

## SPECIFICATION FOR NAVAIDS CRANE

Composite crane control panel with integral joystick controls and indication with provision for remote joystick controls and indication. The panel contains the following starters:

Topping:	61.6/30.8/7.6KW A.C. Starter
Slewing:	39.9/19/4.1KW A.C. Starter
Main Hoist:	70.8KW D.C. Thyristor Drive
Aux Hoist No.1:	40.2KW D.C. Thyristor Drive
Aux Hoist No. 2:	39.3KW D.C. Thyristor Drive

The A.C. starters will be used for crane position control and will comprise 3 speed pole changing forward and reversing direct on line.

The D.C. starters will be used for crane hoist and will comprise 3 phase, 6 pulse, 4 quadrant thyristor drive with torque limiting device.

Control of these starters would be by means of (a) pedestal or deck type console(s) remotely sited.

The composite panel will be built to IP42 and will comprise five cubicles, each of which would house the drive components, access to which will be via doors hinged on the front. The panel is manufactured from zinc coated (zintec) sheet steel which is cut, formed and seam welded to produce a robust unit. The metal surfaces are prepared, degreased and primed and finished in a two pack polyurethane paint, Admiralty Grey in colour unless an alternative to BS4800 is requested on your order.

### Composite Dimensions (mm)

Height:	1800
Width:	3000
Depth:	600
Main Electrical Supply:	600 volt 3 phase 60 hz
Control Electrical Supply:	120 volt via an internal double wound transformer with earth screen

### Crane Positioning

the motors will comprise:

#### Topping Motor Data

Frame Size T42/315

<u>Output</u>	<u>Full Load Current</u>	<u>Speed</u>
61.6KW	75 amp	1800 rpm
30.8KW	59 amp	900 rpm
7.6KW	33 amp	225 rpm

#### Slewing Motor Data

Frame Size T36/250

<u>Output</u>	<u>Full Load Current</u>	<u>Speed</u>
39.9KW	38 amp	1800 rpm
19.0KW	33 amp	900 rpm
4.1KW	22 amp	225 rpm

Each starter is mounted in its own enclosure and will comprise:  
(Mounted within the enclosure)

- 1 - Door interlocked circuit breaker.
- 3 - Low speed motor circuit protection breaker.
- 2 - 1800 rpm mechanically and electrically interlocked contactors.
- 1 - 1800 rpm overload relay.
- 2 - 900 rpm mechanically and electrically interlocked contactors.
- 1 - 900 rpm overload relay.
- 2 - 450 rpm mechanically and electrically interlocked contactors.
- 1 - 450 rpm overload relay.
- 1 - Pole change contactor.
- 1 - Current transformer for use with the remote mounted ammeter.
- 1 - Double wound control transformer 600 volt primary,  
120 volt secondary.
- 1 - Set control circuit fuse links mounted in fuse holders.
- 6 - Control timers.
- 1 - Set control relays.
- 1 - Brake contactor.
- 1 - Brake transformer-rectifier.
- 1 - Panel anti-condensation heater and thermostat.

1 - 110V A.C 2 pin socket for inspection lamp

1 - Set control terminals

The control panels would accept signals from limit switches mounted on the crane to limit its movement.

Mounted on the panel door would be:-

1 - Supply on lamp

1 - Ready lamp

1 - Lock off stop pushbutton - key reset

The panel will be complete with all main and control interconnectors having all cables terminated with crimped lugs and identified with internationally colour coded cable numbers.

A pocket will be provided in the inner side of the door to hold the necessary equipment drawings.

### Crane Hoist

Motor data:

Main Hoist                      Frame Size DD315

Output              Armature Current              Speed

70.8KW                      265 amp                      800 rpm

70.8KW                      135 amp                      1600 rpm

Field Weakening To                      2500 rpm

Aux Hoist No.1 Motor Data              Frame Size DD280

Output              Armature Current              Speed

40.2KW                      78 amp                      958 rpm

0-958 Constant Torque

Field Weakening To                      2500 rpm

Aux Hoist No.2 Motor Data              Frame Size DD250

Output              Armature Current              Speed

39.5KW                      77 amp                      1320 rpm

0-1320 Constant Torque

Field Weakening To                      2250 rpm

Each D.C drive will be mounted in its own enclosure and will comprise:-

Mounted within the enclosure

1 - Door interlocked circuit breaker

1 - Suitably rated triple pole main line A.C contactor

1 - Motor cooling fan starter comprising contactor, thermal overload, fuses

3 - High speed fuses complete with tripped fuse interlocks arranged to stop the drive in the event of a high speed fuse failure

- 6 - Limb chokes for fault limitation and transient voltage protection
- 2 - Fully controlled, anti parallel connected, suppressed half, 3 phase, 6 pulse thyristor converter bridges rated continuously for use in an ambient temperature to BS587 (max 40°C with average 35°C) each bridge complete with device suppression networks, cooling fans and over-temperature protection circuit
- 1 - Brake transformer rectifier
- 1 - Panel anti-condensation heater and thermostat
- 1 - 110V A.C 2 pin socket for inspection lamp
- 1 - Transducer for current feedback purposes and indication purposes

#### Electronic Modules

- 1 - Set electronic control modules consisting of:-

Regulator Board incorporating:

Speed control circuit containing the speed error amplifier, speed setting reference and current limiting circuitry.

Current control circuit containing the current amplifier stability circuits and current suicing networks.

Electronic instantaneous overload circuit offering sub cycle protection against high levels (the instantaneous overload provides firing circuit pulse suppression and does not rely on the main contactor clearing the high level fault current).

Comprehensive forward and reverse bridge protection and inhibit circuits.

"S Law" Ramp Board incorporating:

Acceleration control circuit providing controlled rate of change of tachometer generator voltage for accelerating the drive to the required speed.

Four Quadrant DCVT providing:

Forward and Reverse Current Feedback.

Twin Firing Circuit Boards providing:

The 6 block pulses which control the conduction of each fully controlled armature bridge.

Auxiliary Components Board incorporating:

Preset potentiometers to allow the setting up of the following control parameters:

Reverse Current Stability

Reverse Current Limit

Forward Current Limit

Forward Current Stability  
Speed Stability  
Set Minimum Speed  
Set Maximum Speed  
Ammeter Trim

#### Main Components of Field Circuit

- 1 - Single phase field supply transformer complete with secondary resistors for fixed field weakening
- 1 - Set interlocked field voltage selection contactors
- 1 - Full wave, single phase diode bridge rectifier
- 1 - Set field failure protection equipment

#### CONTROL CIRCUIT

- 1 - 600/110V centre tapped, double wound control circuit transformer
- 1 - Set suitably rated HRC fuses for protection of control circuit wiring

Provision is made for reception of following remote operator controls:-

Raise/Lower Speed	}	All on a Joystick Control
High Speed		
Start		
Stop		
Emergency Stop		

Mounted on the panel door is:-

Lock Off Stop Pushbutton - key reset  
Ready Lamp  
Supply Available Lamp  
Reset Pushbutton

#### Monitoring

Armature current and voltage

Test meter and flying lead

Alarm indication and tripping of drive will occur in event of:-

- Motor Field Failure
- Stack Overtemperature
- Electronic Overload
- External Interlocks
- Motor Overtemperature
- Phase Rotation Wrong/Loss

### Protection

Phase Loss

Undervoltage

Electronic Current Limit

Limb Harmonic Suppression Reactor

Field Failure

A.C. Internal Overload

D.C. Overload

Converter Ventilation Failure

The panel is complete with all main and control interconnections having all cables terminated with crimped lugs and identified with internationally colour coded cable numbers. A pocket is in the inner side of the door to hold the necessary equipment drawings.

### A.C. & D.C. MOTORS FOR CRANE WINCH DRIVES

All machines offered conform to the relevant British Standards and Lloyd's Unrestricted Requirements, being wound with class 'F' insulation 1 hour rated and suitable for use on the supplies specified.

### D.C. MOTORS

The D.C. Motors are totally enclosed, deck watertight, shunt wound interpoler, horizontal C flange mounting type have 2 end plate mounted grease lubricated bearings and a bare splined shaft extension at the driving end. A terminal box is provided suitable for cable termination. Radio interference suppressors are fitted internally. A tacho generator is fitted for speed control.

Motor Data:

Main Hoist	Frame Size DD315	
Output	Armature Current	Speed
70.8KW	265 amp	800 rpm
70.8KW	135 amp	1600 rpm
Field Weakening to		2500 rpm

Aux Hoist No.1 Motor Data		Frame Size DD280
Output	Armature Current	Speed
40.2KW	78 amp	958 rpm
0-958 Constant Torque		
Field Weakening to		2500 rpm

Aux Hoist No.2 Motor Data		Frame Size DD250
Output	Armature Current	Speed
39.5KW	77 amp	1320 rpm
0-1320 Constant Torque		
Field Weakening to		2250 rpm

### A.C. MOTORS

The A. C. motors are totally enclosed, deck watertight, squirrel cage induction, 3 speed horizontal speed foot mounting type having 2 end plate mounted grease lubricated bearing and a bare splined shaft extension at the driving end.

A terminal box are provided suitable for cable termination.

Topping Motor Data		Frame Size T42/315
Output	Full Load Current	Speed
61.6KW	75 amp	1800 rpm
30.8KW	59 amp	900 rpm
7.6KW	33 amp	225 rpm

Slewing Motor Data		Frame Size T36/250
Output	Full Load Current	Speed
39.9KW	48 amp	1800 rpm
19.0KW	33 amp	900 rpm
4.1KW	22 amp	225 rpm

### BRAKES

Electromagnetic brakes are supplied separately for each drive. The brakes are spring loaded fail-safe protected against seawater to IP65.

#### Topping

Type 41      Standard 55mm bore with keyway    Static Torque 690 Nm

#### Slewing

Type 37      Standard 48mm bore with keyway    Static Torque 440 Nm

#### Main Hoist

Type 54      Standard 70mm bore with keyway    Static Torque 1760 Nm

#### Aux Hoist No.1

Type 41      Standard 55mm bore with keyway    Static Torque 690 Nm

#### Aux Hoist No.2

Type 47      Standard 60mm bore with keyway    Static Torque 1100 Nm

#### CONTROL CONSOLE

This will comprise a 6mm aluminium plate set into a pedestal structure and inclined for ease of operation.

The console will consist of:

- 1 - 4 direction joystick for slewing and topping control
- 1 - Long scale topping ammeter
- 1 - Long scale slewing ammeter
- 1 - Raise/lower joystick for main hoist
- 1 - Raise/lower joystick for aux hoist no.1
- 1 - Raise/lower joystick for aux hoist no.2
- 1 - Long scale main hoist ammeter
- 1 - Long scale aux hoist no.1 ammeter
- 1 - Long scale aux hoist no.2 ammeter
- 1 - Port/Starboard duty switch (only required on dual control systems)
- 5 - Motor overtemperature lamps
- 3 - Fault lamps
- 3 - Overtravel lamps
- 1 - Power available lamp
- 1 - Port selected lamp - optional
- 1 - Starboard selected lamp - optional
- 1 - Override limit pushbutton for crane parking
- 1 - Emergency stop lock off mushroom head pushbutton
- 1 - Set terminals



Each raise/lower joystick has a high speed request pushbutton in the top of the joystick.

Each joystick is fully screened from others by aluminium barrier plates which also serve to strengthen the unit.

# D. C. TEST CERTIFICATE

Client INDUSTRIAL & MARINE SWITCHGEAR

Serial No. 38139/1

Order No. SM18828/1422/6

Job No. Date 5.7.84

B.H.P./KVA 95/95/22.38	Rating 1 HOUR	R.P.M. Loaded 800/1600/2500
Size DD315C	Enc. T.E.D.W. (IP56)	R.P.M. Light -
Volts 290/575/575	Type DC MOTOR	Conn. SHUNT INT SEP EXC
Amps 265/135/31.5	Spec. I.E.E. & BS4999	Class of Insulation 'F'

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input	Rotation looking on Drive End REVERSING		
SHUNT		COLD		4.45	250		Atmosphere °C 20		
REV 'N'	100	290	707	4.45	250		Temprise THERMO		
	100	290	704	4.45	250		Armature	76	56
10.10	265	290	706	4.45	250	76.85	Commutator	51	31
							Shunt	57	37
TEMPS 11.10	265	290	783	3.5	250	76.85	Series	-	-
FL	135	575	1550	3.5	250	77.6	Interpole	85	65
	203	575	1573	3.5	250	116.7	Brake		
	31.5	575	2500	1.62	103	18.1	Brake D.C.	Cold	Warm
	63	575	2500	1.62	103	36.2	Volts		
WINDING RES FIGS ARM 0.0217/0.0264							Amps		
COLD/HOT INTERPOLES 0.0103/0.014							Watts		
	SHUNT	56	/	71.4			BRAKING TORQUE		
HEATERS		110/1/60 HTZ					lbs. ft.		
OVERLOADS							% F.L.T.		
EFFICIENCY READINGS							REGULATOR		
Loading of Machine			1/2	3/4	4/4	5/4	Type:		
Efficiency %				91.2	91.9		No.:		
Remarks HEATER CCT CHECKED FOR CONTINUITY							Ins. Res. Hot Meg Ω		
63 OHMS, THERMO-STATS CHECKED N/C							2 K.V. A.C. Test for One Minute O.K.		
TACHO O/P VOLTS CHECKED							AIR GAP MP 0.14		
VIBRATION TO BS4999 N GRD							IP 0.14		

Test Engineer E.H. & S.H.

Date of Test 6.11.84

per pro DAVID McCLURE LTD

*DBW*

MAIN HOIST-TYPICAL

DAVID McCLURE LTD, STOCKPORT

# D. C. TEST CERTIFICATE

Serial No. 38139/1

Client .....

Order No. ....

Job No. .... Date .....

B.H.P./K.W.		Rating		R.P.M. Loaded	
Size		Enc.		R.P.M. Light	
Volts		Type		Conn.	
Amps		Spec.		Class of Insulation	

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input	Rotation looking on Drive End		
							Atmosphere °C		
	NO	LOAD	READINGS				Temprise		
	6.0	290	773	3.5	250		Armature		
	6.0	295	783	3.5	250		Commutator		
							Shunt		
	8.4	575	1540	3.5	250		Series		
	8.4	580	1550	3.5	250		Interpole		
							Brake		
	7.2	575	2522	1.62	103		Brake D.C.		Cold Warm
	7.4	570	2500	1.62	103		Volts		
							Amps		
							Watts		
							BRAKING TORQUE		
							lbs. ft.		
OVERLOADS							% F.L.T.		
EFFICIENCY READINGS							REGULATOR		
Loading of Machine			1/2	3/4	4/4	5/4	Type:		
Efficiency							No.:		
Remarks							Ins. Res. Hot Meg Ω		
							2 k.v. A.C. Test for One Minute O.K.		
							AIR GAP		

Test Engineer D. C. W. Date of Test .....

per pro DAVID McCLURE LTD .....

DAVID McCLURE LTD, STOCKPORT

# D. C. TEST CERTIFICATE

Client **INDUSTRIAL & MARINE SWITCHGEAR**

Serial No. **38139/10**

Order No. **SM18828/1422/6**

Job No. \_\_\_\_\_ Date **5.7.84**

DAVID McCLURE LTD, STOCKPORT

B.H.P. <del>500</del> <b>54/54</b>		Rating <b>1 HOUR</b>		R.P.M. Loaded <b>0/958/2500</b>	
Size <b>DD.280B</b>		Enc. <b>T.E.D.W. IP56</b>		R.P.M. Light <b>-</b>	
Volts <b>A 575</b>		Type <b>HOR-FLG-MTG</b>		Conn. <b>SHUNT SEP EXC 250 VOLTS</b>	
Amps <b>78</b>		Spec. <b>IEE &amp; BS.4999</b>		Class of Insulation <b>F</b>	

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input	Rotation looking on Drive End		
	<b>COLD</b>	<b>SHUNT</b>		<b>4.25</b>	<b>250</b>		Atmosphere °C <b>23</b>		
<b>REVERSE 'N'</b>	<b>70</b>	<b>450</b>	<b>625</b>	<b>4.25</b>	<b>250</b>		Temprise		
	<b>70</b>	<b>450</b>	<b>629</b>	<b>4.25</b>	<b>250</b>		Armature	<b>78</b>	<b>55</b>
	<b>78</b>	<b>575</b>	<b>820</b>	<b>4.25</b>	<b>250</b>		Commutator	<b>68</b>	<b>45</b>
<b>11.20</b>	<b>78</b>	<b>575</b>	<b>2500</b>	<b>0.85</b>	<b>50</b>	<b>44.85</b>	Shunt	<b>33</b>	<b>10</b>
<b>11.50</b>	<b>78</b>	<b>575</b>	<b>2500</b>	<b>0.85</b>	<b>52</b>	<b>44.85</b>	Series	<b>-</b>	<b>-</b>
<b>12.20</b>	<b>78</b>	<b>575</b>	<b>2500</b>	<b>0.84</b>	<b>53</b>	<b>44.85</b>	Interpole	<b>79</b>	<b>56</b>
			<b>TEMPS</b>				Brake	<b>-</b>	<b>-</b>
<b>BS FL</b>	<b>78</b>	<b>575</b>	<b>958</b>	<b>2.6</b>	<b>180</b>	<b>44.85</b>	Brake D.C.	<b>Cold</b>	<b>Warm</b>
<b>NL BS</b>	<b>1.9</b>	<b>575</b>	<b>828</b>	<b>4.25</b>	<b>250</b>	<b>1.09</b>	Volts		
<b>N TS</b>	<b>2.7</b>	<b>575</b>	<b>2490</b>	<b>0.85</b>	<b>57</b>	<b>1.55</b>	Amps		
<b>WINDING RES FICS ARM</b>	<b>0.173</b>	<b>INT/POLES</b>	<b>0.085</b>				Watts		
	<b>SHUNT</b>	<b>58.8 OHMS</b>					<b>BRAKING TORQUE</b>		
							lbs. ft.		
<b>OVERLOADS 60% FOR 15 SECS OK</b>							<b>% P.L.T.</b>		
<b>EFFICIENCY READINGS</b>							<b>REGULATOR</b>		
Loading of Machine			<b>1/2</b>	<b>3/4</b>	<b>4/4</b>	<b>5/4</b>	Type:		
Efficiency							No.:		
Remarks <b>HEATER OCT CHECKED FOR CONTINUITY 50 OHMS</b>							Ins. Res. Hot <b>200</b> Meg $\Omega$		
<b>TACHO O/P VOLTS CHECKED COMMUTATION &amp; VIBRATION</b>							2 k.v. A.C. Test for One Minute <b>O.K.</b>		
<b>LEVELS SATISFACTORY</b>							AIR GAP MP <b>0.13</b>		
							IP <b>0.13</b>		

Test Engineer **E.H & S.H**

Date of Test **12.12.84**

per pro DAVID McCLURE LTD

**AUX HOIST - TYPICAL**

# D. C. TEST CERTIFICATE

Client INDUSTRIAL & MARINE SWITCHGEAR

Serial No. 38139/9

Order No. SM18828/1422/6

Job No.

Date 5.7.84

DAVID McCLURE LTD, STOCKPORT

B.H.P. <del>XXX</del> 54/54		Rating 1 HOUR		R.P.M. Loaded 0/958/2500	
Size DD.280B		Enc. T.E.D.W. IP56		R.P.M. Light -	
Volts A 0.575 F 250		Type IND-FLG-MTG		Conn. SHUNT SEP EXC	
Amps 78		Spec. IEE & BS.4999		Class of Insulation F	

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input	Rotation looking on Drive End REV		
	COLD	SHUNT		4.25	250		Atmosphere °C 22		
REVERSE 'N'	70	500	698	4.25	250		Temprise		
	70	500	708	4.25	250		Armature	80	58
	78	575	812	4.25	250		Commutator	60	38
11.05	78	575	958	2.7	170	44.85	Shunt	57	35
11.35	78	575	958	2.7	185	44.85	Series	-	-
12.05	78	575	958	2.7	190	44.85	Interpole	81	59
			TEMPS				Brake	-	-
FL TS	78	575	2500	0.81	55	44.85	Brake D.C.	Cold	Warm
NL BS	2.3	575	831	4.25	250	1.32	Volts		
NL TS	3.3	575	2500	0.81	53	1.89	Amps		
WINDING RES			FIGS ARM 0.166 OIM				Watts		
			INTERPOLES 0.085 OIM				BRAKING TORQUE		
			SHUNT 58.8 OIMS				lbs. ft.		
OVERLOADS 60% 15 SECS OK							% F.L.T.		
EFFICIENCY READINGS							REGULATOR		
Loading of Machine			1/2	3/4	4/4	5/4	Type:		
Efficiency							No.:		
Remarks HEATER CCT CHECKED FOR CONTINUITY 50 OIMS TACID O/P VOLTS CHECKED COMPUTATION & VIBRATION LEVELS SATISFACTORY							Ins. Res. Hot 200 Meg Ω		
							2 k.v. A.C. Test for One Minute O.K.		
							AIR GAP MP 0.13		
							IP 0.13		

Test Engineer E.H. & S.H.

Date of Test 12.12.84

per pro DAVID McCLURE LTD

*[Signature]*

# D. C. TEST CERTIFICATE

Client INDUSTRIAL & MARINE SWITCHGEAR

Serial No. 38139/3

Order No. SM18828/1422/6

Job No. \_\_\_\_\_

Date 5.7.84

DAVID McCLURE LTD, STOCKPORT

B.H.P./KW. <u>0/56/53</u>		Rating <u>1 HOUR</u>		R.P.M. Loaded <u>0/1320/2500</u>	
Size <u>DD.250B</u>		Enc. <u>T.E.D.W. IP56</u>		R.P.M. Light <u>-</u>	
Volts <u>A 0-575 F 250</u>		Type <u>DC MOTOR</u>		Conn. <u>SHUNT SEP EXC</u>	
Amps <u>82/77</u>		Spec. <u>IEE &amp; BS.4999</u>		Class of Insulation <u>'F'</u>	

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input	Rotation looking on Drive End REV		
	<u>COLD</u>	<u>FIELD</u>		<u>2.95</u>	<u>250</u>		Atmosphere °C <u>19</u>		
<u>REVERSE 'N'</u>	<u>50</u>	<u>575</u>	<u>1175</u>	<u>2.9</u>	<u>250</u>		Temprise <u>THERMO</u>		
	<u>50</u>	<u>575</u>	<u>1185</u>	<u>2.9</u>	<u>250</u>		Armature	<u>72</u>	<u>53</u>
<u>3.05</u>	<u>77</u>	<u>575</u>	<u>2500</u>	<u>0.91</u>	<u>79</u>	<u>44.27</u>	Commutator	<u>59</u>	<u>40</u>
<u>4.05</u>	<u>77</u>	<u>575</u>	<u>2500</u>	<u>0.91</u>	<u>83</u>	<u>44.27</u>	Shunt	<u>38</u>	<u>19</u>
			<u>TEMPS</u>				Series	<u>-</u>	<u>-</u>
<u>TS NL</u>	<u>2.9</u>	<u>585</u>	<u>2500</u>	<u>0.91</u>	<u>82</u>	<u>1.69</u>	Interpole	<u>71</u>	<u>52</u>
<u>BS FL</u>	<u>82</u>	<u>575</u>	<u>1280</u>	<u>2.6</u>	<u>250</u>	<u>47.2</u>	Brake	<u>-</u>	<u>-</u>
<u>BS NL</u>	<u>2.4</u>	<u>575</u>	<u>1270</u>	<u>2.6</u>	<u>250</u>	<u>1.38</u>	Brake D.C.	<u>Cold</u>	<u>Warm</u>
							Volts		
<u>WINDING RES FIGS</u>	<u>ARM</u>	<u>= 0.122 OHM</u>					Amps		
	<u>INTERPOLES</u>	<u>= 0.074 OHM</u>					Watts		
	<u>SHUNT</u>	<u>= 85 OHMS</u>					<u>BRAKING TORQUE</u>		
							<u>lbs. ft.</u>		
<u>OVERLOADS 60% 15 SECS OK</u>							<u>% F.L.T.</u>		
<u>EFFICIENCY READINGS</u>							<u>REGULATOR</u>		
Loading of Machine			<u>1/2</u>	<u>3/4</u>	<u>4/4</u>	<u>5/4</u>	Type:		
Efficiency							No.:		
<u>Remarks HEATER CCT CHECKED FOR CONTINUITY</u> <u>125 OHMS E &amp; V TANDEM TACHO FEK 6/3</u> <u>60V/1000RPM CHECKED FOR O/P VOLTS</u>							Ins. Res. Hot <u>200</u> Meg $\Omega$		
							2 k.v. A.C. Test for One Minute <u>O.K.</u>		
							AIR GAP MP <u>0.090</u>		
							IP <u>0.120</u>		

Test Engineer E.H. & S.H.

Date of Test 12.11.84

per pro DAVID McCLURE LTD D.B.W.

Aux Hoist - TYPICAL

# D. C. TEST CERTIFICATE

Client **INDUSTRIAL & MARINE SWITCHGEAR**

Serial No. **38139/4**

Order No. **SM18828/1422/6**

Job No. \_\_\_\_\_

Date **5.7.84**

DAVID McCURE LTD, STOCKPORT

B.H.P./KVA <b>56/53</b>		Rating <b>1 HOUR</b>		R.P.M. Loaded <b>0/1320/2500</b>	
Size <b>DD.250B</b>		Enc. <b>T.E.D.W. IP56</b>		R.P.M. Light <b>-</b>	
Volts <b>A 0-575</b>		Type <b>DC MOTOR</b>		Conn. <b>SHUNT SEP EXC 250 VOLTS</b>	
Amps <b>82/77</b>		Spec. <b>IEE &amp; BS.4999</b>		Class of Insulation <b>'F'</b>	

Time	Amps	Volts	R.P.M.	Shunt Amps	Shunt Volts	K.W. Input	Rotation looking on Drive End <b>REV</b>		
	<b>COLD</b>	<b>FIELD</b>		<b>3.0</b>	<b>250</b>		<b>Atmosphere °C 20</b>		
<b>REVERSE 'N'</b>	<b>50</b>	<b>575</b>	<b>1176</b>	<b>3.0</b>	<b>250</b>	<b>28.75</b>	<b>Temprise THERMO</b>		
	<b>50</b>	<b>575</b>	<b>1184</b>	<b>3.0</b>	<b>250</b>	<b>28.75</b>	<b>Armature</b>	<b>80</b>	<b>60</b>
<b>9.10</b>	<b>82</b>	<b>575</b>	<b>1180</b>	<b>3.0</b>	<b>250</b>	<b>47.15</b>	<b>Commutator</b>	<b>55</b>	<b>35</b>
<b>9.40</b>	<b>82</b>	<b>575</b>	<b>1270</b>	<b>2.5</b>	<b>250</b>	<b>47.15</b>	<b>Shunt</b>	<b>46</b>	<b>26</b>
<b>10.10</b>	<b>82</b>	<b>575</b>	<b>1300</b>	<b>2.35</b>	<b>250</b>	<b>47.15</b>	<b>Series</b>	<b>-</b>	<b>-</b>
			<b>TEPS</b>				<b>Interpole</b>	<b>75</b>	<b>55</b>
<b>50% O.L.</b>	<b>123</b>	<b>575</b>	<b>1283</b>	<b>2.35</b>	<b>250</b>	<b>70.72</b>	<b>Brake</b>		
	<b>77</b>	<b>575</b>	<b>2500</b>	<b>0.92</b>	<b>85</b>	<b>44.2</b>	<b>Brake D.C.</b>	<b>Cold</b>	<b>Warm</b>
	<b>115</b>	<b>575</b>	<b>2500</b>	<b>0.91</b>	<b>84</b>	<b>66.12</b>	<b>Volts</b>		
<b>BS NL</b>	<b>2.3</b>	<b>575</b>	<b>1270</b>	<b>2.45</b>	<b>250</b>	<b>1.322</b>	<b>Amps</b>		
<b>TS NL</b>	<b>3.2</b>	<b>575</b>	<b>2425</b>	<b>0.92</b>	<b>85</b>	<b>1.84</b>	<b>Watts</b>		
<b>TS NL</b>	<b>2.9</b>	<b>586</b>	<b>2500</b>	<b>0.92</b>	<b>85</b>		<b>BRAKING TORQUE</b>		
<b>WDG RES FIGS ARM 0.123 INT/POLES 0.072 SHUNT 83.3 OHMS</b>							<b>lbs. ft.</b>		
<b>OVERLOADS 60% FOR 15 SECS OK</b>							<b>% F.L.T.</b>		
<b>EFFICIENCY READINGS</b>							<b>REGULATOR</b>		
<b>Loading of Machine</b>			<b>1/2</b>	<b>3/4</b>	<b>4/4</b>	<b>5/4</b>	<b>Type:</b>		
<b>Efficiency</b>							<b>No.:</b>		
<b>Remarks HEATER CCT CHECKED FOR CONTINUITY 120 OHMS</b> <b>E &amp; V TANDEM TACHO FEK 6/3 60V/1000 RPM</b> <b>CHECK FOR O/P VOLTS</b>							<b>Ins. Res. Hot 200 Meg Ω</b>		
							<b>2 k.v. A.C. Test for One Minute O.K.</b>		
							<b>AIR GAP MP 0.090"</b>		
							<b>IP 0.120"</b>		

Test Engineer **E.H. & S.H**

Date of Test **12.11.84**

per pro DAVID McCURE LTD

*[Signature]*

Serial No. 38139/8

## A. C. TEST CERTIFICATE

Client **INDUSTRIAL MARINE  
SWITCHGEAR LTD**O/No. **SM18828/1422/6**Date **5.7.84**

B.H.P. <b>53.5/25.5/8.5</b>	Volts <b>600</b>	Hertz <b>60</b>	Enc. <b>T.E.D.W.</b>
Size <b>TS36/250</b>	Amps <b>48/33/22</b>	Conn. <b>TAPPED &amp; Y3</b>	Type <b>AC SCR</b>
Rtg. <b>1 HOUR</b>	Phases <b>3</b>	R.P.M. <b>1775/885/210</b>	Class of Insulation <b>F</b>

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW KVA	Atmosphere °C
<b>HIGH</b>	<b>SPEED</b>	<b>4 POLE WINDING</b>	<b>TAPPED</b>	<b>2 CCT Y3</b>					Temprise
									Stator
<b>8.10</b>	<b>600</b>	<b>45.6</b>	<b>1767</b>	<b>60</b>	<b>17.6</b>	<b>26.4</b>	<b>44</b>	<b>0.93</b>	Stator Iron
									Rotor
<b>9.10</b>	<b>600</b>	<b>46</b>	<b>1763</b>	<b>60</b>	<b>18.1</b>	<b>26.9</b>	<b>45</b>	<b>0.94</b>	Rotor Iron
				<b>TEMPS</b>					Slip Rings
<b>NL</b>	<b>600</b>	<b>10.5</b>	<b>1800</b>	<b>60</b>	<b>-1.9</b>	<b>4.0</b>	<b>2.1</b>	<b>0.19</b>	Brake Coil
									Flash Test at <b>2.52 K.V. O.K.</b>
									Ins. Res. to Frame <b>200 Meg Ω</b>
									Rotor Volts
									Rotor Amps
Pull-Out									AIR GAP <b>0.035</b>
Locked Rotor	<b>348</b>	<b>210</b>	<b>0</b>	<b>60</b>	<b>-2.0</b>	<b>62</b>	<b>60</b>	<b>0.474</b>	

Loads	1/2	3/4	4/4	5/4	Res. per Phase		Ins. Res. per Phase	
Efficiency			<b>89.9</b>		Stator	HS	Rotor	
P.F.			<b>0.94</b>		20 Cold	<b>0.168 Ω</b>	Ω	Meg Ω
STARTING TORQUE					22 Hot	<b>0.215 Ω</b>	Ω	Meg Ω
<b>46</b> lbs. at <b>2</b> ft. RAD. on <b>348</b> Volts					%Inc.	<b>28</b>		
with <b>210</b> AMPS gives <b>172</b> % F.L.T.	BRAKING TORQUE							
with <b>754</b> % F.L.C. on Full Volts	lbs. ft.							
MECHANICAL BALANCE O.K.					% F.L.T.			
ROTATION <b>REV</b> Looking on Drive End	Brake D.C.		Volts	Amps	Watts			
	Cold							
	Hot							

Remarks **THERMOSTATS AND HEATERS FITTED**Test Engineer **E.H. & S.H.**Date of Test **7.11.84**

p.p. DAVID McCLURE LTD.

*P. G. W.*

SLEWING WINCH

DAVID McCLURE LTD., STOCKPORT




Serial No. 38139/8

## A. C. TEST CERTIFICATE

Client	O/No.	Date
--------	-------	------

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

KW

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW KVA	Atmosphere °C
READINGS 8 POLE TAPPED MESH 3									Temprise
FL	600	32	888	60	4.4	17.6	22	0.66	Stator
									Stator Iron
									Rotor
									Rotor Iron
NL	600	22	900	60	-5.4	7.5	2.1	0.092	Slip Rings
									Brake Coil
									Flash Test at K.V. O.K.
									Ins. Res. to Frame Meg $\Omega$
									Rotor Volts
									Rotor Amps
Pull-Out									AIR GAP 
Locked Rotor	268	110	0	60	-2.0	24	22	0.431	

Loads	1/2	3/4	4/4	5/4	Res. per Phase		Ins. Res. per Phase	
Efficiency			0.86		Stator		Rotor	
P.F.			0.66		20 Cold	0.672 $\Omega$	$\Omega$	Meg $\Omega$
STARTING TORQUE					Hot	$\Omega$	$\Omega$	Meg $\Omega$
46 lbs. at	2 ft. RAD. on	268 Volts			%Inc.			
with 110 AMPS gives 304 % F.L.T.					BRAKING TORQUE lbs. ft.			
with 746 % F.L.C. on Full Volts					% F.L.T.			
MECHANICAL BALANCE O.K.					Brake D.C.	Volts	Amps	Watts
ROTATION REV Looking on Drive End					Cold			
					Hot			

Remarks

Test Engineer

Date of Test

p.p. DAVID McCLURE LTD.



DAVID McCLURE LTD, STOCKPORT


DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/8

# A. C. TEST CERTIFICATE

Client **INDUSTRIAL MARINE SWITCHGEAR LTD** O/No. \_\_\_\_\_ Date \_\_\_\_\_

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW KVA	Atmosphere °C
	<b>LOW SPEED STAR 3 SEP WINDING</b>								Temprise
									Stator
	600	22.5	213	60	-3.04	9.54	6.5	0.28	Stator Iron
	600	24	203	60	-1.9	11.2	9.3	0.37	Rotor
	600	24.5	200	60	-1.7	11.6	9.9	0.39	Rotor Iron
	600	26	195	60	-1.44	12.4	10.96	0.406	Slip Rings
	600	28	185	60	-1.2	13.6	12.4	0.426	Brake Coil
	600	30	174	60	-1.2	14.4	13.2	0.423	Flash Test at K.V. O.K.
	600	31.8	158	60	-1.2	15.2	14	0.423	Ins. Res. to Frame Meg Ω
	600	21.75	225	60	-4.8	7.8	3.0	0.132	Rotor Volts Rotor Amps
Pull-Out									AIR GAP 
Locked Rotor	408	25.6	0	60	-1.2	8.0	6.8	0.38	

Loads	1/2	3/4	4/4	5/4	Res. per Phase		Ins. Res. per Phase	
Efficiency					Stator		Rotor	
P.F.					20 Cold	1.15 Ω	Ω	Meg Ω

STARTING TORQUE					Hot	Ω	Ω	Meg Ω	Meg Ω
59 lbs. at 2 ft. RAD. on 408 Volts					%Inc.				

with 25.6 AMPS gives 185 % F.L.T.					BRAKING TORQUE				lbs. ft.
with 171 % F.L.C. on Full Volts					% F.L.T.				

MECHANICAL BALANCE O.K.					Brake D.C.	Volts	Amps	Watts
ROTATION REV Looking on Drive End					Cold			
					Hot			

Remarks \_\_\_\_\_

Test Engineer \_\_\_\_\_

Date of Test 7.11.84

p.p. DAVID McCLURE LTD.

*D665*


DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/5

# A. C. TEST CERTIFICATE

Client **INDUSTRIAL MARINE SWITCHGEAR LTD** O/No. **SM18828/1422/6** Date


B.H.P. **82.7/41.3/10.3** Volts **600** Hertz **60** Enc. **T.E.D.W.**  
 Size **T842/315** Amps **75/59/33** Conn. **TAPPED & Y3** Type **AC SCR**  
 Rtg. **1 HOUR** Phases **3** R.P.M. **1775/885/210** Class of Insulation **'F'**

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW KVA	Atmosphere °C <b>21C</b>	
<b>HIGH</b>	<b>SPEED</b>	<b>4</b>	<b>POLE</b>	<b>WINDING</b>	<b>TAPPED</b>	<b>2</b>	<b>OCT</b>	<b>Y3</b>	Temprise	
<b>3.45</b>	<b>600</b>	<b>72</b>	<b>1775</b>	<b>60</b>	<b>28</b>	<b>40</b>	<b>68</b>	<b>0.91</b>	Stator	<b>84</b>
									Stator Iron	-
<b>4.45</b>	<b>600</b>	<b>72</b>	<b>1765</b>	<b>60</b>	<b>27.6</b>	<b>40.4</b>	<b>68</b>	<b>0.91</b>	Rotor	-
				<b>TEMPS</b>					Rotor Iron	-
									Slip Rings	-
<b>NL</b>	<b>600</b>	<b>15.75</b>	<b>1800</b>	<b>60</b>	<b>-3.0</b>	<b>6.1</b>	<b>3.1</b>	<b>0.19</b>	Brake Coil	-
									Flash Test at <b>2.2</b> K.V. <b>O.K.</b>	
									Ins. Res. to Frame <b>200</b> Meg $\Omega$	
									Rotor Volts	
									Rotor Amps	
Pull-Out									AIR GAP <b>0.045</b> 	
Locked Rotor	<b>240</b>	<b>235</b>	<b>0</b>	<b>60</b>	<b>-4.0</b>	<b>48</b>	<b>44</b>	<b>0.45</b>		

Loads	1/2	3/4	4/4	5/4	Res. per Phase		Ins. Res. per Phase	
Efficiency			<b>90</b>		Stator		Rotor	
P.F.			<b>0.91</b>		20c Cold		<b>0.105 <math>\Omega</math></b>	$\Omega$
STARTING TORQUE					21c Hot		<b>0.14 <math>\Omega</math></b>	$\Omega$
38 lbs. at 2 ft. RAD. on 240 Volts					%Inc.		<b>33</b>	
with 235 AMPS gives 193 % F.L.T.					BRAKING TORQUE			
with 783 % F.L.C. on Full Volts					lbs. ft.			
MECHANICAL BALANCE O.K.					% F.L.T.			
ROTATION <b>REV</b> Looking on Drive End					Brake D.C.	Volts	Amps	Watts
					Cold			
					Hot			

Remarks **THERMOSTATS AND HEATERS FITTED**

Test Engineer **E.H. & S.H**  
 Date of Test **7.11.84**

p.p. DAVID McCLURE LTD.  


TOPPING WINCH.

Serial No. 38139/5

## A. C. TEST CERTIFICATE

Client \_\_\_\_\_ O/No. \_\_\_\_\_ Date \_\_\_\_\_

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

KW

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	$\frac{KW}{KVA}$	Atmosphere °C 20
	READINGS	8	POLE	TAPPED	MESH	3			Temprise
FL	600	46	885	60	11.2	26.4	37.6	0.79	Stator
									Stator Iron
									Rotor
NL	600	27	900	60	-6.8	8.8	2.0	0.071	Rotor Iron
									Slip Rings
									Brake Coil
									Flash Test at 2.2 K.V. O.K.
									Ins. Res. to Frame 200 Meg $\Omega$
									Rotor Volts
									Rotor Amps
Pull-Out									AIR GAP
Locked Rotor	214	123	0	60	-2.0	22	2.0	0.44	

Loads	1/2	3/4	4/4	5/4	Res. per Phase		Ins. Res. per Phase	
Efficiency			90		Stator	Rotor	Stator	Rotor
P.F.			0.79		20°C Cold	0.42 $\Omega$	Meg $\Omega$	Meg $\Omega$
STARTING TORQUE					Hot	$\Omega$	Meg $\Omega$	Meg $\Omega$
40 lbs. at 2 ft. RAD. on 214 Volts					%Inc.			
with 123 AMPS gives 256 % F.L.T.					BRAKING TORQUE lbs. ft.			
with 584 % F.L.C. on Full Volts					% F.L.T.			
MECHANICAL BALANCE O.K.					Brake D.C.	Volts	Amps	Watts
ROTATION REV Looking on Drive End					Cold			
					Hot			

Remarks **VIBRATION DE V = 0.50 T = 0.40 A = 0.70 VELOCITY**  
**NDE V = 0.50 T = 0.40 A = 0.55 RMS MM/SEC**

Test Engineer \_\_\_\_\_

Date of Test \_\_\_\_\_

p.p. DAVID McCLURE LTD.

DAVID McCLURE LTD, STOCKPORT


DAVID McCLURE LTD, STOCKPORT

Serial No. 38139/5

# A. C. TEST CERTIFICATE

Client **INDUSTRIAL MARINE SWITCHGEAR LTD** O/No. \_\_\_\_\_ Date \_\_\_\_\_

B.H.P.	Volts	Hertz	Enc.
Size	Amps	Conn.	Type
Rtg.	Phases	R.P.M.	Class of Insulation

Time	Volts	Amps	R.P.M.	Hz	W1	W2	W1 + W2	KW KVA	Atmosphere °C
	LOW	SPEED	STAR	3	SEP	WDG			Temprise
	600	33.6	212	60	-3.6	14.8	11.2	0.32	Stator
FL	600	36	206	60	-2.8	16.8	14	0.37	Stator Iron
	600	38	201	60	-2.4	17.84	15.44	0.39	Rotor
	600	40	194	60	-2.0	19.20	17.20	0.41	Rotor Iron
	600	42	188	60	-2.0	20.16	18.16	0.42	Slip Rings
	600	43	184	60	-2.0	20.64	18.64	0.42	Brake Coil
									Flash Test at 2.2 K.V. O.K.
									Ins. Res. to Frame 200 Meg Ω
NL	600	31	225	60	-7.2	10.8	3.6	0.11	Rotor Volts
									Rotor Amps
Pull-Out									AIR GAP 
Locked Rotor	272	25.6	0	60	-1.0	5.28	4.28		

Loads	1/2	3/4	4/4	5/4	Res. per Phase		Ins. Res. per Phase	
Efficiency					Stator		Rotor	
P.F.					20c Cold	0.668 Ω	Ω	Meg Ω
STARTING TORQUE					Hot	Ω	Ω	Meg Ω
40 lbs. at 2 ft. RAD. on 272 Volts					%Inc.			Meg Ω
with 25.6 AMPS gives 151 % F.L.T.					BRAKING TORQUE lbs. ft.			
with 171 % F.L.C. on Full Volts					% F.L.T.			
MECHANICAL BALANCE O.K.					Brake D.C.	Volts	Amps	Watts
ROTATION REV Looking on Drive End					Cold			
					Hot			

Remarks \_\_\_\_\_

Test Engineer \_\_\_\_\_

Date of Test \_\_\_\_\_

p.p. DAVID McCLURE LTD.  
