SECTION/Description **Pages**

Micro Processor based PWM Drivers

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

EC - PWM - A1 - MPC1 - P

Description

Micro-processor based PWM electronic driver for remote control of a single proportional solenoid valve.

Operation

The EC-PWM-MPC1 Proportional Valve driver supplies a solenoid with a *PWM (Pulse Width Modulated)* current proportional to the input signal from a potentiometer, PLC or other control systems

Adjustments of "Imin/Imax", "Ramp time", "Deadband" and "Dither" can be effected directly from a key-pad integrated on the front panel

Mounting option: panel-mounting style with INPUT/OUTPUT multi-core sheathed cable

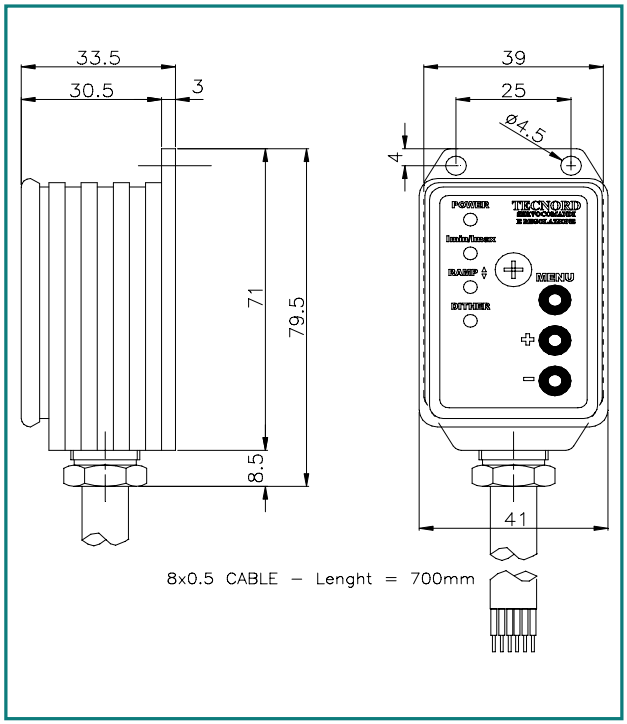
Features

- The current in the solenoid is independent of change in the coil resistance and in supply voltage variations.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and supply.
- Output is protected against short circuits, reversed polarity, over-current and over-temperature.

Specifications

● Operating voltage:	8.5-30 Vdc	
● Max current consumption:	100mA (no load applied)	
● Operating temperature:	-25 / +85 °C	
● Degree of protection:	IP 67	
● Analog input signal:	Standard:	0-5 V
	Option 1:	0-10 V
	Option 2:	0-20 mA
● Input impedance:	50k Ohm	
● Typical ctrl pot resistance:	2 - 47k Ohm	
● Current output range (PWM):	100-3000 mA	
● PWM dither frequency:	55-200 Hz (adjustable)	
● Adjustable ramp time:	0.05 - 5 s	

Dimensions



Applications

- Primary applications are the control of non-feedback pressure and flow proportional valves to attain smooth acceleration/deceleration and fine-metering control of linear and rotary actuators

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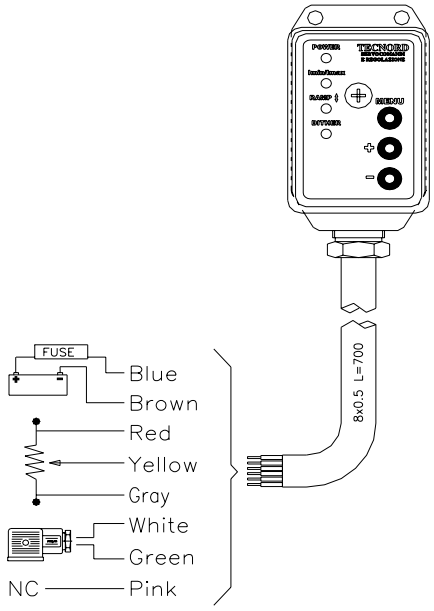
Circuit board pinout - Wiring diagram

Wiring Color Codes

Blue	+Battery
Brown	-Battery (GND)
Red	Command signal supply (+5V)
Yellow	Command signal in
Gray	Command signal GND
White	Proportional coil output
Green	Proportional coil current feedback line
Pink	Spare / Not used



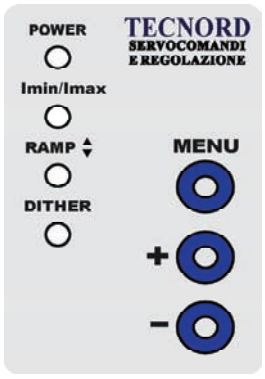
Fuse

A 5A fuse must be inserted on the BLUE wire connecting the EC-MPC1 driver to the power source.

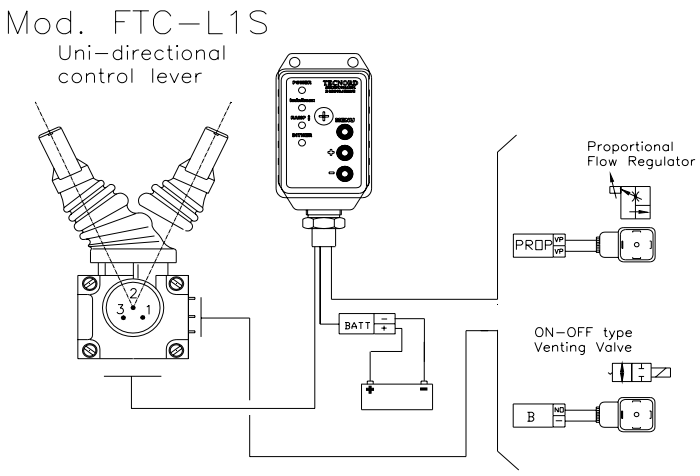
Adjustments

The following adjustments can be made directly from the front key-pad by selecting the 3-pushpins in various combinations:

- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency



Application example



Remote operation of a proportional flow control valve from single axis / unidirectional control lever incorporating a rotary potentiometer and a center / power-off switch for the energizing of an auxiliary solenoid-operated dump valve.

Ordering Information: *EC - PWM - A1 - MPC1 - P*

A- = Adjustable

C = circuit board only
P = panel mounting

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EC - PWM - A1 - MPC1 - D

Description

Micro-processor based PWM electronic driver for remote control of a single proportional solenoid valve.

Operation

The EC-PWM-MPC1-D Proportional Valve driver supplies a solenoid with a *PWM (Pulse Width Modulated)* current proportional to the input signal from a potentiometer, PLC or other control systems

Adjustments of "Imin/Imax", "Ramp time", "Deadband" and "Dither" can be effected directly from a key-pad integrated on the front panel

Mounting option: Female DIN 43650 socket on valve's side and sheathed exit cable to connect to power source and remote control devices

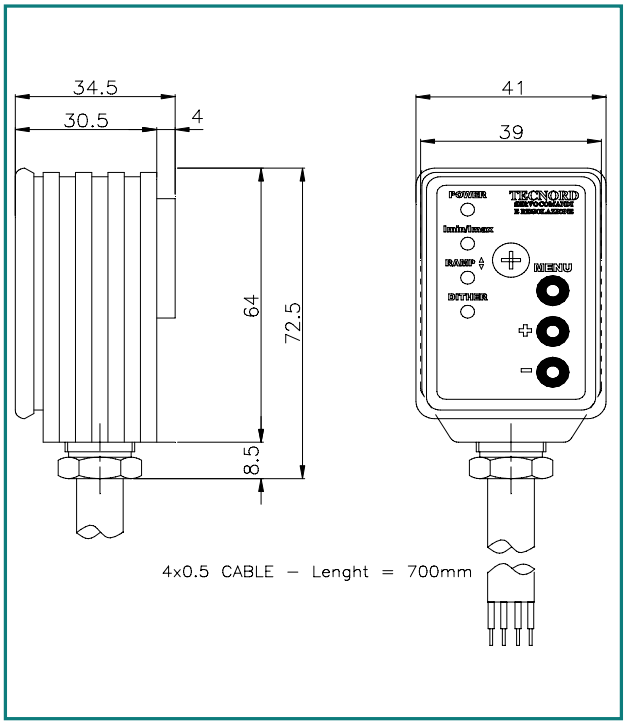
Features

- The current in the solenoid is independent of change in the coil resistance and in supply voltage variations.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and supply.
- Output is protected against short circuits, reversed polarity, over-current and over-temperature.

Specifications

Operating voltage:	8.5-30 Vdc
Max current consumption:	100mA (no load applied)
Operating temperature:	-25 / +85 °C
Degree of protection:	IP 67
Analog input signal:	Standard: 0-5 V
	Option 1: 0-10 V
	Option 2: 0-20 mA
Input impedance:	50k Ohm
Typical ctrl pot resistance:	2 - 47k Ohm
Current output range (PWM):	100-3000 mA
PWM dither frequency:	55-200 Hz (adjustable)
Adjustable ramp time:	0.05 - 5 s

Dimensions



Applications

- 12 Vdc and 24 Vdc systems
- Stable control of proportional valves
- High resolution (10 bits) control
- Field - adjustable applications

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Circuit board pinout - Wiring diagram

Power Supply Wiring Color Codes

Blue	(+) Positive from Power Source
Yell./Green	(-) Negative from (GND)

Remote Potentiometer Wiring Color Codes

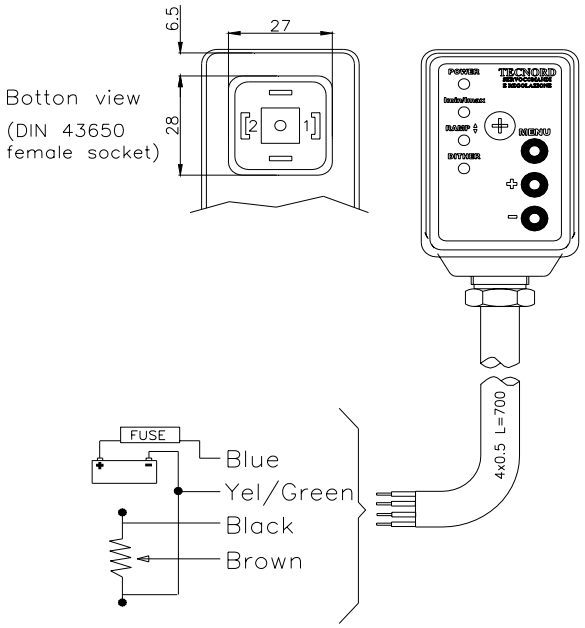
Black	Command signal supply (+5V)
Brown	Command signal in

Proportional Valves Wiring Color Codes

1	Proportional coil output
2	Proportional coil current feedback line

Fuse

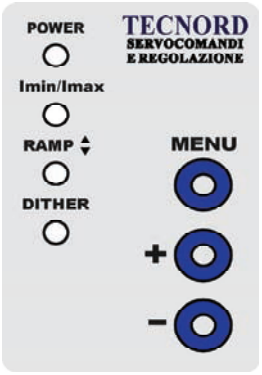
A 5A fuse must be inserted on the BLUE wire connecting the EC-MPC1 driver to the power source.



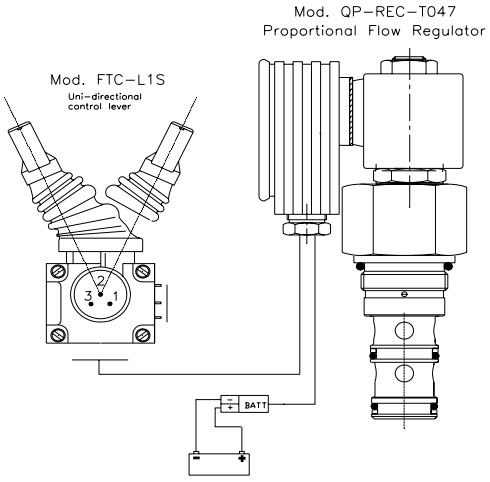
Adjustments

The following adjustments can be made directly from the front key-pad by selecting the 3-pushpins in various combinations:

- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency



Application example



Remote operation of a proportional flow control valve from single axis / unidirectional control lever incorporating a rotary potentiometer and a center / power-off switch

Ordering Information: *EC - PWM - A1 - MPC1 - D*

A- = Adjustable

D = DIN 43650 socket connector

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EC - PWM - A1 - MPC1 - E

Description

Micro-processor based PWM electronic driver for remote control of a single proportional solenoid valve.

Operation

The EC-PWM-MPC1-D Proportional Valve driver supplies a solenoid with a *PWM (Pulse Width Modulated)* current proportional to the input signal from a potentiometer, PLC or other control systems

Adjustments of "Imin/Imax", "Ramp time", "Deadband" and "Dither" can be effected directly from a key-pad integrated on the front panel

Mounting option: Female DIN 43650 socket on valve's side and Male DIN 43650 plug to connect to power source and remote control devices

Features

- The current in the solenoid is independent of change in the coil resistance and in supply voltage variations.
- The inherent superimposed dither frequency helps to overcome friction and stiction effects in the controlled device.
- Supply line is protected against reversed polarity and load dump.
- Input is protected against short circuits to GND and supply.
- Output is protected against short circuits, reversed polarity, over-current and over-temperature.

Specifications

● Operating voltage:	8.5-30 Vdc	
● Max current consumption:	100mA (no load applied)	
● Operating temperature:	-25 / +85 °C	
● Degree of protection:	IP 67	
● Analog input signal:	Standard:	0-5 V
	Option 1:	0-10 V
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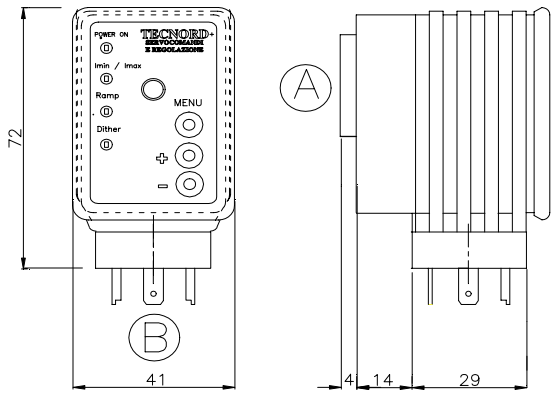
● Input impedance:	50k Ohm	
● Typical ctrl pot resistance:	2 - 47k Ohm	
● Current output range (PWM):	100-3000 mA	
● PWM dither frequency:	55-200 Hz (adjustable)	
● Adjustable ramp time:	0.05 - 5 s	

Dimensions



A : EN 175301-803 Socket (Ex DIN 43650) (To Prop. Valve)
B : EN 175301-803 Plug (from Voltage supply and Remote Control Potentiometer)

Applications

- 12 Vdc and 24 Vdc systems
- Stable control of proportional valves
- High resolution (10 bits) control
- Field - adjustable applications

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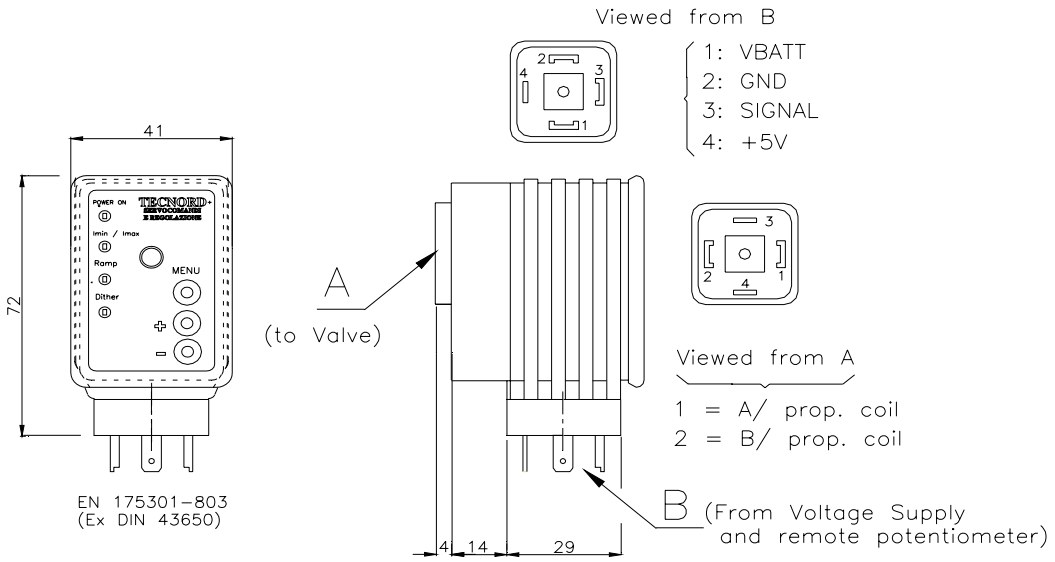
Circuit board pinout - Wiring diagram



Adjustments

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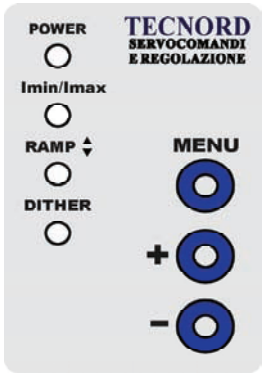
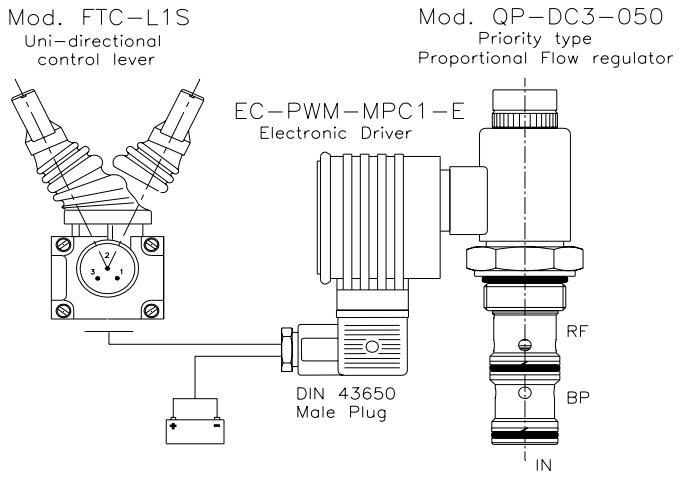
- Imin (minimum output current)
- Imax (maximum output current)
- Ramp-up time
- Ramp-down time
- Dither frequency



Application example



Remote operation of a proportional flow control valve from a single axis / unidirectional control lever incorporating a rotary potentiometer and a center / power-off switch

Ordering Information: ***EC - PWM - A1 - MPC1 - E***

A- = Adjustable

D = DIN 43650 socket connector

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Electronic Joysticks and Switches

Continued Next Page…

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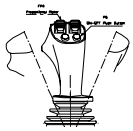
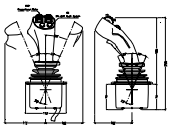
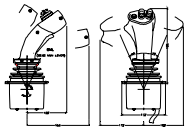


JMF-L4C/NN-MG/A2P9/2FPR 685

JHD-L4C/TT-IC/0100-3 686



JHD-L4C/TT-MG/A2P9/2FPR-3 687



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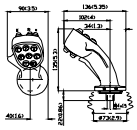
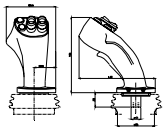
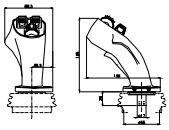


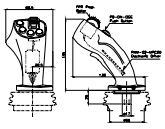
MG-A8P9-0000 689



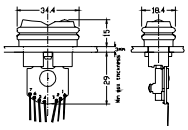
MG-A2P9-2PRS 690



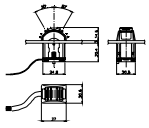
MG-A2P9-2FPR 691



MG-A4P9-1FPR-1PWM 692



PRS-L2S-S0-0-0 693



FPR-L2S-SNCH 694

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Joystick Model Codes

JOYSTICKS

Proportional Control Levers - Joystick Controllers - Ergonomic Handles

MINI Series Control Levers

JLP Series / Low profile control levers

JMF Series multi-functions Joystick Controllers

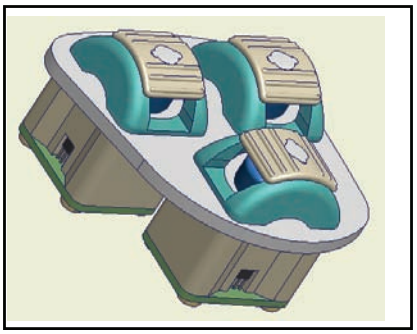
JHD Series multi-functions Joystick Controllers

IE Series Ergonomic Grips

MG Series Ergonomic Grips

FPR - Series proportional Roller Switches

PRS Series Proportional Rocker Switches



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Joystick Controllers

Cross Reference Table

JMF - L4C / MN - MG / A2P9 / 1FPR - 0

- Family & Type
- Main body configuration
- Y-Y/X-X axes analog control configuration
- Type of grip
- Z-Z / ON-OFF controls on handle
- K-K / Analog controls on handle
- Connector type

Tab1	FAMILY AND TYPE	FTC	JLP	JMF	JHD
SIZE		Mini	Mini	Large	Large
Y-Y / X-X AXES & LEVER MOVEMENTS CONFIGURATION		L1S L2S	L2S	L1S L2S L4C L4D	L1S L2S L4C L4D
L1S= Single Axis / Unidirectional L2S= Single axis / Bidirectional	L4C=Dual axes / Cross movement L4D= Multi-axes / All diagonals				
ANALOG CTRL DEVICES ON Y-Y/X-X AXES (See TAB 2 for ref. codes)		3-pin rotary 4-pin rotary	3&4-pin track	3-pin rotary 4-pin rotary	3-pin track 4-pin track
SWITCHED OUTPUTS ON Y-Y / X-X AXES (See TAB 2 for ref. codes)		1 at center 2 at center	2 at center	2 at center	2 at center
HANDLES & GRIPS DESIGNATION:		IP=Paddle IC= Round.	IP=Paddle	IL= Low Profile / No controls IC=Cylindrical / ON-OFF ctrls IE= E-Type / ON-OFF & Analog MG=Multi F / ON-OFF & Analog	
Z-Z On-off push buttons on IE and MG handles				A = 3A Dead Man lever P9 = 3 Amp NO push buttons AP= 200 mA NO push buttons	
K-K Proportional controls IE and MG on handles				PRS= Prop Rocker pot FPR= Prop. Roller pot	
OUTPUT CONNECTORS		0=None 1=AMP(pot only)	2=Dubox	0=None 1=AMP(Pot only)	3= Exit cable 4= Deutsch

Tab2	POTENTIOMETERS & SWITCHED COMBINATIONS	S=40%Vin		S= 50%Vin	S= 80%Vin	S=90%Vin	S=100%Vin
3-PINS ROTARY POT. /ANALOG TRACK ONLY				A		D	
3- PINS ROTARY POT. / 1 NEUTRAL-CENTER SWITCH (EMC)*				B		E	
3-PINS ROTARY POT. / 2 DIRECTIONAL SWITCHES (EMC)*				C		F	
4-PINS ROTARY POT. /ANALOG TRACK ONLY		G					L
4- PINS ROT. POT. / 1 NEUTRAL-CENTER SWITCH (EMC)*		H					M
4-PINS ROTARY POT. / 2 DIRECTIONAL SWITCHES (EMC)*		I					N
				S= 75%Vin	**S= 80%Vin**		**S=100%Vin**
3 & 4 PINS W/ ANALOG & SWITCHED OUTPUTS RESISTIVE TRACKS (RTR)					Q		R
3 - PINS ANALOG W/ SWITCHES (RTR)				O			S
4-PINS W/ ANALOG & SWITCHED OUTPUTS RESISTIVE TRACKS (RTR)				P			T
3-PINS HALL EFFECT SENSOR (Mod. FPR Prop. roller switch only):				U = Special 0.5 -4.5 V output signal / 2.5 V at rest			

(EMC)* = Electro - Mechanical Contact (RTR)** = Resistive Track

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FTC-L1S/A0-IP-0

Features

. Single Axis / Unidirectional
. 3- Pins Rotary Potentiometers
. Optional Enable Switch

Mechanical Specifications

. Lever deflection angle:	50° +/- 1°
. Electrical angle:	50° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (3-pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / A=50% of Vin	1 k ohm +/- 20%
/ D=90% of Vin	2.5 k ohm +/- 20%
/ D=90% of Vin	5 k ohm +/-20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPH 1
. Linearity	2% or better

Neutral Position Switch / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	1.5 A/inductive
. Neutral position switch threshold angle:	+ 4°
. Pot. connector type:	none
	1= AMP Modu / 4 poles

Potentiometer & Switches Options

Y-Y Axis (Main body) Pot.'s & Switches	REFERENCE CODES S=50% Vin	S=90% Vin
3-pin Pot	**A(Std)**	D
3-pin Pot & Neutral Switch	B	E

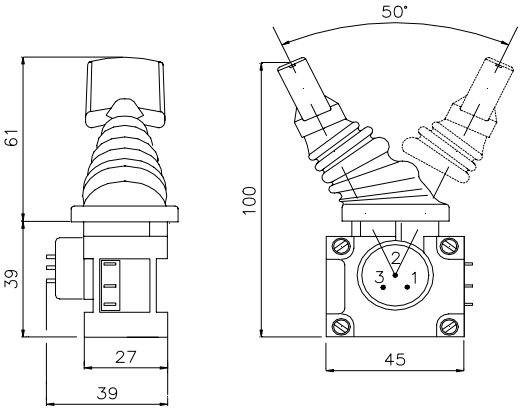
X-X Axis (Main body) Pot.'s & Switches	0 = NOT AVAILABLE
Z-Z Axis (Grip) ON-OFF controls	0 = NOT AVAILABLE
K-K Axis (Grip) Analog Controls	0 = NOT AVAILABLE

Wiring Diagram: *refer to SM-FTC-L2S Service Manual*

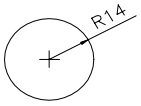
Mod. FTC-L1S/A0-IP-0

Mini / Fingertip proportional control lever

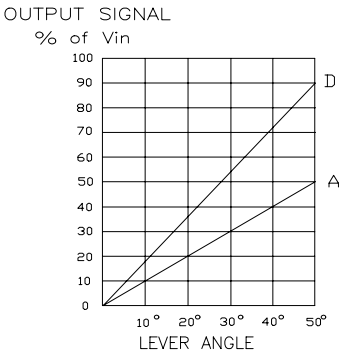
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



3-pins pot. configuration

Ordering Information

FTC - L1S/A0 - IP - *

0 = no exit connector
1= AMP Modu / 4 poles

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FTC-L2S/E0-IP-0

Features

. Single Axis / Bi-Directional
. 3- Pins Rotary Potentiometers
. Optional Center/Power-off or Bi-Directional Switches

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/-25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (3-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / A=50% of Vin	1 k ohm +/- 20%
/ D=90% of Vin	2.5 k ohm +/- 20%
/ D=90% of Vin (Std)	5 k ohm +/-20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPH 1
. Linearity	2% or better

Center/Power- off & Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	1.5 A/inductive
. Directional switches threshold angle:	+/- 4°
. Pot. connector type:	none
	1= AMP Modu / 4 poles

Potentiometer & Switches Options

Y-Y Axis (Main body) Pot.'s & Switches	REFERENCE CODES S=50% Vin	S=90% Vin
3-pin Pot	A	D
3-pin Pot & Center Switch	B	**E(Std)**
3-pin Pot & Bi-Dir. Switch	C	F

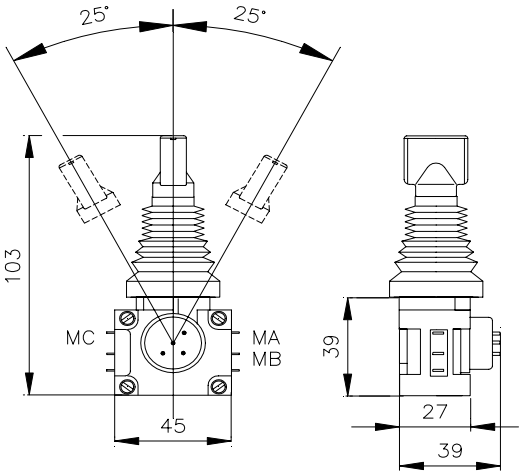
X-X Axis (Main body) Pot.'s & Switches	0 = NOT AVAILABLE
Z-Z Axis (Grip) ON-OFF controls	0 = NOT AVAILABLE
K-K Axis (Grip) Analog Controls	0 = NOT AVAILABLE

Wiring Diagram: *refer to SM-FTC-L2S Service Manual*

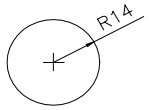
Mod. FTC- L2S /E0 - IP - 0

Mini / Fingertip proportional control lever

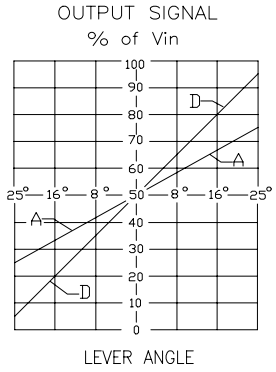
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



4-pins pot. configuration

Ordering Information

Mod. FTC - L2S /E0 - IP - *

0 = no exit connector
1= AMP Modu / 4 poles

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

FTC-L2S/N0-IP-0

Features

. Panel mounting style
. 4- Pins - Center Tap Rotary Potentiometer
. Optional Center/Power-off or Bi-Directional Switches

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/-25° +/- 1°
. Operating temperature range:	-25°C / + 85°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (4-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / G=40% of Vin	10 k ohm +/- 20%
/ L=100% of Vin	5 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPH 1
. Linearity	2% or better

Center/Power- off & Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	1.5 A/inductive
. Directional switches threshold angle:	+/- 4°
. Pot. connector type:	none
	1= AMP Modu / 4 poles

Potentiometers & Switches Options

Y-Y Axis (Main body)	REFERENCE CODES	
Pot.'s & Switches	S=40% Vin	S=100% Vin
4-pin Pot	G	L
4-pin Pot & Center Switch	H	M
4-pin Pot & Bi-Dir. Switch	I	**N (Std)**

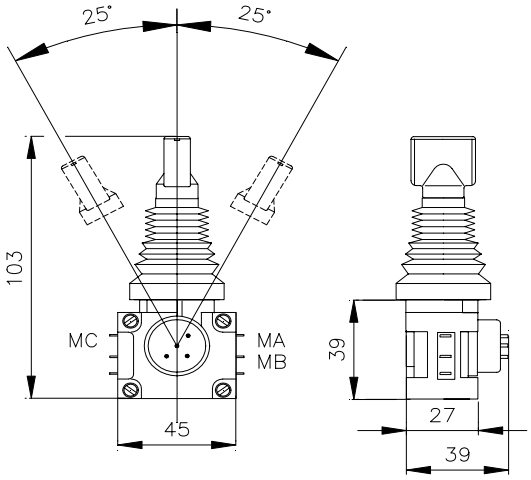
X-X Axis (Main body) Pot.'s & Switches	0 = NOT AVAILABLE
Z-Z Axis (Grip) ON-OFF controls	0 = NOT AVAILABLE
K-K Axis (Grip) Analog Controls	0 = NOT AVAILABLE

Wiring Diagram: *refer to SM-FTC-L2S Service Manual*

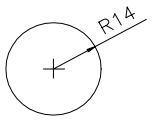
Mod. FTC- L2S / N 0 - IP - 0

Mini / Fingertip proportional control lever

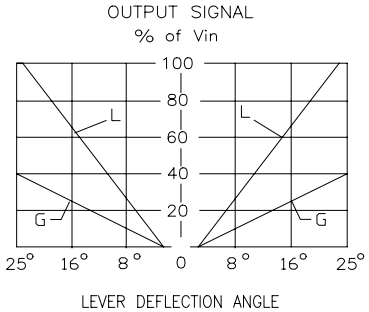
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



Ordering Information

Mod. FTC - L2S / N0 - IP - *

0 = no exit connector
1= AMP Modu / 4 poles

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

JLP-L2S/Q0-IP-D

Features

. Panel mounting style
. 3 pins & 4 pins / center tap potentiometer configuration
. 2 directional center / power-off switches

Mechanical Specifications

. Lever deflection angle:	+/- 32° +/- 1°
. Electrical angle:	+/- 30° +/- 1°
. Operating temperature range:	-25°C / + 85°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Potentiometer (Analog Track)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance : / 080 version	5 k ohm +/- 20%
/ 100 version	4 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 5 (Signal)	50 k ohm
. Max. operating current on pin 5	1 mA
. Output voltage / 080 version	80% of Vin
/ 100 version	100% of Vin
. Linearity	2% or better

Directional Switches

. Typical track resistance:	150 Ohm
. Max. operating input voltage	48 V or +/-24V
. Min. load impedance on pins 2&3 :	50 k ohm
. Max. operating current on pins 2&3	1 mA
. Directional switches threshold angle:	+/- 4°
. Connector type:	7 pin DUBOX
	Mod. 76382.407

Potentiometer & Switches Options

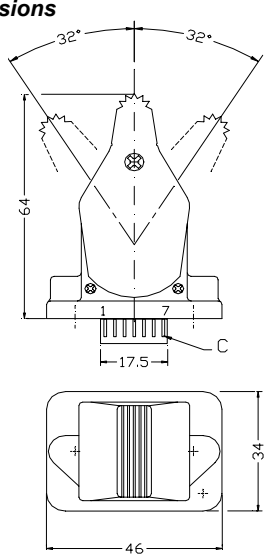
Y-Y Axis (Main body)	REFERENCE CODES	
Pot.'s & Switches	S=80% Vin	S=100% Vin
3-4pin Pot & Bi-Dir Switch	Q	R
X-X Axis (Main body)	0 = NOT AVAILABLE	
Pot.'s & Switches		
Z-Z Axis (Grip)	0 = NOT AVAILABLE	
ON-OFF controls		
K-K Axis (Grip)	0 = NOT AVAILABLE	
Analog Controls		

Wiring Diagram: *refer to SM-JLP-L2S Service Manual*

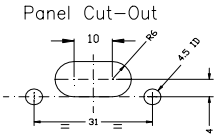
Mod. JLP-L2S / Q0 - IP - D

Single Axis / Bi-directional
Low profile / Fingertip proportional control lever

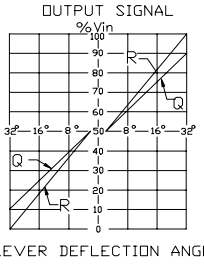
Overall Dimensions



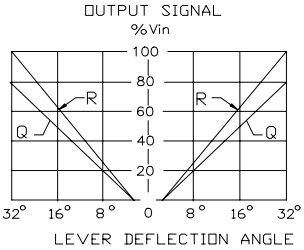
Panel Cut-Out



Output Signal Control Characteristic



3-pins pot. configuration



4-pins pot. configuration

Ordering Information

JLP - L2S / Q0 - IP - D

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

JMF-L2S/F0-IC/0100

Features

. 3 pins Rotary Potentiometers
. Optional Bi-directional Switches
. Cylindrical grip with *DEAD MAN* button or Rocker Switch

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/- 25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (3-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / A=50% of Vin	1 k ohm +/- 20%
/ D=90% of Vin	2.5 k ohm +/- 20%
/ D=90% of Vin (Std)	5 k ohm +/-20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPHS
. Linearity	2% or better

Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	3 A/ Inductive
. Pot. connector type:	none
	1= AMP Mode / 4 poles

Potentiometers & Switches Options

Y-Y Axis (Main body)	REFERENCE CODES	
Pot.'s & Switches	S=50% Vin	S=90% Vin
3-pin Pot	A	D
3-pin Pot & Bi-Dir Switch	C	**F (Std)**

X-X Axis (Main body)	REFERENCE CODES	
Pot.'s & Switches	S=50% Vin	S=90% Vin
3-pin Pot	A	D
3-pin Pot & Bi-Dir Switch	C	**F (Std)**

Z-Z Axis (IC Grip)	REFERENCE CODES
ON-OFF controls	
No push button	0000
Top NO push button	0100
Top rocker switch	0200

K-K Axis (IC Grip)	0 = NOT AVAILABLE
Analog Controls	

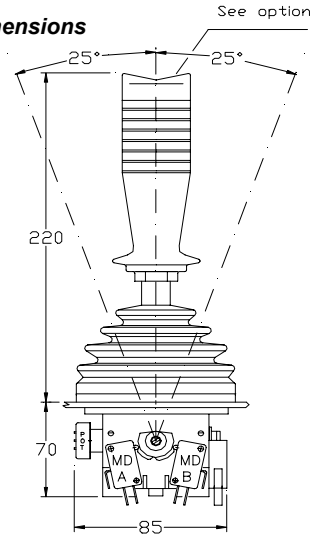
Wiring Diagram: *refer to SM-JMF-L4C Service Manual*

Mod JMF-L2S/F0-IC/0100

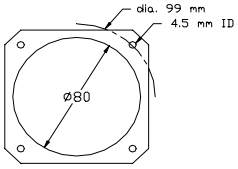
Heavy Duty / Multi-Axis Joystick Controller with IC Cylindrical Grip

*Option **L1S***	*Single axis control / Uni-Directional*
*Option **L2S***	*Single axis control / Bi-directional*
*Option **L4C***	*Cross axis control / Bi-directional*
*Option **L4D***	*Multi-axis control / Bi-directional*

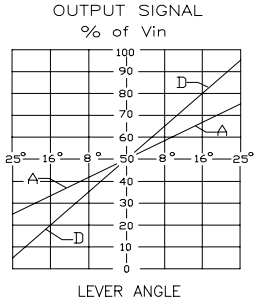
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



Ordering Information

JMF - L** / °° - IC / z z z z

*** = 1S /2S /4C /4D (main body configuration)*
°° = AA / CC / DD / FF (type of pots on main body)
z z z z = 0000 /0100/0200 (push buttons on grip)

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

JMF-L4C/NN-IC/0200

Features

. 4- Pins - Center Tap Rotary Potentiometers
. Optional Bi-Directional Switches
. Cylindrical grip with *DEAD MAN* button or Rocker Switch

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/- 25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (4-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / G=40% of Vin	10 k ohm +/- 20%
/ L=100% of Vin	5 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPHS
. Linearity	2% or better

Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	3 A/ Inductive
. Pot. connector type:	none
	1= AMP Modu / 4 poles

Potentiometers & Switches Options

Y-Y Axis (Main body)	REFERENCE CODES	
Pot.'s & Switches	S=40% Vin	S=100% Vin
4-pin Pot	G	L
4-pin Pot & Bi-Dir. Switch	I	**N (Std)**

X-X Axis (Main body)	REFERENCE CODES	
Pot.'s & Switches	S=40% Vin	S=100% Vin
4-pin Pot	G	L
4-pin Pot & Bi-Dir. Switch	I	**N (Std)**

Z-Z Axis (IC Grip)	REFERENCE CODES
ON-OFF controls	
No push button	0000
Top NORM. OPEN push button	0100
Top rocker switch	0200

K-K Axis (IC Grip)	0 = NOT AVAILABLE
Analog Controls	

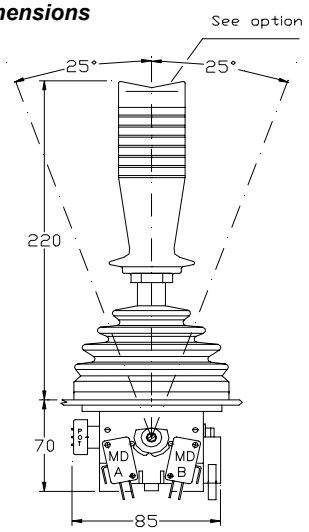
Wiring Diagram: *refer to SM-JMF-L4C Service Manual*

Mod. JMF-L4C /NN-IC/0200

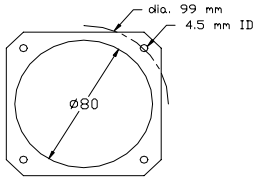
Heavy Duty / Multi-Axis Joystick Controller with IC Cylindrical Grip

*Option **L1S***	*Single axis control / Uni-Directional*
*Option **L2S***	*Single axis control / Bi-directional*
*Option **L4C***	*Cross axis control / Bi-directional*
*Option **L4D***	*Multi-axis control / Bi-directional*

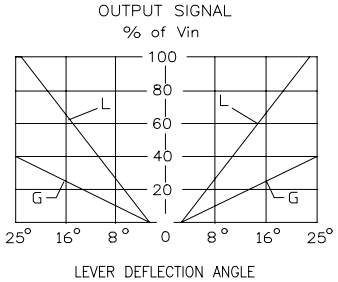
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



Ordering Information

JMF - L** / °° -IC / z z z z

*** = 2S /4C /4D (main body configuration)*
°° = GG / I I / L L / N N (type of pots on main body)
z z z z= 0000 /0100/0200 (push buttons on grip)

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

JMF-L4C/FF-IE/A1P9/1PRS-0

Features

. 3 pins Rotary Potentiometers
. Optional Bi-Directional Switches
. IE type handle

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/- 25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (3-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / A=50% of Vin	1 k ohm +/- 20%
/ D=90% of Vin	2.5 k ohm +/- 20%
/ D=90% of Vin (Std)	5 k ohm +/-20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPHS
. Linearity	2% or better

Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	3 A/ Inductive
. Directional switches threshold angle:	+/- 4°
. Pot. connector type:	none
	1= AMP Modu / 4 poles

Potentiometers & Switches Options

(Y-Y & X-X Axis)	REFERENCE CODES	
Pot.'s & Switches	S=50% Vin	S=90% Vin
3-pin Pot	A	D
3-pin Pot & Bi-Dir Switch	C	**F (Std)**

Z-Z Axis (IE Grip)	REFERENCE CODES
ON-OFF controls	Side & Front panel
No push buttons	0000
Side DEAD MAN push button	A000
1-2-3 push buttons / P9 - 3 Amp	01P9 - 02P9 - 03P9
1-2-3 push buttons / AP - 200 mA	01AP -02AP -03AP

K-K Axis (IE Grip)	REFERENCE CODES
Analog Controls	
No PRS (Prop. Rocker Switch)	0000
No.FPR (Prop. roller)	0000
1 x PRS	1PRS
1x FPR	1FPR

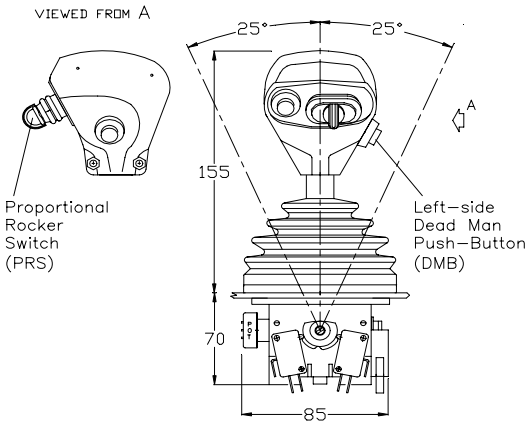
Wiring Diagram: *refer to SM-JMF-L4C Service Manual*

Mod. JMF - L4C/FF-IE/A1P9/1PRS-0

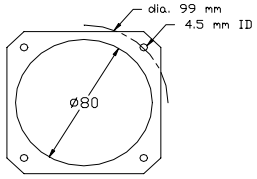
Heavy Duty / Multi-Axis Joystick Controller
with IE Multi-Function ergonomic grip

*Option **L1S**:*	*Single axis control / Uni-Directional*
*Option **L2S***	*Single axis control / Bi-directional*
*Option **L4C***	*Cross axis control / Bi-directional*
*Option **L4D***	*Multi-axis control / Bi-directional*

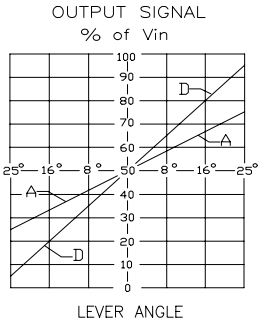
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



Ordering Information

JMF - L** / °° -IE / z z z z / k k k k

*** = 1S /2S /4C /4D (main body configuration)*
°° = AA / CC / DD / FF (type of pots on main body)
z z z z = 01P9 /02P9 /…./A3AP (push buttons on grip)
k k k k = 1PRS/2PRS/1FPR/2FPR

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

JMF-L4C/NN-IE/A1P9/1PRS-0

Features

. 4- Pins - Center Tap Rotary Potentiometers
. Optional Bi-Directional Switches
. IE type handle Designed to be operated with the palm of the hand

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/- 25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (4-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / G=40% of Vin	10 k ohm +/- 20%
/ L=100% of Vin	5 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPHS
. Linearity	2% or better

Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	3 A/ Inductive
. Directional switches threshold angle:	+/- 4°
. Pot. connector type:	none
	1= AMP Modu / 4 poles

Potentiometers & Switches Options

(Y-Y & X-X Axis)	REFERENCE CODES	
Pot.'s & Switches	S=40% Vin	S=100% Vin
4-pin Pot	G	L
4-pin Pot & Bi-Dir. Switch	I	**N (Std)**

Z-Z Axis (IE Grip)	REFERENCE CODES
ON-OFF controls	
No push buttons	0000
Side DEAD MAN push button	A000
1-2-3 push buttons / P9 - 3 Amp	01P9 - 02P9 - 03P9
1-2-3 push buttons / AP - 200 mA	01AP -02AP -03AP

K-K Axis (IE Grip)	REFERENCE CODES
Analog Controls	
No PRS (Prop. Rocker Switch)	0000
No FPR (Prop. roller)	0000
1 x PRS	1PRS
1 x FPR	1FPR

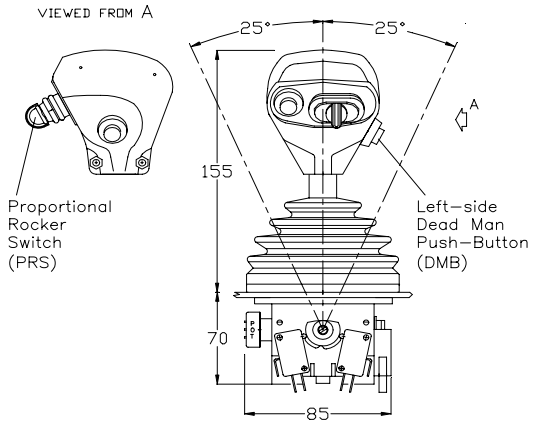
Wiring Diagram: *refer to SM-JMF-L4C Service Manual*

Mod. JMF - L4C/NN-IE/A1P9/1PRS-0

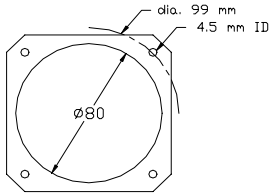
Heavy Duty / Multi-Axis Joystick Controller
with IE Multi-Function ergonomic grip

*Option **L1S**:*	*Single axis control / Uni-Directional*
*Option **L2S***	*Single axis control / Bi-directional*
*Option **L4C***	*Cross axis control / Bi-directional*
*Option **L4D***	*Multi-axis control / Bi-directional*

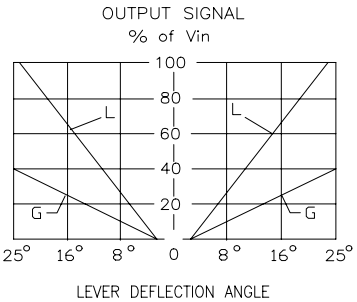
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



4-pins pot
configuration

Ordering Information

JMF - L** / °° -IE / z z z z / k k k k

** = 2S /4C /4D (main body configuration)
°° = GG / I I / L L/ N N (type of pots on main body)
z z z z = 01P9 /02P9 /…./A3AP (push buttons on grip)

k k k k = 1PRS / 2PRS / 1FPR / 2FPR

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

JMF-L4C/NN-MG/A1P9/2PRS-0

Features

. 3-pins and 4- Pins/ Center Tap Rotary Potentiometers
. Optional Center / power-off and Bi-Directional Switches
. MG- type ergonomic grip with PRS / Prop. Rocker Switches

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/- 25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (4-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / G=40% of Vin	10 k ohm +/- 20%
/ L=100% of Vin	5 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPHS
. Linearity	2% or better

Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	3 A/ Inductive
. Directional switches threshold angle:	+/- 4°
. Pot. connector type:	0 = none
	1= AMP Modu / 4 poles

Potentiometers & Switches Options

(Y-Y & X-X Axis)	REFERENCE CODES	
Pot.'s & Switches	S=40% Vin	S=100% Vin
4-pin Pot	G	L
4-pin Pot & Bi-Dir. Switch	I	**N (Std)**

Z-Z Axis (MG Grip)	REFERENCE CODES
ON-OFF controls	
No push buttons	0000
Side DEAD MAN push button	A000
1-2-3….8 push buttons / P9 - 3 Amp	01P9 - 02P9 - …08P9
1-2-3…8 push buttons / AP - 200 mA	01AP -02AP -…08AP

K-K Axis (MG Grip)	REFERENCE CODES
Analog Controls	
No PRS (Prop. Rocker Switch)	0000
1 x PRS	1PRS
2 x PRS	2PRS
3 x PRS	3PRS

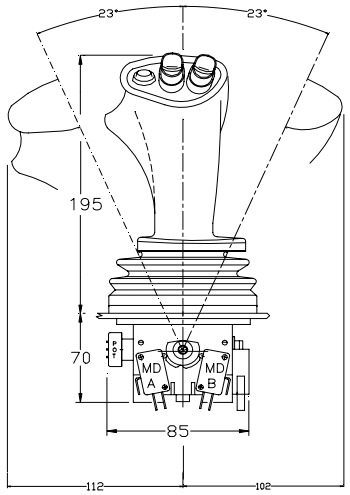
Wiring Diagram: *refer to SM-JMF-L4C Service Manual*

Mod. JMF - L4C/NN-MG/A1P9/2PRS-0

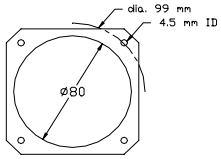
Heavy Duty / Multi-Axis Joystick Controller
with MG Multi-Function ergonomic grip

*Option **L1S** :*	*Single axis control / Uni-Directional*
*Option **L2S***	*Single axis control / Bi-directional*
*Option **L4C***	*Cross axis control / Bi-directional*
*Option **L4D***	*Multi-axis control / Bi-directional*

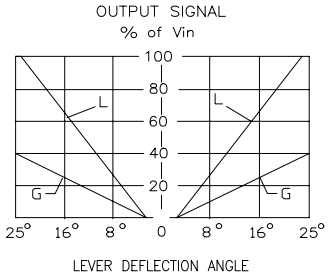
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



4-pins pot configuration

Ordering Information

JMF - L** / °° -MG / z z z z / k k k k - *

** = 2S /4C /4D (main body configuration)
°° = GG / I I / L L/ N N (type of 4-pins pots on main body)
z z z z = 01P9 /08P9 /…./A8AP (push buttons on grip)
k k k k = 1PRS / 2PRS / 3PRS
* = 0 / 1 (Connector type option)

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JMF-L4C/NN-MG/A2P9/2FPR

Features:

. 3-pins and 4- Pins/ Center Tap Rotary Potentiometers
. Optional Center / power-off and Bi-Directional Switches
. MG- type ergonomic grip with FPR Prop. Rollers

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/- 25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (4-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / G=40% of Vin	10 k ohm +/- 20%
/ L=100% of Vin	5 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 2 (Signal)	50 k ohm
. Max. operating current on pin 2	1 mA
. Output voltage	See GRAPHS
. Linearity	2% or better

Directional Switches / EMC* type

. Contacts	Silver Plated
. Max. operating input voltage	48 V or +/-24V
. Max. operating current	3 A/ Inductive
. Directional switches threshold angle:	+/- 4°
. Connectors:	0 = none (Std)

Potentiometers & Switches Options

(Y-Y & X-X Axis)	REFERENCE CODES	
Pot.'s & Switches	S=40% Vin	S=100% Vin
4-pin Pot	G	L
4-pin Pot & Bi-Dir. Switch	I	**N (Std)**

Z-Z Axis (MG Grip)	REFERENCE CODES
ON-OFF controls	
No push buttons	0000
Side DEAD MAN push button	A000
1-2-3….8 push buttons / P9 - 3 Amp	01P9 - 02P9 - …08P9
1-2-3…8 push buttons / AP - 200 mA	01AP -02AP -…08AP

K-K Axis (MG Grip)	REFERENCE CODES
Analog output (Hall effect sensor / 1-5 V output signal)	
No FPR (Prop. Roller)	0000
1 x FPR	1FPR
2 x FPR	2FPR
3 x FPR	3FPR

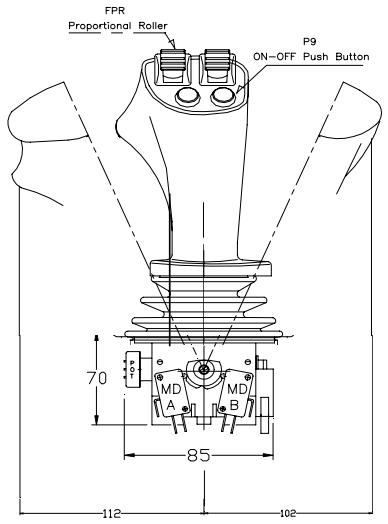
Wiring Diagram: *refer to SM-JMF-L4C Service Manual*

Mod. JMF - L4C/NN-MG/A2P9/2FPR

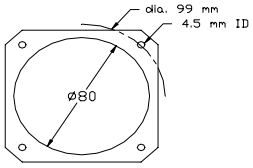
Heavy Duty / Multi-Axis Joystick Controller with MG Multi-Function ergonomic grip

*Option **L2S***	*Single axis control / Bi-directional*
*Option **L4C***	*Cross axis control / Bi-directional*
*Option **L4D***	*Multi-axis control / Bi-directional*

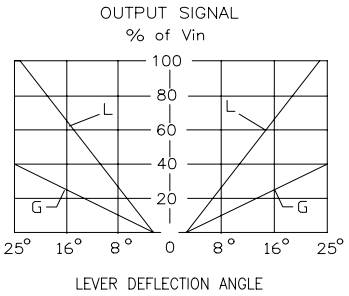
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



4-pins pot configuration

Ordering Information

JMF - L** / °° -MG / z z z z / k k k k

*** = 2S /4C /4D (main body configuration)*
°° = GG / I I / L L/ N N (type of 4-pins pots on main body)
z z z z = 01P9 /08P9 /…./A8AP (push buttons on grip)
k k k k = 1FPR / 2FPR /3FPR

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JHD-L4C/TT-IC/0100-3

Features:

. 3-pins or 4- Pins / Center Tap / RTR (Resistive track)
. Optional Center Bi-Directional Switches
. IC type handle with single/NO and rocker switch push buttons

Mechanical Specifications

. Lever deflection angle:	+/- 25° +/- 1°
. Electrical angle:	+/- 25° +/- 1°
. Operating temperature range:	-25°C / + 80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Electrical Specifications

Analog track (4-Pins Rotary Pot)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / O & P Pot.Options	5 k ohm +/- 20%
/ S & T Pot. Options	3.75 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 5 (Signal)	50 k ohm
. Max. operating current on pin 5	1 mA
. Output voltage / O & P Pot. Options	75% of Vin
/ S & T Pot. Options	100% of Vin
. Linearity	2% or better

Low amperage directional switches on base joystick

. Typical track resistance:	150 Ohm
. Max. operating input voltage	48 V or +/-24V
. Min. load impedance on pins 2&3 :	50 k ohm
. Max. operating current on pins 2&3	1 mA
. Directional switches threshold angle:	+/- 4°
. Connector type:	3 =16 poles cable (Std)
	4= Deutsch HD14-9-16P

Potentiometers & Switches Options

(Y-Y & X-X Axis)	REFERENCE CODES	
Pot.'s & Switches	O/P=75	S/T=100%
3-pin Pot	O	S
4-pin Pot & Bi-Dir Switch	P	T

Z-Z Axis (IC Grip)	REFERENCE CODES
ON-OFF controls	
No push button	0000
Top NORM. OPEN push button	0100
Top rocker switch	0200

K-K Axis (IC Grip)	0 = NOT AVAILABLE
Analog Controls	

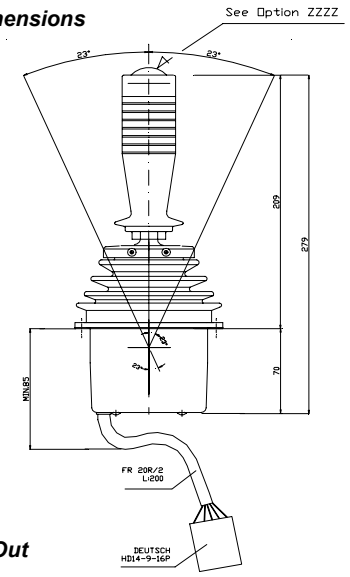
Wiring Diagram: *refer to SM-JHD-L4C Service Manual*

Mod. JHD - L4C/TT-IC/0100- 3

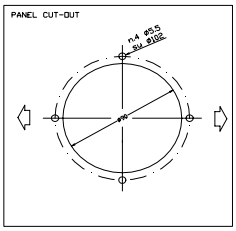
Heavy Duty / Multi-Axis Joystick Controller with IC Cylindrical Grip

*Option **L2S***	*Single axis control / Bi-directional*
*Option **L4C***	*Cross axis control / Bi-directional*
*Option **L4D***	*Multi-axis control / Bi-directional*

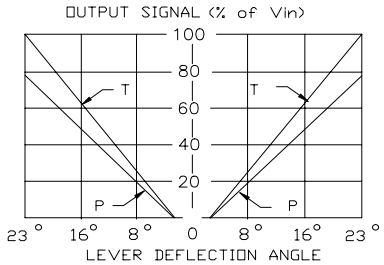
Overall Dimensions



Panel Cut-Out



Output Signal Control Characteristic



4-pins pot configuration

Ordering Information

JHD - L** / °° - IC / z z z z - *

** = 2S /4C /4D (main body configuration)
°° = OO / PP / SS/ TT (type of 3/4-pins pots on main body)
z z z z = 0100 /0200 (push buttons on grip)
* = 3 / 4 (Exit connector type)

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JHD-L4C/TT-MG/A2P9/2FPR-3

Mod. JHD-L4C/TT-MG/A2P9/2FPR-3

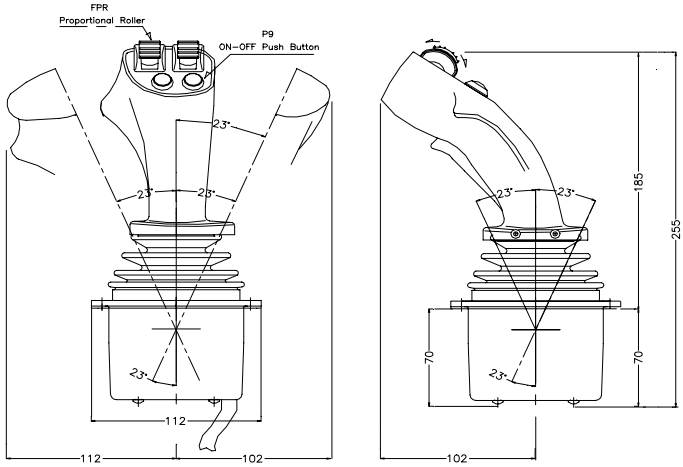
Heavy Duty / Multi-Axis Joystick Controller
with MG Multi-Function ergonomic grip and FPR Prop. Rollers

Features

Mod. ***JHD-L4C*** joystick controller has been designed for use in Mobile Equipment applications in conjunction with TECNORD ***MMS*** electronic drivers to generate analogue and switched signals proportional to the lever deflection angle for the remote control of electro-hydraulic PROPORTIONAL or ON-OFF hydraulic valves of any type and make. A center tap analog track provides an accurate voltage reference for the center position

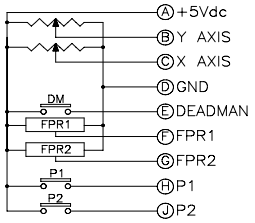
The ***M G*** range of ergonomic handles adopted for this line of joysticks controllers integrates the widest variety of ON-OFF push buttons and PROPORTIONAL ROLLER switches. When coupled with a two - axis base-joystick, up to 3-4-5 analog axes and 2 to 9 ON-OFF push buttons can be integrated in the same joystick package.

Overall dimensions

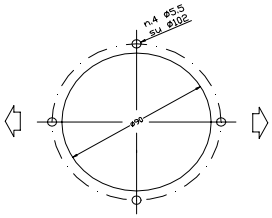


Mechanical Specifications

. Option ***L2S***	*Single axis control / Bi-dir.*
. Option ***L4C***	*Cross axis control / Bi-dir.*
. Option ***L4D***	*Multi-axis control / Bi-dir.*
. Operating temp. range:	-25°C / +80°C
. Protection class:	IP 65
. Life:	3 mill cycles



Wiring diagram



Panel Cut-out

Electrical Specifications

Potentiometers (Analog Tracks on base jstck)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / O & P Pot.Options	5 k ohm +/- 20%
/ S & T Pot. Options	3.75 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 5 (Signal)	50 k ohm
. Max. operating current on pin 5	1 mA
. Output voltage / O & P Pot. Options	75% of Vin
/ S & T Pot. Options	100% of Vin
. Linearity	2% or better

Directional Switches on base joystick

. Typical track resistance:	150 Ohm
. Max. operating input voltage	48 V or +/-24V
. Min. load impedance on pins 2&3 :	50 k ohm
. Max. operating current on pins 2&3	1 mA
. Directional switches threshold angle:	+/- 4°
. Connector type:	3 =16 poles cable (Std)
	4= Deutsch HD14-9-16P
. Counter connector p/n:	Deutsch HD16-P-16S

Wiring Diagram: *refer to SM-JHD-L4C Service Manual*

Potentiometers & Switches Options

(Y-Y & X-X)	REFERENCE CODES	
Base prop. ctrls / Joystick	O/P=75%	S/T=100%
3-pins Pot	O	S
4-pins Pot & Bi-Dir Switch	P	T

Z-Z Axis (MG Grip)	REFERENCE CODES
ON-OFF Controls	
No push buttons	0000
Side DEAD MAN push button	A000
1-2-3….8 push buttons / P9 - 3 Amp	01P9 - 02P9 - …08P9
1-2-3…8 push buttons / AP - 200 mA	01AP -02AP -…08AP

K-K Axis (MG Grip)	REFERENCE CODES
Analog output (Hall effect sensor / 1-5 V output signal	
No FPR (Prop. roller)	0000
1 x FPR	1FPR
2 x FPR	2FPR
3 x FPR	3FPR

Ordering Information

JHD - L** / °° - MG / z z z z - k k k k - *

*** = 2S /4C /4D (main body configuration)*
°° = OO / PP / SS/ TT (type of 3/4-pins pots on main body)
z z z z = P9 / AP (push buttons on grip)
k k k k = 1FPR / 2FPR /3FPR (Prop. Rollers on Grip front)
** = 3 / 4 (Exit connector type)*

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JHD-L4C/TT-MG/A1P9/2PRS-3

Mod. JHD-L4C/TT-MG/A1P9/2PRS - 3

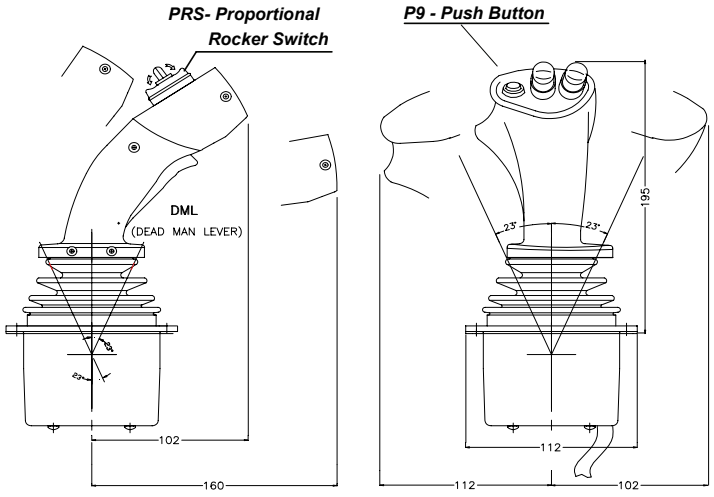
Heavy Duty / Multi-Axis Joystick Controller
with MG Multi-Function ergonomic grip and PRS Prop. Rocker Switches

Features

Mod. ***JHD-L4C*** joystick controller has been designed for use in Mobile Equipment applications in conjunction with TECNORD ***M M S*** electronic drivers to generate analogue and switched signals proportional to the lever deflection angle for the remote control of electro-hydraulic PROPORTIONAL or ON-OFF hydraulic valves of any type and Make. A center tap on the analog track provides an accurate voltage reference for the center position.

The ***M G*** range of ergonomic handles adopted for this line of joysticks controllers integrates the widest variety of ON-OFF push buttons and PROPORTIONAL rocker and roller switches. When coupled with a two - axis base joystick, up to 3-4-5 analog axes and 2 to 9 ON-OFF push buttons can be integrated in the same joystick package.

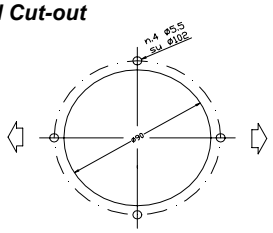
Overall dimensions



Mechanical Specifications

. Option ***L2S***	Single axis control / Bi-dir.
. Option ***L4C***	Cross axis control / Bi-dir.
. Option ***L4D***	Multi-axis control / Bi-dir.
. Operating temp. range:	-25°C / +80°C
. Protection class:	IP 65
. Life:	3 mill cycles

Panel Cut-out



Electrical Specifications

Potentiometers (Analog Tracks on base jstck & PRS)

. Electrical power rating:	0.25 W @ 25°C
. Ohmic resistance: / O & P Pot.Options	5 k ohm +/- 20%
/ S & T Pot. Options	2,5 k ohm +/- 20%
. Max. operating input voltage (Vin):	48 V or +/-24V
. Min. load impedance on pin 5 (Signal)	50 k ohm
. Max. operating current on pin 5	1 mA
. Output voltage / O & P Pot. Options	75% of Vin
/ S & T Pot. Options	100% of Vin
. Linearity	2% or better

Directional Switches on base joystick

. Typical track resistance:	150 Ohm
. Max. operating input voltage	48 V or +/-24V
. Min. load impedance on pins 2&3 :	50 k ohm
. Max. operating current on pins 2&3	1 mA
. Directional switches threshold angle:	+/- 4°

. Connector type:	3 =16 poles cable (Std)
	4= Deutsch HD14-9-16P

Wiring Diagram: *refer to SM-JHD-L4C-MG Service Manual*

Potentiometers & Switches Options

(Y-Y & X-X)	REFERENCE CODES	
Base prop. ctrls / Joystick	O/P=75%	S/T=100%
3-pin Pot & Bi-Dir Switch	O	S
4-pin Pot & Bi-Dir Switch	P	T

Z-Z Axis (MG Grip)	REFERENCE CODES
ON-OFF Controls	
No push buttons	0000
Side DEAD MAN push button	A000
1-2-3….8 push buttons / P9 - 3 Amp	01P9 - 02P9 - …08P9
1-2-3…8 push buttons / AP - 200 mA	01AP -02AP -…08AP

K-K Axis (MG Grip)	REFERENCE CODES
Analog Controls	
No PRS (Prop. Rocker Switch)	0000
1 x PRS	1PRS
2 x PRS	2PRS
3 x PRS	3PRS

*JHD - L** / °° - MG / z z z z - k k k k - **

*** = 2S /4C /4D (main body configuration)*
°° = OO / PP / SS/ TT (type of 3/4-pins pots on main body)
z z z z = P9 / AP (push buttons on grip)
k k k k = 1 PRS / 2 PRS /3 PRS (Prop. Rocker Switches on Grip front)
*** = 3 / 4 (Exit connector type)*

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MG-A8P9-0000

Mechanical Specifications:

. Material:	Thermoplastic
. Color:	Black
. Operating temperature range:	-25 °C / + 85°C
. Connecting hub:	Female thread / M14 x1.5

Electrical Specifications of push buttons

A - Dead man front lever:

. Rated amperage	3 Amp inductive

P9 - Push buttons

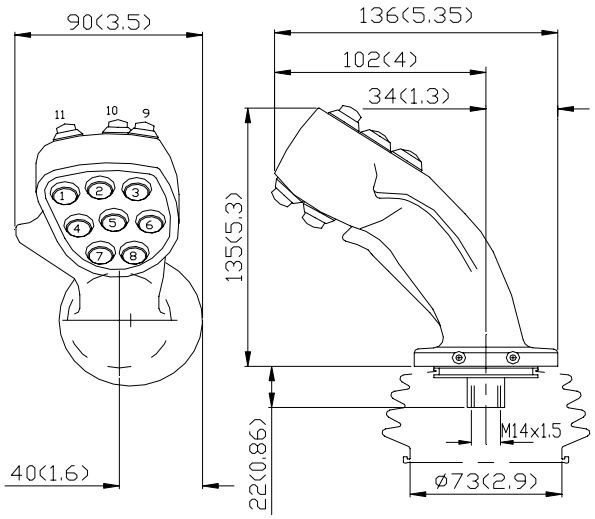
. No. of push buttons on front panel:		up to 8
. No. of push buttons on rear edge:		up to 3
. Rated amperage		3 Amp inductive
. Life:		> 100,000 cycles
. Available colors:	red	Blue
	yellow	black
	green	white

AP - Push buttons

. No. of push buttons on front panel:	up to 8
. No. of push buttons on rear edge:	up to 3
. Typical Amperage rating:	200 mA
. Life:	> 500,000 cycles

Pre-wired exit cable: 250 mm

Overall Dimensions



Mod. MG-A8P9-R3P9

** Rubber gather and retainer ring are supplied separately*

Mod. MG-A8P9-0000

Multi-function ergonomic handle with ON-OFF push buttons

- Optimum ergonomic design
- High performance switches
- Easy adaptability to existing joystick control levers

Ordering Information

	D-man P/B	*Front P/B*	*Rear P/B*
MG-0000-0000	0	0	0
MG-A000-0000	yes	0	0
MG-A1P9-0000:	yes	1xP9	0
MG-A2P9-0000:	yes	2xP9	0
MG-A8P9-0000:	yes	8xP9	0
MG-A8P9-R1P9	yes	8xP9	1xP9
MG-A8P9-R2P9	yes	8xP9	2xP9
MG-A8P9-R3P9	**yes**	**8xP9**	**3xP9**
MG-A1AP -0000	yes	1xAP	0
MG-A2AP-0000	yes	2xAP	0
MG-A8AP-R1AP	yes	8xAP	1xAP
MG-A8AP-R2AP	yes	8xAP	2xAP
MG-A8AP-R3AP	yes	8xAP	3xAP

Phone: (815) 397-6628 Fax: (815) 397-2526 E-mail: delta@delta-power.com

MG-A2P9-2PRS

Mechanical Specifications:

. Material:	Thermoplastic
. Plastic handle color	Black
. Operating temperature range:	-25 °C / + 85°C
. Connecting joint:	Female thread / M14 x1.5

Electrical Specifications of push buttons

A / Dead man front lever & P9 / Push buttons

. Rated amperage	3 Amp inductive
. Life:	> 100,000 cycles

AP - Push buttons

. Rated amperage	200 mA
. Life:	> 500,000 cycles

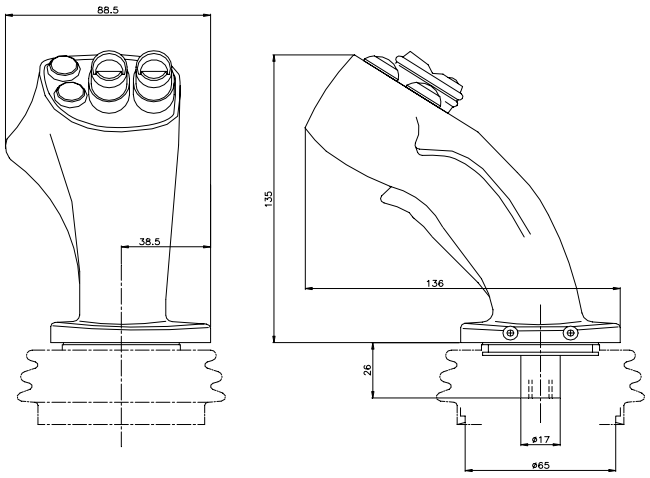
PRS Proportional Rocker Switch

. Configuration:	3-pins resistive pot
	4-pins / Center tap
	2 x Center /Power-off switched outputs

. Rotation angle:	+/- 24°
. Resistive track power rating:	0.5 Watt @ 25°C
. Resistive track Ohmic resistance:	5 k Ohm +/- 20%
. Linearity	2%
. Vin (max)	48V or +/- 24V
. Rated output current of potentiometer:	1 mA
. Rated current of switched outputs:	1 mA
. Min resistive load on bidirectional switched outputs:	50 k Ohm
. Operating temperature range:	-25 °C / + 85°C
. Environmental protection degree (above panel):	IP67
. Life:	>1.000.000 cycles

Pre-wired exit cable: 250 mm

Overall Dimensions



Mod. MG-A2P9-2PR

** Rubber gather and retainer ring are supplied separately*

Mod. MG-A2P9-2PRS

Multi-function ergonomic handle with ON-OFF push buttons and PRS Proportional Rocker Switches

- Optimum ergonomic design
- High performance switches
- Easy adaptability to existing joystick control levers

Ordering Information

	D-man P/B	Front P/B	Front PRS
MG-01P9-1PRS	0	1xP9	1
MG-A2P9-1PRS	yes	2xP9	1
MG-A3P9-1PRS	yes	3xP9	1
MG-A4P9-1PRS	yes	4xP9	1
MG-01P9-2PRS	0	1xP9	2
MG-A1P9-2PRS	yes	1xP9	2
MG-A2P9-2PRS	**yes**	**2xP9**	**2**
MG-0000-2PRS	0	0	2
MG-A000-2PRS	yes	0	2
MG-A000-3PRS	yes	0	3
MG-01AP-1PRS	0	1xAP	1
MG-A2AP-1PRS	yes	2xAP	1
MG-A3AP-1PRS	yes	3xAP	1
MG-A4AP-1PRS	yes	4xAP	1
MG-01AP-2PRS	0	1xAP	2
MG-A1AP-2PRS	yes	1xAP	2
MG-A2AP-2PRS	yes	2xAP	2

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MG-A2P9-2FPR

Mechanical Specifications:

. Material:	Thermoplastic
. Plastic handle color	Black
. Operating temperature range:	-25°C / + 85° C
. Connecting joint:	Female thread / M14 x1.5

Electrical Specifications of push buttons

A - Dead man front lever:

. Rated amperage	3 Amp inductive
. Life:	> 100,000 cycles

P9 - Push buttons

. Rated amperage	3 Amp inductive
. Life:	> 100,000 cycles

AP - Push buttons

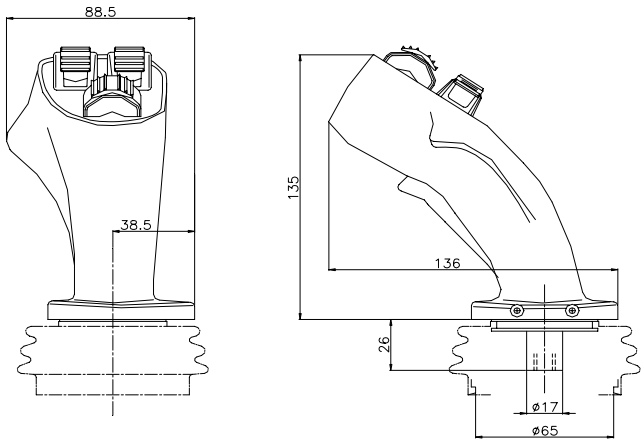
. Rated amperage	200 mA
. Life:	> 500,000 cycles

FPR Proportional Roller

. Configuration:	3-pins connection / Hall Effect contactless sensor
. Rotation angle	+/- 23°
. Supply voltage:	8-32 Vdc
. Current consumption at rest:	25 mA
. Signal output @ rest:	2.5 Vdc +/-0.0V
. Full output signal range:	0.5 - 4.5 V, +/-0.2V
. Rated output current:	1 mA
. Operating temperature range:	-25 °C / + 85°C
. Environmental protection degree (above panel):	IP67
. Life:	>5.000.000 cycles

Pre-wired exit cable:	250 mm

Overall Dimensions



Mod. MG-A000-3FPR

** Rubber gather and retainer ring are supplied separately*

Mod. MG-A2P9-2FPR

Multi-function ergonomic handle with ON-OFF push buttons and FPR Proportional Rollers

- Optimum ergonomic design
- High performance switches
- Easy adaptability to existing joystick control levers

Ordering Information

	D-man P/B	*Front P/B*	*Front FPR*
MG-01P9-1FPR	0	1xP9	1
MG-A2P9-1FPR	yes	2xP9	1
MG-A3P9-1FPR	yes	3xP9	1
MG-A4P9-1FPR	yes	4xP9	1
MG-01P9-2FPR	0	1xP9	2
MG-A1P9-2FPR	yes	1xP9	2
MG-A2P9-2FPR	**yes**	**2xP9**	**2**
MG-0000-2FPR	0	0	2
MG-A000-2FPR	yes	0	2
MG-A000-3FPR	**yes**	**0**	**3**
MG-01AP-1FPR	0	1xAP	1
MG-A2AP-1FPR	yes	2xAP	1
MG-A3AP-1FPR	yes	3xAP	1
MG-A4AP-1FPR	yes	4xAP	1
MG-01AP-2FPR	0	1xAP	2
MG-A1AP-2FPR	yes	1xAP	2
MG-A2AP-2FPR	yes	2xAP	2

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MG-A4P9-1FPR-1PWM

Mechanical Specifications:

. Material:	Thermoplastic
. Plastic handle color	Black
. Operating temperature range:	-25°C / + 85° C
. Connecting joint:	Female thread / M14 x1.5

Electrical Specifications of push buttons

A/ Dead man front lever & P9/ Push Buttons

. Rated amperage	3 Amp inductive
. Life:	> 100,000 cycles

FPR Proportional Roller

. Configuration:	3-pins connection / Hall Effect contactless sensor
. Rotation angle	+/- 23°
. Supply voltage:	8-32 Vdc
. Current consumption at rest:	25 mA
. Signal output @ rest:	2.5 Vdc +/-0.0V
. Full output signal range:	0.5 - 4.5 V, +/-0.2V
. Rated output current:	1 mA
. Operating temperature range:	-25 °C / + 85°C
. Environmental protection degree (above panel):	IP67
. Life:	>5.000.000 cycles

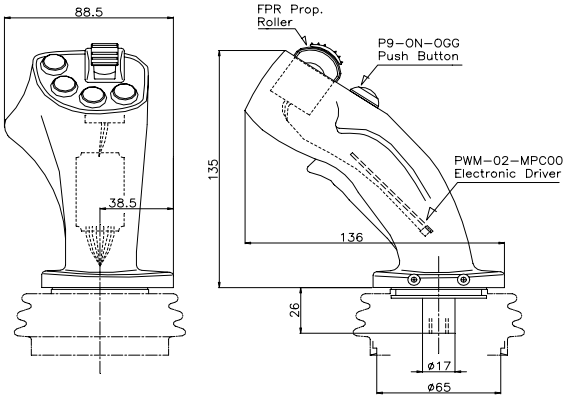
PWM - Pulse Width Modulated output current driver

. Supply voltage:	8 - 32 Volt
. Max. current draw:	100 mA
. Current output range:	Factory set btw 0 and 1400 mA
. PWM dither frequency:	100 Hz
. Operating temperature range:	-25°C/+85°C

Pre-wired exit cable:

. Standard length	250 mm
. Wiring diagram:	Refer to MG-1FPR - PWM Service Manual

Overall Dimensions



Mod. MG-A4P9-1FPR-1PWM

** Rubber gather and retainer ring are supplied separately*

Mod. MG-A4P9-1FPR-1PWM

Multi-function ergonomic handle with ON-OFF push buttons, 1 x FPR Proportional Rollers and built-in PWM driver for a bidirectional / dual proportional coil

- Optimum ergonomic design
- High performance switches
- Easy adaptability to existing joystick control levers

Ordering Information

	D-man P/B	Front P/B	FPR	PWM
MG-01P9-1FPR-1PWM	0	1xP9	1	1
MG-A2P9-1FPR-1PWM	yes	2xP9	1	1
MG-A3P9-1FPR-1PWM	yes	3xP9	1	1
MG-A4P9-1FPR-1PWM	**yes**	**4xP9**	**1**	**1**
MG-01AP-1FPR-1PWM	0	1xAP	1	1
MG-A2AP-1FPR-1PWM	yes	2xAP	1	1
MG-A3AP-1FPR-1PWM	yes	3xAP	1	1
MG-A4AP-1FPR-1PWM	yes	4xAP	1	1

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PRS-L2S-S0-0-0

Mechanical Specifications:

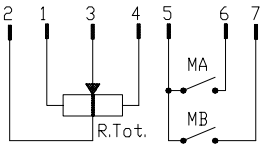
. Main body material:	Acetyl resin / Teflon compound
. Rubber gather material	EPDM / 35-45 shore - A
. Rubber gather color	Black
. Operating temperature range:	-25°C / + 85° C
. Environmental protection	IP 66 (above panel)
. Life:	>1.000.000 cycles

Electrical Specifications

. Configuration: 3-pins resistive pot. w/o directional switches
4-pins resistive pot. w/ bidirectional switches

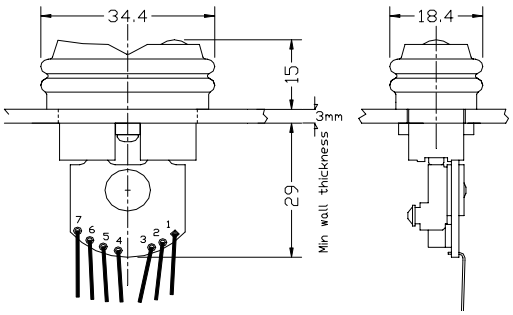
. Mechanical rotation angle	+/- 24°
. Resistive track power rating:	0.5 Watt @ 25°C
. Resistive track Ohmic resistance:	5 k Ohm +/- 20%
. Linearity	2%
. Vin (max)	48V or +/- 24V
. Rated output current of potentiometer:	1 mA
. Rated current of switched outputs:	1 mA
. Min resistive load on bidirectional switched outputs:	50 k Ohm
. Operating temperature range:	-25 °C / + 85°C
. Pre-wired exit cable:	250 mm

Electrical Schematic

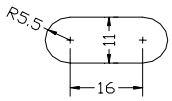


P & T version
4-pins type

Overall Dimensions



Panel cut - out



Ordering Information

Mod. MG - L2S - ° ° - *

° ° = O / S (75%/ 100% 3-pins pot.) - P / T (75% / 100% 4 pin pots)
Q / R (80% / 100% 3 & 4 pins)
* = 0 / L (with or without mini-paddle)

Mod. PRS - L2S - S0 - 0 - 0

Mini Proportional Rocker Switch with built-in bidirectional switched outputs

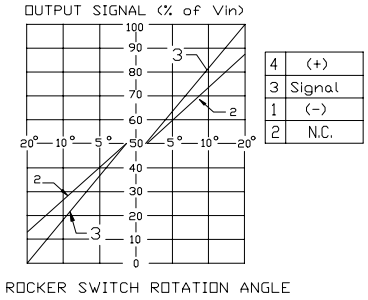
- Optimum ergonomic design for panel-mounting on remote control boxes and for the retrofitting of joystick handles

- High performance resistive tracks

Ordering Information

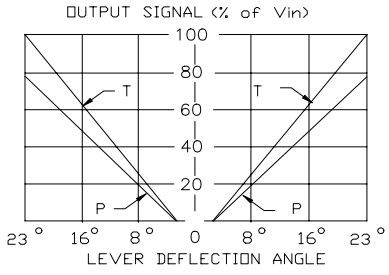
3 - PINS / STD CONFIGURATION

PRS - L2S - O0 3-pins pot - 75% of Vin / Bidir. switches
PRS - L2S - S0 3-pins pot - 100% of Vin / Bidir. switches



4-PINS / CENTER TAP CONFIGURATION

PRS - L2S - P0 4-pins pot - 75% of Vin / Bidir. switches
PRS - L2S - T0 4-pins pot - 100% of Vin / Bidir. switches



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PRS-L2S-SNCH

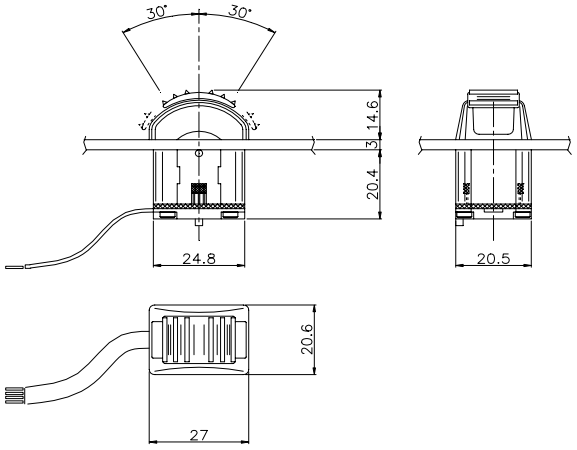
Mechanical Specifications:

. Main body material:	Acetal resin & Teflon compound
. Main body colour:	Yellow
. Rubber gaither material	EPDM / 35-45 shore - A
. Operating temperature range:	-25°C / + 85° C
. Environmental protection	IP 68
. Life:	>5.000.000 cycles

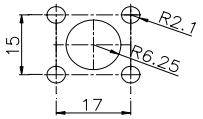
Electrical Specifications

. Configuration:	3-pins connection / Hall Effect contactless sensor	
. Rotation angle		+/- 30°
. Supply voltage:		8-32 Vdc
. Current consumption at rest:	SNCH (S1 only)	15 mA
	TWCH (S1/S2 9	25 mA
. Signal output @ rest:		2.5 Vdc +/-0.1V
. Full output signal range:		0.5 - 4.5 V, +/-0.2V
. Rated output current:		1 mA
. Operating temperature range:		-25 °C / + 85°C
. Environmental protection degree (above panel):		IP67
. Life:		>5.000.000 cycles

Overall Dimensions



Panel cut-out



Electrical Connections:

FPR - L2S - SNCH- 0
(Single channell)

Yellow:	+ 5Vdc
Orange:	(-) Ground
Red:	S1
Brown:	not used

FPR - L2S - TWCH - 0
(Twin channell)

Yellow:	+ 5Vdc
Orange:	(-) Ground
Red:	S1
Brown:	S2

Mod. FPR - L2S - SNCH

- Mini Proportional Roller Switch with built-in bidirectional switched outputs

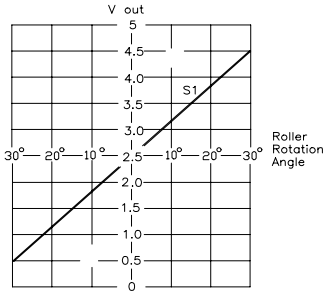
- Optimum ergonomic design for panel-mounting on remote control boxes and for the retrofitting of joystick handles

- High performance Hall Effect Sensor Circuitry

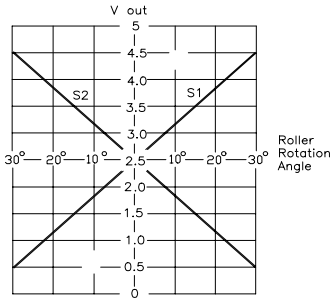
- Single Channell and Twin Channell configurations

Control Characteristic

FPR - L2S - SNCH - 0 (Single Channell)



FPR - L2S - TWCH - 0 (Twin Channell)



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