



OPERATING AND MAINTENANCE MANUAL

ARM 5E ELECTRIC ARM



Reference : MUE00646GBC-1

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1. UP DATE CHART

ISSUE	DATE	SUBJECT	ORIGINATOR	VERIFICATION	APPROVAL
Draft A	15-10-10	Draft Issue	KD	BJ	PS
Issue A	18-10-10	Original Issue	KD	BJ	PS
Issue B	03-12-10	COMMS added	KD	BJ	PS
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2. INTRODUCTION

This manual is written for suitably qualified personnel in charge of operating and running this equipment. Operating and running must be done according to appropriate general rules. Non appropriate or defective use may lead to an irreversible failure of different components of the equipment. If any failure occurs, the user must check that the device is safe for its environment.

Before every operation, the operator must check that all the equipment are correctly plugged in accordance with this manual.

CAUTION: REPAIRING THE EQUIPMENT WHILE SWITCHED ON IS RESERVED TO QUALIFIED TECHNICIANS

CAUTION: THE 0.5 LITRE COMPENSATOR IS FULLY CHARGED AND READY TO USE. WHEN CONNECTING ENSURE THAT THE PISTON ROD IS HELD IN POSITION WHILST THE HOSE CONNECTIONS ARE MADE.

3. SPECIFICATION

SLEW	- 120 DEGREES (Left hand or Right hand mounting)
ELEVATE	- 85 DEGREES
ELBOW	- 145 DEGREES
JAW ROTATE	- CONTINUOUS
JAW OPENING	- 150mm at the tips
REACH	- 1.0 METRES
LIFT	- 25KG AT 4 AMPS AT FULL EXTENSION
JAW ROTATE TORQUE	- >25NM AT 4 AMPS
JAW CLOSING FORCE	- 60Kg AT 4 AMPS
WEIGHT	- 18.5KG IN WATER 27KG IN AIR
SUPPLY	- 24 - 30vdc - 240vac
DEPTH	- 6000 METRES

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4. DESCRIPTION

4.1 System Components

The five function Electric Arm consists of five major components, these are:-

- a) Surface Control Unit.
- b) SubSea Housing.
- c) The Manipulator Arm.
- d) Compensator 0.5 Litre
- e) Manifold

4.2 Surface Control Unit

The Surface Control Unit is powered by AC mains with an auto switching power supply which has the range of 100Vac to 240Vac. The mains input to the unit is hard wired and has been fitted with a UK standard 13amp plug fused with a 1amp fuse. The USB port although fitted is only used for factory configuration. This Surface Control Unit has the capability of either RS232 or RS485, but has been configured to operate in RS485 and has the supplied test lead with the correct connector fitted.

The Surface Control Unit is custom built meaning some variations between systems may exist depending upon the customers requirement. However, the supplied Surface Control Unit for this System is pictured below in photo 1.



Photo 1
(Surface Control Unit)

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The Manipulator arm is controlled via the Joystick, the Joystick Toggle and the Jaw Grip / Cutter switch (Positioned to the left of the Joystick). The following movements of the Manipulator Arm in relation to the Surface Control Unit demands will occur and are proportional to the level of demand by the operator.



Photo 2
(Joystick and Jaw controls)

4.3 Demands

Joystick pulled back (towards the operator) - Shoulder up.
Joystick pushed forward (away from the operator) - Shoulder down.
Joystick moved to the left - Slew left.
Joystick moved to the right - Slew right.
Toggle depressed back - Elbow up.
Toggle depressed forward – Elbow down.
Toggle depressed left – Jaw rotates to the left (counterclockwise).
Toggle depressed right - Jaw rotates to the right (clockwise).
Jaw Grip / Cutter pushed away from the operator – Jaws open.
Jaw Grip / Cutter pulled towards the operator – Jaws close.

4.4 LED's

There are three LED's fitted to the Surface Control Unit, these are non functional with this Control configuration and are used with the more advanced Position Feedback Manipulator System.

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4.5 SubSea Housing

This contains the five Motor Driver boards within a waterproof housing that are essential for the operation of the arm. Failure of the integrity of this Pod will render the system inoperative and probably cause irreparable damage to the electronics housed within. Connections to this Pod are made through the five Sea-Con underwater connectors, the connector description and pin connections are shown in section 5, Electrical Connections.

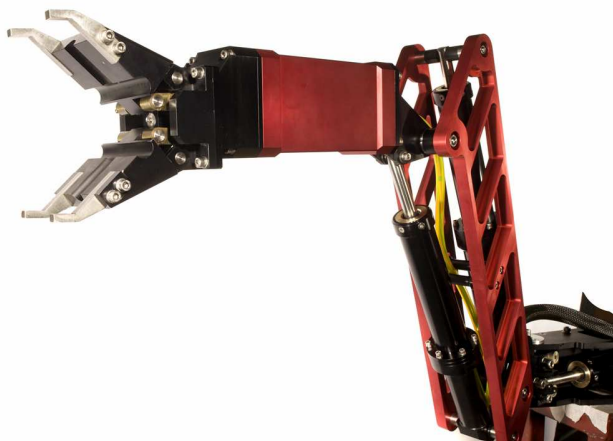


Photo 4
(Electronics Pod)

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4.6 Manipulator Arm

The manipulator supplied is the versatile 5 function version, and although is tolerant to every day use care must be taken with the cables as these for part of the integrity and are oil filled. The mounting arrangements for this Arm can be found at the rear of the manual



(Manipulator Arm)

4.7 Compensator

The Compensator supplied is of the 0.5 litre size. This unit has been supplied fully charged and ready to use. When connecting to the manifold with the length of 0.25" tubing (As supplied) it must be ensured that the piston rod is held in position whilst the hose connections are made. Also supplied is a self sealing snap connector for easy refilling / topping up of the system

4.8 Manifold

The Manifold supplied is the 4 way unit. The hoses are already fitted to the unit and once the Manipulator has been fitted to the vehicle can be connected to each of the Actuators. Connections are made by simply pushing the tube into the connector and are of the 'Push Fit' type. To remove a tube, pull back the locking ring and remove the tube by pulling.

4.9 COMMS

The following section describes the Comms/software details

- RS485 (handshake line, 14 bytes down, 14 bytes up)
- 19200 baud rate.
- USB link, appears as COM port on PC, for details see windows device manger (control panel/System/hardware/Device Manager/Ports(COM&LPT))

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4.9.1 Installation Notes

Note the software has been designed to run on a 32 bit XP machine, it may however run on other windows operating systems but has not been extensively tested.

- Disable screen savers and all power management on target machine.
- Install software from USB pen (setup.msi or setup.exe)
- Install the device driver, when USB is plugged in you will be prompted to do so and given options to locate the folder for the driver, select the folder containing csipcdc.cat and csipcdc.inf (these can be found on the USB pen and in the programs file folder after the software is installed)
- Note the CDC driver might need to be installed on every port, try to always use the same USB port or install every port at this point. Swapping ports is also likely to make the COM number change.

5. ELECTRICAL CONNECTIONS

5.1 SubSea Housing

Electrical connections are made to the Subsea Housing via Sea-Con connectors. These have been orientated so that the possibility of incorrect connection has been reduced.

PL1 8 way Power and Communications

PIN	FUNCTION
1	24 Volt
2	24 Volt
3	0 Volt
4	0 Volt
5	RS 232 TX / RS485 H
6	RS 232 RX / RS485 L
7	0 Volt RS 232 / RS485 Screen
8	Not defined

SKT3 8 way Slew

PIN	FUNCTION
1	Slew Phase A
2	Slew Phase B
3	Slew Phase C
4	Slew Hall Power
5	Slew Hall A
6	Slew Hall B
7	Slew Hall C
8	Slew Hall Ground

SKT4 8 way Elbow

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PIN	FUNCTION
1	Elbow Phase A
2	Elbow Phase B
3	Elbow Phase C
4	Elbow Hall Power
5	Elbow Hall A
6	Elbow Hall B
7	Elbow Hall C
8	Elbow Hall Ground

SKT1 16 way Jaw Rotate and Jaw Close

PIN	FUNCTION
1	Jaw Rotate Phase A
2	Jaw Rotate Phase B
3	Jaw Rotate Phase C
4	Jaw Rotate Hall Power
5	Jaw Rotate Hall A
6	Jaw Rotate Hall B
7	Jaw Rotate Hall C
8	Jaw Rotate Hall Ground
9	Jaw Close Phase A
10	Jaw Close Phase B
11	Jaw Close Phase C
12	Jaw Close Hall Power
13	Jaw Close Hall A
14	Jaw Close Hall B
15	Jaw Close Hall C
16	Jaw Close Hall Ground

SKT2 16 way Shoulder and Auxiliary

PIN	FUNCTION
1	Shoulder Phase A
2	Shoulder Phase B
3	Shoulder Phase C
4	Shoulder Hall Power
5	Shoulder Hall A
6	Shoulder Hall B
7	Shoulder Hall C
8	Shoulder Hall Ground
9	Not defined
10	Not defined
11	Not defined
12	Not defined
13	Not defined
14	Not defined
15	Not defined
16	Not defined

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The colour coding for each of the actuators follows a common theme and are as follows:-

FUNCTION	COLOUR
Phase A	Green
Phase B	Red
Phase C	Black
Hall Power	Yellow
Hall A	Blue
Hall B	Orange
Hall C	Brown
Hall Ground	White

6. OPERATING PROCEDURE

6.1 Electrical Connection

Connect the Arm to the SubSea housing using to protocol set out in section 5.1 above. Connect the Power / Communications (As supplied) to the SubSea housing. Connect a suitable 24Vdc supply to the Red (positive) and Black (negative) cables. A DC supply that is able to supply 10amps will be sufficient to operate all of the Arms functions simultaneously.

6.2 General Safety

Ensure that on initial start up that all personnel and equipments are clear from the working parameters of the Arm. Ensure that when the Arm is in operation that persons are not physically 'inspecting' the workings of the Arm as serious injury may occur.

6.3 Operation

Detail operation parameters of the Surface Control are set out in Para 4.3.

7. MAINTENANCE

7.1 General Care

The 5E Electric Arm has been designed for ease of maintenance by a competent engineer.

After each use, wash the Arm with fresh water liberally and dry if possible. Check for tightness of fixtures and fittings adjusting if necessary. Check for galvanic corrosion of the arm, the first signs of which may appear upon sharp edges or corners. Touch up any scratches, marks or digs with black enamel paint as required, then spray with a water dispersant e.g. WD40. Finally check the condition of any anodes if fitted and replace if required. It is recommended that Magnesium anodes are used in fresh water, and Zinc used in Sea water.

In the unfortunate occurrence of water ingress within the units at depth, care must be taken when stripping the actuator as it may now contain higher than atmospheric pressure once the Arm has been returned to the surface.

7.2 Maintenance Manual

A full Maintenance Manual is available upon request and describes in detail the assembly of the actuators and the consumables used in the manufacture of this Manipulator.

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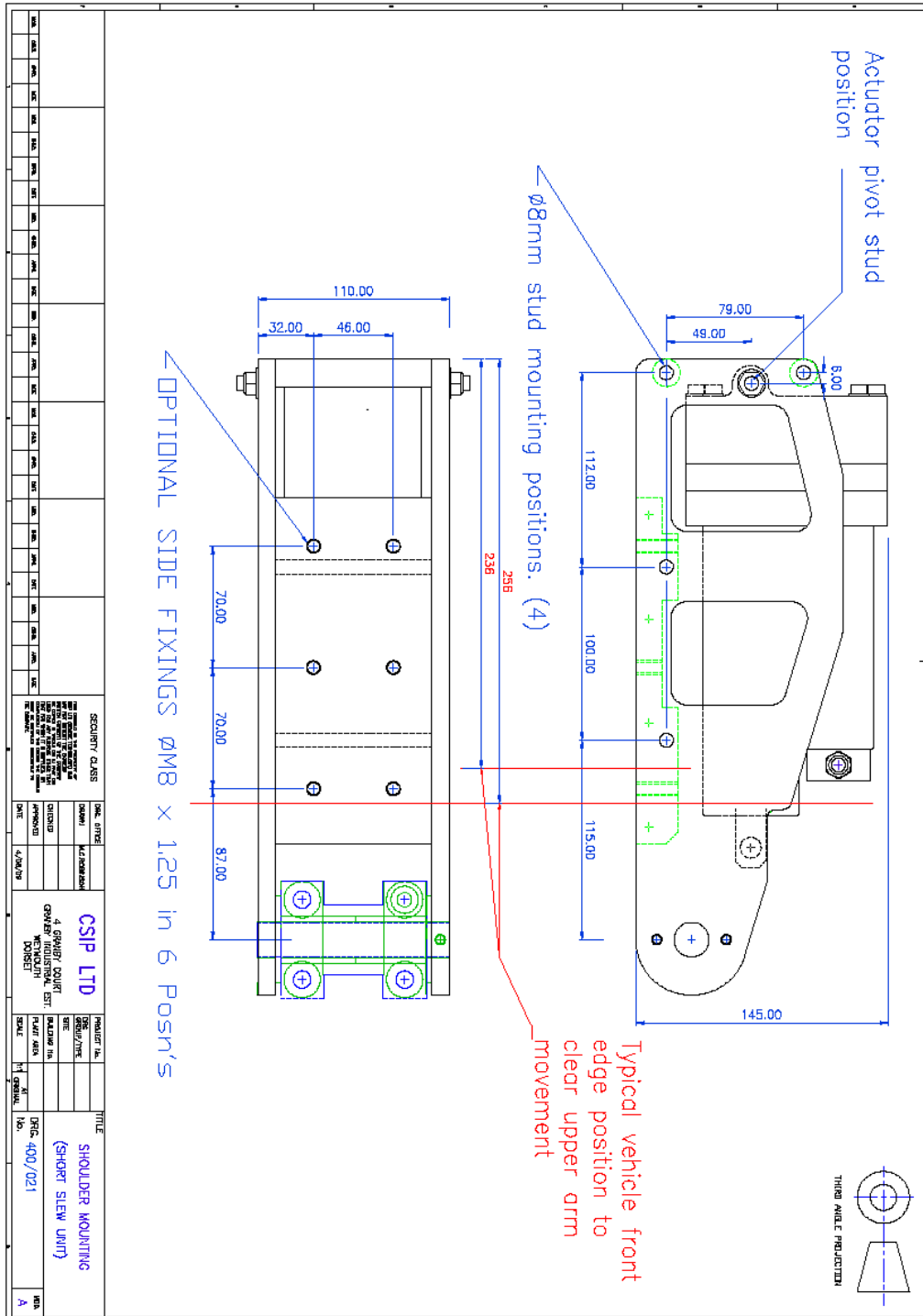
8. TROUBLESHOOTING

8.1 The manipulator appears Non Functional

If you are sure you are using the right port then please check the power supply is turned on and the umbilical cable is correctly plugged and unbroken.

Ensure that the SubSea Housing has been connected correctly and that the Water matable connectors are fully engaged.

9. MOUNTING



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10. CONTACTS

For Product and Technical Support please contact in the first instance:-

SAV Montpellier :

Tél : 33 (0) 4 67 63 64 00

Fax : 33 (0) 4 67 52 14 88

E-mail : eca-hytec@ecagroup.com

Web : www.ecahytec.com

11. GUARANTEE EXTENT

11.1 GENERALITIES

Refer to the general and specific conditions of the contract.

11.2 WARRANTY DURATION

The equipment is guaranteed (parts and labour) for a period of twelve months from the date of purchase.

12. TECHNICAL ASSISTANCE

See contract general and specific conditions related to technical assistance.