

Operation Readiness Clearance (ORC)
of
SpinQuest (E1039) GV bypass control system

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Contents

1	The tasks of the GV bypass controlling system	3
2	The components of the system	3
3	Included safety features	4
4	GV bypass mechanical setup.....	4
5	Wiring diagram of the box.....	5
6	Specifications.....	5
6.1	Stepper motor	5
	ST4118D3004-B, Nanotech.....	5
6.2	Motor controller	6
6.3	24 V Power Supply	7

1 The tasks of the GV bypass controlling system

- Controls the opening of the gate valve (GV) bypass valve in the target cave.

The complete system operates from 24V.

2 The components of the system

Table 1 : The components of the system

Qty	Item	Model
1	Motor Controller	ST10-plus, AppliedMotion
1	24 V power Supply	LRS-100-24, MEAN WELL USA
1	Stepper motor	ST4118D3004-B, Nanotech
2	Limit Switches	311SM6-T, Honeywell
1	Rotary Potentiometer	3545S-1-502L, Bourns inc

The first two items of the above table are placed in a rack mountable metallic box. The stepper motor, Potentiometer, and the limit switches are in the target cave.

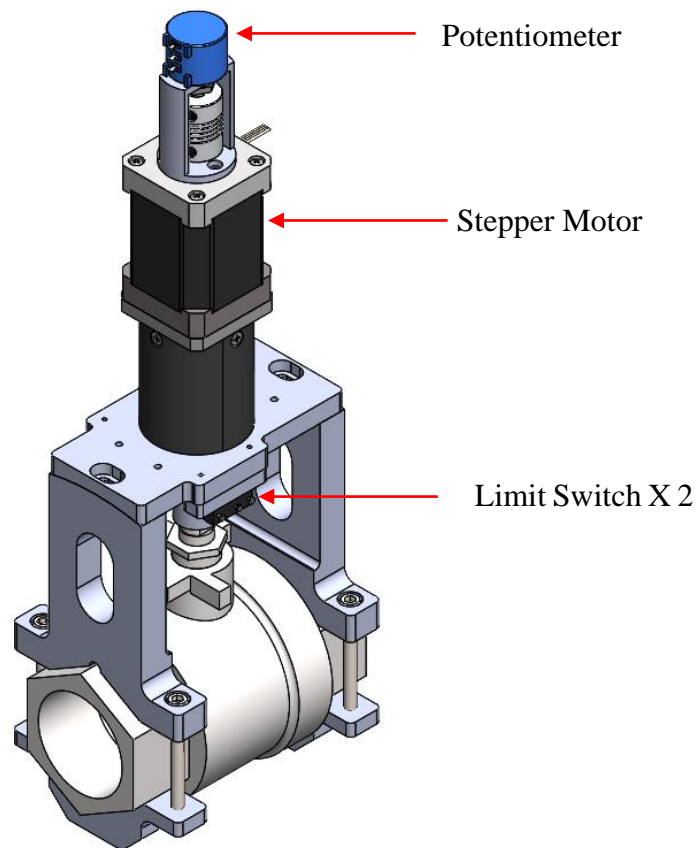
The following images shows the construction of the system



3 Included safety features

- 110 V ON/OFF switch
- 110V/5A glass fuse
- All the high voltage wires (110V) and terminals are properly covered
- All the connecting points, cables and the LED indicators are properly labeled

4 GV bypass mechanical setup




5 Wiring diagram of the box

The complete wiring diagram of the box is attached separately

6 Specifications

6.1 Stepper motor

ST4118D3004-B, Nanotech

SPECIFICATION \ CONNECTION	BIPOLAR
VOLTAGE (VDC)	3.3
AMPS/PHASE	3.0
RESISTANCE/PHASE (Ohms)@25°C	1.1±15%
INDUCTANCE/PHASE (mH) @1KHz	2.7±20%
HOLDING TORQUE (Nm) [lb-in]	0.8 [7.08]
DETENT TORQUE (Nm) [lb-in]	2.8x10 ⁻² [0.25]
STEP ANGLE (°)	1.8
STEP ACCURACY (NON-ACCUM)	±5% 
ROTOR INERTIA (Kg-m ²) [lb-in ²]	1.02x10 ⁻⁵ [3.48x10 ⁻²]
WEIGHT (Kg) [lb]	0.5 [1.1]
TEMPERATURE RISE: MAX.80°C (MOTOR STANDSTILL; FOR 2 PHASE ENERGIZED)	
AMBIENT TEMPERATURE -10°~ 50°C [14°F ~ 122°F]	
INSULATION RESISTANCE 100 MOhm (UNDER NORMAL TEMPERATURE AND HUMIDITY)	
INSULATION CLASS B 130° [266°F]	
DIELECTRIC STRENGTH 500VAC FOR 1 MIN. (BETWEEN THE MOTOR COILS AND THE MOTOR CASE)	
AMBIENT HUMIDITY MAX. 85% (NO CONDENSATION)	

6.2 Motor controller

Model Number: ST10-Plus, AppliedMotions



Table 2 : Specifications of the Motor controller

920-0027 Rev. F
2/22/2023

ST5/10-S & Plus Hardware Manual

Technical Specifications

POWER AMPLIFIER: All Models

AMPLIFIER TYPE	Dual H-Bridge, 4 Quadrant
CURRENT CONTROL	4 state PWM at 20 Khz
OUTPUT CURRENT	ST5 Series 0.1 – 5.0 amps/phase in 0.01 amp increments ST10 Series 0.1 – 10.0 amps/phase in 0.01 amp increments
POWER SUPPLY	ST5 Series External 24 - 48 VDC Power Supply Required ST10 Series External 24 - 80 VDC Power Supply Required
INPUT VOLTAGE RANGE	ST5 Series 18 - 53 VDC ST10 Series 18 - 88 VDC
PROTECTION	Over-Voltage, Under-voltage, Over-Temp, Motor/wiring shorts (Phase-to-Phase, Phase-to-Ground).
IDLE CURRENT REDUCTION	Reduction range of "0 – 90%" of "Running Current" after delay selectable in milliseconds.
AMBIENT TEMPERATURE	0 to 55°C (32 - 158°F) (ST10 must be mounted to suitable heatsink)
HUMIDITY	90% non-condensing.

CONTROLLER: All Models

MICROSTEP RESOLUTION	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev.
ANTI-RESONANCE (Electronic Damping)	Raises the system damping ratio to eliminate midrange instability and allow stable operation throughout the speed range and improves settling time.
TORQUE RIPPLE SMOOTHING	Allows for fine adjustment of phase current waveform harmonic content to reduce low-speed torque ripple in the range 0.25 to 1.5 rps
AUTO SETUP	Measures motor parameters and configures motor current control and anti-resonance gain settings
SELF TEST	Checks Internal & External Power supply voltages. Diagnoses open motor phases and motor resistance changes >40%. Detects encoder wiring and signal faults (differential encoder only).
MICROSTEP EMULATION	Performs high resolution stepping by synthesizing fine microsteps from coarse steps (Step & Direction Mode Only) .
COMMAND SIGNAL SMOOTHING	Software configurable filtering reduces jerk and excitation of extraneous system resonances (Step & Direction Mode Only).

6.3 24 V Power Supply

Model Number: LRS-100-24, MEAN WELL USA

Table 3 : Specifications of the 24 V power supply



100W Single Output Switching Power Supply

LRS-100 series

SPECIFICATION

MODEL		LRS-100-3.3	LRS-100-5	LRS-100-12	LRS-100-15	LRS-100-24	LRS-100-36	LRS-100-48
OUTPUT	DC VOLTAGE	3.3V	5V	12V	15V	24V	36V	48V
	RATED CURRENT	20A	18A	8.5A	7A	4.5A	2.8A	2.3A
	CURRENT RANGE	0 ~ 20A	0 ~ 18A	0 ~ 8.5A	0 ~ 7A	0 ~ 4.5A	0 ~ 2.8A	0 ~ 2.3A
	RATED POWER	66W	90W	102W	105W	108W	100.8W	110.4W
	RIPPLE & NOISE (max.) Note.2	100mVp-p	100mVp-p	120mVp-p	120mVp-p	150mVp-p	200mVp-p	200mVp-p
	VOLTAGE ADJ. RANGE	2.97 ~ 3.6V	4.5 ~ 5.5V	10.2 ~ 13.8V	13.5 ~ 18V	21.6 ~ 28.8V	32.4 ~ 39.6V	43.2 ~ 52.8V
	VOLTAGE TOLERANCE Note.3	± 3.0%	± 2.0%	± 1.0%	± 1.0%	± 1.0%	± 1.0%	± 1.0%
	LINE REGULATION Note.4	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%
	LOAD REGULATION Note.5	± 2.0%	± 1.0%	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%
	SETUP, RISE TIME	500ms, 30ms/230VAC 500ms, 30ms/115VAC at full load						
HOLD UP TIME (Typ.)	55ms/230VAC 10ms/115VAC at full load							
INPUT	VOLTAGE RANGE	85 ~ 264VAC 120 ~ 373VDC (Withstand 300VAC surge for 5sec. Without damage)						
	FREQUENCY RANGE	47 ~ 63Hz						
	EFFICIENCY (Typ.)	84.5%	86%	88%	88.5%	90%	90.5%	91%
	AC CURRENT (Typ.)	1.9A/115VAC 1.2A/230VAC						
	INRUSH CURRENT (Typ.)	C.O.L.D START 50A/230VAC						
	LEAKAGE CURRENT	<0.75mA / 240VAC						
PROTECTION	OVER LOAD	110 ~ 150% rated output power Protection type : Hiccup mode, recovers automatically after fault condition is removed						
	OVER VOLTAGE	3.8 ~ 4.45V	5.75 ~ 6.75V	13.8 ~ 16.2V	18.75 ~ 21.75V	28.8 ~ 33.6V	41.4 ~ 48.6V	55.2 ~ 64.8V
		Protection type : Shut down o/p voltage, re-power on to recover						
ENVIRONMENT	WORKING TEMP.	-30 ~ +70°C (Refer to "Derating Curve")						
	WORKING HUMIDITY	20 ~ 90% RH non-condensing						
	STORAGE TEMP., HUMIDITY	-40 ~ +85°C, 10 ~ 95% RH non-condensing						
	TEMP. COEFFICIENT	± 0.03%/°C (0 ~ 50°C)						
	VIBRATION	10 ~ 500Hz, 5G 10min/1cycle, 60min. each along X, Y, Z axes						
	OVER VOLTAGE CATEGORY	III; Compliance to BS EN/EN61558, BS EN/EN50178, BS EN/EN60664-1, BS EN/EN62477-1; altitude up to 2000 meters						
SAFETY & EMC (Note 8)	SAFETY STANDARDS	UL 62368-1, TUV BS EN/EN62368-1, BS EN/EN60335-1, BS EN/EN61558-1/2-16, CCC GB4943.1, BSMI CNS14336-1, EAC TP TC 004, S/NZ 962368.1 (by CB), KC K60950-1 (for LRS-100-12/24 only), BIS IS 13252 (Part 1): 2010/IEC 60950-1: 2005 approved						
	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC I/P-F/G: 2KVAC O/P-F/G: 1.25KVAC						
	ISOLATION RESISTANCE	I/P-O/P, I/P-F/G, O/P-F/G: 100M Ohms / 500VDC / 25°C / 70% RH						
	EMC EMISSION	Compliance to BS EN/EN55032 (CISPR32) Class B, BS EN/EN55014, BS EN/EN61000-3-2, -3, GB/T 9254, BSMI CNS13438, EAC TP TC 020, KC KN32, KN35 (for LRS-100-12/24 only)						
	EMC IMMUNITY	Compliance to BS EN/EN61000-4-2, 3, 4.5, 6, 8, 11, BS EN/EN61000-6-2 (BS EN/EN50082-2), BS EN/EN55035, heavy industry level, EAC TP TC 020, KC KN32, KN35 (for LRS-100-12/24 only)						

END