of the actuator will be considerably reduced. The electronic control cards controls the level of the surge and slows the change to a level that the current will not rise above the preset value.

Control Card Fault Indication

The actuator control card has an LED on it that is used to indicate a fault with the system. Faults indicated on the actuator control card are current overload (indicated by the LED staying on continuously) and overheating of the actuator (indicated by the LED flashing on and off). The LED indicator will be reset when the fault is removed and the actuator is operated again or if the power to the control box is turned off.

Method of Fault Finding the Electrical Control System.

Check the drawing on the next page and ensure the dip switches on the electronic control card have been set correctly. It should be noted that the card is capable of operating from 12 to 34 Volts DC, so the dip switches need to be set up for either 12 volt or 24 volt. Check the dip switch labelled control logic on the control card, the switch should be set to the GND position. Please contact Magnum Australia if the dip switch is not in the GND position.

1. Check if the electric actuator is OK.

This can be done by removing the wires that are in terminal (1) and (2) of the electronic control card. Mark the wires with the purpose of putting them back in the same place. Connect the wire that was in (1) directly to the positive of the battery and the wire that was in (2) directly into the negative. Do the reverse process by connecting the wire that was in (1) directly to the negative of the battery and the wire that was in (2) directly to the positive.

If the actuator moves in any one of the above, it means the actuator is OK and this is not the problem. If there is not movement from either test, the actuator is faulty and needs to be replaced. If the actuator is OK, connect it up back to the electronic card. Look at the notes above, the actuator is operating at less than half current, and it is highly unlikely that the linear actuator will damage.

2. If the actuator is OK you need to check the electronic board.

Step 1, check that there is power on the board using a voltmeter. Place the test points of the voltmeter on terminals (3) and (4). If the voltmeter measures 12V or 24V that is used to power the system, go to step 2. In case of not getting any reading, check the fuse and the power to the cannon.

Step 2, take a piece of wire and connect it to a good earth. Touching terminal (6), the cannon should move in one direction. Touch terminal (7), the cannon should move in the opposite direction. If the cannon moves, it means that the card is OK and the problem is with the joystick.

Replace the joystick and try again. If there is not movement when touching terminals (6) or (7), the problem is with the card. Replace the electronic control card and try again.

1

2

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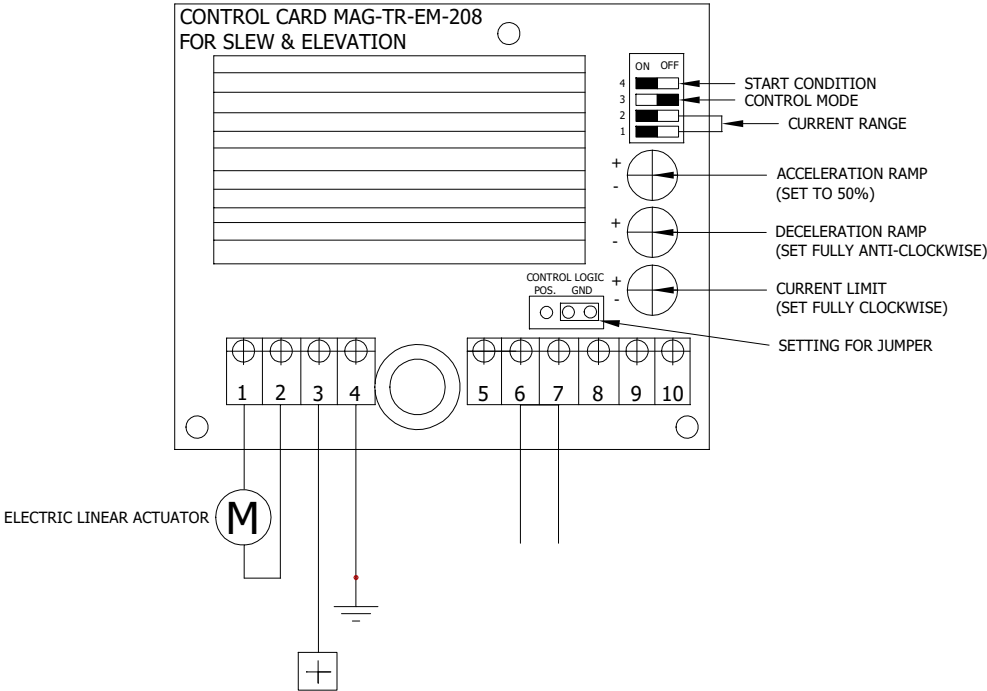
9

10

CONTROL CARD SETTINGS FOR SLEW & ELEVATION ACTUATORS

24V DC SETTINGS

1 - 5A DIP SWITCH 1 - ON & DIP SWITCH 2 - ON



CONNECTED TO 12V - 34V DC POSITIVE THROUGH IGNITION



CONNECTED TO 24V DC NEGATIVE

CONTRACT:

LOCATION:

+L1

Main electrical closet

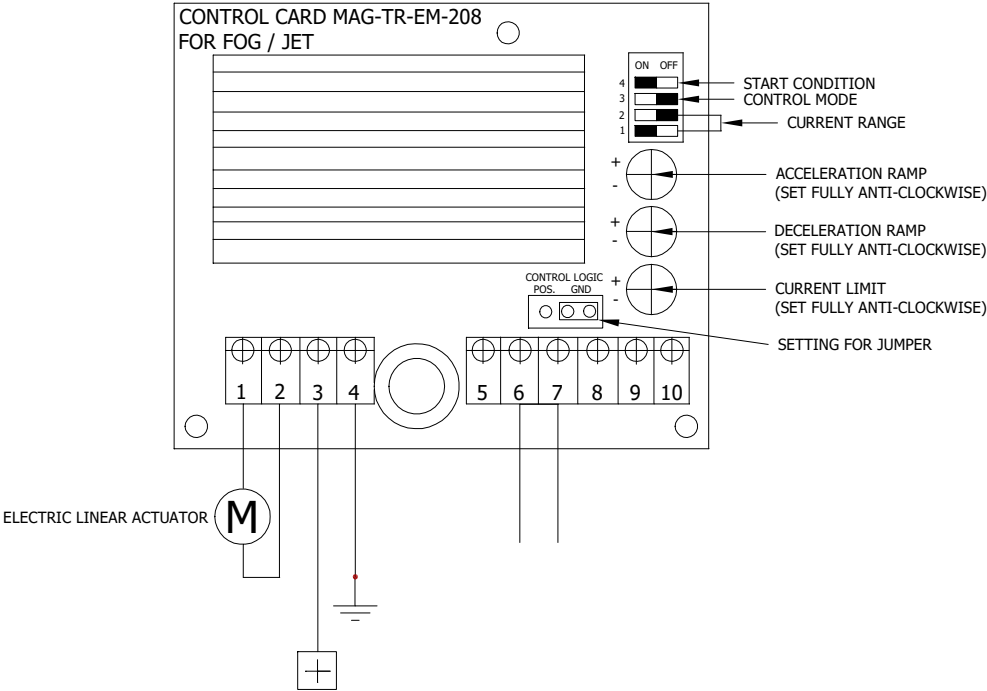
RM65-E-360-C
CONTROL CARD SETTINGS RM65-E-360-C
SLEW AND ELEVATION

				REVISION
				0
0	11/09/2020	AlbertoC		SCHEME
REV.	DATE	NAME	CHANGES	08
User data 1			User data 2	

CONTROL CARD SETTINGS FOR FOG / JET NOZZLE ACTUATOR

24V DC SETTINGS

5 - 10A DIP SWITCH 1 - ON & DIP SWITCH 2 - OFF



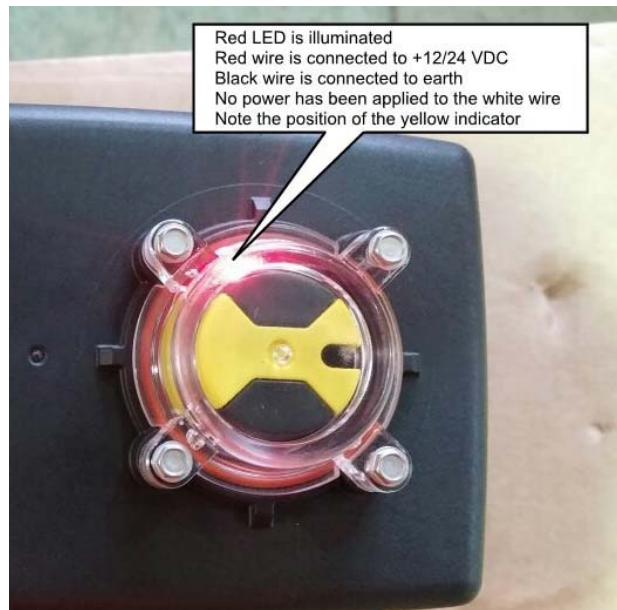
<div><div></div><div>CONNECTED TO 12V - 34V DC POSITIVE THROUGH IGNITION</div></div> <div><div></div><div>CONNECTED TO 24V DC NEGATIVE</div></div>	RM65-E-360-C							REVISION
	CONTROL CARD SETTINGS RM65-E-360-C				0	11/09/2020	AlbertoC	0
	FOG AND JET				REV.	DATE	NAME	SCHEME
					CHANGES			09
CONTRACT:	LOCATION:	+L1		Main electrical closet	User data 1			User data 2



9. Electric Operated Butterfly Valve



1. Power is required in order to open or close the valve. Red wire is positive, black wire is negative, and white wire is the signal wire.
2. The valve will open when the power is applied to the white wire and will close when there is no power on the white wire. It should be noted for both of these actions; power needs to be live on the red and black wire
3. The following graphics shows the indicator on the actuator of the butterfly valve when the butterfly valve is in the closed position.



4. The following graphics shows the indicator on the actuator of the butterfly valve when the butterfly valve is in the opened position. It should be noted the signal for the green LED comes from an inbuilt limit switch on the open position of the actuator. The green LED is illuminated when /after the shaft has rotated to the 90 degree position.



KZ VALVE



KZValve EH2 Actuator Installation, Operation, & Maintenance Guide

KZCO motorized valve actuators are built to provide years of maintenance free use when properly installed in compatible applications. Disregarding feedback signals, there are two primary types of control circuits; variable positioning (commonly polarity reversing) and on/off (commonly one or two switched signals). Always refer to the standard wiring diagrams for testing of the control harness. As a general rule, standard actuators will rotate clockwise (viewed from the top) while running to a valve closed position and counter clockwise while running to a valve open position. All KZCO motorized actuators currently require power to operate in either direction.

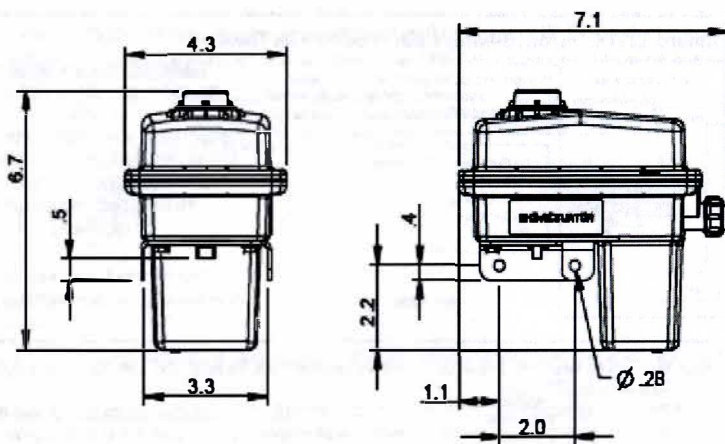
The KZValve EH2 Actuator is waterproof. The actuator housing is rated NEMA 6P and meets the IP68 rating of the ISO 60529 Standard.

NEMA 6P: National Electrical Manufacturers Association Enclosure Type 6P - (waterproof) – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (hose directed water and the entry of water during prolonged submersion at a limited depth); that provides an additional level of protection against corrosion and that will be undamaged by the external formation of ice on the enclosure.

The KZValve EH2 Actuator is ignition safe. The housing is rated NEMA 7D and meets the USCG Electrical Systems Standard.

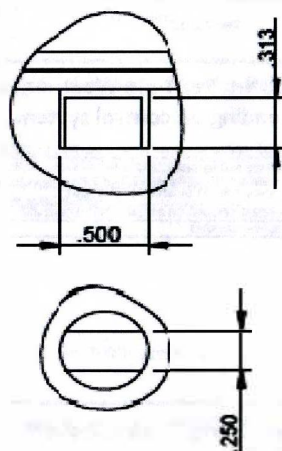
NEMA 7D: National Electrical Manufacturers Association Enclosure Type 7D - (ignition safe) - Enclosures are for indoor use in locations classified as Class I, Groups A, B, C, or D and shall be capable of withstanding the pressures resulting from an internal explosion of specified gases, and contain such an explosion sufficiently that an explosive gas-air mixture existing in the atmosphere surrounding the enclosure will not be ignited. Enclosed heat generating devices shall not cause external surfaces to reach temperatures capable of igniting explosive gas-air mixtures in the surrounding atmosphere. Enclosures shall meet explosion, hydro-static, and temperature design tests. **Class I** locations are areas where flammable gases may be present in sufficient quantities to produce explosive or flammable mixtures. **Division 1** designates an environment where flammable gases, vapors, liquids, combustible dusts or ignitable fibers and flyings are likely to exist under normal operating conditions. **Group D:** Atmospheres containing gasoline, hexane, naptha, benzene, butane, propane, alcohol, acetone, benzol, lacquer solvent vapors, or natural gas.

NOTE: OPENING THE CASE WILL VOID WARRANTY.



Dimensions are in inches

OUTPUT SHAFT DETAIL



SCALE 1.000

Actuator	Weight (lbs)
EH2	3.8

EH2 SERIES ACTUATORS

EH2 Actuator

Design Features:

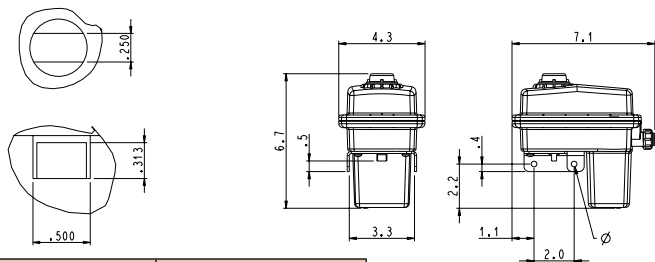
- Mid-Size Motorized Valve Actuator
- Valve Sizes: ¾" to 3"
- 12/24V DC and 24V AC Available
- Various Cycle Time Options Available
- Visit www.kzvalve.com for Engineering Data Details

Actuator Housing Rated NEMA 6P (waterproof), NEMA 7D (ignition safe) and Exceeds the USCG Electrical Systems Standard



EH2 Series Actuator

Output Shaft Detail

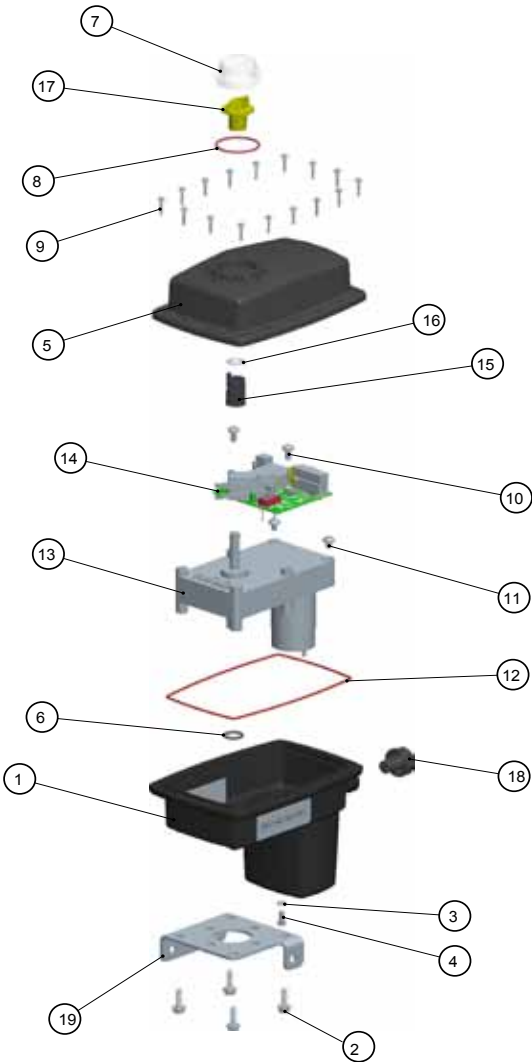


Actuator	Weight (lbs.)
EH2	4

Materials List

No.	P/N	Description	Qty
1	EH2-1200-N	Case, EH2, Lower, Nylon	1
2	100-0018	Bolt, #10-32 x 5/8 Machine Hex Washer Head	4
3	EH-139	O-Ring, #008, Pressure Test Port, Viton	1
4	EH-157	Screw, 8-18 x 3/8" SS	1
5	EH2-1201-N* EH2-1202-N	Case, EH2, Upper Lid with Dome, Nylon Case, EH2, Upper Lid, Blank, Nylon	1
6	EHPT-140	O-Ring, #112, Motor Shaft, Viton	1
7	EH3-114	Dome, Clear, Lexan	1
8	EH-130	O-Ring, #027, Dome, Silicone	1
9	EHPT-1103	Screw, #5 x 9/16", SS	16
10	EHPT-143	Bolt, 10-32 x 3/8", SS	2
11	EH2-1178	Bolt, 10-32 x 1/4", Nylon	2
12	EH2-1221	O-Ring, EH2 Lid, Silicone	1
13	**	Gear Motor	1
14	**	PCB Assembly	1
15	499-0100	Cam Assembly	1
16	EH-104	Retainer, Push-On 5/16" Shaft, SS	1
17	EH3-115Y* EH3-115R	Flag, Yellow, Polypropylene Flag, Red, Polypropylene	1
18	**	Wire Harness	1
19	100437	Bracket, SS	1

EH2 SERIES - TORQUE VALUES		
Motor Code	Max BreakAway Torque	Max Operating Torque
U	350 in #	250 in #
V	245 in #	175 in #
W	308 in #	220 in #
Y	308 in #	220 in #
Z	168 in #	120 in #



*Shown in assembly **Refer to **How to Order an EH2 by Model Number** on page 2.

EH2 SERIES ACTUATORS

HOW TO ORDER AN **EH2** BY MODEL NUMBER:

1 0 D Y 0 - P 0 1

ELECTRONIC CONTROL TYPE	POSITION FEEDBACK OPTIONS	OPERATING VOLTAGE	MOTOR CODE	CYCLE TIME SECONDS	WATERPROOF CONNECTOR TYPE	CASE OPTION	VERSION OR OTHER OPTIONS
Control signal type method for operation/positioning purposes	Feedback signal type or method for position indication	Voltage for input power and control signal(s)	Motor series and 12V design speed	Cycle time for non standard operating speeds	Wire harness connector Manufacturer and Type	Option for blank lid and/or indicator flag type	Product version and/or special options
0 = (1) Negative signal to open – DC only 1 = (1) Signal positive signal to open – 12/24V (DC/AC) 2 = (2) Signals (1) positive – open / (2) positive – close positionable/ PWM compatible – 12/24V (DC/AC) 5 = 55 Relay drive control 6 = 60,60A,60B Relay drive controls 7 = 62 Relay drive non-PWM A = 4~20mA – positionable – 12/24V (DC/AC) B = 0~5v – positionable – 12/24V (DC/AC) C = 0~10v – positionable – 12/24V (DC/AC) D = Dial-A-Matic – positionable use with DM-2 controller – 12/24V (DC/AC) K = Direct drive 50K reversing polarity (2-wire)	0 = None 1 = Negative @ open / negative @ closed (system voltage DC) fused to 0.5 amp 2 = Positive@ open/positive closed (system voltage DC) fused to 0.5 amp 3 = Dry-contacts (NO and COM) @ open and closed fused to 1 amp 4 = Dry pot, 5K Ω 0.1 amp resistive load 5 = Analog feedback for SL Control A = Positive@ open (system voltage DC) Fused to 1 amp B = Dry contacts for open (no-com) C = Positive@ closed (system voltage DC) Fused to 1 amp D = Digital RS-232 (consult factory for availability) M = Ground@ open (DC only) fused to 1 amp	A = 24V AC and 12/24V DC B = 24V AC and 12/24 with manual override disconnect C = 12/24V DC with manual override disconnect D = 12V DC only E = 12/24V DC only F = 24V DC only G = 24V AC/VDC '6' Relay drive controls H = 12/24V DC 'K' Direct drive controls	U = 7 sec V = .75 sec @ 24V W = 3 sec Y = 1.5 sec Z = .5 sec	0 = None S = Voltage compensated PWM** **For EH2 Series only w/o Pot or speed sense PCB	D = Deutsch Receptacle P = WeatherPak Tower 1 = WeatherPak Shroud	B = Blank lid 0 = Indicator flag	1 = Standard (no special options) V = 180° Operation M = Manual over-ride equipped O = Normally Open** U = Special bracket (EHPT-160-U) must be used with EH2, 78 or 79 series 3 way valves ** Consult factory
All cycle times are based on 12V input				CONSULT FACTORY FOR OPTIONS NOT LISTED			

Actuator Information

Motorized Actuators:

Case: NYLON Lids are available without position indicator flag (Blank Lid Option "B")

Dome: Position indicator cover, Clear Polycarbonate.

Hardware: Stainless Steel, 304, 316 & 18/8

Wire Leads: Typically ~ 16" with Black PVC jacket and Color coded 18ga. Multi strand tinned copper wire with color coded jacket.

Wire Connectors: Packard "Weather Pak" type in 2, 3 & 4 place plugs (Male & Female)

Motor Control (Wiring Type): Varies 12/24 volt DC & AC. All PCB's have terminal blocks to attach external wire leads.

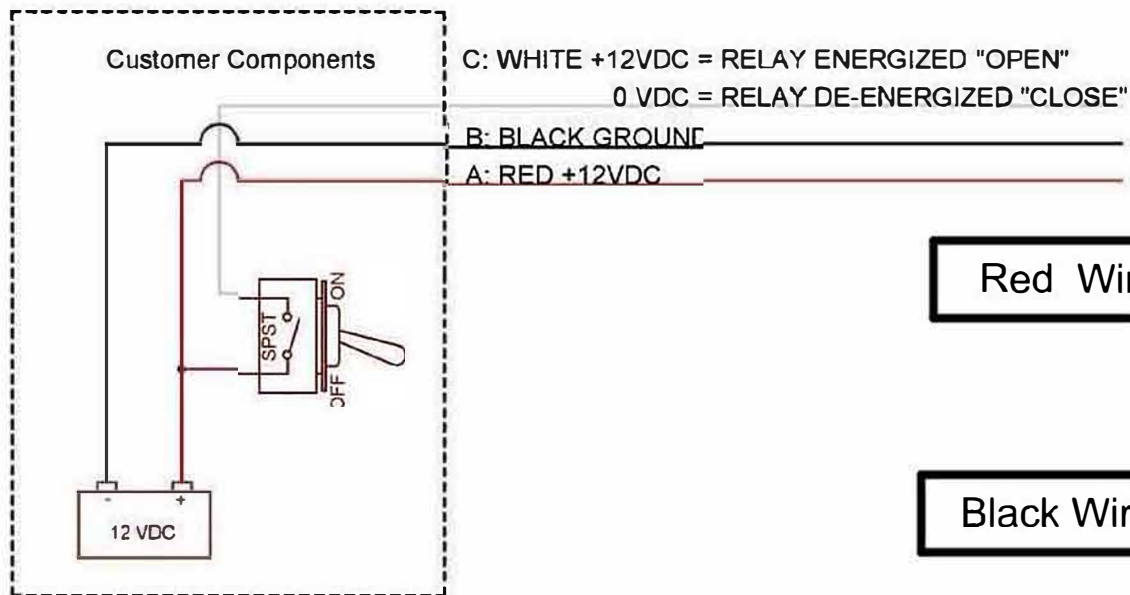
Rotation: 1/4 turn (90 degree) standard, cam is adjustable for operations up to 270 degrees and multiple stops. (See ELIMINATOR wiring)

Life: Application & Duty Dependent. Life is typically up to 500,000 cycles where the valve and actuator are matched properly to the application.

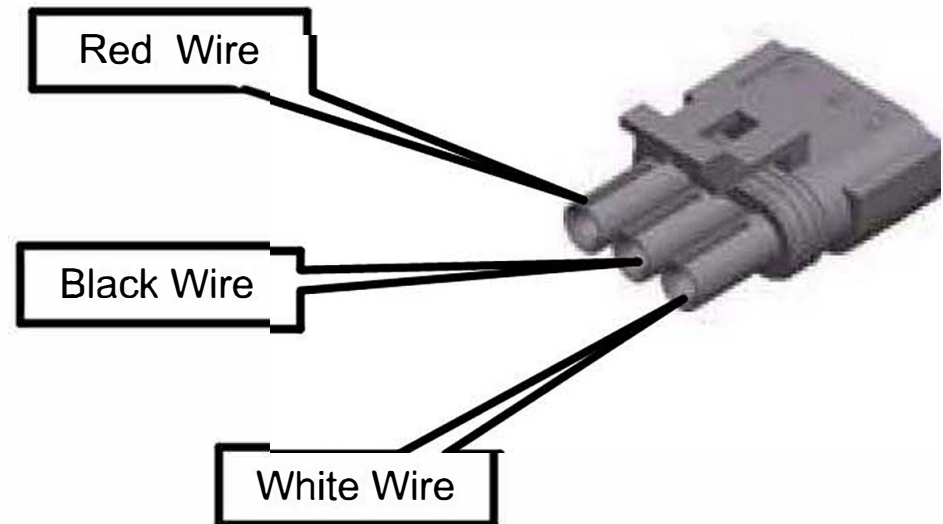
Actuator CT Code	C.T. @ ~13.8 VDC (90 Degree)	EH2 & EH3 Max Break Away Torque	EH2 & EH3 Max Running Torque	Voltage Range DC	Current (amps) Run/Stall	Typical Duty Cycle	Operating Temp. Range
U	8 sec	120 / 275	250 / 550	9 ~ 30	1 / 2.5	50%	-32F ~ 125F
V	1.5 sec	100 / 250	250 / 550	9 ~ 30	1.5 / 4	50%	-32F ~ 125F
W	3 sec	120 / 275	250 / 550	9 ~ 30	1.5 / 4	50%	-32F ~ 125F
Y	1.5 sec	120 / 275	250 / 550	8 ~ 26	1.5 / 9	50%	-32F ~ 125F
Z	.5 sec	60 / 100	---	8 ~ 26	1.5 / 9	50%	-32F ~ 125F
M	.8 sec	35 / 65	---	6 ~ 24	1 / 2	50%	-32F ~ 125F
N	1.5 sec	35 / 65	---	6 ~ 26	1 / 2	50%	-32F ~ 125F
O	12 sec	35 / 65	---	6 ~ 26	.8 / 1.5	50%	-32F ~ 125F
P	2.5 sec	35 / 65	---	6 ~ 26	1 / 2	50%	-32F ~ 125F
Q	7 sec	35 / 65	---	6 ~ 26	1 / 2	50%	-32F ~ 125F

Control Relay: 100~150 ma current draw when activated. Applies to On position in KZ control wiring with built in relay, (55, 60, 60A, 60B, 66, 66C, etc.).

BASIC WIRING DIAGRAMS



COMMON ACTUATOR CONNECTOR PLUG



12/24VDC on EH2

Motorized Valve Troubleshooting

ACTUATOR Problem	Possible Cause	Solution
Motor will not run at all	<ul style="list-style-type: none"> a. Limit switch problem b. Cam assembly problem c. Integrated circuit breaker tripped d. Dead or open short in control harness e. Dead or open short in actuator control circuit f. Failed gear motor 	<ul style="list-style-type: none"> a. Check and adjust limit switches per instructions b. Check and adjust cams per instructions c. Disconnect power to unit for 20 seconds, reconnect power. d. Check harness for cuts in insulation or sharp pinch points. Check for continuity of each wire in the harness. Check connectors for damage/corrosion. Repair or replace as needed. e. Check actuator housing for damage or missing hardware. Check actuator for internal corrosion. Check for loose motor lead. Clean circuit with electrical contact cleaner and compressed air. Solder connections if necessary. Replace circuit board assembly if required. f. Disconnect motor leads at circuit board or motor. Apply power directly to motor terminals. Motor should run continuously when power is applied. Replace motor if rotation is not smooth.
Motor runs continuously	<ul style="list-style-type: none"> a. Limit switch problem b. Cam assembly problem c. Defective or damaged circuit board component 	<ul style="list-style-type: none"> a. Check and adjust limit switches per instructions b. Check and adjust cams per instructions c. Replace circuit board assembly
Constantly tripping integrated circuit breaker or blowing of line fuse	<ul style="list-style-type: none"> a. Valve operating torque excessive; tight from incompatible valve, media, or build-up b. Defective or damaged circuit board component c. Failed gear motor 	<ul style="list-style-type: none"> a. Remove motorized actuator from valve. Manually turn with torque wrench when possible. Confirm that valve torque is within actuator capacity. Refer to actuator information chart in Engineering section of catalog. Disassemble and clean valve. b. Many models have internal relays. Listen for audible click upon activation. Bypass circuit board assembly to test motor. (See c.) c. Disconnect motor leads at circuit board or motor. Apply power directly to terminals. Motor should run continuously when power is applied. Replace motor if rotation is not smooth.
Valve Problem	Possible Cause	Solution
Valve is leaking past ball	<ul style="list-style-type: none"> a. Seat damaged or worn out b. Valve is not stopping at proper closed position 	<ul style="list-style-type: none"> a. Install repair kit b. Adjust limit switches of actuator
Valve stem leaks	<ul style="list-style-type: none"> a. Worn stem seals b. Damaged stem or stem bore 	<ul style="list-style-type: none"> a. On metal valves, tighten stem packing nut $\frac{1}{4}$ to $\frac{1}{2}$ turn. CAUTION! Over tightening stem nut could cause excessive operating torque and trip internal circuit breaker. If leak continues or for plastic valves, install repair kit. b. Replace valve stem if available, otherwise replace valve.
Valve body leaks	<ul style="list-style-type: none"> a. Loose body bolts or excessive operating pressure b. Defective body seals 	<ul style="list-style-type: none"> a. Check bolts and confirm application is within recommended pressure ratings. b. Install repair kit or replace valve.
Valve operating torque excessive	<ul style="list-style-type: none"> a. Swollen seals or particulate build-up in valve chamber b. Valve bolts too tight c. Stem nut too tight or damaged stem seal 	<ul style="list-style-type: none"> a. Check valve for compatibility with product. May require valve cleaning, repair kit, or new valve. b. Loosen bolts slightly. (plastic, bolted valves only) c. Loosen stem nut slightly. Install repair kit if needed.



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Revision:

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