

Rotork Actuators on Black Liquor Recovery Boilers

A Guide and Recommendations for Setting up Rotork Valve Actuators on Rapid Drain Valves and Feed Water Stop Valves on Black Liquor Recovery Boilers

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<i>1400/1600 Series - Publication E270E</i>	<i>http://www.rotork.com/docSearch.E270E</i>
<i>IQ Mk 1</i>	<i>Publication E170E Mark 1 http://www.rotork.com/docSearch.E170E</i>
<i>IQ Mk 2</i>	<i>Publication E170E2 http://www.rotork.com/docSearch.E170E2</i>

Section 1

Introduction and Rotork Supply History

Rotork has been supplying Electric motor operators on Black Liquor recovery boilers for over four decades. Over this period of time our products have under gone improvements in design that have increased reliability as well as flexibility of application.

These design improvements have followed the general migration of industrial equipment from hardwire technology to printed circuit and microprocessor technology. Rotork has undertaken this process incrementally and cautiously over the years. Originally the 1400 series wiring on our A range actuator was entirely hardwired. In the early 1980's we introduced the 1600 series A range that incorporated some solid state controls and enhanced features such as automatic phase correction and enhance versatility of control. Many of these features were then complemented with the introduction of the IQ series in the early 1990's. The main advance was the introduction of non-intrusive control setting. This enabled the settings of the actuator to be confirmed or adjusted without a removal of electrical covers. The benefit being that no dirt or moisture could contaminate the internals of the actuator degrading its inherent reliability.

A further refinement of the IQ, designated IQ Mk. 2 was introduced in 2000. This actuator includes as standard a data logger so operational history can be downloaded to monitor performance and facilitate asset management features such as preventive or predictive maintenance.

With these changes in our products have come some changes in the methods of installation and set up. The requirements for Black Liquor recovery boilers are quite specific as defined in BLRBAC good practice. We have revisited these requirements and combined this with our experience to come up with the attached recommendations for wiring hook up and settings on our actuators.

We hope that this document will act as a definitive reference manual for the application of Rotork actuators on Black Liquor recovery boiler valves.

Glossary

ESP – Emergency shutdown procedure – As referenced in BLRBAC recommended good practice.

ESD – Emergency shut down – As referenced in Rotork literature.

Clarification of Application of the IQ Mk. 1 and Mk. 2

There have been several questions regarding the Rotork ESD connections used for the ESP function and the battery functions of the Rotork IQ units. Below are some answers to most frequently asked questions.

Battery

1. Why does Rotork use a battery in its IQ actuators?

An LCD display is used to give position and other information locally at the actuator. There needs to be some form of back up power to provide this display should the main AC power be lost. Additionally, the remote indication in the control room needs to be updated should the actuator be operated manually during loss of main power. The battery provides back up power for the LCD and the remote position indicating relays. There is a position processor in the IQ actuator that provides incremental position indication between fully open and fully closed. This position processor will also be updated by the battery should the valve be manually operated during a power outage. For these three reasons it is important to have the battery to provide power on loss of main AC power.

2. Will the actuator operate after a power interruption?

If power is interrupted to the actuator there will be no effect on its operation. However, if power is lost and the battery is low then again there will be no impact on the actuator provided the correct settings are made. This means that the “power loss inhibit” needs to be disabled per setting instructions attached. See also the decision table in section 3.

3. Will the settings be lost in the actuator on power down with a low battery?

No. The actuator settings are in non-volatile RAM. With a complete lack of power the settings remain the same and do not default to the original factory defaults. On power up the required settings will be reactivated. If the actuator is moved while it is powered down then only the end of travel switch settings will need to be reset. See also the decision table in section 3.

4. Will the settings be lost if the battery is changed with power down?

No. Settings will not be lost and end of travel position will not be affected providing the actuator is not moved during battery change out.

5. Can the battery condition be detected and monitored on both Mk. 1 and Mk. 2 IQ's?

The battery condition can be checked locally on the actuator indicator display. The battery low condition can be monitored remotely as well. See Section 4, Matrix of features, for relevant pages of instruction literature.

6. How often do the batteries need to be changed?

The shelf life of a battery is seven years. Recommendation is that batteries be changed every three to five years.

7. Does anything need to be done to the actuator after a power outage?

Usually nothing needs to be done to the actuator after a power outage. Whether the battery is present or not. Assuming that the actuator has been set up with the power loss inhibit disabled. See the decision table in section 3.

ESD Terminals for ESP Operation

1. Why does Rotork have separate terminals for ESD?

These terminals are a way of ensuring that under emergency conditions (ESP) the actuator will go to the desired position. All models except 1400 series A range have dedicated ESD terminals. The 1400 series A range can be wired to provide ESD function. See Section 5 Subsection 1.

2. Will the actuator operate the valve during a ESP if the local selector is in the stop or local position?

All actuators can be wired for ESD/ESP. However for A Range 1600 series & IQ Mk1 if the local stop is selected the ESD will be disabled. The local stop position can be detected by the monitor relay which is standard for those models. This monitor relay can be connected to an alarm, indicating the non availability of the actuator. Alternatively the actuator can be modified by adding a PC board that will allow the bypass function. This is a factory service modification.

3. Can the ESD override external interlocks?

The 1400 series A range hookup will bypass interlocks.

The IQ Mk. 2 can be programmed so that the ESD overrides external interlocks.

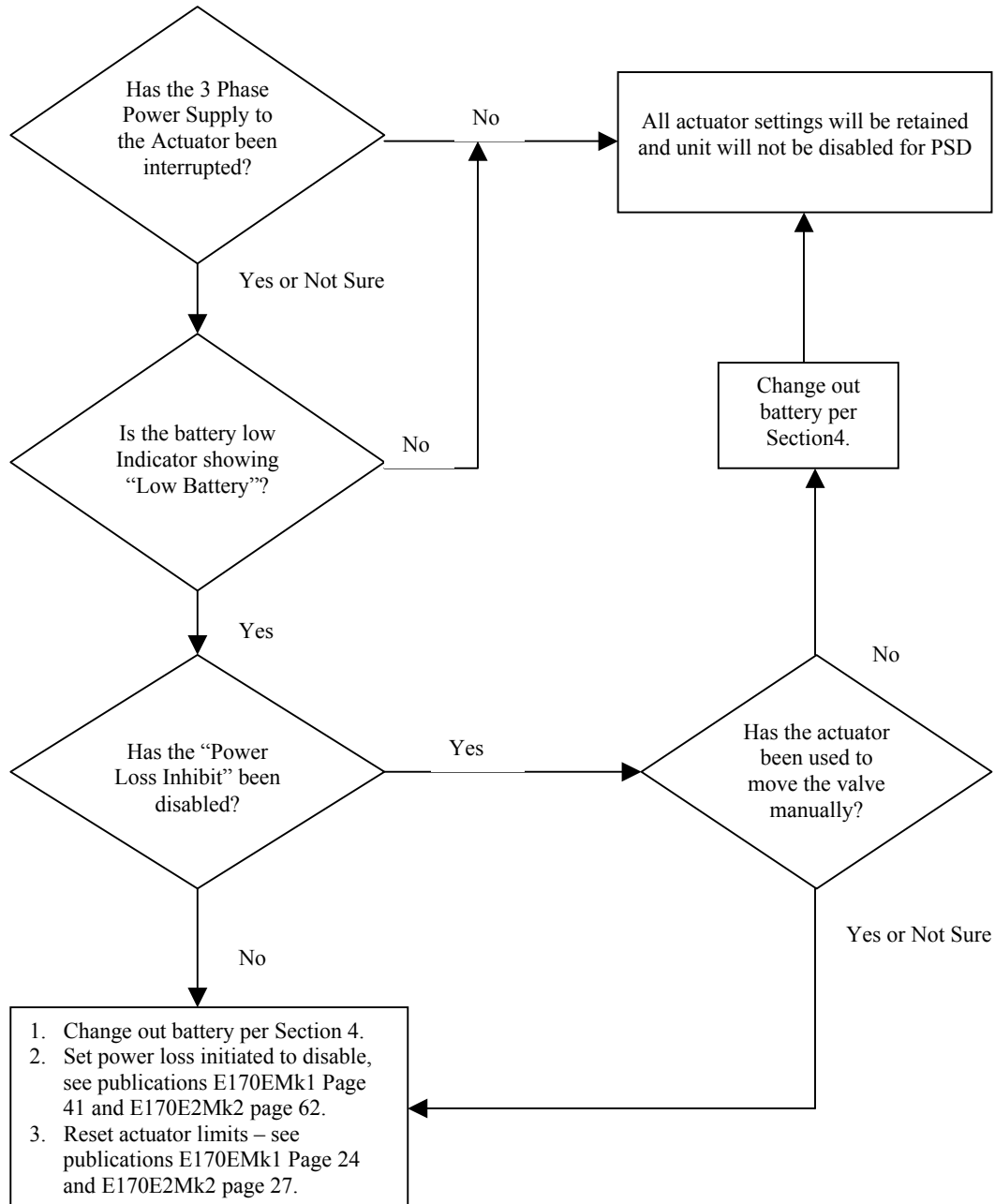
The IQ Mk. 1 & 1600 series A range would need external field wiring to achieve this function.

4. Stall Timer what is it?

The “stall timer” is present on IQ MKI and MKII. If the motor is energized but yet the actuator does not move (jammed valve or other cause) then the stall timer will normally de-energize the motor to prevent damage. This stall timer can be bypassed by setting it to a maximum time to ensure the greatest effort has been applied to a rapid drain valve to open it.

Section 3 Decision Table

IQ MK1 and MK2 Decision Table For Remedial Action in the Event of Power Interruption



Battery Change Out Procedure for IQ Mk1 Actuators



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For non hazardous areas (WT) the power may be left on the actuator during battery change out.

Battery

While the actuator is in for maintenance it is recommended that its battery be changed, this is situated in its own compartment to the left of the pushbuttons. Remove the four fixing screws using a 4mm allen key, pull off cover.

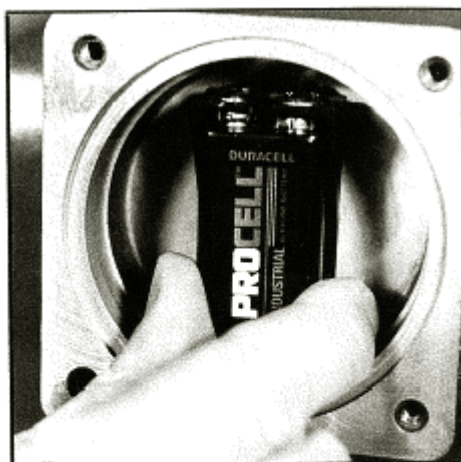
Unclip battery and replace with new item, two types are fitted as original equipment:-

For CENELEC Enclosure

Must only use a Duracell Procell MN 1604 alkaline battery. However, some countries outside of the EC which accept a basic CENELEC enclosure may demand a battery to suit their national specification, if in doubt then check.

For FM-CSA-WT Enclosures

Battery type Ultralife lithium cell is fitted.



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Battery Change Out Procedure for IQ mk2 Actuators

Use an 8mm Allen key to remove the sealing plug, ensuring the "O" ring seal remains on the plug. Disconnect the battery wiring loom from the battery terminals. Using the black pull strap, lift the battery out of the rubber sealing pocket.



Fig. 10

For non hazardous areas (WT) the power may be left on the actuator during battery change out.

Battery Types

For European hazardous area certified actuators (ATEX) use an Ultralife U9VL lithium manganese dioxide battery only. For FM and CSA certified enclosures use an Ultralife U9VL lithium manganese dioxide battery. Equivalent, UL recognised, batteries may be used. For watertight (WT) actuator enclosures use an Ultralife U9VL lithium manganese dioxide battery or any equivalent 9V battery. If in doubt regarding the correct battery type, contact Rotork.

Fitting Replacement Battery

Fit the pull strap around the replacement battery and insert into the rubber sealing pocket. Reconnect the battery wiring loom to the battery terminals. Refit the battery sealing plug ensuring "O" ring is in good condition and correctly fitted. Hand tighten sealing plug using an 8mm Allen key.

		Rapid drain valve setup recommendations					
Rotork Actuator Model	1400		1600		IQ Mk 1		IQ Mk 2
ESD dedicated terminals for an ESP	Yes with Hook up	Must be wired to provide ESD funtion. Section 6.1	Yes		Yes		Yes
Does the ESD override external interlocks during an ESP	Yes with Hook up	Must be wired to override interlock funtion. Section 6.1	Caution	This must be done by external wiring	Caution	This must be done by external wiring	Select See publication E170E2 Page 35
Power interruption must not inhibit motion	N/A		N/A		Select	See publication E170E Mark1 Page 42	Select See publication E170E2 Page 62
Local battery indication	N/A		N/A		Yes	See publication E170E Mark1 Page 50	Yes See publication E170E2 Page 6
Remote battery indication	N/A		N/A		Yes	See publication E170E Mark1 Page 29	Yes See publication E170E2 Page 32
Settings retained on total power down	Yes		Yes		Yes	See section 3	Yes See section 3
Local stop must not inhibit ESP	Yes with Hook up	Must be wired to override local stop. Section 6.1	Factory service modification	modify by adding PC board. Also "Local stop" can be indicated by Monitor relay.	Factory service modification	Factory service can modify by adding PC board. Also "Local stop" can be indicated by Monitor relay.	Select See publication E170E2 Page35
Password protection available on settings	No		No		Yes	See publication E170E Mark1 Page 15	Yes See publication E170E2 Page 18
Bypass torque switch in open direction	Yes with set up	See setup section 6.1	Yes with set up	See setup section 6.2	Select	See setup section 6.3	Select See setup section 6.4
Disable "stalled motor" time out protection	N/A		N/A		Factory service modification	Factory service can modify by reprograming with service tool.	Factory service modification Factory service can modify by reprograming with service tool.
Bypass thermostat for ESP	Yes with Hook up	Must be wired to override thermstat. Section 6.1	Yes with Hook up	Must be wired to override thermstat. Section 6.2	Select	See publication E170E Mark1 Page 30	Select See publication E170E2 Page34

Feed Water Stop Valve Settings - 1400

Wiring Diagram: 1410-40

Hookup Drawing: WS18336

Recommended Settings:		Operating Manual		
		E270E		
		Section/Page		

Primary Settings:				
Direction To Close	Clock	As built		
Close Action	Torque	Section 5.13 / Page 10	Physical Setting	
Open Action	Limit	Section 5.13 / Page 10	Physical Setting	
Torque Valve Closing	By Application	Section 5.14 / Page 10	Physical Setting	
Torque Valve Opening	75% Rated Torque	Section 5.14 / Page 10	Physical Setting	
Close Limit	By Application	Section 5.12 / Page 7-10	Physical Setting	
Open Limit	By Application	Section 5.14 / Page 7-10	Physical Setting	

Indications Settings:				
Indication Contact CAS1	Make at Full Shut	As built		
Indication Contact OAS1	Make at Full Open	As built		
Indication Contact CAS2	Break at Full Shut	As built		
Indication Contact OAS2	Break at Full Open	As built		

Control Mode Settings:		
ESD Enabled	Enabled	By hookup reference WS18336
ESD Action	Close	By hookup reference WS18336
ESD Contact Type	ESD on Applied Signal	By hookup reference WS18336
ESD Bypass Thermostat	Bypass Enabled	By hookup reference WS18336
ESD Override Interlocks	Override On	By hookup reference WS18336
ESD Override Local Stop	Override On	By hookup reference WS18336
Maintained Local Controls	Maintained	Standard Diagram Function
External Interlocks	Enabled	By hookup reference WS18336
Torque Switch Bypass	Enabled	Torque Latch in Anti-clock direction.

Options:				
Additional Indication Contacts	None			
CPT (Position Transmitter)	None			
Folomatic (Positioner)	None			
Bus System Interface	None			
Interrupter Timer	None			

Rapid Drain Valve Settings - 1400

Wiring Diagram: 1410-40

Hookup Drawing: WS18337

Recommended Settings:		Operating Manual E270E Section/Page		
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Primary Settings:

Direction To Close	Clock	As built		
Close Action	Torque	Section 5.13 / Page 10	Physical Setting	
Open Action	Limit	Section 5.13 / Page 10	Physical Setting	
Torque Valve Closing	By Application	Section 5.14 / Page 10	Physical Setting	
Torque Valve Opening	Boost / Motor Stall	Section 5.14 / Page 10	Physical Setting	
Close Limit	By Application	Section 5.12 / Page 7-10	Physical Setting	
Open Limit	By Application	Section 5.14 / Page 7-10	Physical Setting	

Indications Settings:

Indication Contact CAS1	Make at Full Shut	As built		
Indication Contact OAS1	Make at Full Open	As built		
Indication Contact CAS2	Break at Full Shut	As built		
Indication Contact OAS2	Break at Full Open	As built		

Control Mode Settings:

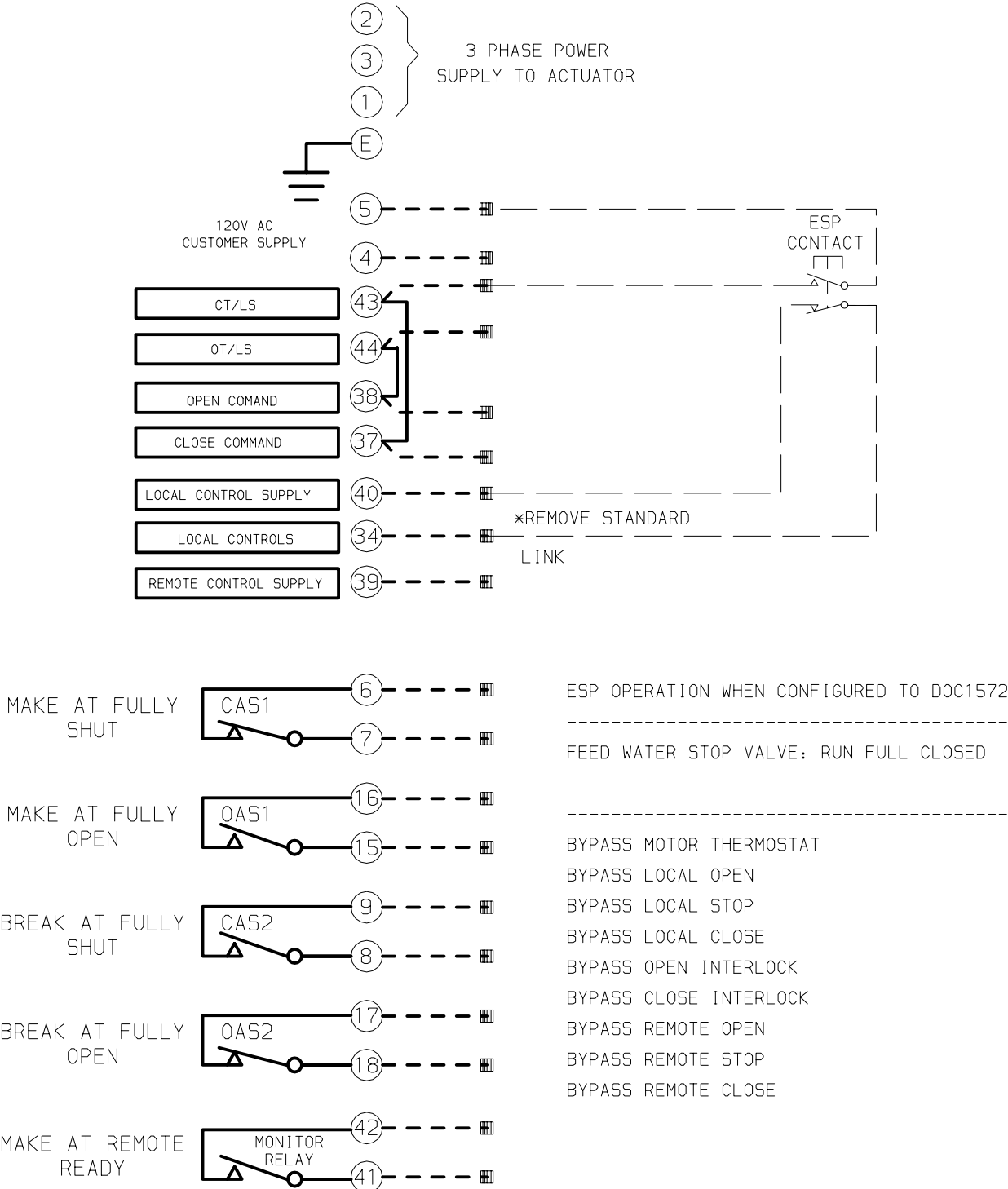
ESD Enabled	Enabled	By hookup reference WS18337		
ESD Action	Open	By hookup reference WS18337		
ESD Contact Type	ESD on Applied Signal	By hookup reference WS18337		
ESD Bypass Thermostat	Bypass Enabled	By hookup reference WS18337		
ESD Override Interlocks	Override On	By hookup reference WS18337		
ESD Override Local Stop	Override On	By hookup reference WS18337		
Maintained Local Controls	Maintained	Standard Diagram Function		
External Interlocks	Enabled	By hookup reference WS18337		
Torque Switch Bypass	Enabled	Torque Latch in Anti-clock direction.		

Options:

Additional Indication Contacts	None			
CPT (Position Transmitter)	None			
Folomatic (Positioner)	None			
Bus System Interface	None			
Interrupter Timer	None			

RECOMMENDED HOOKUP FOR 'A' RANGE 1400 SERIES WIRING DIAGRAM
1410-40 FOR ESP (EMERGENCY SHUT-DOWN PROCEDURES) FOR
FEED WATER STOP VALVES WHEN CONFIGURED TO
ROTORK DOCUMENT DOC1572.

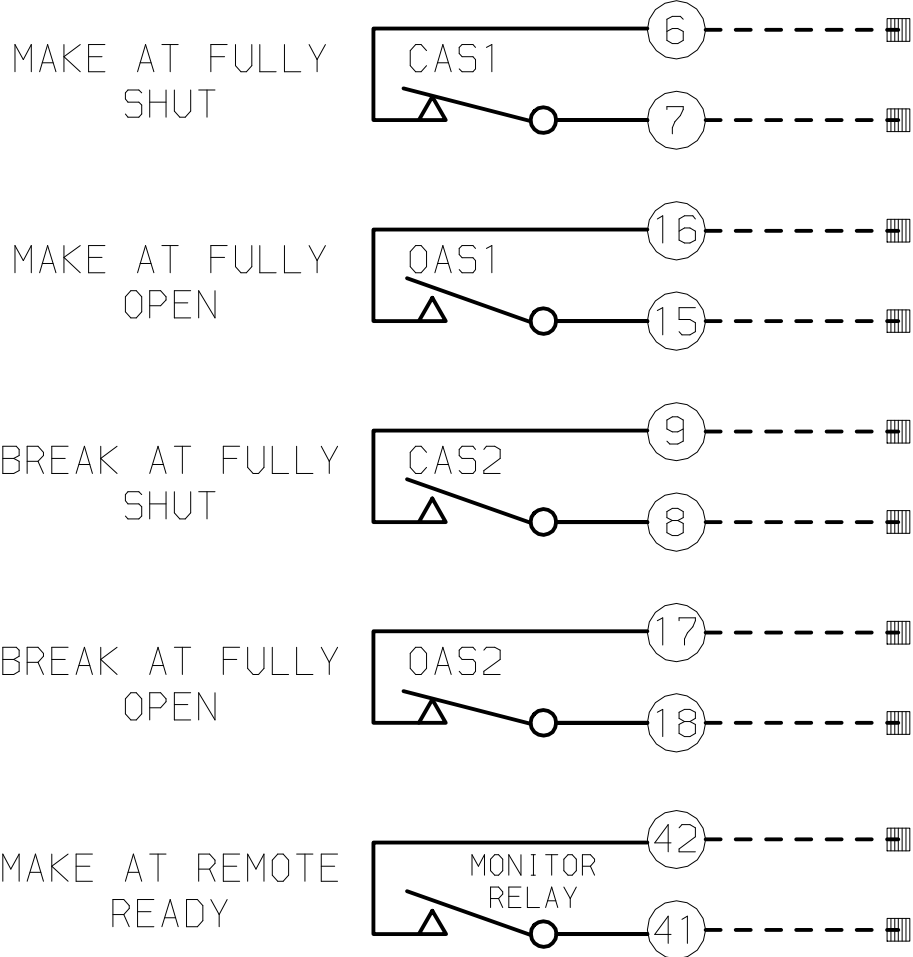
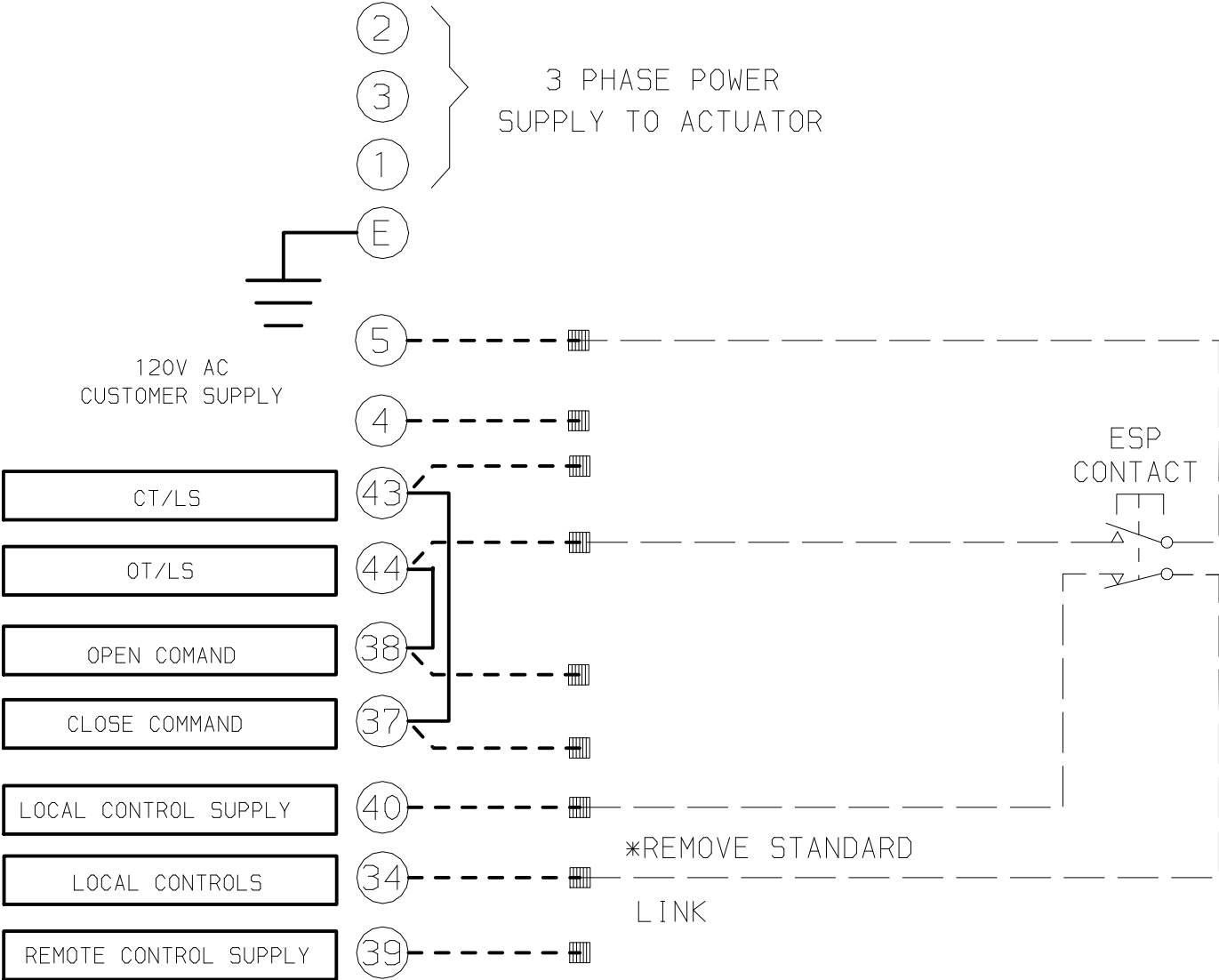
CIRCUIT DIAGRAM No
WS18336-02



No 01	DATE 6/05	REVISION FIRST ISSUE	No	DATE	REVISION	DRAWN TPW DATE 06/02/05	CHECKED CW DATE 06/02/05	1410-40 FEED WATER STOP ESP HOOKUP PER DOC1572
02	090205	MODIFIED TITLE.				rotork ROTORK CONTROLS BATH UK, BA1 3JQ. tel (0225) 28451. ROCHESTER, NY 14624 tel (716) 328-1550	CIRCUIT DIAGRAM Z	WS18336-02

RECOMMENDED HOOKUP FOR 'A' RANGE 1400 SERIES WIRING DIAGRAM
1410-40 FOR ESP (EMERGENCY SHUT-DOWN PROCEDURES) FOR
RAPID DRAIN VALVES WHEN CONFIGURED TO
ROTORK DOCUMENT DOC1572.

CIRCUIT DIAGRAM No
WS18337-01



ESP OPERATION WHEN CONFIGURED TO DOC1572

RAPID DRAIN VALVE : RUN FULLY OPEN

BYPASS MOTOR THERMOSTAT
BYPASS LOCAL OPEN
BYPASS LOCAL STOP
BYPASS LOCAL CLOSE
BYPASS OPEN INTERLOCK
BYPASS CLOSE INTERLOCK
BYPASS REMOTE OPEN
BYPASS REMOTE STOP
BYPASS REMOTE CLOSE

No 01	DATE 6/05	REVISION FIRST ISSUE	No	DATE	REVISION	DRAWN TPW DATE 06/02/05	CHECKED CW DATE 06/02/05	1410-40 RAPID DRAIN ESP HOOKUP PER DOC1572
						rotork ROTORK CONTROLS BATH UK. BA1 3JQ. tel (0225) 28451. ROCHESTER, NY 14624 tel (716) 328-1550		CIRCUIT DIAGRAM Z WS18337-01

Feed Water Stop Valve Settings - 1600mk5

Local Stop Bypass during ESP

Wiring Diagram: WD18392

Hookup Drawing: WS18393

Recommended Settings:		Operating Manual		
		E270E		
		Section/Page		

Primary Settings:				
Direction To Close	Clock	AE4/2 / Page 10	SW1.5	On
Close Action	Torque	Section 5.13 / Page 10	Physical Setting	
Open Action	Limit	Section 5.13 / Page 10	Physical Setting	
Torque Valve Closing	By Application	Section 5.14 / Page 10	Physical Setting	
Torque Valve Opening	75% Rated Torque	Section 5.14 / Page 10	Physical Setting	
Close Limit	By Application	Section 5.12 / Page 7-10	Physical Setting	
Open Limit	By Application	Section 5.14 / Page 7-10	Physical Setting	

Indications Settings:				
Indication Contact CAS1	Make at Full Shut	As built		
Indication Contact OAS1	Make at Full Open	As built		
Indication Contact CAS2	Break at Full Shut	As built		
Indication Contact OAS2	Break at Full Open	As built		

Control Mode Settings:				
ESD Enabled	Enabled	AE4/2 / Page 10	SW1.7	On
ESD Action	Close	AE4/2 / Page 10	SW1.3	On
ESD Contact Type	ESD on Applied Signal			
ESD Bypass Thermostat	Bypass Enabled	AE4/2 / Page 10	SW1.8	On
ESD Override Interlocks	Override On	Setting Not Available		
ESD Override Local Stop	Override On	Enabled through special Wiring Diagram (additional PC Board)		
Maintained Local Controls	Maintained	AE4/2 / Page 10	SW1.4	On
Two Wire Priority	Close Priority	AE4/2 / Page 10	SW2.3	On
			SW2.4	On
External Interlocks	Enabled	AE4/2 / Page 10	SW2.1	Off
			SW2.2	Off
Stall Time	Max Time	AE4/2 / Page 10	SW1.6	Off
Slall Timer	Enabled	AE4/2 / Page 10	SW2.5	On
Torque Switch Bypass	Enabled	Torque Latch in Anti-clock direction.		

Options:				
Additional Indication Contacts	None			
CPT (Position Transmitter)	None			
Folomatic (Positioner)	None			
Remote Control Source	None			
Bus System Interface	None			
Interrupter Timer	None	AE4/2 / Page 10	SW1.1	Off
			SW1.2	Off

Rapid Drain Valve Settings - 1600mk5

Local Stop Bypass during ESP

Wiring Diagram: WD18392

Hookup Drawing: WS18393

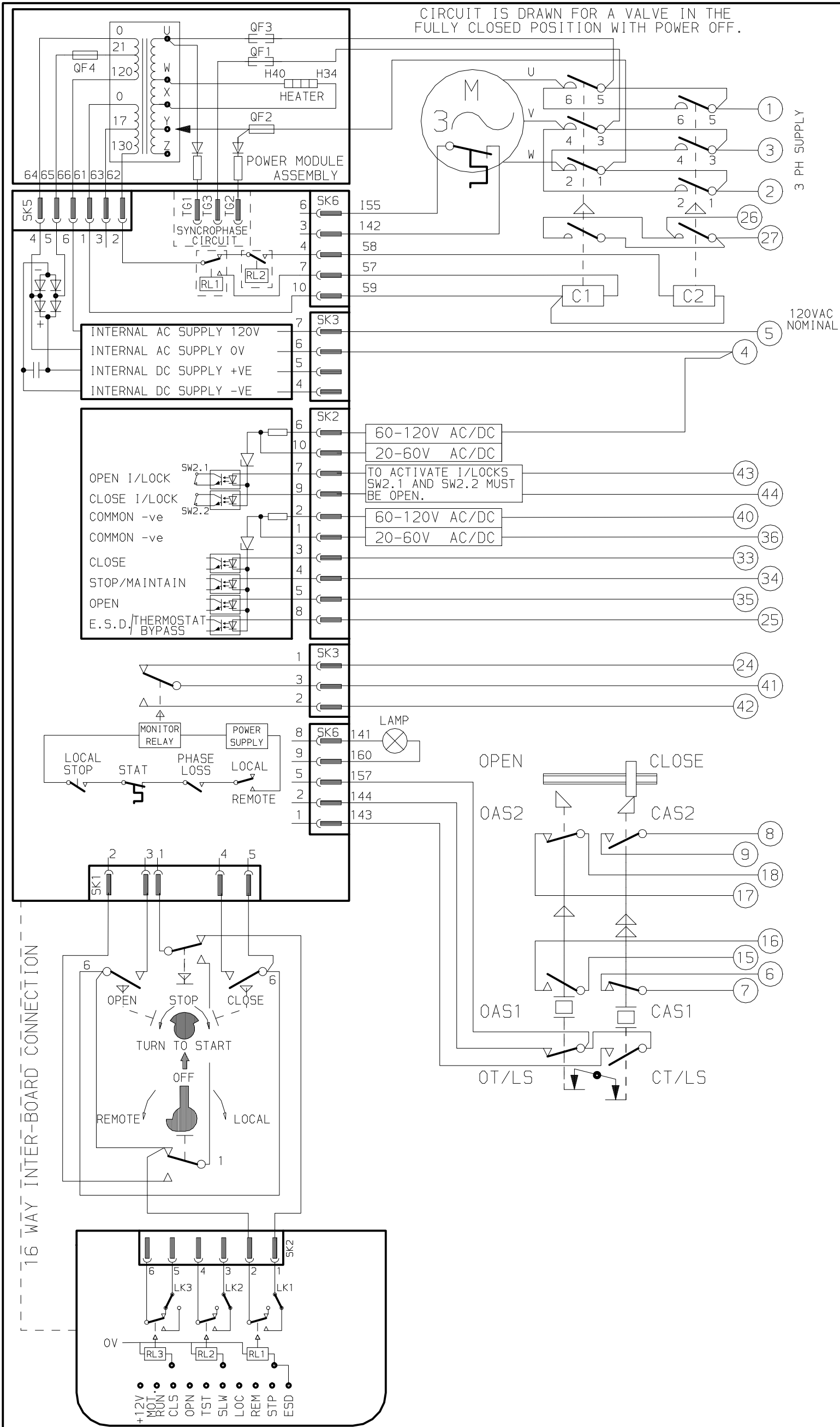
Recommended Settings:		Operating Manual		
		E270E		
		Section/Page		

Primary Settings:				
Direction To Close	Clock	AE4/2 / Page 10	SW1.5	On
Close Action	Torque	Section 5.13 / Page 10	Physical Setting	
Open Action	Limit	Section 5.13 / Page 10	Physical Setting	
Torque Valve Closing	By Application	Section 5.14 / Page 10	Physical Setting	
Torque Valve Opening	Boost / Motor Stall	Section 5.14 / Page 10	Physical Setting	
Close Limit	By Application	Section 5.12 / Page 7-10	Physical Setting	
Open Limit	By Application	Section 5.14 / Page 7-10	Physical Setting	

Indications Settings:				
Indication Contact CAS1	Make at Full Shut	As built		
Indication Contact OAS1	Make at Full Open	As built		
Indication Contact CAS2	Break at Full Shut	As built		
Indication Contact OAS2	Break at Full Open	As built		

Control Mode Settings:				
ESD Enabled	Enabled	AE4/2 / Page 10	SW1.7	On
ESD Action	Open	AE4/2 / Page 10	SW1.3	Off
ESD Contact Type	ESD on Applied Signal			
ESD Bypass Thermostat	Bypass Enabled	AE4/2 / Page 10	SW1.8	On
ESD Override Interlocks	Override On	Setting Not Available		
ESD Override Local Stop	Override On	Enabled through special Wiring Diagram (additional PC Board)		
Maintained Local Controls	Maintained	AE4/2 / Page 10	SW1.4	On
Two Wire Priority	Close Priority	AE4/2 / Page 10	SW2.3	On
			SW2.4	On
External Interlocks	Enabled	AE4/2 / Page 10	SW2.1	Off
			SW2.2	Off
Stall Time	Max Time	AE4/2 / Page 10	SW1.6	Off
Slall Timer	Enabled	AE4/2 / Page 10	SW2.5	On
Torque Switch Bypass	Enabled	Torque Latch in Anti-clock direction.		

Options:				
Additional Indication Contacts	None			
CPT (Position Transmitter)	None			
Folomatic (Positioner)	None			
Remote Control Source	None			
Bus System Interface	None			
Interrupter Timer	None	AE4/2 / Page 10	SW1.1	Off
			SW1.2	Off



CIRCUIT DIAGRAM No - REV

WD18392-01

TRANSFORMER TAPPING OPTIONS

Pt No 33653 (TYPE AA)

TAP	NOM 50/60HZ	50HZ	60HZ
W	220/230	176-242	198-259
X	380/400	304-418	342-446
Y	415/420	332-457	374-487
Z	440/460	352-484	396-517

FUSE QF2 - 250mA ANTI-SURGE

Pt No 33642 (TYPE BB)

TAP	NOM 50/60HZ	50HZ	60HZ
W	346/380	285-388	321-419
X	480/500	406-552	432-564
Y	240/240	192-261	216-282
Z*	550/575	445-605	501-654

FUSE QF2 - 250mA ANTI-SURGE

* 150mA ANTI-SURGE

Pt No 31836 (TYPE C)

TAP	NOM 50/60HZ	50HZ	60HZ
X	660/660	534-726	600-726

FUSE QF2 - 150mA ANTI-SURGE

ALL TRANSFORMER TYPES - QF4 500mA

SLOW BLOW

WHEN FITTED QF1 AND QF3 WILL

BE AS QF2.

MAX EXTERNAL LOAD ON TERMINALS

4 & 5 TO BE 15VA.

O - OPEN

C - CLOSE

C1 & C2 - CONTACTOR COILS.

T/LS - TORQUE/LIMITSWITCH

AS1 - AUXILIARY LIMIT SWITCH

BREAK CONTACT AT END OF TRAVEL

AS2 - AUXILIARY LIMIT SWITCH

BREAK CONTACT AT END OF TRAVEL

WIRES ARE IDENTIFIED AT EACH END

BY TERMINAL No. OR BY WIRE No.

SHOWN

FOR TYPICAL REMOTE CONTROL

INDICATING, MONITORING AND ALARM

CIRCUITS SEE PUBLICATION AE4/2

CONTROL SIGNAL THRESHOLD VOLTAGES

MAXIMUM 'OFF' 3V.

MINIMUM CONTROL SIGNAL 300ms.

E.S.D. CONTROL SIGNAL VOLTAGE MUST

BE EQUAL TO OR GREATER THAN ALL

OTHER CONTROL SIGNAL VOLTAGES.

TORQUE AND LIMIT SWITCH OPERATION

SWITCH	OPEN	INTER	SHUT
OT/LS			
CT/LS			
CAS1			
CAS2			
OAS1			
OAS2			

INDICATES SWITCH MADE

No
01

DATE

REVISION

SIMILAR TO 1610X01

Ref. **DOC1572**

rotork

ROTORK CONTROLS LTD
BATH ENGLAND, BA1 3JQ.
(Phone 01225-733200)

ROTORK CONTROLS INC
ROCHESTER, NY 14624.
tel (716) 328-1550

DRAWN

TPW

DATE

081905

CHECKED

K.S

DATE

081905

1610X01 + STOP BYPASS

CIRCUIT DIAGRAM No -REV

WD18392-01

Feed Water Stop Valve Settings - IQ

Local Stop Bypass during ESP

Wiring Diagram: WD18394

Hookup Drawing: WS18395

Recommended Settings:		Operating Manual E170E Section/Page	Screen	Setting
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Primary Settings:

Direction To Close	Clock	Section 8/ Page 19	C1	C
Close Action	Torque	Section 8/ Page 20	C2	Ct
Open Action	Limit	Section 8/ Page 21	C3	OL
Torque Valve Closing	By Application	Section 8/ Page 22	tC	% Rated
Torque Valve Opening	75% Rated Torque	Section 8/ Page 23	tO	75
Close Limit	By Application	Section 8/ Page 24	LC	
Open Limit	By Application	Section 8/ Page 24	LO	

Indications Settings:

Indication Contact 1	Make at Full Shut	Section 9.2/ Page 28	R1	CL / no
Indication Contact 2	Make at Full Open	Section 9.2/ Page 28	R2	OP / no
Indication Contact 3	Break at Full Shut	Section 9.2/ Page 28	R3	CL / nc
Indication Contact 4	Break at Full Open	Section 9.2/ Page 28	R4	OP / nc

Control Mode Settings:

ESD Enabled	Enabled	Section 9.3/ Page 29	A1	on
ESD Action	Close	Section 9.3/ Page 29	A2	CL
ESD Contact Type	ESD on Applied Signal	Section 9.3/ Page 29	A3	no
ESD Bypass Thermostat	Bypass Enabled	Section 9.3/ Page 30	A4	on
ESD Override Interlocks	Override On	Setting Not Available		
ESD Override Local Stop	Override On	Enabled through special Wiring Diagram (additional PC Board)		
Maintained Local Controls	Maintained	Section 9.3/ Page 30	A5	on
Two Wire Priority	Close Priority	Section 9.3/ Page 30	A6	OF
			A7	OF
External Interlocks	Enabled	Section 9.3/ Page 31	A8	on
Display Invert	Disabled	Section 9.3/ Page 31	A9	OF
Torque Switch Bypass	Enabled	Default program setting not available.		

Options:

Additional Indication Contacts	None			
CPT (Position Transmitter)	None	Section 9.8/ Page 38	OI	OF
Folomatic (Positioner)	None	Section 9.4/ Page 32	OF	OF
Remote Control Source	None			
Bus System Interface	None	Section 9.5/ Page 35	OP	OF
Interrupter Timer	None	Section 9.6/ Page 39	OJ	OF
Setting Tool – Local Control	Disabled	Section 9.7/ Page 41	Or	OF
Power Loss Inhibit.	Disabled	Section 9.9/ Page 42	OS	OF

Rapid Drain Valve Settings - IQ

Local Stop Bypass during ESP

Wiring Diagram: WD18394

Hookup Drawing: WS18395

Recommended Settings:		Operating Manual E170E Section/Page	Screen	Setting
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Primary Settings:

Direction To Close	Clock	Section 8/ Page 19	C1	C
Close Action	Torque	Section 8/ Page 20	C2	Ct
Open Action	Limit	Section 8/ Page 21	C3	OL
Torque Valve Closing	By Application	Section 8/ Page 22	tC	% Rated
Torque Valve Opening	Boost / Motor Stall	Section 8/ Page 23	tO	bb
Close Limit	By Application	Section 8/ Page 24	LC	
Open Limit	By Application	Section 8/ Page 24	LO	

Indications Settings:

Indication Contact 1	Make at Full Shut	Section 9.2/ Page 28	R1	CL / no
Indication Contact 2	Make at Full Open	Section 9.2/ Page 28	R2	OP / no
Indication Contact 3	Break at Full Shut	Section 9.2/ Page 28	R3	CL / nc
Indication Contact 4	Break at Full Open	Section 9.2/ Page 28	R4	OP / nc

Control Mode Settings:

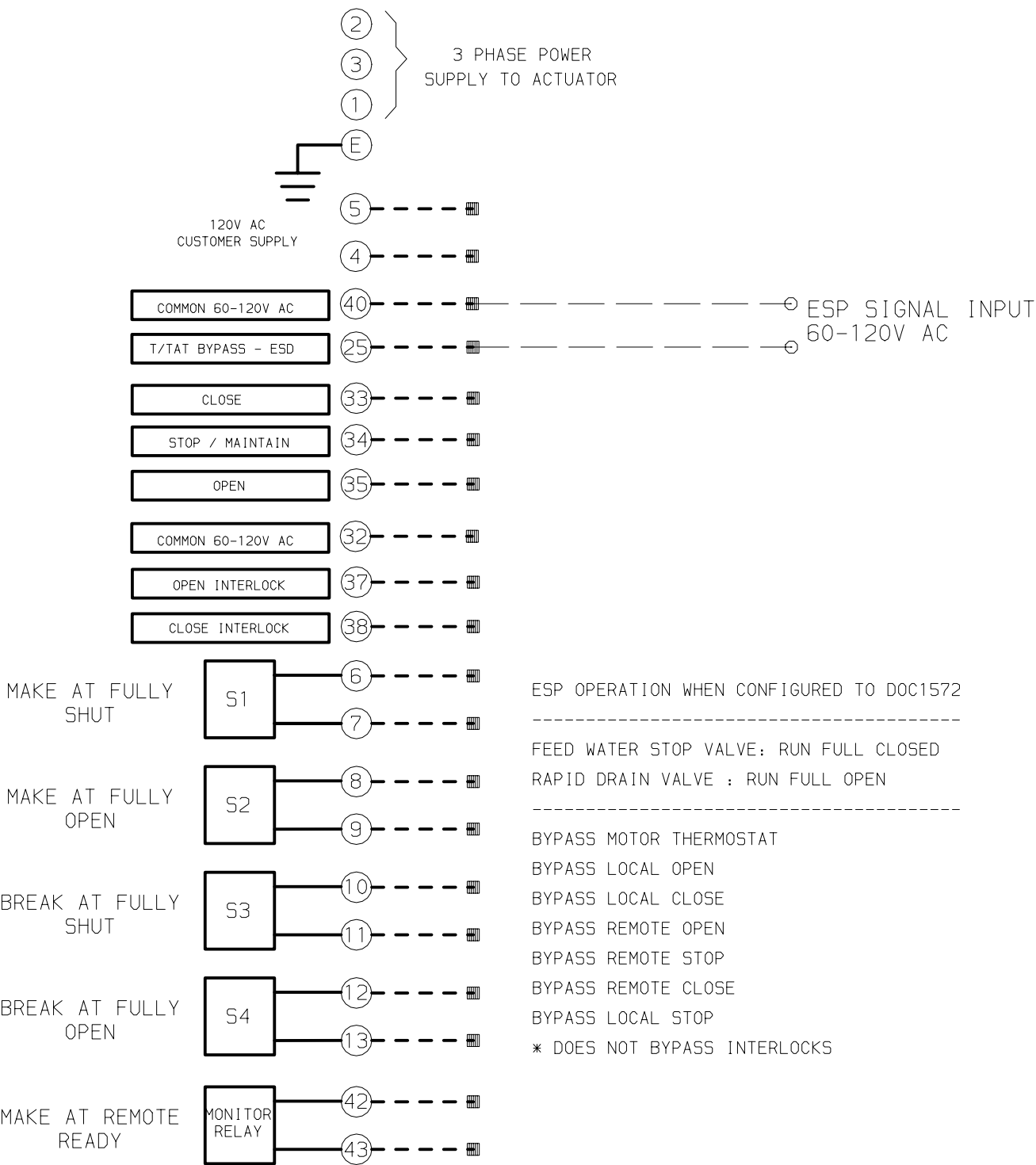
ESD Enabled	Enabled	Section 9.3/ Page 29	A1	on
ESD Action	Open	Section 9.3/ Page 29	A2	OP
ESD Contact Type	ESD on Applied Signal	Section 9.3/ Page 29	A3	no
ESD Bypass Thermostat	Bypass Enabled	Section 9.3/ Page 30	A4	on
ESD Override Interlocks	Override On	Setting Not Available		
ESD Override Local Stop	Override On	Enabled through special Wiring Diagram (additional PC Board)		
Maintained Local Controls	Maintained	Section 9.3/ Page 30	A5	on
Two Wire Priority	Close Priority	Section 9.3/ Page 30	A6	OF
			A7	OF
External Interlocks	Enabled	Section 9.3/ Page 31	A8	on
Display Invert	Disabled	Section 9.3/ Page 31	A9	OF
Torque Switch Bypass	Enabled	Default program setting not available.		

Options:

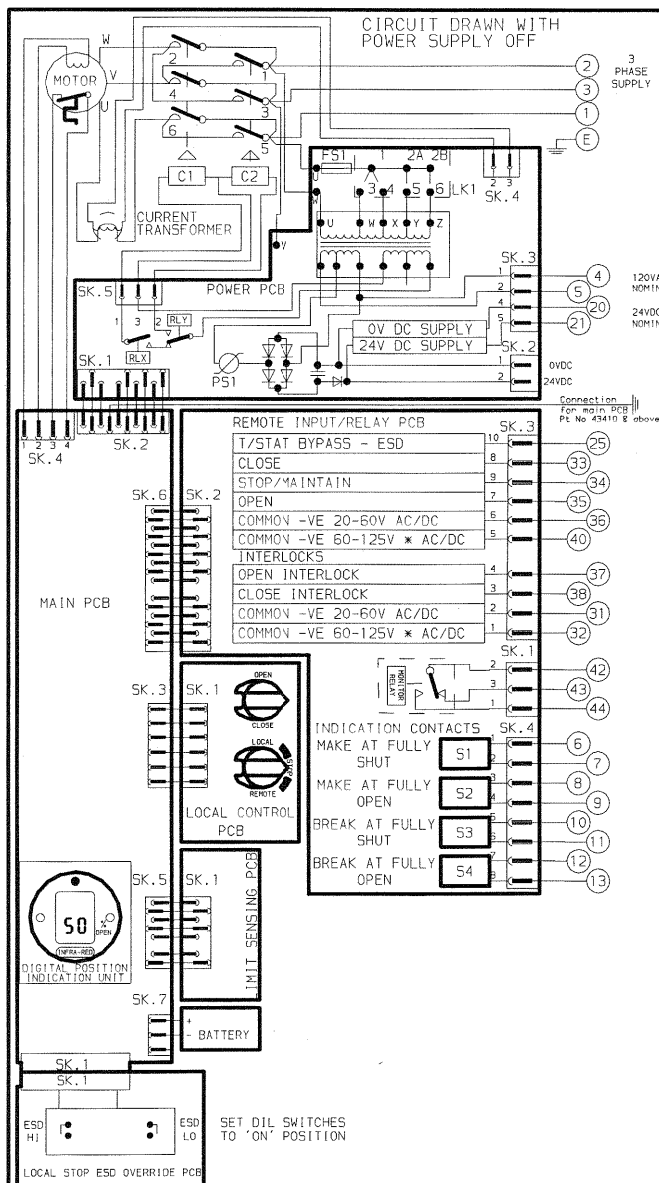
Additional Indication Contacts	None			
CPT (Position Transmitter)	None	Section 9.8/ Page 38	OI	OF
Folomatic (Positioner)	None	Section 9.4/ Page 32	OF	OF
Remote Control Source	None			
Bus System Interface	None	Section 9.5/ Page 35	OP	OF
Interrupter Timer	None	Section 9.6/ Page 39	OJ	OF
Setting Tool – Local Control	Disabled	Section 9.7/ Page 41	Or	OF
Power Loss Inhibit.	Disabled	Section 9.9/ Page 42	OS	OF

RECOMMENDED HOOKUP FOR IQ WIRING DIAGRAM WD18394
FOR ESP (EMERGENCY SHUT-DOWN PROCEDURES) FOR
FEED WATER STOP AND RAPID DRAIN VALVES WHEN CONFIGURED TO
ROTORK DOCUMENT DOC1572.

CIRCUIT DIAGRAM No
WS18395-02



No 01	DATE 8/05	REVISION FIRST ISSUE	No	DATE	REVISION	DRAWN TPW DATE 08/22/05	CHECKED CW DATE 08/22/05	WD18394 ESP HOOKUP PER DOC1572
02	090205	MODIFIED TITLE.				rotork ROTORK CONTROLS BATH UK, BA1 3JQ. tel (0225) 28451. ROCHESTER, NY 14624 tel (716) 328-1550	CIRCUIT DIAGRAM Z	WS18395-02



CIRCUIT DIAGRAM No. -REV
WD18394-02
C E I D F

TRANSFORMER TAPPING OPTIONS

TYPE 1			
TAP	NOM 50/60HZ	50HZ	60HZ
W	220/230	176-242	198-259
X	380/400	304-418	342-446
Y	415/420	332-457	374-487
Z	440/460	352-484	396-517

FUSE FS1 - 250mA ANTI-SURGE

TYPE 2			
TAP	NOM 50/60HZ	50HZ	60HZ
W	346/380	285-388	321-419
X	480/500	406-552	432-564
Y	240/240	192-261	216-282
Z	550/575	445-605	501-654

FUSE FS1 - 250mA ANTI-SURGE

* 150mA ANTI-SURGE

TYPE 3			
TAP	NOM 50/60HZ	50HZ	60HZ
X	660/660	534-726	600-726
Y	690/-	558-759	-

FUSE FS1 - 150mA ANTI-SURGE

ALL TRANSFORMER TYPES - PS1 SELF
RESETTING FUSE

NOTE

WHERE CUSTOMERS WANT TO HAVE THE
THERMOSTAT BY-PASSED DURING
EMERGENCY SHUTDOWN OPERATION, IT
SHOULD BE NOTED THAT ANY ACTUATOR
HAZARDOUS ENCLOSURE CERTIFICATION
WILL BE INVALIDATED WHILE THE
THERMOSTAT IS BY-PASSED.

MAX EXTERNAL LOAD ON TERMINALS
4 & 5 TO BE 15VA.

MAX EXTERNAL LOAD ON TERMINALS
20 & 21 TO BE 5W

* THE MAXIMUM VOLTAGE THAT CAN BE
APPLIED TO THE REMOTE INPUTS IS
125V.

FOR TYPICAL REMOTE CONTROL
INDICATING, MONITORING AND ALARM
CIRCUITS SEE PUBLICATION E120E

CONTROL SIGNAL THRESHOLD VOLTAGES
TO BE MINIMUM 'ON' 20V AC/DC
MAXIMUM 'OFF' = 3V
MINIMUM CONTROL SIGNAL DURATION
TO BE 300ms.

CURRENT DRAWN FROM EACH REMOTE
CONTROL SIGNAL IS 5mA ON 24V DC

WIRES ARE IDENTIFIED AT EACH END
BY TERMINAL No. OR TAG No.

ESD NOTE

THE LOCAL STOP IS INOPERABLE FOR
AN ESD CONDITION.
ESD CAN BE SET FOR A ACTIVE 'HI
OR LO' INPUT SIGNAL.

REMOTE CONTROL CIRCUITS

THE INFRA RED SETTING TOOL ENABLES VARIOUS
DIFFERENT REMOTE CONTROLS TO BE CONFIGURED.
UNLESS SPECIFIED REQUIREMENTS ARE STATED WITH
THE ORDER ACTUATORS WILL BE SUPPLIED CONFIGURED
AS FOLLOWS:-
MAINTAINED LOCAL CONTROL
CLOCKWISE TO CLOSE
THERMOSTAT BY-PASSED ON ESD
OPEN AND CLOSED INTERLOCKS DISABLED
CLOSE SIGNAL PRIORITY
INTERRUPTOR TIMER DISABLED
THE TYPICAL REMOTE CONTROL CIRCUITS SHOWN BELOW
APPLY TO THESE UNLESS OTHERWISE STATED

REMOTE CONTROLS MAY BE FED INTERNALLY IN THE
FOLLOWING WAYS:-

- FROM THE 24VDC SUPPLY AT TERMINAL 5 WHEN
TERMINALS 4-36 MUST BE LINKED.
- FROM THE 120VAC SUPPLY AT TERMINAL 5 WHEN
TERMINALS 4-40 MUST BE LINKED.

REMOTE CONTROLS MAY BE FED FROM AN EXTERNAL SUPPLY
WHEN THE ZERO/-VE OF THE SUPPLY SHOULD BE CONNECTED
AS FOLLOWS:-

- TO TERMINAL 36 FOR UP TO 60V AC OR DC.
- TO TERMINAL 40 FOR 60V TO 120V AC OR DC.
- TERMINALS 4-36 ALSO TO BE LINKED FOR FORM D, E,
AND F CONTROL.

THE INPUT TO THE IO SERIES ACTUATOR LOGIC
CIRCUITS ASSOCIATED WITH THE REMOTE CONTROLS
MAY BE USED WITH CABLE CAPACITANCE OF UP
TO 2µF BETWEEN CORES

MAX. EXTERNAL LOAD ON 24VDC
SUPPLY FROM ACTUATOR
TERMINALS 4 - 5 TO BE 5W

FORM A

OPEN/CLOSE PUSH TO RUN CONTROL
(LOCAL CONTROL REMAINS SELF MAINTAINED)

FORM B

OPEN/CLOSE MAINTAIN CONTROL
WITH MID TRAVEL REVERSAL

FORM C

OPEN/STOP/CLOSE MAINTAINED CONTROL

FORM D

TWO WIRE CONTROL, ENERGIZE TO OPEN
DE-ENERGIZE TO CLOSE
(CONFIGURE FOR OPEN PRIORITY)
CUSTOMER TO LINK 5 - 33

FORM E

TWO WIRE CONTROL, ENERGIZE TO CLOSE
DE-ENERGIZE TO OPEN
CUSTOMER TO LINK 5 - 35

FORM F

EMERGENCY SHUT-DOWN TO CLOSE VALVE
OVERRIDING THERMOSTAT AND ANY EXISTING SIGNAL
MAY BE ADDED TO ANY OF THE CIRCUITS ABOVE
ACTUATORS MAY BE CONFIGURED SO THAT
THERMOSTAT IS NOT BY-PASSED DURING ESD OPERATION
TO OVERRIDE EXTERNAL INTERLOCKS ON ESD
ADDITIONAL REMOTE CONTACTS MUST BE PROVIDED.

(# = SEE NOTE ABOVE)

No	DATE	REVISION
01	102505	FIRST ISSUE.
02	102505	ADDED DIL NOTE.

rotork	ROTORK CONTROLS LTD BATH, ENGLAND BA1 3JQ (Phone 01225-733200)	CONFIG BY TPW DATE 082205 CHECKED TLW BASE WD 200-001 JOB No - M.I. No.
	ROTORK CONTROLS INC ROCHESTER, NY 14624 tel (585) 247-2308	

200-001 + LOCAL STOP ESD OVERRIDE	CIRCUIT DIAGRAM No. -REV WD18394-02 C E I D F
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Feed Water Stop Valve Settings - IQmk2

Wiring Diagram: 3000-001

Hookup Drawing: WS18333

Recommended Settings:		Operating Manual E170E2 Section/Page	Screen	Setting
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Primary Settings:

Direction To Close	Clock	Section 8/ Page 22	C1	C
Close Action	Torque	Section 8/ Page 23	C2	Ct
Open Action	Limit	Section 8/ Page 24	C3	OL
Torque Valve Closing	By Application	Section 8/ Page 25	tC	% Rated
Torque Valve Opening	75% Rated Torque	Section 8/ Page 26	tO	75
Close Limit	By Application	Section 8/ Page 27	LC	
Open Limit	By Application	Section 8/ Page 27	LO	

Indications Settings:

Indication Contact 1	Make at Full Shut	Section 9.2/ Page 32,33	R1	CL / no
Indication Contact 2	Make at Full Open	Section 9.2/ Page 32,33	R2	OP / no
Indication Contact 3	Break at Full Shut	Section 9.2/ Page 32,33	R3	CL / nc
Indication Contact 4	Break at Full Open	Section 9.2/ Page 32,33	R4	OP / nc

Control Mode Settings:

ESD Enabled	Enabled			
ESD Action	Close	Section 9.3/ Page 34	A1	CL
ESD Contact Type	ESD on Applied Signal	Section 9.3/ Page 34	A2	no
ESD Bypass Thermostat	Bypass Enabled	Section 9.3/ Page 34	A3	on
ESD Override Interlocks	Override On	Section 9.3/ Page 35	A4	on
ESD Override Local Stop	Override On	Section 9.3/ Page 35	A5	on
Maintained Local Controls	Maintained	Section 9.3/ Page 35	A6	on
Two Wire Priority	Close Priority	Section 9.3/ Page 35	A7	CL
External Interlocks	Enabled	Section 9.3/ Page 36	A8	on
Display Invert	Disabled	Display can be physically inverted.		
Conditional Control	Disabled	Section 9.3/ Page 36	A9	OF
Torque Switch Bypass Unseating	Enabled	Section 9.3/ Page 36	At	on

Options:

Additional Indication Contacts	None	Section 9.4/ Page 37	OE	OF
CPT (Position Transmitter)	None	Section 9.5/ Page 38	OI	OF
Folomatic (Positioner)	None	Section 9.6/ Page 39	OF	OF
Remote Control Source	None	Section 9.7/ Page 42	Od	rE
Bus System Interface	None	Section 9.8/ Page 43	OP	OF
Interrupter Timer	None	Section 9.13/ Page 60	OJ	OF
Setting Tool – Local Control	Disabled	Section 9.14/ Page 62	Or	OF
Power Loss Inhibit.	Disabled	Section 9.15/ Page 62	OS	OF

Rapid Drain Valve Settings - IQmk2

Wiring Diagram: 3000-001

Hookup Drawing: WS18333

Recommended Settings:		Operating Manual E170E2 Section/Page	Screen	Setting
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Primary Settings:

Direction To Close	Clock	Section 8/ Page 22	C1	C
Close Action	Torque	Section 8/ Page 23	C2	Ct
Open Action	Limit	Section 8/ Page 24	C3	OL
Torque Valve Closing	By Application	Section 8/ Page 25	tC	% Rated
Torque Valve Opening	Boost / Motor Stall	Section 8/ Page 26	tO	bb
Close Limit	By Application	Section 8/ Page 27	LC	
Open Limit	By Application	Section 8/ Page 27	LO	

Indications Settings:

Indication Contact 1	Make at Full Shut	Section 9.2/ Page 32,33	R1	CL / no
Indication Contact 2	Make at Full Open	Section 9.2/ Page 32,33	R2	OP / no
Indication Contact 3	Break at Full Shut	Section 9.2/ Page 32,33	R3	CL / nc
Indication Contact 4	Break at Full Open	Section 9.2/ Page 32,33	R4	OP / nc

Control Mode Settings:

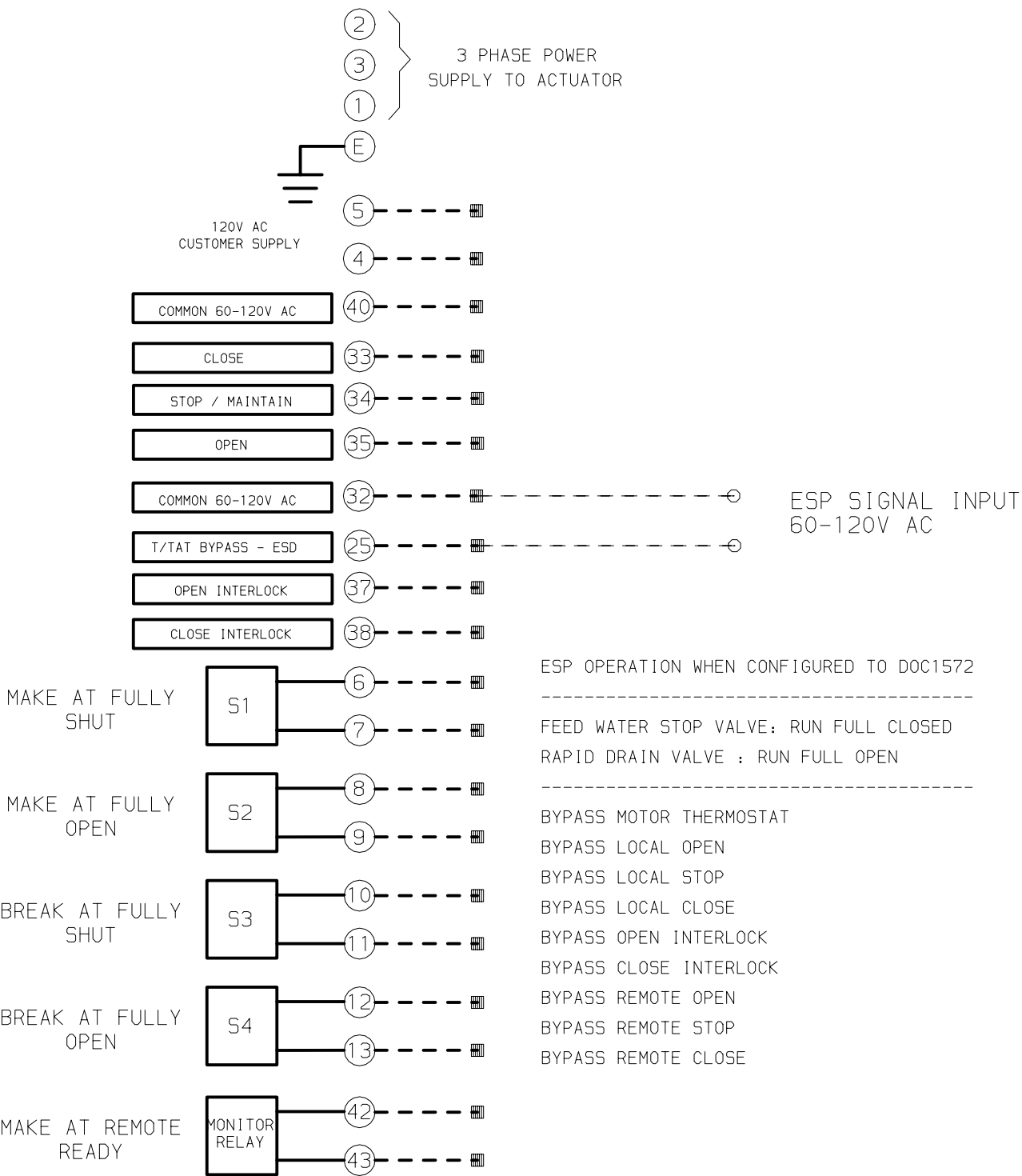
ESD Enabled	Enabled			
ESD Action	Open	Section 9.3/ Page 34	A1	OP
ESD Contact Type	ESD on Applied Signal	Section 9.3/ Page 34	A2	no
ESD Bypass Thermostat	Bypass Enabled	Section 9.3/ Page 34	A3	on
ESD Override Interlocks	Override On	Section 9.3/ Page 35	A4	on
ESD Override Local Stop	Override On	Section 9.3/ Page 35	A5	on
Maintained Local Controls	Maintained	Section 9.3/ Page 35	A6	on
Two Wire Priority	Close Priority	Section 9.3/ Page 35	A7	CL
External Interlocks	Enabled	Section 9.3/ Page 36	A8	on
Display Invert	Disabled	Display can be physically inverted.		
Conditional Control	Disabled	Section 9.3/ Page 36	A9	OF
Torque Switch Bypass Unseating	Enabled	Section 9.3/ Page 36	At	on

Options:

Additional Indication Contacts	None	Section 9.4/ Page 37	OE	OF
CPT (Position Transmitter)	None	Section 9.5/ Page 38	OI	OF
Folomatic (Positioner)	None	Section 9.6/ Page 39	OF	OF
Remote Control Source	None	Section 9.7/ Page 42	Od	rE
Bus System Interface	None	Section 9.8/ Page 43	OP	OF
Interrupter Timer	None	Section 9.13/ Page 60	OJ	OF
Setting Tool – Local Control	Disabled	Section 9.14/ Page 62	Or	OF
Power Loss Inhibit.	Disabled	Section 9.15/ Page 62	OS	OF

RECOMMENDED HOOKUP FOR IQMK2 WIRING DIAGRAM 3000-001
FOR ESP (EMERGENCY SHUT-DOWN PROCEDURES) FOR
FEED WATER STOP AND RAPID DRAIN VALVES WHEN CONFIGURED TO
ROTORK DOCUMENT DOC1572.

CIRCUIT DIAGRAM No
WS18333-02



No 01	DATE 6/05	REVISION FIRST ISSUE	No	DATE	REVISION	DRAWN DATE	TPW 06/02/05	CHECKED DATE	CW 06/02/05	3000-001 ESP HOOKUP PER DOC1572
02	090205	MODIFIED TITLE.				rotork	ROTORK CONTROLS BATH UK, BA1 3JQ. tel.(0225) 28451. ROCHESTER, NY 14624 tel.(716) 328-1550	CIRCUIT DIAGRAM Z		
								WS18333-02		

