

## JOYSTICKS AND GRIPS



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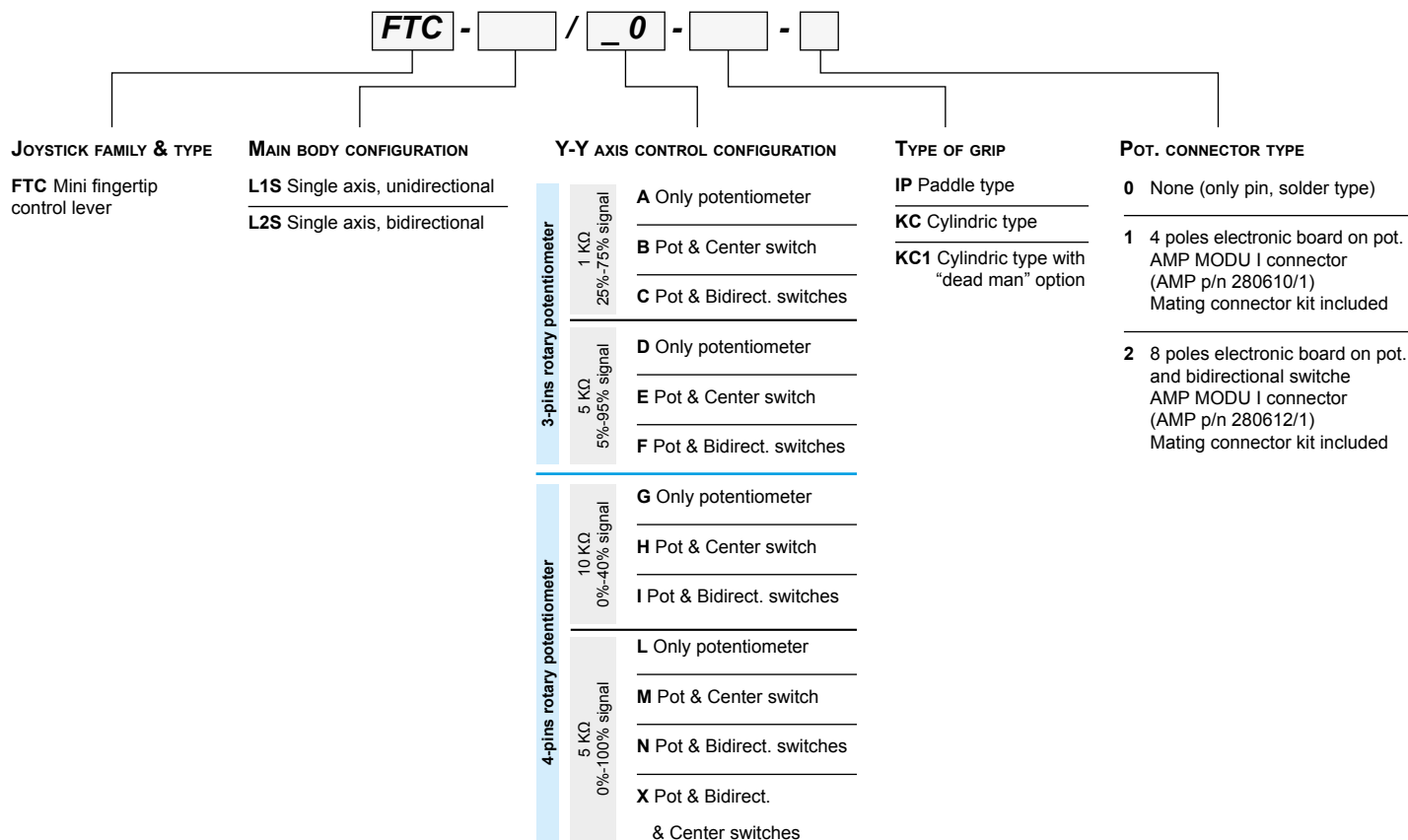
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## FINGERTIP PROPORTIONAL CONTROL LEVERS AND SWITCHES

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FTC proportional control lever	JK4	JK9
FTH contactless proportional control lever	JK5	JK12
JLP proportional control lever	JK6	JK14
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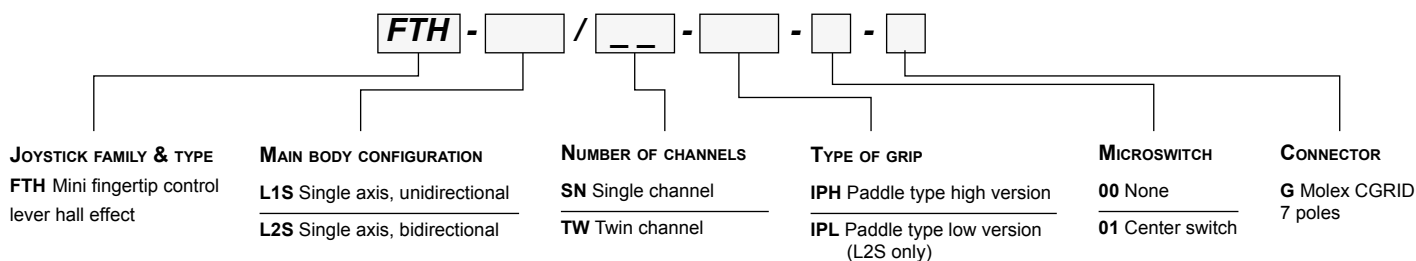
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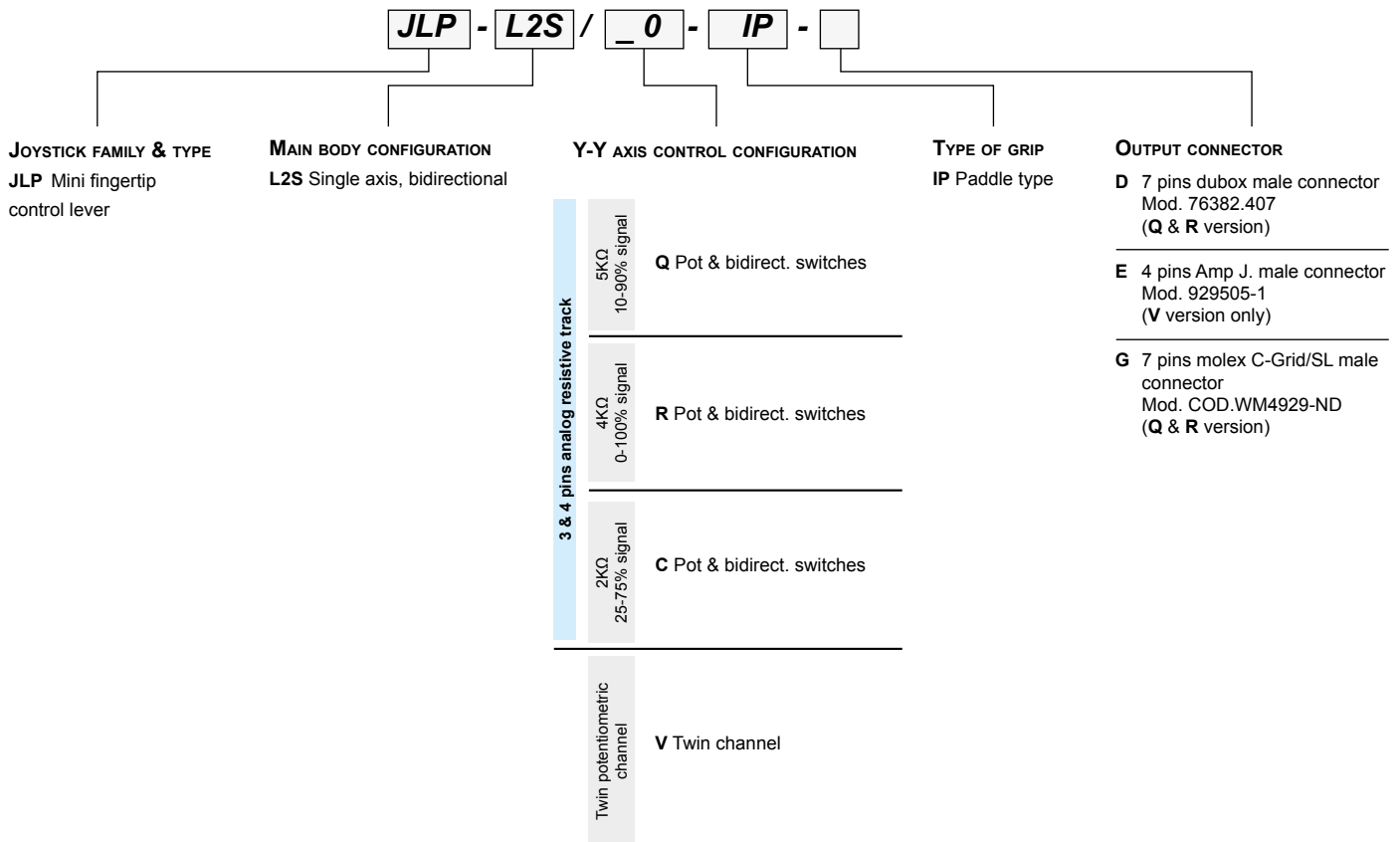


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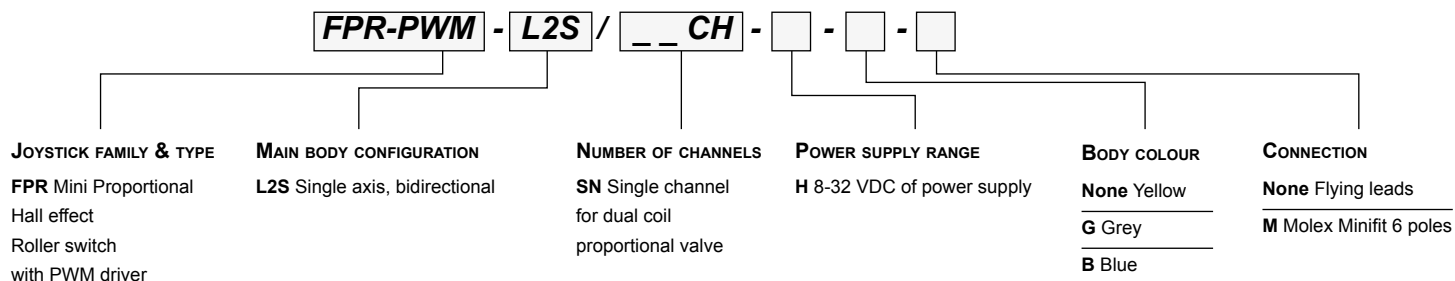
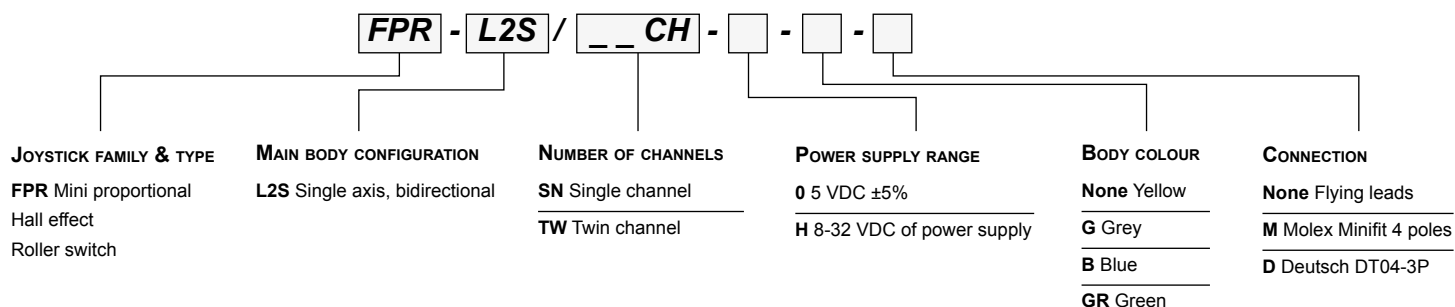
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**FPR** FINGERTIP PROPORTIONAL SWITCHES

ORDERING INFORMATION



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**FTC-L1S FINGERTIP PROPORTIONAL CONTROL LEVER**

**FEATURES**

- Single axis / unidirectional.
- 3-pins rotary potentiometer.
- 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 (above panel)
Life:	3 million cycles

**ELECTRICAL SPECIFICATIONS**

**3-pins rotary potentiometer**

Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of Vin	1 kΩ ±20%
/ D = 90% of Vin	5 kΩ ±20%
Max. operating input voltage (Vin):	48 V or ±24 V
Min. load impedance on pin 2 (signal):	50 kΩ
Max. operating current on pin 2:	1 mA
Output voltage:	see graph
Linearity (resistive track):	2% or better
Connection type:	0 = solder type (no connector) 1 = AMP Modu I/ 4 poles con. (mating connector kit included)

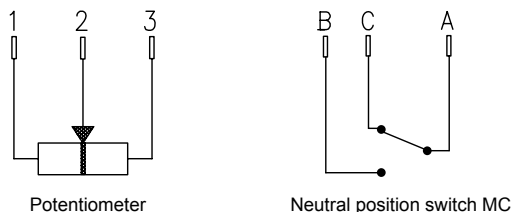
**Neutral position switch (electromechanical type)**

Contact:	silver plated (solder type)
Max. operating input voltage:	48 V or ±24 V
Max. operating current:	1.5 A / inductive
Neutral pos. switch threshold angle:	+4°
Protection class:	IP 55 (IP 67 available on request)

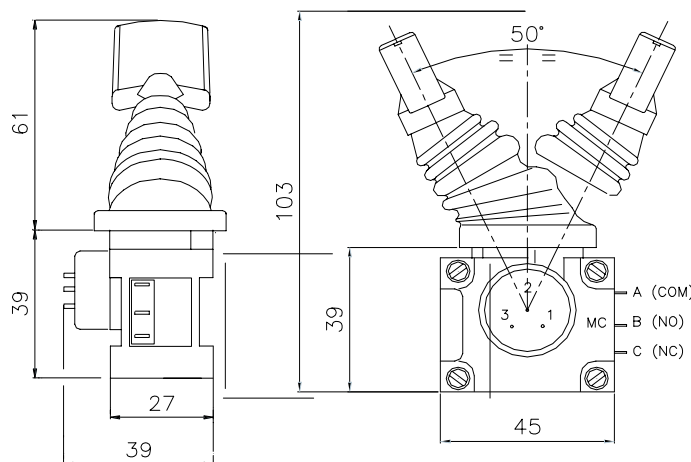
**POTENTIOMETER & SWITCHES OPTIONS**

	Reference codes	
Output signal	S= 50% Vin	S= 90% Vin
3-pins pot	A (Std)	D
3-pins pot & enable switch	B	E

**ELECTRICAL CONNECTIONS**

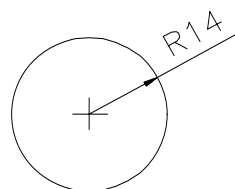


**OVERALL DIMENSIONS**

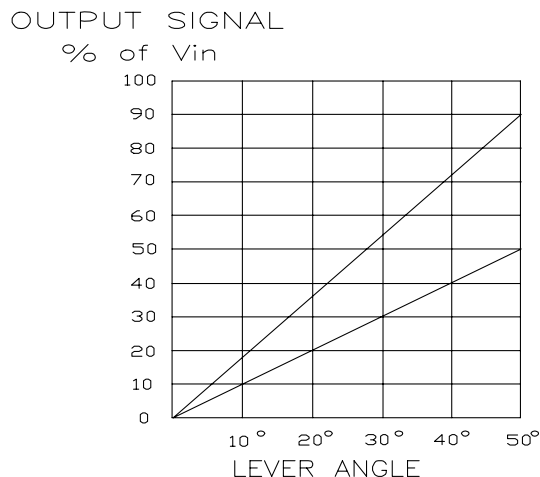


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

**PANEL CUT-OUT**



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



**FTC ORDERING INFORMATION: see page JK4**

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**FTC-L2S FINGERTIP PROPORTIONAL CONTROL LEVER**

**FEATURES**

- Single axis / bidirectional.
- 3-pins rotary potentiometer.
- Optional center / power-off or bidirectional switches.

**MECHANICAL SPECIFICATIONS**

Lever deflection angle:	$\pm 25^\circ \pm 1^\circ$
Electrical angle:	$\pm 25^\circ \pm 1^\circ$
Operating temperature range:	$-25^\circ\text{C} / +80^\circ\text{C}$
Protection class:	IP 65 (above panel)
Life:	3 million cycles

**ELECTRICAL SPECIFICATIONS**

**3-pins rotary potentiometer**

Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of $V_{in}$	1 k $\Omega$ $\pm 20\%$
/ D = 90% of $V_{in}$	5 k $\Omega$ $\pm 20\%$
Max. operating input voltage ( $V_{in}$ ):	48 V or $\pm 24$ V
Min. load impedance on pin 2 (signal):	50 k $\Omega$
Max. operating current on pin 2:	1 mA
Output voltage:	see graph
Linearity (resistive track):	2% or better
Connection type:	0 = solder type (no connector) 1 = AMP Modu I / 4 poles con. (mating connector kit included)

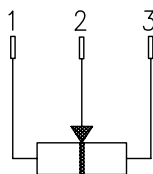
**Center / bidirectional switches (electromechanical type)**

Contacts:	silver plated (solder type)
Max. operating input voltage:	48 V or $\pm 24$ V
Max. operating current:	1.5 A/inductive
Neutral pos. switch threshold angle:	$+4^\circ$
Protection class:	IP 55

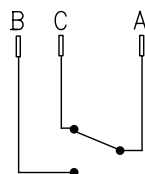
**POTENTIOMETER & SWITCHES OPTIONS**

	Reference codes	
Output signal	S= 50% $V_{in}$	S= 90% $V_{in}$
3-pin potentiometer	A	D
3-pin pot & center switch	B	E (Std)
3-pin pot & bidirectional switch	C	F

**ELECTRICAL CONNECTIONS**

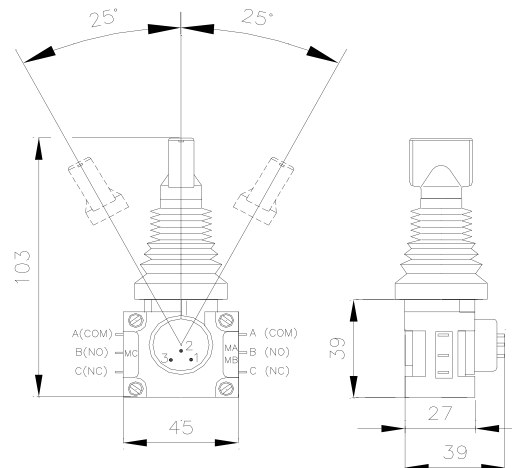


Potentiometer



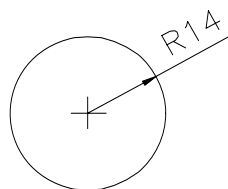
Same schematic for MA, MB (bidirectional switches) or MC (center switch)

**OVERALL DIMENSIONS**

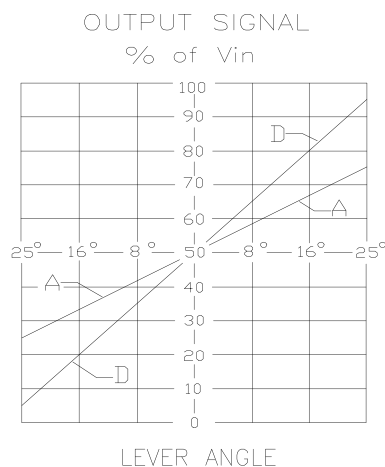


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

**PANEL CUT-OUT**



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



3-pins potentiometer configuration

**FTC ORDERING INFORMATION: see page JK4**

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**FTC-L2S FINGERTIP PROPORTIONAL CONTROL LEVER**

**FEATURES**

- Single axis / bidirectional.
- 4-pins rotary potentiometer.
- Optional center / power-off or bidirectional switches.

**MECHANICAL SPECIFICATIONS**

Lever deflection angle:	$\pm 25^\circ \pm 1^\circ$
Electrical angle:	$\pm 25^\circ \pm 1^\circ$
Operating temperature range:	-25°C / +80°C
Protection class:	IP 65 (above panel)
Life:	3 million cycles

**ELECTRICAL SPECIFICATIONS**

**4-pins rotary potentiometer**

Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / G = 40% of Vin	1 kΩ ± 20%
/ L = 100% of Vin	5 kΩ ± 20%
Max. operating input voltage (Vin):	48 V or ±24 V
Min. load impedance on pin 2 (signal):	50 kΩ
Max. operating current on pin 2:	1 mA
Output voltage:	see graph
Linearity (resistive track):	2% or better
Connection type:	0 = solder type (no connector) 1 = AMP Modu I/ 4 poles con. (mating connector kit included)

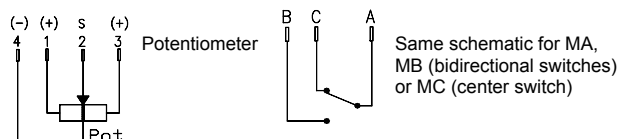
**Center / bidirectional switches (electromechanical type)**

Contacts:	silver plated (solder type)
Max. operating input voltage:	48 V or ±24 V
Max. operating current:	1.5 A/inductive
Neutral pos. switch threshold angle:	+4°
Protection class:	IP 55 (IP 67 available on request)

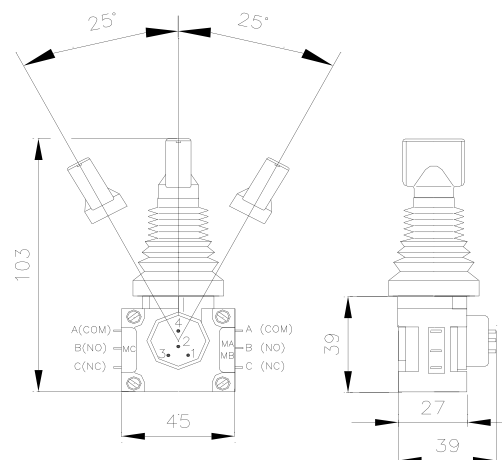
**POTENTIOMETER & SWITCHES OPTIONS**

	Reference codes	
Output signal	S= 40% Vin	S= 100% Vin
4-pin potentiometer	G	L
4-pin pot & center switch	H	M
4-pin pot & bidirectional switches	I	N (Std)
4-pin pot & bidirectional switches & center switch	None	X

**ELECTRICAL CONNECTIONS**

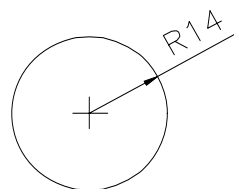


**OVERALL DIMENSIONS**

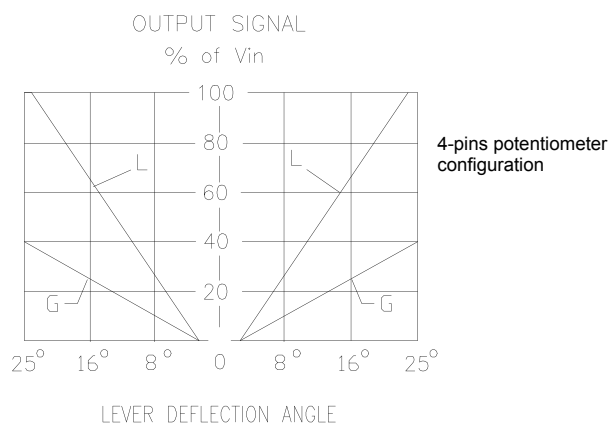


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

**PANEL CUT-OUT**



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



**FTC ORDERING INFORMATION: see page JK4**

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**FTH-L1S CONTACTLESS FINGERTIP PROPORTIONAL CONTROL LEVER**

**FEATURES**

- Single axis / unidirectional.
- Contactless, hall effect sensor.
- Optional "out of neutral" switch.
- Optional dual sensor (redundant).

**MECHANICAL SPECIFICATIONS**

Lever deflection angle:	50° ±1°
Electrical angle:	50° ±1°
Operating temperature range:	-25°C / +80°C
Protection class:	IP 67
Life:	> 3 million cycles (without switch)
Connector:	molex CGRID/SL, 7 male pins

**ELECTRICAL SPECIFICATIONS**

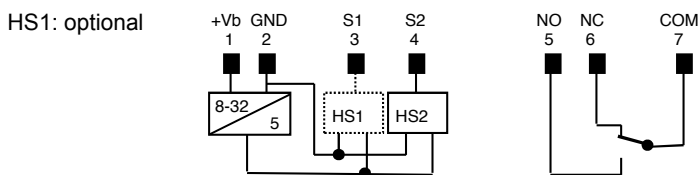
**Linear, hall-effect sensor**

Power supply voltage:	8÷32 VDC
Current consumption:	< 15 mA (30 mA with 2 sensors)
Output signal in neutral:	< 0.1 V
Output signal range:	0.5 V ÷ 4.5 V
Tolerance on output signal:	±0.1 V
Linearity:	< 2%
Max. output current:	1 mA
Directional switch operating voltage:	< 48 VDC
Directional switch max. current:	1 A

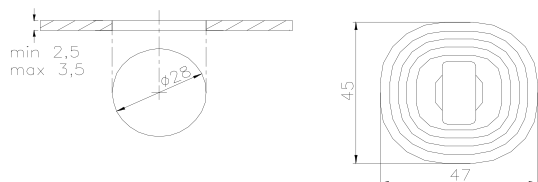
**Neutral position switch (electromechanical type)**

Contacts:	silver plated (solder type)
Max. operating input voltage:	48 V or ±24 V
Max. operating current:	1 A
Neutral pos. switch threshold angle:	7°
Protection class:	IP 67

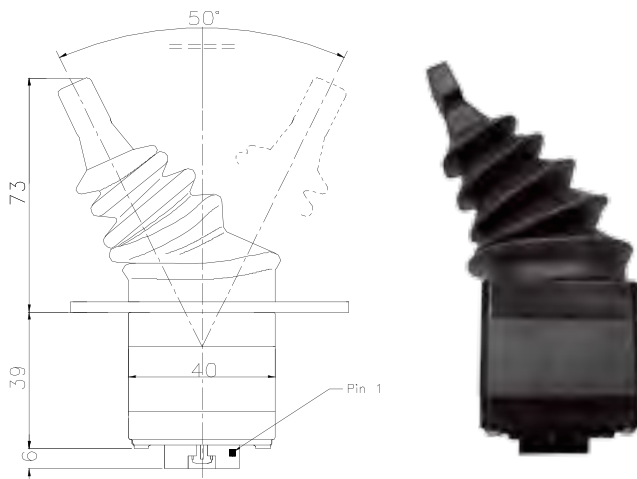
**ELECTRICAL CONNECTIONS**



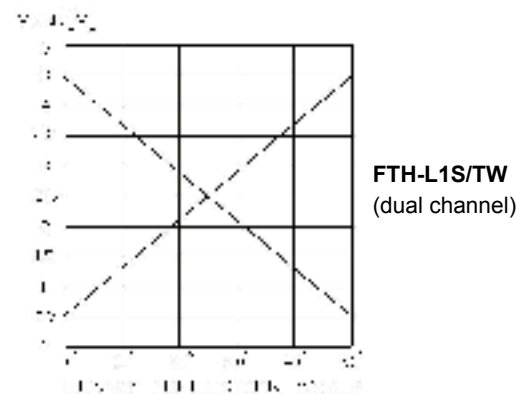
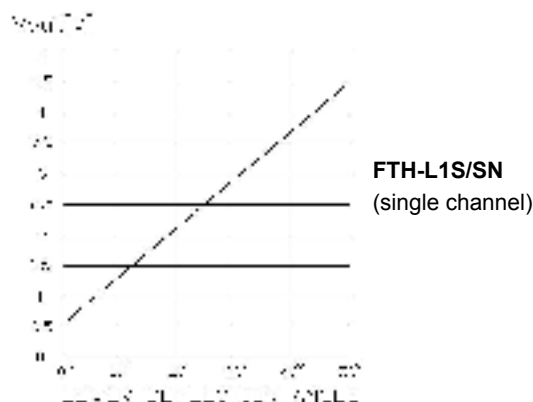
**PANEL CUT-OUT AND MOUNTING**



**OVERALL DIMENSIONS**



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



**FTH ORDERING INFORMATION: see page JK5**

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**FTH-L2S CONTACTLESS FINGERTIP PROPORTIONAL CONTROL LEVER**

**FEATURES**

- Single axis / bidirectional.
- Contactless, hall effect sensor.
- Optional "out of neutral" switch.
- Optional dual sensor (redundant).

**MECHANICAL / ENVIRONMENTAL SPECIFICATIONS**

Lever deflection angle:	$\pm 25^\circ \pm 1^\circ$
Electrical angle:	$\pm 25^\circ \pm 1^\circ$
Operating temperature range:	-25°C / +85°C
Protection class:	IP 67
Life:	> 3 million cycles (without switch)
Connector:	molex CGRID/SL, 7 male pins

**ELECTRICAL SPECIFICATIONS**

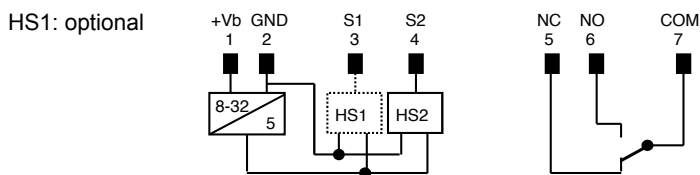
**Linear, hall-effect sensor**

Power supply voltage:	8÷32 VDC
Current consumption:	< 15 mA (30 mA with 2 sensors)
Output signal in neutral:	2.50 V $\pm$ 0.1 V
Output signal range:	0.5 V $\div$ 4.5 V
Tolerance on output signal:	$\pm$ 0.1 V
Linearity:	< 2%
Max. output current:	1 mA
Directional switch operating voltage:	< 48 VDC
Directional switch max. current:	1 A

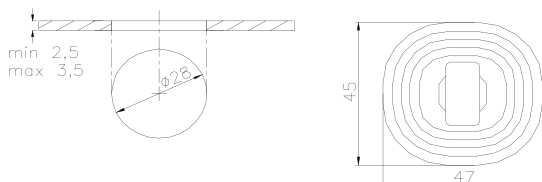
**Neutral position switch (electromechanical type)**

Contacts:	silver plated (solder type)
Max. operating input voltage:	48 V or $\pm$ 24 V
Max. operating current:	1 A
Neutral pos. switch threshold angle:	7°
Protection class:	IP 67

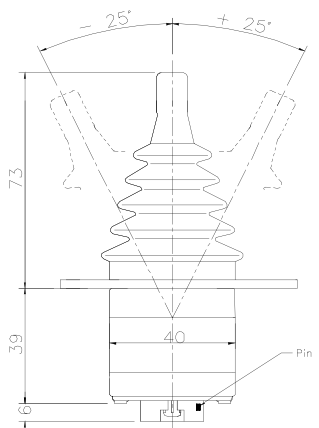
**ELECTRICAL CONNECTIONS**



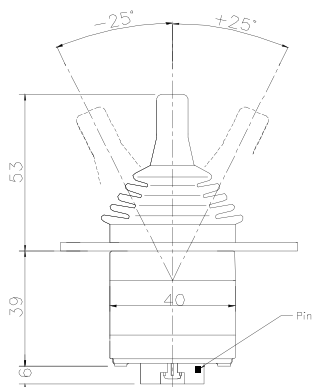
**PANEL CUT-OUT AND MOUNTING**



**OVERALL DIMENSIONS**



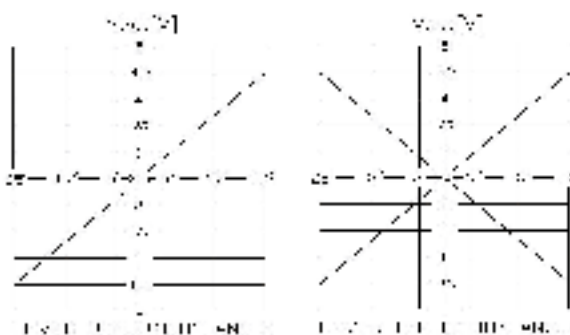
Paddle type high



Paddle type low



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



FTH-L2S/SN (single channel)

FTH-L2S/TW (dual channel)

**FTH ORDERING INFORMATION: see page JK5**

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**JLP-L2S FINGERTIP PROPORTIONAL CONTROL LEVER**

**FEATURES**

- Single axis / bidirectional, panel mounting style.
- 3-4 pins potentiometer configuration.
- Bidirectional switches.

**MECHANICAL SPECIFICATIONS**

Lever deflection angle:	$\pm 32^\circ \pm 1^\circ$
Electrical angle:	$\pm 30^\circ \pm 1^\circ$
Operating temperature range:	$-25^\circ\text{C} / +85^\circ\text{C}$
Protection class:	IP 65 (above panel)
Life:	3 million cycles
Fixing screws included:	2 - M4x16

**ELECTRICAL SPECIFICATIONS**

**Potentiometer**

Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of $V_{in}$	8 k $\Omega$ $\pm 20\%$
/ Q = 80% of $V_{in}$	5 k $\Omega$ $\pm 20\%$
/ R = 100% of $V_{in}$	4 k $\Omega$ $\pm 20\%$
Max. operating input voltage ( $V_{in}$ ):	48 V or $\pm 24$ V
Min. load impedance on pin 5 (signal):	50 k $\Omega$
Max. operating current on pin 5:	1 mA
Output voltage:	see graph
Linearity (resistive track):	2% or better

**Directional switches**

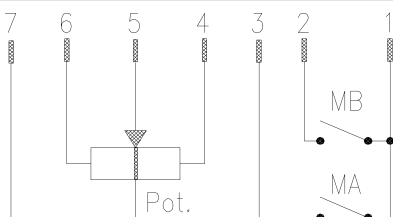
Typical track resistance:	150 Ohm
Max. operating input voltage:	48 V or $\pm 24$ V
Min. load impedance on pins 2&3:	50 k $\Omega$
Max. operating current on pins 2&3:	1 mA
Directional switches threshold angle:	$\pm 4^\circ$
Connector type: Mod. D Dubox = P.N. 76382.407 wiring	
Mod. G Molex = C-Grid P.N. 50-57-9407	

**POTENTIOMETER & SWITCHES OPTIONS**

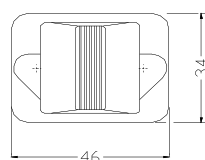
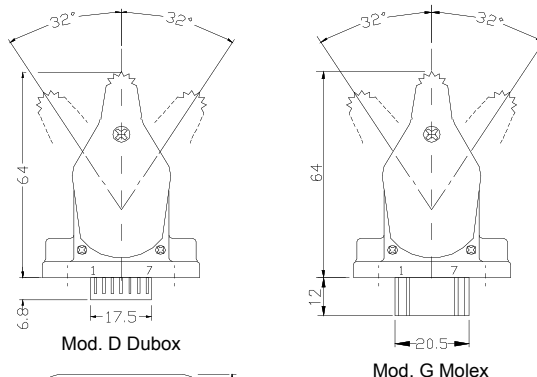
**Reference codes**

Output signal	S= 80% $V_{in}$	S= 100% $V_{in}$	S= 50% $V_{in}$
3-4 pins pot & bidir. switch	Q	R	C

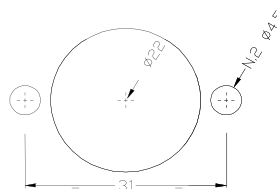
**ELECTRICAL CONNECTIONS**



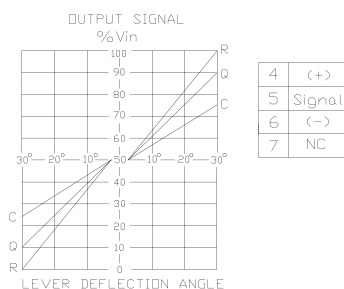
**OVERALL DIMENSIONS**



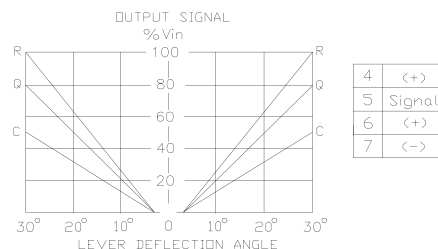
**PANEL CUT-OUT**



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



3-pins configuration wiring



4-pins configuration wiring

**JLP ORDERING INFORMATION: see page JK6**

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**JLP-L2S TWIN CHANNEL FINGERTIP PROPORTIONAL CONTROL LEVER**

**FEATURES**

- Single axis / bidirectional, panel mounting style.
- Twin channel potentiometer joystick.
- Redundancy on the 100% of the stroke.

**MECHANICAL SPECIFICATIONS**

Lever deflection angle:	$\pm 32^\circ \pm 1^\circ$
Electrical angle:	$\pm 30^\circ \pm 1^\circ$
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 (above panel)
Life:	3 million cycles
Fixing screws included:	2 - M4x16

**ELECTRICAL SPECIFICATIONS**

**Potentiometer**

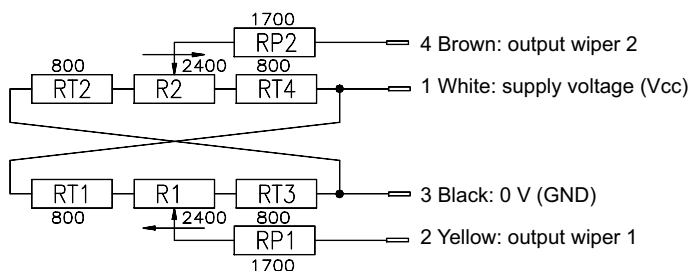
Electrical power rating:	0.25 W @ 25°C
Total resistance between pin 1 and 3:	2 kΩ ±20%
Nominal voltage supply (V <sub>in</sub> ):	10 V
Tolerance between track 1 and 2:	± 4% of V <sub>cc</sub>
Output voltage:	see graph
Load resistance:	100 kΩ - nominal 50 kΩ - minimum
Linearity (resistive track):	2% or better
Connector type:	AMP JPT P.N. 929505-1

**POTENTIOMETER & SWITCHES OPTIONS**

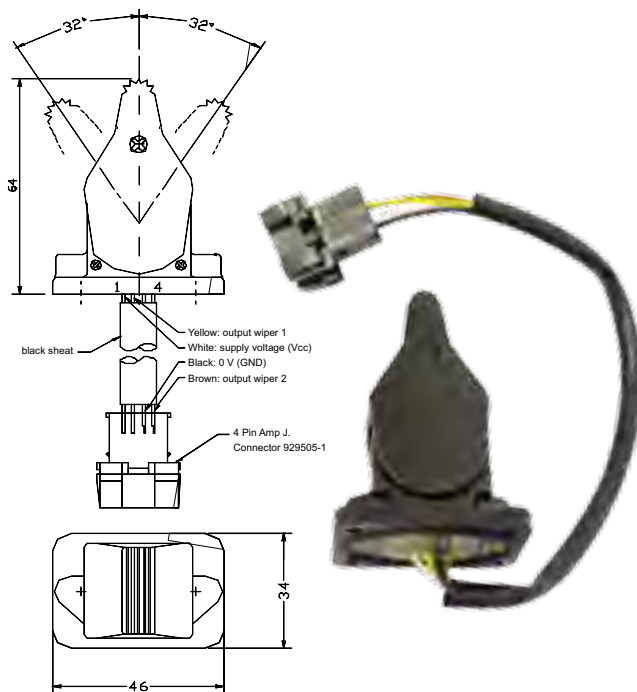
	Reference codes
Output signal	S= 60% V <sub>in</sub>
3 pins potentiometer	V

**ELECTRICAL CONNECTIONS**

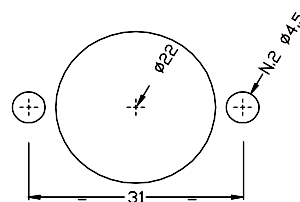
Pinout



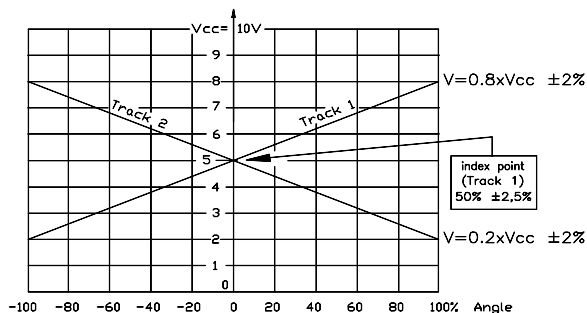
**OVERALL DIMENSIONS**



**PANEL CUT-OUT**



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



**JLP ORDERING INFORMATION: see page JK6**

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**FPR PROPORTIONAL ROLLER SWITCH WITH HALL EFFECT SENSOR**

**FEATURES**

- Mini proportional roller switch with optimum ergonomic design for panel-mounting.
- High performance hall effect sensor circuitry.
- Twin channel configuration for redundancy.

**MECHANICAL SPECIFICATIONS**

Rotation angle:	±30°
Body material:	acetal resin / teflon compound
Colours available:	grey, blue, green, yellow
Rubber gaiter material:	EPDM / 35-45 shore - A
Operating temperature range:	-25°C / +85°C
Environmental protection:	IP 68 (above panel)
Life:	> 5.000.000 cycles

**ELECTRICAL SPECIFICATIONS**

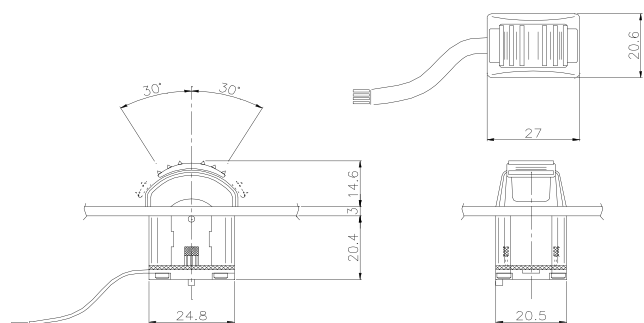
Signal output @ rest:	2.5 VDC ±0.1 V
Supply voltage:	H - Version = 8+32 VDC 0 - Version = 5 VDC ±5%
Full output signal range:	0.5 - 4.5 V, ±0.2 V
Current consumption at rest:	SNCH (S1 only) 15 mA TWCH (S1/S2) 25 mA
Rated output current:	1 mA
Connection type: flying leads =	coloured flat cable 100 mm
connector =	molex Minifit 4 poles P.N. 5559-4P Deutsch 3 poles P.N. DTO4-3P

**ELECTRICAL CONNECTIONS**

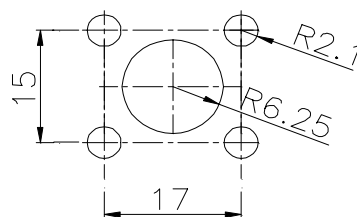
**FPR - L2S - SNCH (single chan.)      FPR - L2S - TWCH (twin chan.)**

- |                        |                          |
|------------------------|--------------------------|
| (1) Yellow: +5 VDC     | (1) Yellow: + 5 VDC      |
| (2) Orange: (-) ground | (2) Orange: (-) ground   |
| (3) Red: output 1 (S1) | (3) Red: output 1 (S1)   |
| (4) Brown: not used    | (4) Brown: output 1 (S2) |

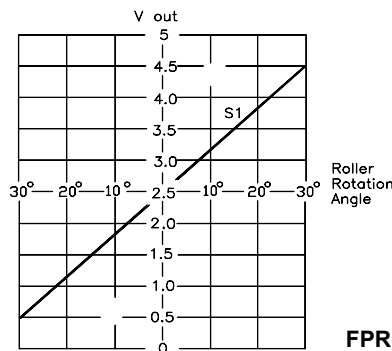
**OVERALL DIMENSIONS**



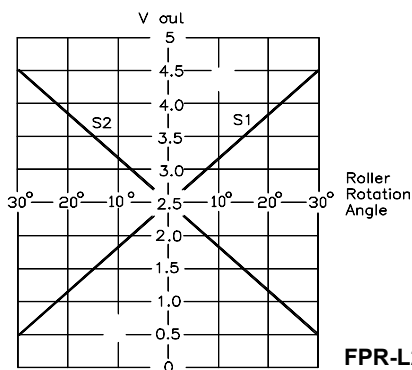
**PANEL CUT-OUT**



**OUTPUT SIGNAL CONTROL CHARACTERISTIC**



**FPR-L2S/ SNCH (single channel)**



**FPR-L2S-TWCH (twin channel)**

**FPR ORDERING INFORMATION: see page JK7**

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**FPR-PWM** PROPORTIONAL ROLLER SWITCH WITH PWM DRIVER

**FEATURES**

- Mini proportional roller switch with optimum ergonomic design for panel-mounting.
- High performance hall effect sensor circuitry.
- PWM electronic driver integrated into the roller for remote control of a dual-coil proportional solenoid valve.

**MECHANICAL SPECIFICATIONS**

Rotation angle:	±30°
Main body material:	acetal resin / teflon compound
Colours available:	yellow, grey, blue
Rubber gaiter material:	EPDM / 35-45 shore - A
Operating temperature range:	-25°C / +85°C
Environmental protection:	IP 68 (above panel)
Life:	> 5.000.000 cycles

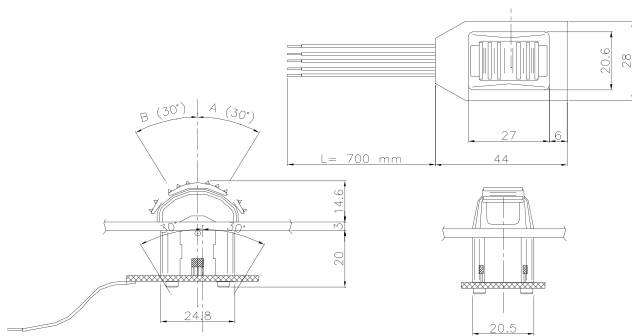
**ELECTRICAL SPECIFICATIONS**

Supply voltage:	8÷32 VDC
Current consumption with no load:	100 mA
PWM dither frequency:	100 Hz
Wire lenght:	700 mm
Current output range (PWM):	100÷1500 mA @ 12 VDC
Connection type: flying leads =	GLX 0.5 sqmm
connector =	molex Minifit 6 poles P.N. 5559-6P

**ELECTRICAL CONNECTIONS**

- (1) Red: +Battery
- (2) Black: -Battery (GND)
- (3) Orange: PWM Valve A+
- (4) Gray: PWM Valve B+
- (5) White: PWM A- / B- (common)
- (6) Not used

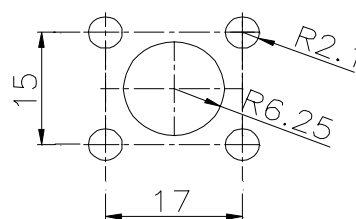
**OVERALL DIMENSIONS**



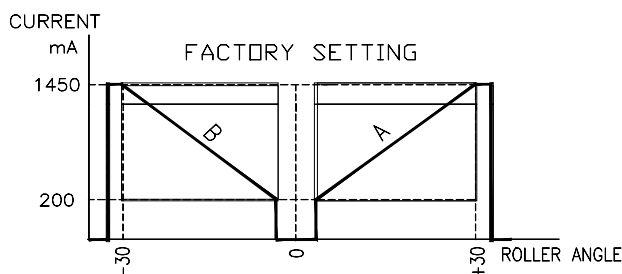
**FPR ORDERING INFORMATION:** see page JK7



**PANEL CUT-OUT**



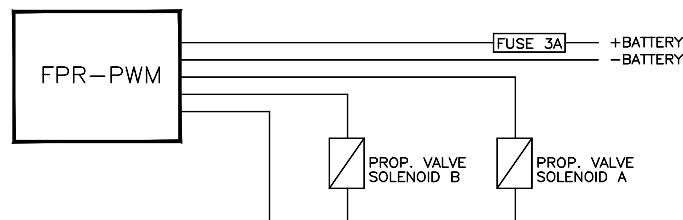
**PWM OUTPUT CHARACTERISTIC EXAMPLE**



The following values are factory set:

- I<sub>min</sub> (minimum output current)
- I<sub>max</sub> (maximum output current)
- Dither

**APPLICATION EXAMPLE**



**Ordering Code**

**23.0409.160** (I<sub>min</sub> = 200mA, I<sub>max</sub> = 1500mA, PWM = 100Hz)

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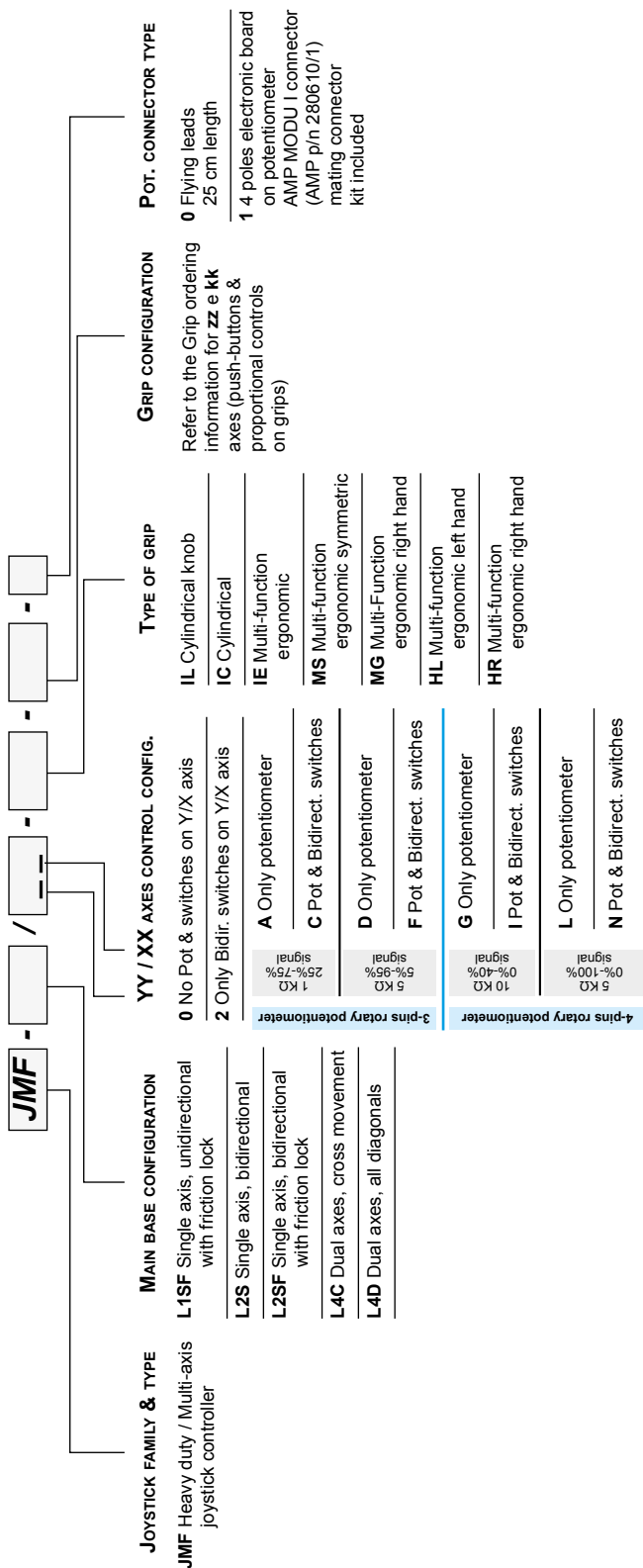
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## HEAVY DUTY MULTI-AXIS JOYSTICKS

DESCRIPTION	ORDERING INFORMATION PAGE	TECHNICAL INFORMATION PAGE
JMF potentiometric joystick body	JK20	JK22
JHM hall effect joystick body	JK21	JK28

**Note:** 1) The joystick base does not include the grip.  
2) The joystick base includes the rubber gaiter.





EXAMPLE:



**JMF-L4C/NN**  
BASE

+



**MG/A6P9/0000/R000-0**  
GRIP

=

**JMF-L4C/NN-MG/A6P9/0000/R000-0**  
COMPLETE JOYSTICK  
(with flying leads)

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JOYSTICK FAMILY & TYPE	MAIN BASE CONFIGURATION	YY / XX AXES CONTROL CONFIG.	TYPE OF GRIP	GRIP CONFIGURATION	CONNECTOR TYPE
<b>JHM</b> Heavy duty / Multi-axis hall effect type joystick controller	<b>L2S</b> Single axis, bidirectional <b>L4C</b> Dual axes, cross movement <b>L4D</b> Dual axes, all diagonals	<b>ANL</b> Analog signal 0.5>2.5>4.5 VDC power supply range = 5 VDC ±5% <b>ANH</b> Analog signal 0.5>2.5>4.5 VDC power supply range = 8-32 VDC <b>AVS</b> Center tap output signal with digital directional signals <b>TCN</b> 1 PWM output in combination with up to 4 on-off channels <b>PWM</b> Pulse with modulation current output factory preset or set via PC <b>MLT</b> adjustable output signal for closed loop prop. actuators <b>CAN</b> CANbus version for connection to CANbus line J1939 protocol	<b>IL</b> Cylindrical knob <b>IC</b> Cylindrical <b>IE</b> Multi-function ergonomic <b>MS</b> Multi-function ergonomic symmetric <b>MG</b> Multi-function ergonomic right hand <b>HL</b> Multi-function ergonomic left hand <b>HR</b> Multi-function ergonomic right hand	Refer to the grip ordering information for <b>z z e k k</b> axes (push-buttons & proportional controls on grips)	<b>3</b> Flying leads 25 cm length <b>4</b> Male connector, 12 poles, Deutsch DT04-12P, 25 cm cable length <b>5</b> Male connector, 4 poles, Deutsch DT04-4P, 25 cm cable length (for CANbus version only) <b>6</b> Male connector, 6 poles, Deutsch DT04-6P, 25 cm cable length <b>7</b> Male connector, 8 poles, Deutsch DT04-8P, 25 cm cable length

Note:  
for TCN, PWM and MLT versions, a 4 poles Deutsch DT04-4P connector is always included



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**JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK (JOYSTICK BASE ONLY)**

**FEATURES**

The JMF potentiometric joystick controller has been designed for use in mobile and industrial field application. The potentiometer in use, available with 3 or 4-pins configuration, grants precision and a long working life.

When coupled with an **M** range of ergonomic multi-function handles, up to 5 proportional axes and 9 on-off push buttons can be integrated in the same joystick. Power directional switches are available.

**MECHANICAL SPECIFICATIONS**

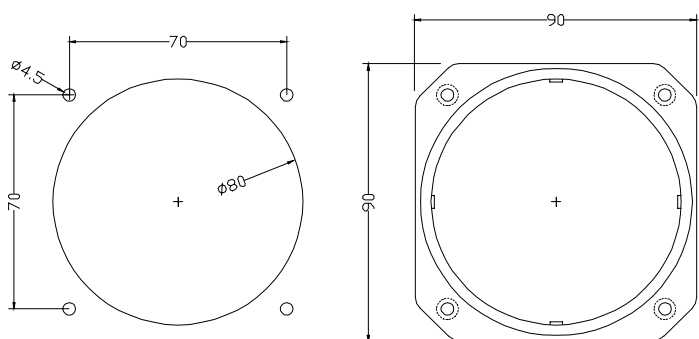
Lever deflection angle:	±25° ±1°
Electrical angle:	±25° ±1°
Operating temperature range:	-25°C / +80°C
Protection class (above panel):	up to IP 67, depending on grip
Life:	3 million cycles

**POTENTIOMETER & SWITCHES OPTIONS (Y-Y AND X-X AXIS)**

	Reference codes	
Output signal	S= 50% Vin	S= 90% Vin
3-pins pot	A D	
3-pins pot & bidirectional switches	C F (Std)	

	Reference codes	
Output signal	S= 40% Vin	S=100% Vin
4-pins pot	G L	
4-pins pot & bidirectional switches	I N (Std)	

**PANEL CUT-OUT AND MOUNTING**



**AVAILABLE JOYSTICK MOVEMENTS**

- \*Option L1S Single axis control / Unidirectional
- \*Option L2S Single axis control / Bidirectional
- Option L4C Cross axis control / Bidirectional
- Option L4D Multi axis control / Bidirectional

\* friction lock option available for L1S and L2S



Shown with IC grip

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**JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK (JOYSTICK BASE ONLY)**

**ELECTRICAL SPECIFICATIONS**

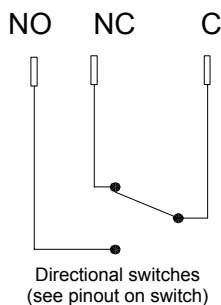
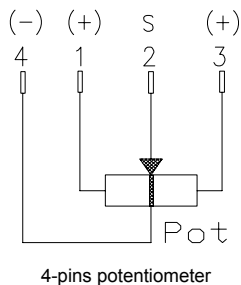
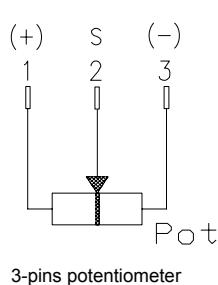
**Directional switches (electromechanical type)**

Contacts:	silver plated
Max. operating input voltage:	125/250 Vac
Max. operating current:	16 A (5 A on request)*
Pot. connector type:	0 = None (solder type) 1 = AMP Modu I/4 poles
Neutral pos. switch threshold angle:	$\pm 10^\circ$ ( $\pm 5^\circ$ on request)*
Protection class:	IP 55 (specials available on request)

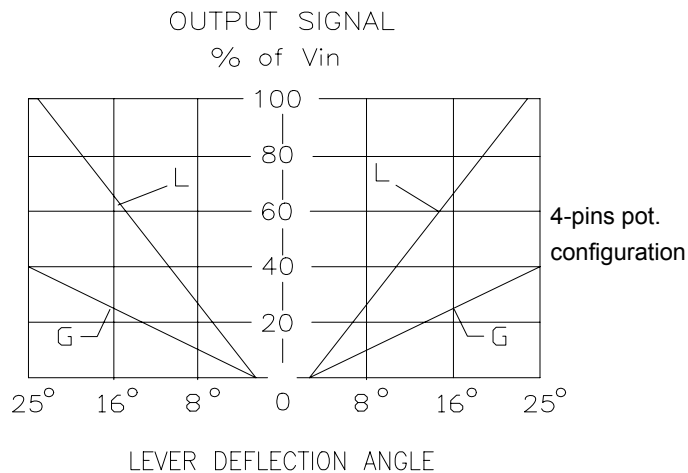
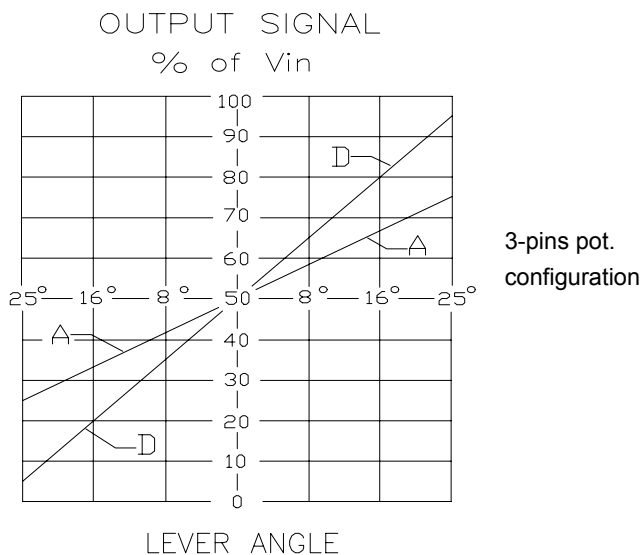
**Rotary potentiometer**

Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of $V_{in}$ (3-pins version) / D = 90% of $V_{in}$	1 k $\Omega$ $\pm 20\%$ 5 k $\Omega$ $\pm 20\%$
Ohmic resistance: / G = 40% of $V_{in}$ (4-pins version) / L = 100% of $V_{in}$	10 k $\Omega$ $\pm 20\%$ 5 k $\Omega$ $\pm 20\%$
Max. operating input voltage ( $V_{in}$ ):	48 V or $\pm 24$ V
Min. load impedance on pin 2 (signal):	50 k $\Omega$
Max. operating current on pin 2:	1 mA
Output voltage:	see graphs
Linearity (resistive track):	2% or better
Protection class:	IP 67

**ELECTRICAL CONNECTIONS (for solder type connector)**



**OUTPUT SIGNAL CONTROL CHARACTERISTICS**



AVAILABLE GRIPS: see page JK42

JMF ORDERING INFORMATION: see page JK20

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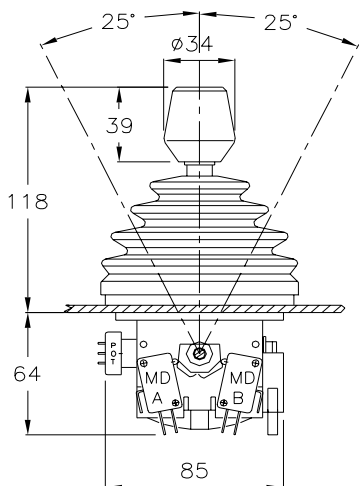
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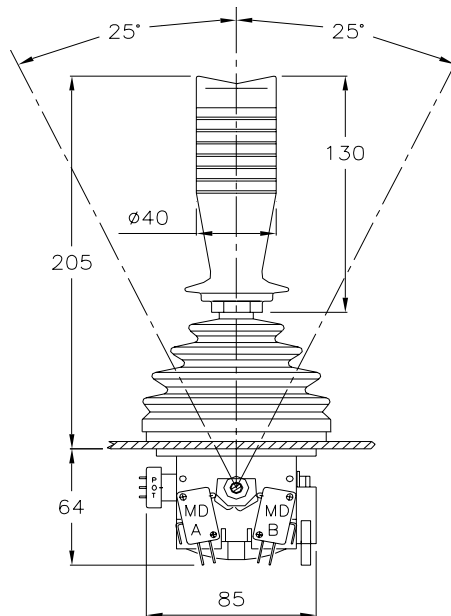
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**JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK**

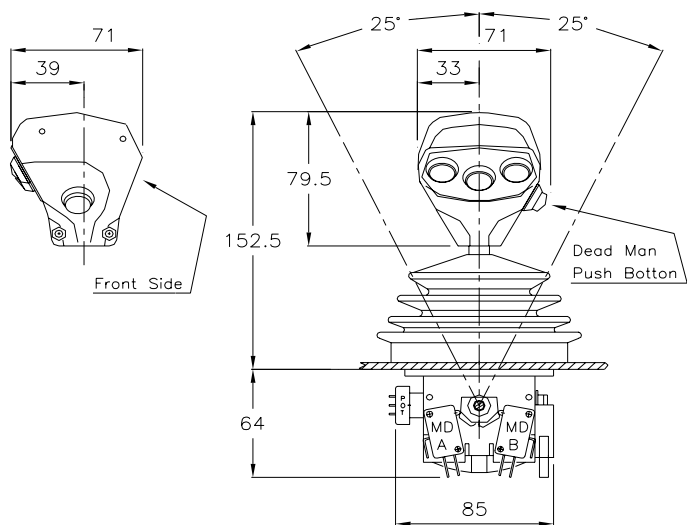
**JMF joystick with grips - configuration examples with overall dimensions**



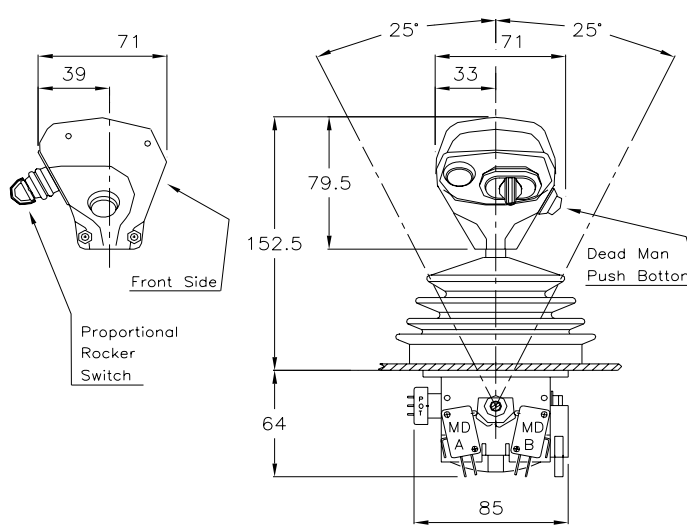
JMF base with IL handle  
Complete code: **JMF-L4C/NN-IL 0000**



JMF base with IC handle  
Complete code: **JMF-L4C/NN-IC 0200**



JMF base with IE type handle  
Complete code: **JMF-L4C/NN-IE A3P9 0000**



JMF base with IE type handle  
Complete code: **JMF-L4C/NN-IE A1P9 1PRS**

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**JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK**

*JMF joystick with grips - configuration examples with overall dimensions*



JMF base with MS type handle  
Complete code: **JMF-L4C/NN-MS A6P9 R3P9**



JMF base with MS type handle  
Complete code: **JMF-L4C/NN-MS A2P9 2FPR R1P9**



JMF base with MG type handle  
Complete code: **JMF-L4C/NN-MG A4P9 R1P9**



JMF base with MG type handle  
Complete code: **JMF-L4C/NN-MG A2P9 1FPR R1P9**

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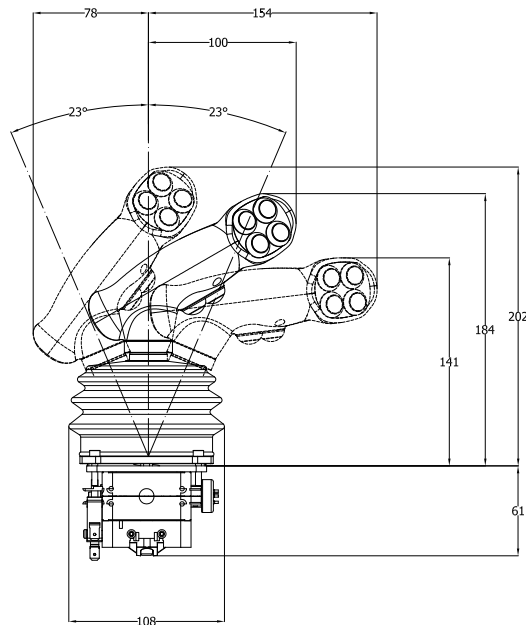
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**JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK**

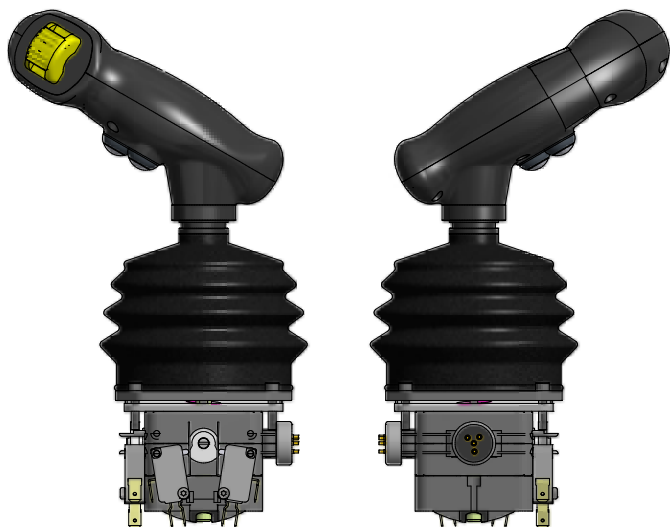
*HL joystick with grips - configuration examples with overall dimensions*



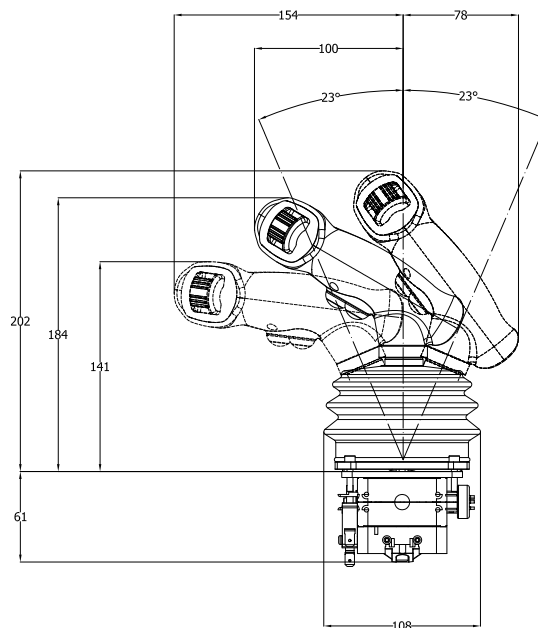
JMF base with HL type handle  
Complete code: **JMF-L4C/NN-HL-04P9-2P9/RDFF**



JMF base with HL type handle  
Complete code: **JMF-L4C/NN-HL-04P9-2P9/RDFF**



JMF base with HR type handle  
Complete code: **JMF-L4C/NN-HR-0FPR-2P9/R000**



JMF base with HR type handle  
Complete code: **JMF-L4C/NN-HR-0FPR-2P9/R000**

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**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)****FEATURES**

The JHM joystick controller has been designed for use in mobile and industrial field applications. The use of the hall effect sensor, which eliminates any contact between moving electrical parts, improves overall resolution, precision and life. A complete line of built-in electronic drivers, generating on-off, proportional and CANbus control signals, guarantees the highest controllability of any type of electro-hydraulic system.

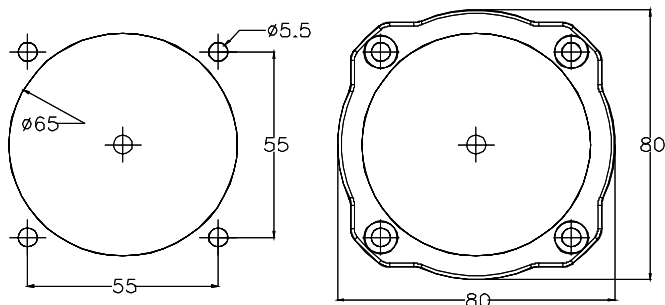
When coupled with an ergonomic multi-function handle of the **M** range, up to 5 proportional axes and 9 on-off push buttons can be integrated in the same joystick. As further option, the JHM is also available with a magnetic position detent on the Y or X axis.

**MECHANICAL SPECIFICATIONS**

Main body material:	aluminium
Boot material:	NBR / Shore 50 - UV proof
Lever deflection angle:	$\pm 22^\circ \pm 1^\circ$
Electrical angle:	$\pm 22^\circ \pm 1^\circ$
Operating temperature range:	-25°C / +80°C
Protection class (above panel):	up to IP 67, depending on grip
Life:	> 5 million cycles

**ELECTRICAL SPECIFICATIONS**

Sensor:	hall effect contactless technology
Supply voltage:	ANL version = 5 VDC $\pm 5\%$ other versions = 8÷32 VDC
Current consumption @ rest:	25 mA (sensor only)
Connector type:	Deutsch DT04-12P other types available on request
Output signal configuration:	see next pages for all versions

**PANEL CUT-OUT AND MOUNTING****AVAILABLE JOYSTICK MOVEMENTS**

<b>Option L2S</b>	Single axis control / Bidirectional
<b>Option L4C</b>	Cross axis control / Bidirectional
<b>Option L4D</b>	Multi axis control / Bidirectional



Shown with MS grip

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**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**

**ANL & ANH VERSIONS**

**Basic version**

Current consumption @ rest:	< 25 mA (sensor only)
Supply voltage:	ANL version = 5 VDC ±5% ANH version = 8÷32 VDC
Signal output @ rest:	2.5 VDC ±0.2 V
Output signal range:	0.5 ÷ 4.5 V ±0.2 V (see graph)
Rated output current:	1 mA
Protections (ANH version):	overvoltage and reversed polarity

**AVS VERSION**

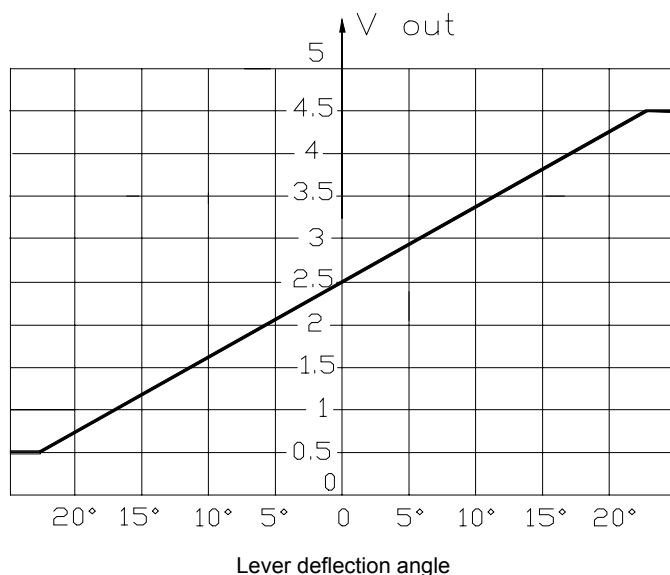
**Center tap output signal with digital directional signals**

Current consumption @ rest:	< 150 mA (without external load)
Supply voltage (Vin):	8÷32 VDC
Signal output @ rest:	0 V
Output signal range:	0÷5 V ±0.2 V (see graph)
Rated output current:	1 mA

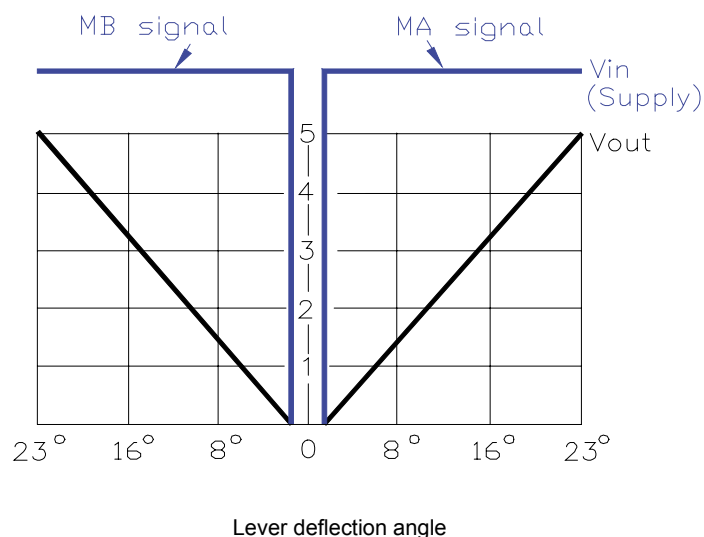
**(MA and MB signals on graph)**

Digital directional outputs on both axes:	0 / Vin (0.7 A max)
Digital directional outputs switching angle:	between 2° and 5°

**OUTPUT SIGNAL CONTROL CHARACTERISTICS**



**OUTPUT SIGNAL CONTROL CHARACTERISTICS**



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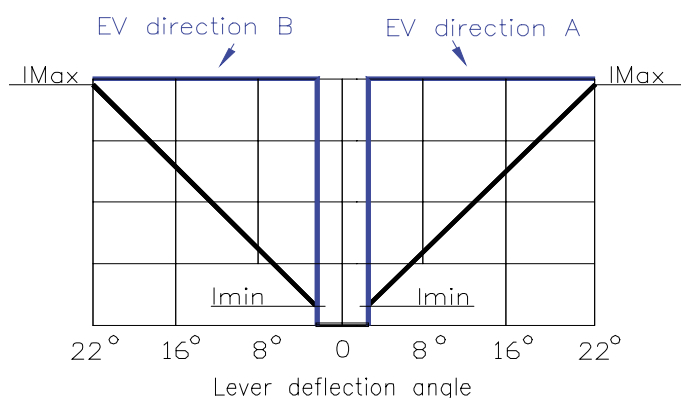
**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**

**TCN VERSIONS**

**1 PWM output in combination with up to 5 on-off outputs**

Supply voltage:	8÷32 VDC
Current consumption @ rest:	< 250 mA
PWM output:	1 x single proportional solenoid valves
Current output range (PWM):	100 to 1600 mA (3A available on request)
Dither frequency:	60 to 250 Hz (100 Hz factory preset)
Adjustable ramp time:	0.05 to 5 s
Power digital outputs:	5 (3.5 A)
Adjustments:	via PC, RS232 serial line connection, using the Tecnord calibration and configuration tool (see picture below)

**OUTPUT SIGNAL CONTROL CURVE**



Imin and digital outputs activation: between 2° and 5°

**ADJUSTABLE PARAMETERS**

The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool.

By use of the configuration window:

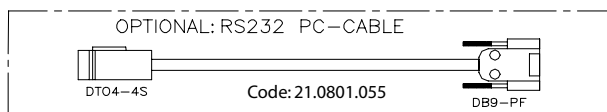
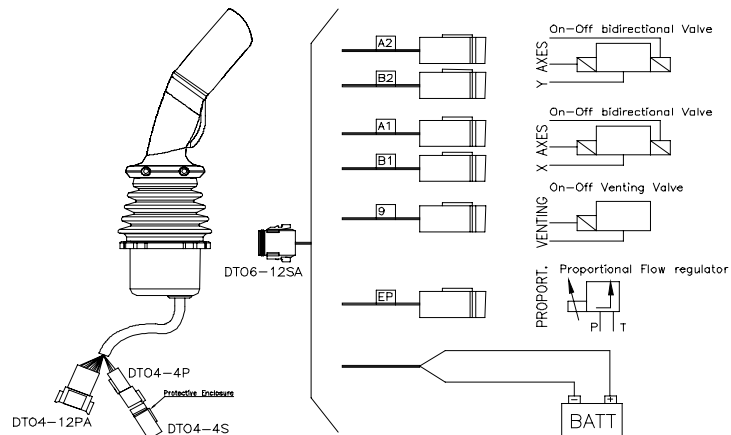
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse, virtual cross movement.
- Current setpoint selection (for 360° movement only).
- Output assignment on-off auxiliary valves.

By use of the calibration window:

- Operating parameters: Imin, Imax, Ramps.

**APPLICATION EXAMPLE**

Shown with MS grip



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**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**

**PWM VERSIONS**

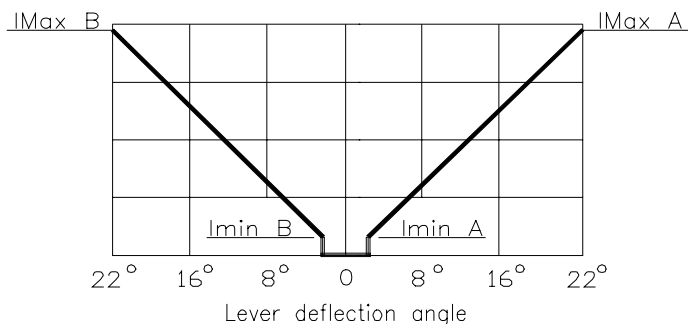
**2 PWM output channels**

Supply voltage:	8÷32 VDC
Current consumption @ rest:	250 mA
PWM output:	2 x dual proportional solenoid valves
Current output range (PWM):	100 to 1600 mA (3 A available on request)
Dither frequency:	60 to 250 Hz (100 Hz factory preset)
Adjustable ramp time:	0.05 to 5 s
Power digital outputs:	2 (3.5 A)
Adjustments:	via PC, RS232 serial line connection, using the Tecnord calibration and configuration tool (see picture below)

**Notes:**

- 1) 3rd axis available using FPR-PWM roller switch - I<sub>max</sub> = 1.5 A
- 2) the base height is 60 mm instead of the standard 46 mm

**OUTPUT SIGNAL CONTROL CURVE**



**ADJUSTABLE PARAMETERS**

The following parameters are adjustable via RS232 serial line by means of the calibration/configuration tool.

By use of the configuration window:

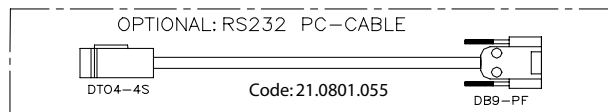
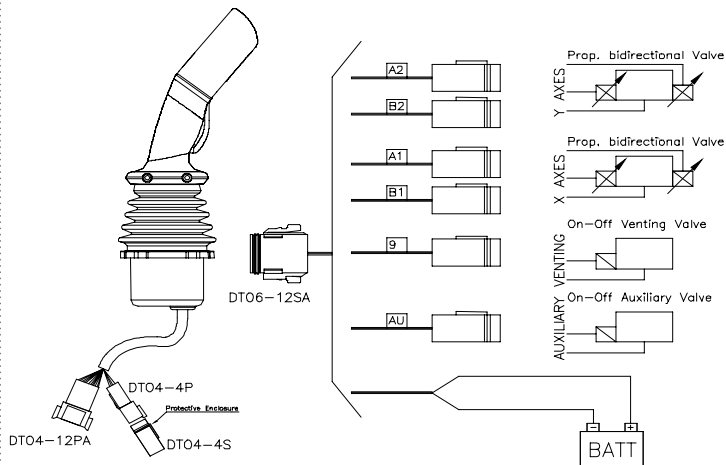
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse, virtual cross movement.
- Current setpoint selection (for 360° movement only).
- Output assignment on-off auxiliary valves.
- Digital directional output signals on both axes (N.O. or N.C. mode)

By use of the calibration window:

- Operating parameters: I<sub>min</sub>, I<sub>max</sub>, Ramp up and Ramp down times.

**APPLICATION EXAMPLE**

Shown with MS grip



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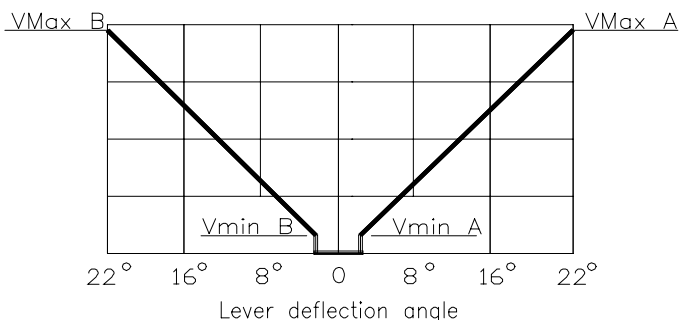
**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**

**MLT VERSIONS**

**Output adjustable signal for closed loop proportional actuators**

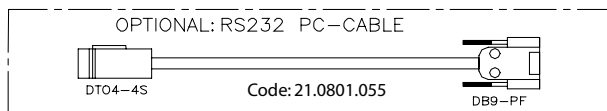
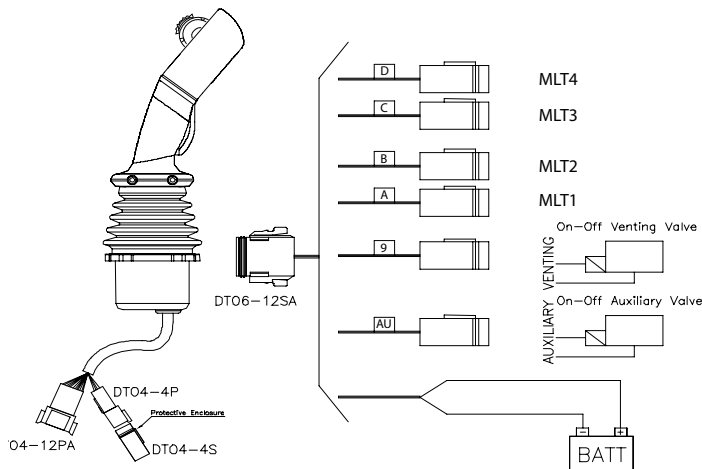
Supply voltage:	8÷32 VDC
Current consumption @ rest:	250 mA
Analog outputs:	4
Output signal range:	linear signal 0.9÷4.1 V 2÷6 V or ratiometric output available on request
Rated output current:	15 mA
Power digital outputs:	4 (0.7 A)
Digital inputs available:	2
Adjustments:	via RS232 serial line

**OUTPUT SIGNAL CONTROL CURVE**



**APPLICATION EXAMPLE**

Shown with MS grip



**ADJUSTABLE PARAMETERS**

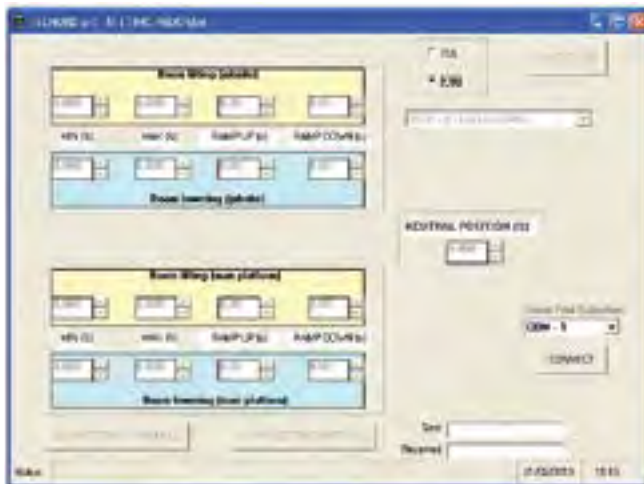
The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool.

By use of the configuration window:

- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Setpoint selection (for 360° movement only).
- Output assignment on-off auxiliary valves.

By use of the calibration window:

- Operating parameters: Imin, Imax, Ramp up, Ramp down.



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**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**

**CANBUS VERSIONS**

Supply voltage:	8÷32 VDC
Current consumption @ rest:	< 250 mA
Physical layer:	ISO 11898, 250 Kbit/s
Protocol:	J1939/ CANopen
Connector type:	Deutsch DT04-4P

With CANbus link, following signals can be managed on the multifunctional grip:

- 4 digital outputs 0.7A (LEDs, detent coils, buzzers, etc).
- 6 analog voltage input 0-5 V (proportional rollers and mini-joysticks).
- 6 digital inputs (push buttons, toggles, etc).



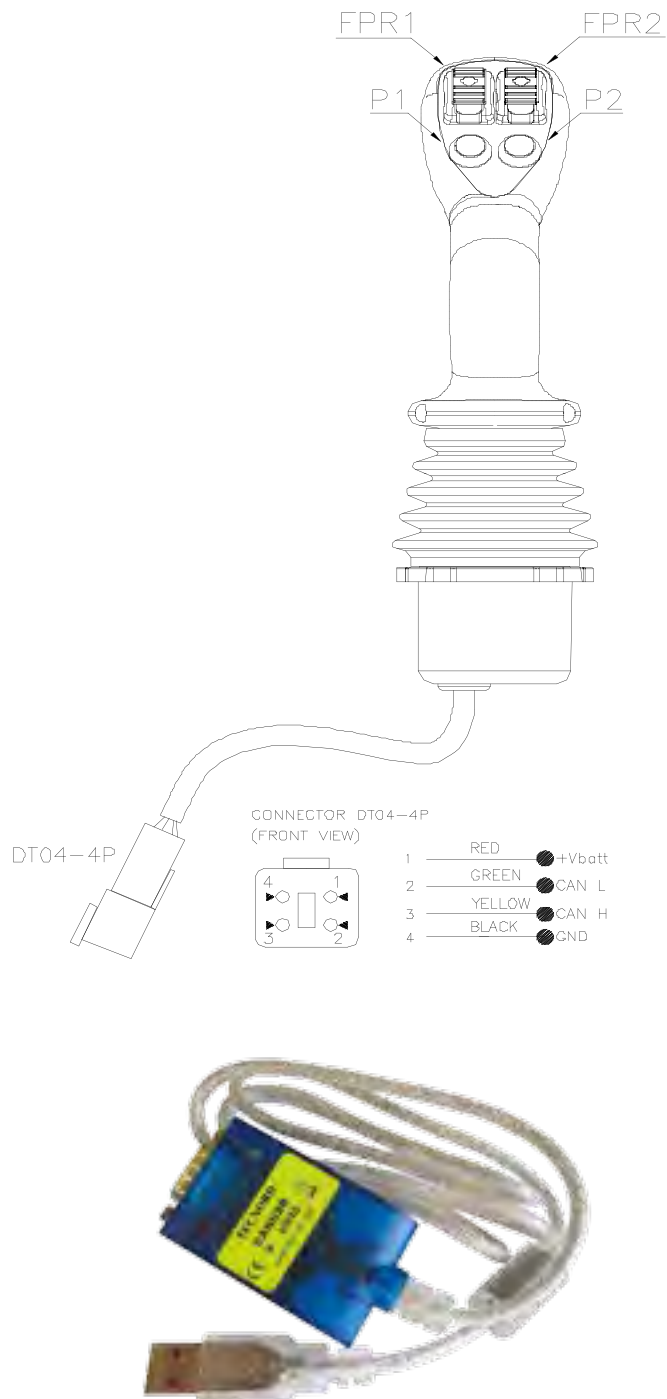
**ADJUSTABLE PARAMETERS**

The following parameters are adjustable via Can line by means of a specific calibration and configuration tool and an hardware interface device (see picture). By use of the configuration window:

- Node ID

**APPLICATION EXAMPLE**

Shown with MS grip



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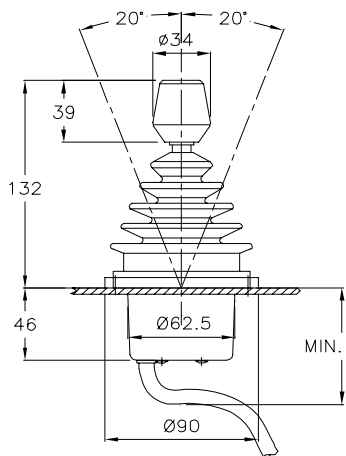
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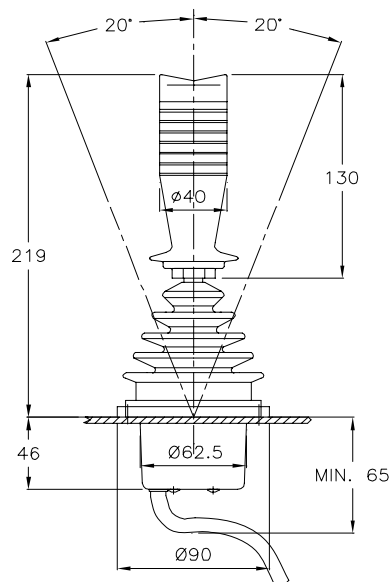
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**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK**

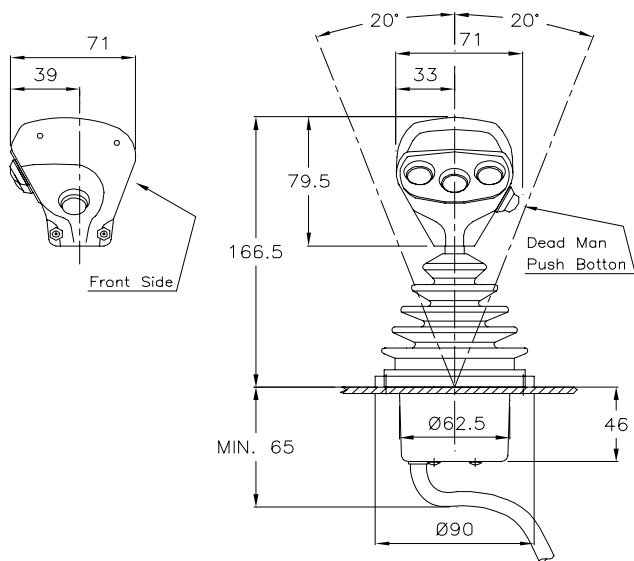
**JHM joystick with grips - configuration examples with overall dimensions**



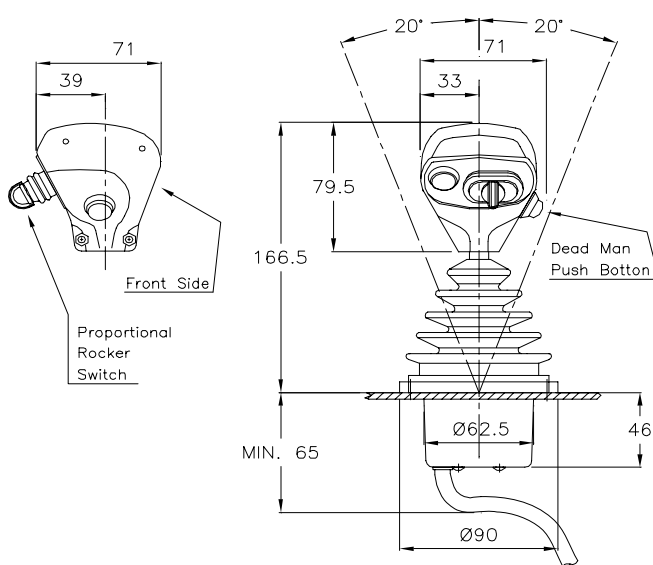
JHM base with IL handle  
Complete code: **JHM-L4D/ANH-IL 0000**



JHM base with IC handle  
Complete code: **JHM-L4D/ANH-IC 0200**



JHM base with IE type handle  
Complete code: **JHM-L4D/ANH-IE A4P9 0000**



JHM base with IE type handle  
Complete code: **JHM-L4D/ANH-IE A1P9 1PRS**

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**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK**

*JHM joystick with grips - configuration examples with overall dimensions*



JHM base with MS type handle  
Complete code: **JHM L4D/ANH-MS A6P9 R3P9**



JHM base with MS type handle  
Complete code: **JHM L4D/ANH-MS A2P9 2FPR R1P9**



JHM base with MG type handle  
Complete code: **JHM L4D/ANH-MG A4P9 R1P9**



JHM base with MG type handle  
Complete code: **JHM L4D/ANH-MG A2P9 1FPR 0000**

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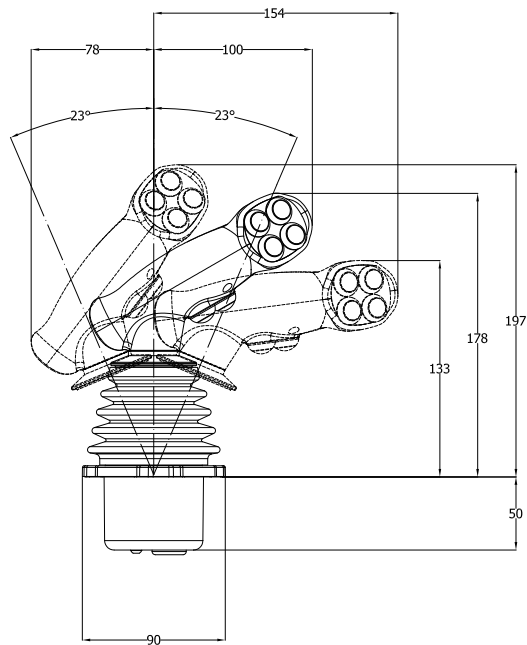
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**JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK**

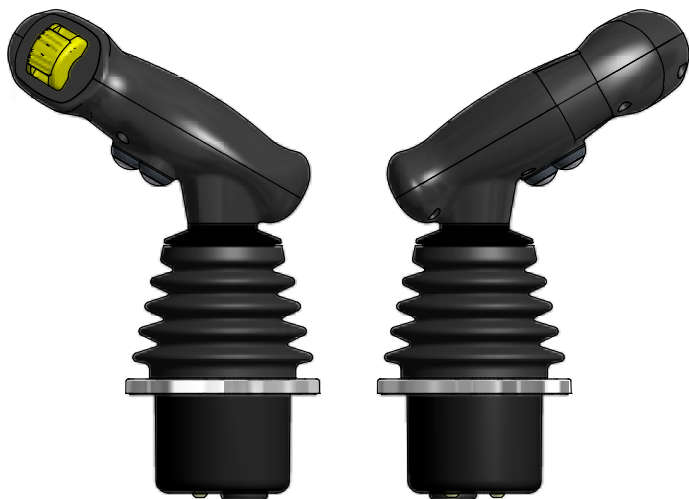
*HR joystick with grips - configuration examples with overall dimensions*



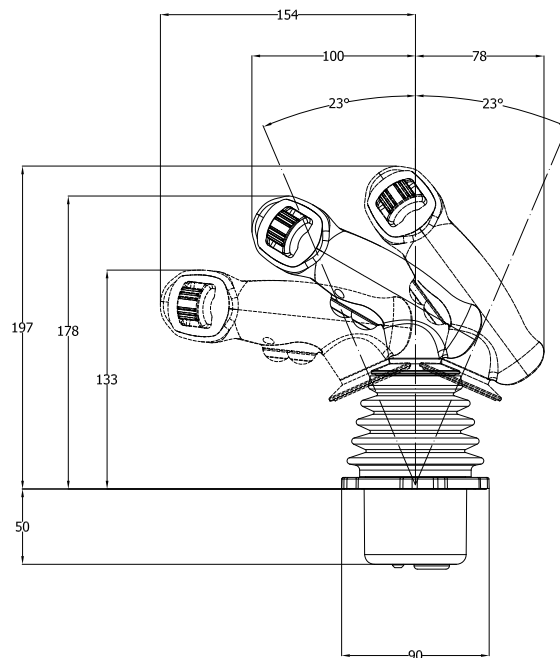
JHM base with HL type handle  
Complete code: **JHM-L4D/ANH-HL-04P9-2P9/RDFF**



JHM base with HL type handle  
Complete code: **JHM-L4D/ANH-HL-04P9-2P9/RDFF**



JHM base with HR type handle  
Complete code: **JHM-L4C/NN-HR-0FPR-2P9/R000**



JHM base with HR type handle  
Complete code: **JHM-L4C/NN-HR-0FPR-2P9/R000**

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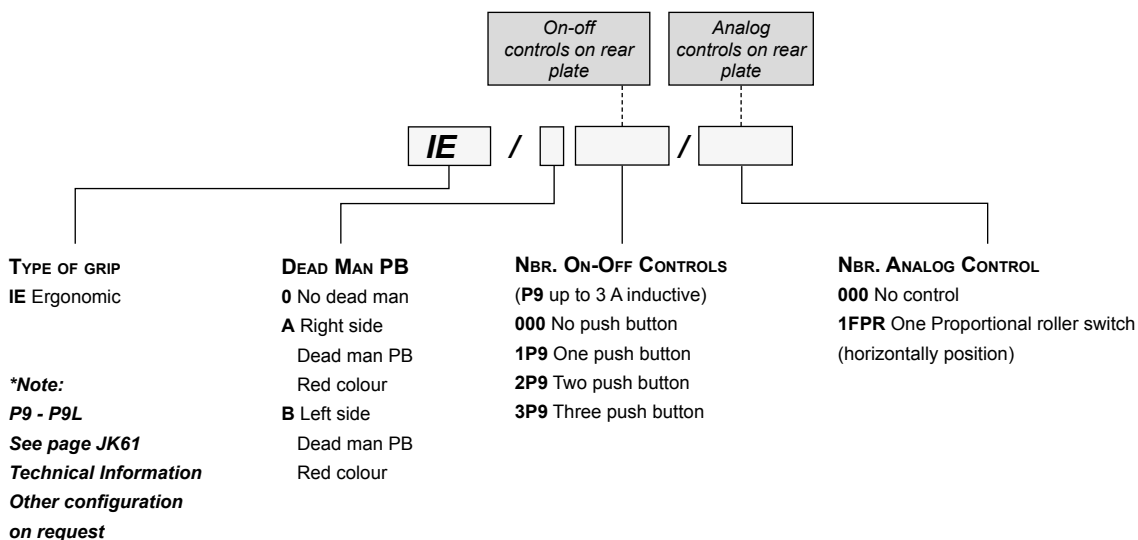
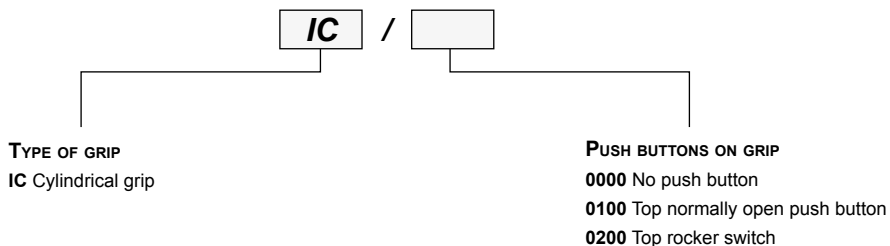
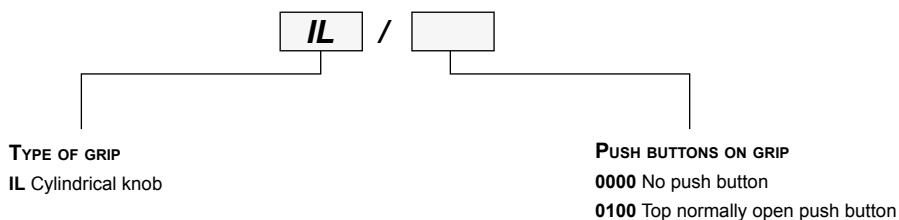
## ERGONOMIC GRIPS

DESCRIPTION	ORDERING INFORMATION PAGE	TECHNICAL INFORMATION PAGE
<b>IL</b> cylindrical knob <b>IC</b> cylindrical	JK38	JK42
<b>IE</b> ergonomic, gear type, multi-functions	JK38	JK43
<b>HL</b> multi-function ergonomic left hand grip	JK39	JK44
<b>HR</b> multi-function ergonomic right hand grip	JK39	JK46
<b>MS</b> ergonomic, symmetric, multi-functions	JK40	JK48
<b>MG</b> ergonomic, right hand, multi-functions	JK41	JK51

- Note:**
- 1) Ergonomic grips can be used as stand alone devices.
  - 2) Grips do not include rubber gaiter and retainer ring, which must be ordered separately.

IL / IC / IE GRIPS

ORDERING INFORMATION



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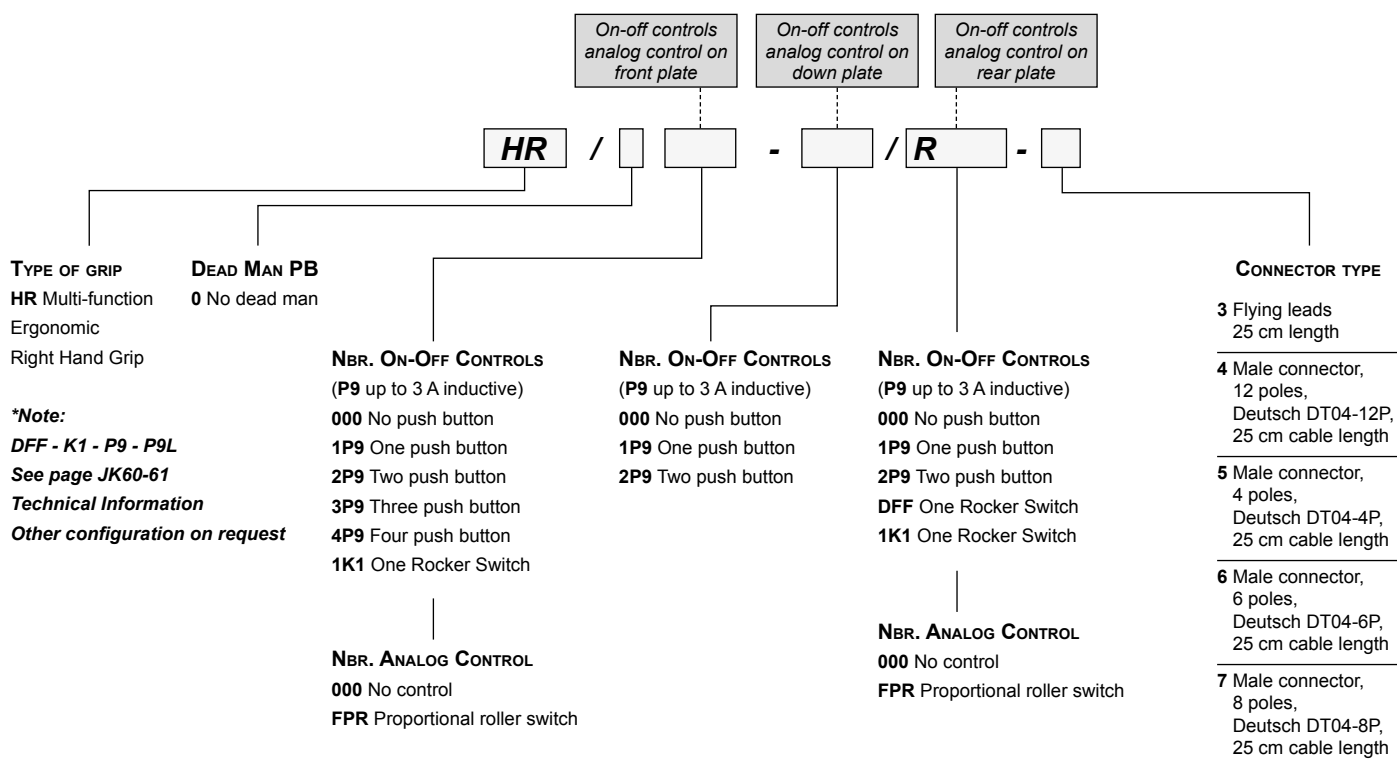
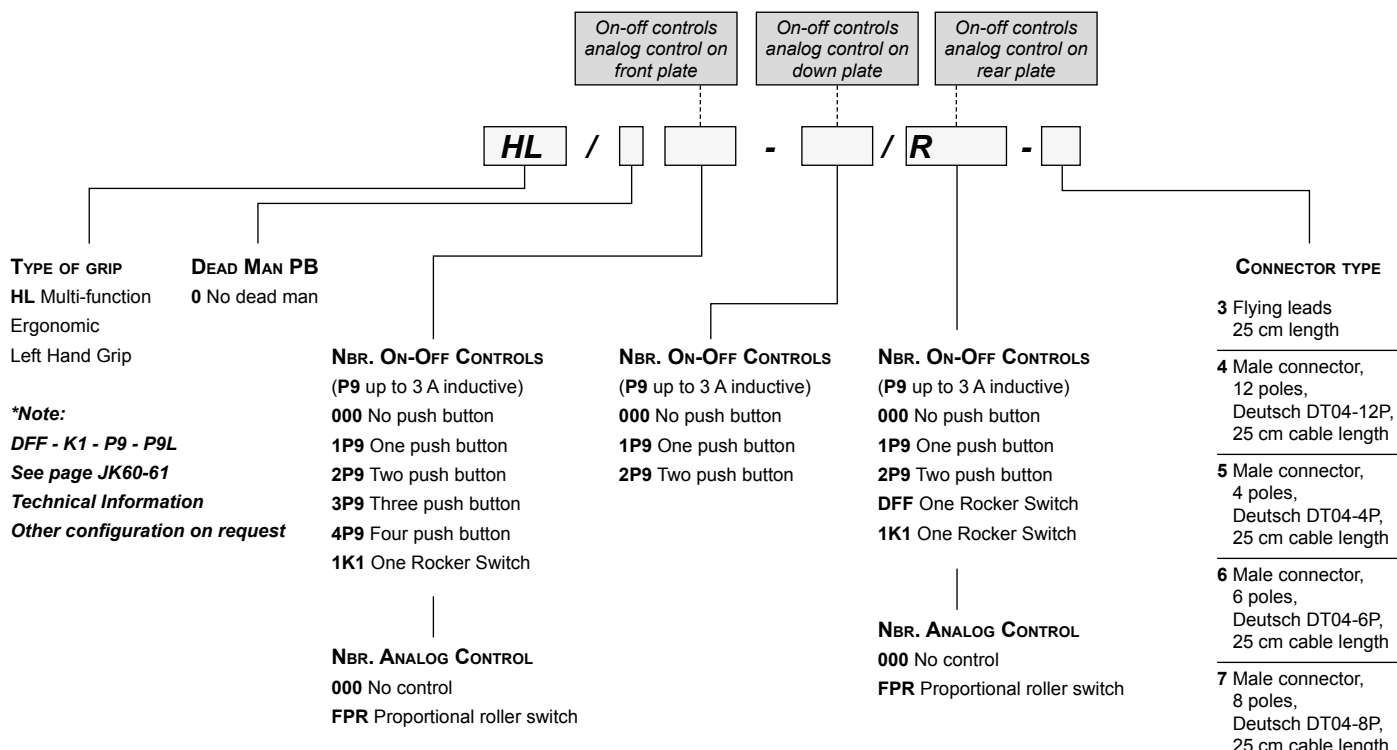


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HL / HR ERGONOMIC GRIP

ORDERING INFORMATION



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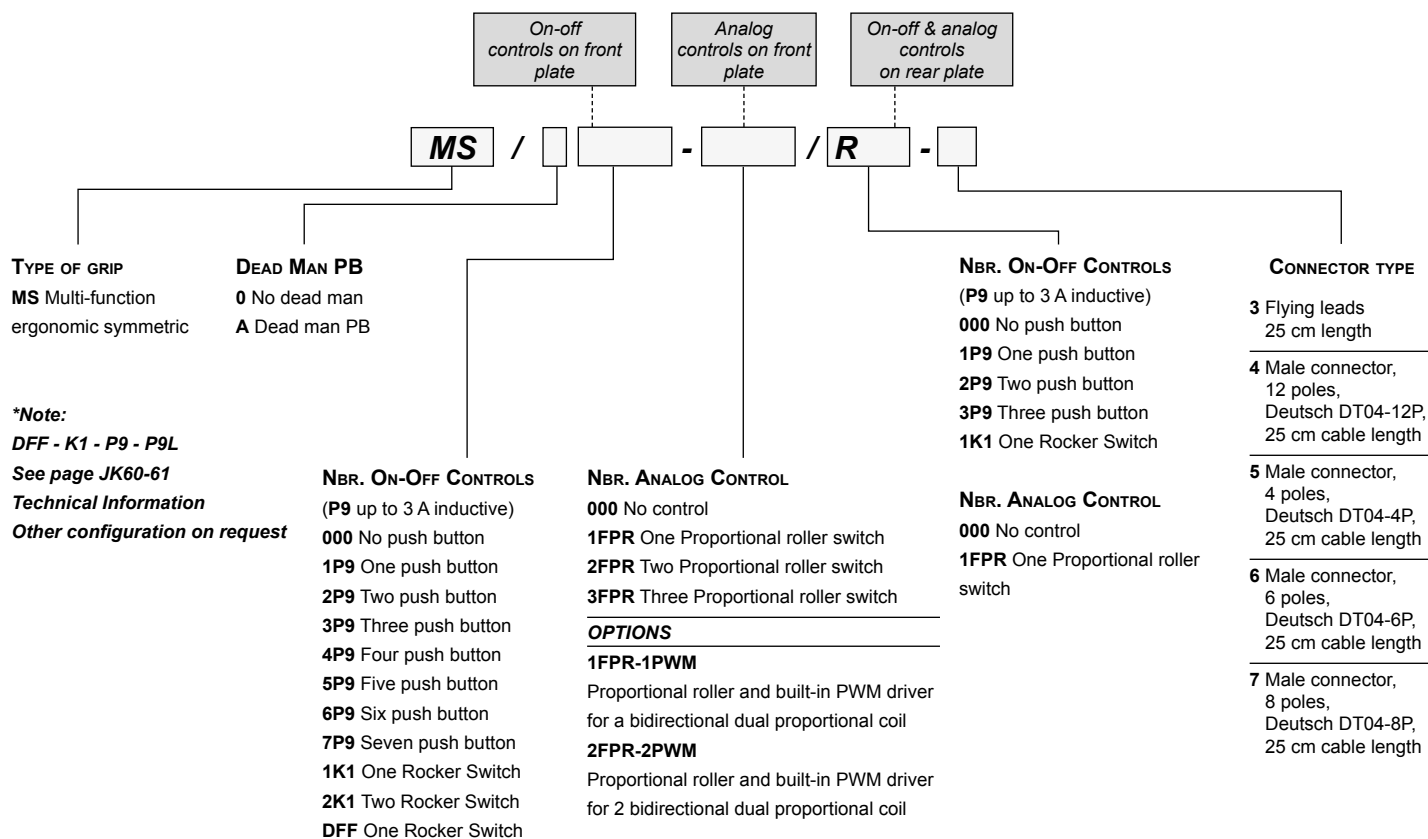
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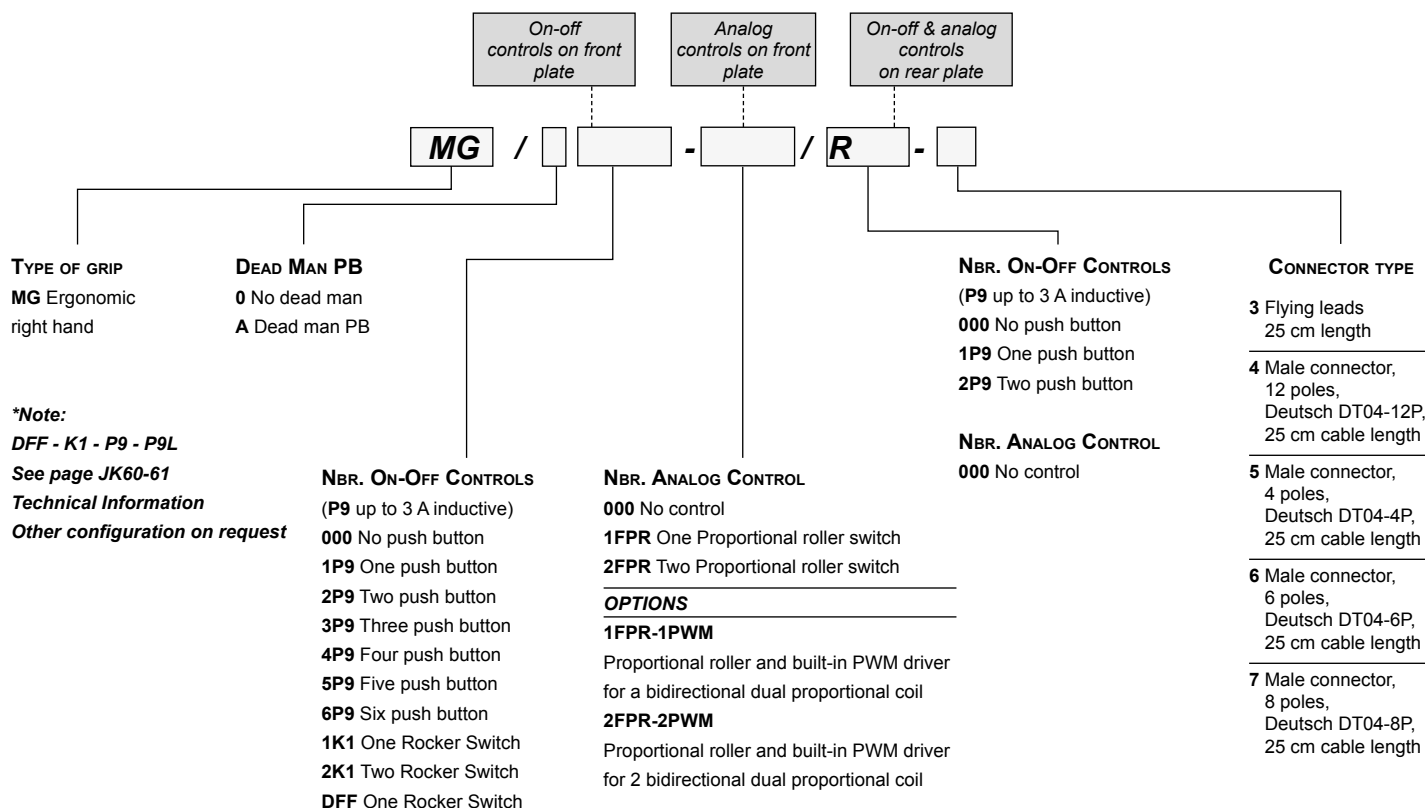
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**IL - IC GRIPS****IL - CYLINDRICAL KNOB****MECHANICAL SPECIFICATIONS**

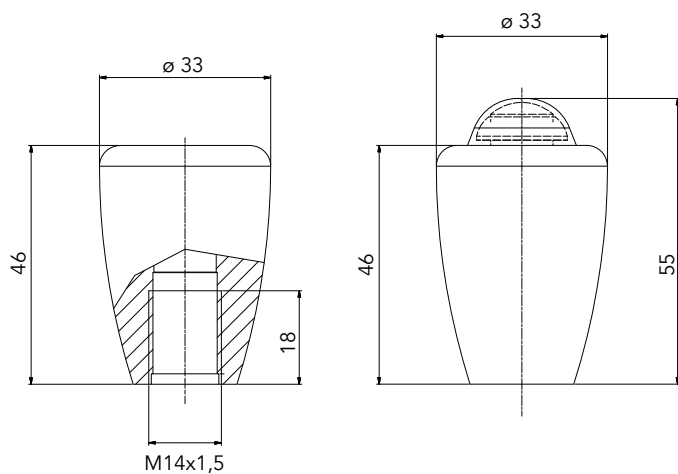
Body material:	Thermoplastic elastomer
Colour:	black
Operating temperature range:	-20°C / +60°C
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
Insulating cable material:	PVC

**TOP PUSH BUTTON**

Rated amperage:	3 A inductive
Life:	> 100.000 cycles
Protection class:	IP 64

**OVERALL DIMENSIONS**

**IL-0000**  
No push button

**IL-0100**  
Top push button  
(No circuit)

**IC - CYLINDRICAL GRIP****MECHANICAL SPECIFICATIONS**

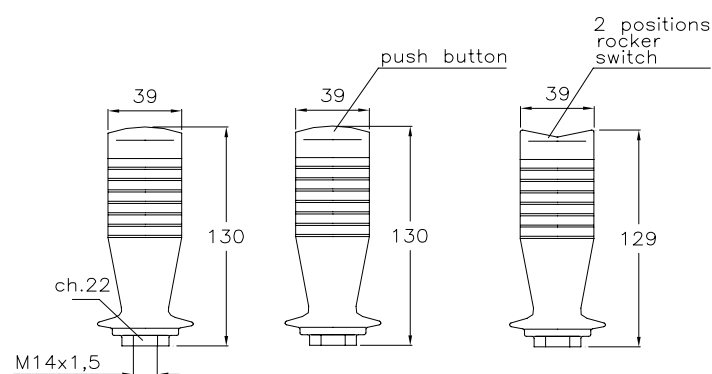
Body material:	nylon
Bottom rubber material:	neoprene
Colour:	black
Operating temperature range:	-20°C / +60°C
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
Insulating cable material:	PVC

**PUSH BUTTON AND ROCKER SWITCH**

Contacts:	silver plated
Rated amperage:	16 A / 250 vac 3 A / 24 VDC
Electrical life:	> 100.000 cycles
Mechanical life:	> 3.000.000 cycles
Protection class:	IP 54

**OVERALL DIMENSIONS**

**IC-0000**  
No push button

**IC-0100**  
Top push button  
(No circuit)

**IC-0200**  
Top rocker switch

**IL - IC ORDERING INFORMATION: see page JK38**

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**IE MULTI-FUNCTION ERGONOMIC GRIP**

**FEATURES**

- Multi-functions ergonomic grip gear type with on-off and proportional switches.
- Easy adaptability to existing joystick control lever.

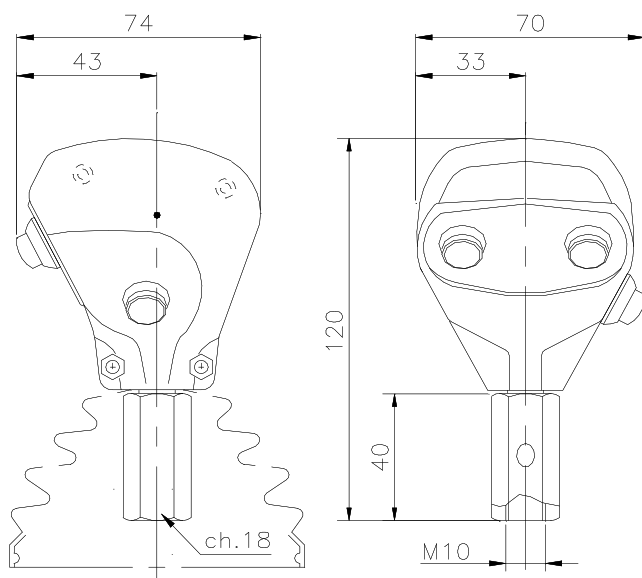
**MECHANICAL SPECIFICATIONS**

Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Connecting hub:	female thread / M10 x 1.5
Protection class:	IP 65 (plain grip)

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
<b>Available push buttons and switches</b>	
P9 - P9L - Push buttons:	see page JK61 Technical Information
A - Side dead man push button:	see above specifications for P9 push button
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

**OVERALL DIMENSIONS**



**CONFIGURATION EXAMPLES**

	D-man P/B	Rear P/B	Rear FPR
IE/0000/0000	0	0	0
IE/A000/0000	yes	0	0
IE/A1P9/0000	yes	1xP9	0
IE/A2P9/0000	yes	2xP9	0
IE/A3P9/0000	yes	3xP9	0
IE/0000/1FPR	0	0	1xFPR
IE-A1P9-1FPR	yes	1xP9	1xFPR

**IE ORDERING INFORMATION:** see page JK38

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**HL MULTI-FUNCTION ERGONOMIC LEFT HAND GRIP****new****FEATURES**

- Optimum ergonomic design.
- High performance switches.

**MECHANICAL SPECIFICATIONS**

Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request)
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

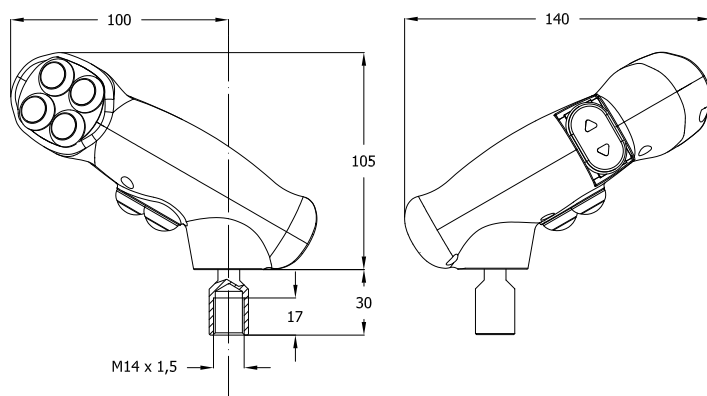
Prewired exit cable: 250 mm

**Available push buttons and switches**

DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

**OVERALL DIMENSIONS**

Mod.  
HL/04P9-2P9/RDFF



**HL ORDERING INFORMATION:** see page JK39



**FRONT VIEW - LEFT HAND**

**CONFIGURATION EXAMPLES**

	FRONT P/B	DOWN P/B	REAR P/B
HL/0000-000/R000	0	0	0
HL/01P9-000/R000	1xP9	0	0
HL/02P9-000/R000	2xP9	0	0
HL/03P9-000/R000	3xP9	0	0
HL/04P9-000/R000	4xP9	0	0
HL/04P9-1P9/R000	4xP9	1xP9	0
HL/04P9-2P9/R000	4xP9	2xP9	0
HL/04P9-2P9/R1P9	4xP9	2xP9	1xP9
HL/04P9-2P9/R2P9	4xP9	2xP9	2xP9
HL/0FPR-000/R000	1xFPR	0	0
HL/0000-000/RFPR	0	0	1xFPR
HL/0FPR-000/RFPR	1xFPR	0	1xFPR
HL/01K1-000/R000	1xK1	0	0
HL/0000-000/R1K1	0	0	1xK1
HL/01K1-000/R1K1	1xK1	0	1xK1
HL/0DFF-000/R000	1xDFF	0	0
HL/0000-000/RDFF	0	0	1xDFF
HL/0DFF-000/RDFF	1xDFF	0	1xDFF

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**HL MULTI-FUNCTION ERGONOMIC LEFT HAND GRIP****new****FEATURES**

- Optimum ergonomic design.
- High performance switches.

**MECHANICAL SPECIFICATIONS**

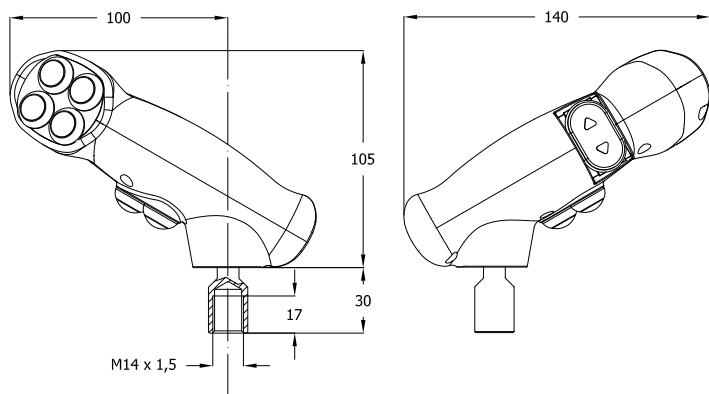
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request)
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
<b>Available push buttons and switches</b>	
DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

**OVERALL DIMENSIONS**

Mod.  
HL/04P9-2P9/RDFF



REAR VIEW - LEFT HAND

**CONFIGURATION EXAMPLES**

	FRONT P/B	DOWN P/B	REAR P/B
HL/0000-000/R000	0	0	0
HL/0FPR-000/R000	1xFPR	0	0
HL/0FPR-1P9/R000	1xFPR	1xP9	0
HL/0FPR-2P9/R000	1xFPR	2xP9	0
HL/0FPR-2P9/R1P9	1xFPR	2xP9	1xP9
HL/0FPR-2P9/R2P9	1xFPR	2xP9	2xP9
HL/0FPR-000/R1FPR	1xFPR	0	1xFPR
HL/0FPR-1P9/R1FPR	1xFPR	1xP9	1xFPR
HL/0FPR-2P9/R1FPR	1xFPR	2xP9	1xFPR

**HL ORDERING INFORMATION:** see page JK39

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## HR MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP

new

## FEATURES

- Optimum ergonomic design.
- High performance switches.

## MECHANICAL SPECIFICATIONS

Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request)
Connecting hub:	female thread / M14 x 1.5

## ELECTRICAL SPECIFICATIONS

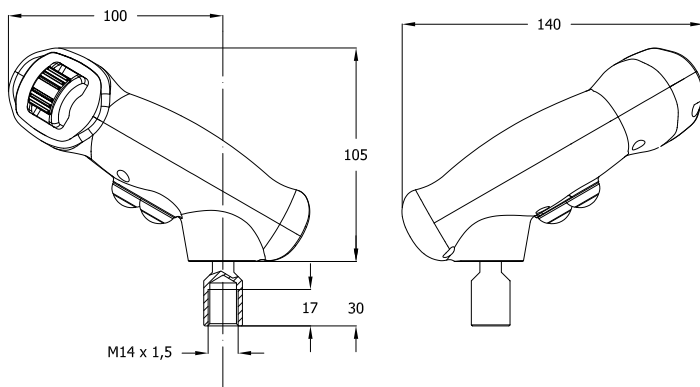
Prewired exit cable: 250 mm

## Available push buttons and switches

DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

## OVERALL DIMENSIONS

Mod.  
HR/0FPR-2P9/R000



HR ORDERING INFORMATION: see page JK39



FRONT VIEW - RIGHT HAND

## CONFIGURATION EXAMPLES

	FRONT P/B	DOWN P/B	REAR P/B
HR/0000-000/R000	0	0	0
HR/01P9-000/R000	1xP9	0	0
HR/02P9-000/R000	2xP9	0	0
HR/03P9-000/R000	3xP9	0	0
HR/04P9-000/R000	4xP9	0	0
HR/04P9-1P9/R000	4xP9	1xP9	0
HR/04P9-2P9/R000	4xP9	2xP9	0
HR/04P9-2P9/R1P9	4xP9	2xP9	1xP9
HR/04P9-2P9/R2P9	4xP9	2xP9	2xP9
HR/0FPR-000/R000	1xFPR	0	0
HR/0000-000/RFP9	0	0	1xFPR
HR/0FPR-000/RFP9	1xFPR	0	1xFPR
HR/01K1-000/R000	1xK1	0	0
HR/0000-000/R1K1	0	0	1xK1
HR/01K1-000/R1K1	1xK1	0	1xK1
HR/0DFF-000/R000	1xDFF	0	0
HR/0000-000/RDFF	0	0	1xDFF
HR/0DFF-000/RDFF	1xDFF	0	1xDFF

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**new****HR MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP****FEATURES**

- Optimum ergonomic design.
- High performance switches.

**MECHANICAL SPECIFICATIONS**

Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request)
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

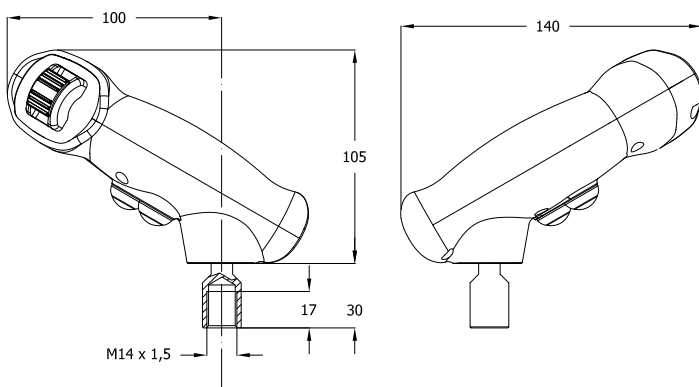
Prewired exit cable: 250 mm

**Available push buttons and switches**

DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

**OVERALL DIMENSIONS**

Mod.  
HR/0FPR-2P9/R000



**HR ORDERING INFORMATION:** see page JK39



**REAR VIEW - RIGHT HAND**

**CONFIGURATION EXAMPLES**

	FRONT P/B	DOWN P/B	REAR P/B
HR/0000-000/R000	0	0	0
HR/0FPR-000/R000	1xFPR	0	0
HR/0FPR-1P9/R000	1xFPR	1xP9	0
HR/0FPR-2P9/R000	1xFPR	2xP9	0
HR/0FPR-2P9/R1P9	1xFPR	2xP9	1xP9
HR/0FPR-2P9/R2P9	1xFPR	2xP9	2xP9
HR/0FPR-000/R1FPR	1xFPR	0	1xFPR
HR/0FPR-1P9/R1FPR	1xFPR	1xP9	1xFPR
HR/0FPR-2P9/R1FPR	1xFPR	2xP9	1xFPR

**MS MULTI-FUNCTION ERGONOMIC SYMMETRIC GRIP**

**FEATURES**

- Optimum ergonomic design.
- High performance switches.

**MECHANICAL SPECIFICATIONS**

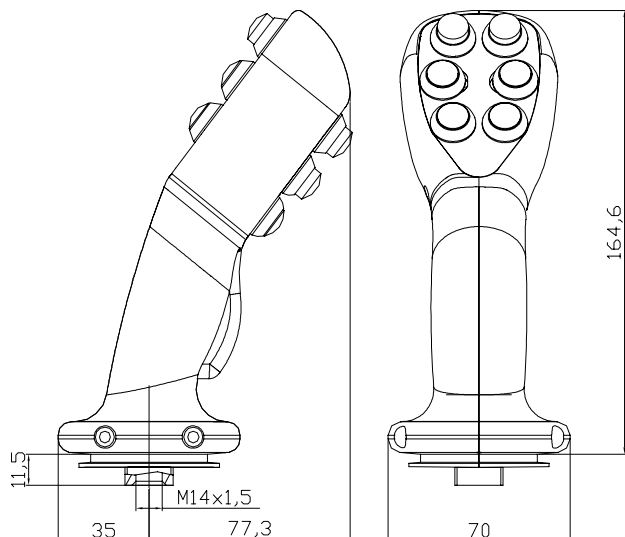
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
<b>Available push buttons and switches</b>	
A - Dead man push button	
Rated amperage:	up to 3 A inductive
Protection class (microswitch):	IP 67
DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

**OVERALL DIMENSIONS**

Mod.  
MS-A6P9-R3P9



**CONFIGURATION EXAMPLES**

	D-man P/B	Front P/B	Rear P/B
MS/0000/0000	0	0	
MS/A000/0000/0000	yes	0	
MS/A1P9/0000/0000	yes	1xP9	
MS/A2P9/0000/0000	yes	2xP9	
MS/A3P9/0000/0000	yes	3xP9	
MS/A4P9/0000/0000	yes	4xP9	
MS/A5P9/0000/0000	yes	5xP9	
MS/A6P9/0000/0000	yes	6xP9	
MS/A6P9/0000/R1P9	yes	6xP9	1xP9
MS/A6P9/0000/R2P9	yes	6xP9	2xP9
MS/A6P9/0000/R3P9	yes	6xP9	3xP9

**MS ORDERING INFORMATION: see page JK40**

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**MS MULTI-FUNCTION ERGONOMIC SYMMETRIC GRIP**

**FEATURES**

- Optimum ergonomic design.
- High performance switches.

**MECHANICAL SPECIFICATIONS**

Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

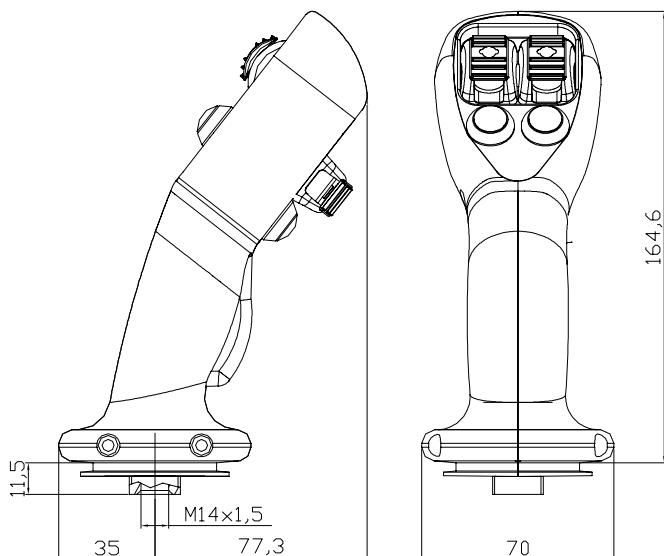
**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
<b>Available push buttons and switches</b>	
A - Dead man push button	
Rated amperage:	up to 3 A inductive
Protection class (microswitch):	IP 67
DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor



**OVERALL DIMENSIONS**

Mod.  
MS-A2P9-2FPR-F1P9



**CONFIGURATION EXAMPLES**

	D-man P/B	Front P/B	Front FPR	Rear P/B	Rear FPR
MS/01P9/1FPR/0000	0	1xP9	1xFPR		
MS/A2P9/1FPR/0000	yes	2xP9	1xFPR		
MS/A3P9/1FPR/R1P9	yes	3xP9	1xFPR	1xP9	
MS/A4P9/1FPR/R2P9	yes	4xP9	1xFPR	2xP9	
MS/A4P9/1FPR/F1P9	yes	4xP9	1xFPR	1xP9	1xFPR
MS/A4P9/1FPR/F2P9	yes	4xP9	1xFPR	2xP9	1xFPR
MS/A2P9/2FPR/0000	yes	2xP9	2xFPR	0	
MS/A2P9/2FPR/R1P9	yes	2xP9	2xFPR	1xP9	
MS/A2P9/2FPR/R2P9	yes	2xP9	2xFPR	2xP9	
MS/A2P9/2FPR/F1P9	yes	2xP9	2xFPR	1xP9	1xFPR
MS/A2P9/2FPR/F2P9	yes	2xP9	2xFPR	2xP9	1xFPR
MS/A000/3FPR/0000	yes	0	3xFPR	0	
MS/A000/3FPR/R1P9	yes	0	3xFPR	1xP9	
MS/A000/3FPR/R2P9	yes	0	3xFPR	2xP9	

**MS ORDERING INFORMATION:** see page JK40

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**MS MULTI-FUNCTION ERGONOMIC SYMMETRIC GRIP**

**FEATURES**

- Optimum ergonomic design.
- Internal PWM driver.

**MECHANICAL SPECIFICATIONS**

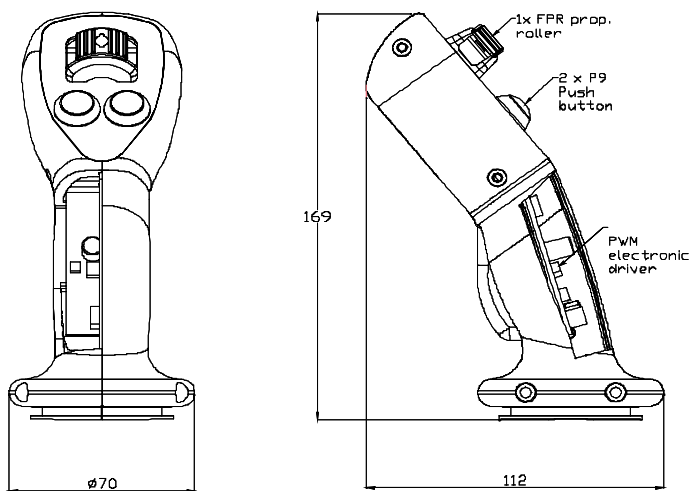
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
<b>Available push buttons and switches</b>	
A - Dead man push button	
Rated amperage:	up to 3 A inductive
Protection class (microswitch):	IP 67
DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

**OVERALL DIMENSIONS**

Mod.  
MS-A2P9-1FPR-1PWM



**PWM - Pulse width modulated output current driver for a dual coil proportional valve**

Supply voltage:	8-32 Volt
Max. current draw:	100 mA
Current output range:	factory set btw 0 and 1500 mA
PWM dither frequency:	100 Hz
Operating temperature range:	-25°C / +85°C

**CONFIGURATION EXAMPLES**

	D-man P/B	Front P/B	Front FPR
MS/01P9/1FPR/1PWM	0	1xP9	1xFPR
MS/A2P9/1FPR/1PWM	yes	2xP9	1xFPR
MS/A3P9/1FPR/1PWM	yes	3xP9	1xFPR
MS/A4P9/1FPR/1PWM	yes	4xP9	1xFPR

**MS ORDERING INFORMATION: see page JK40**

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**MG MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP**

**FEATURES**

- Optimum ergonomic design.
- High performance switches.

**MECHANICAL SPECIFICATIONS**

Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

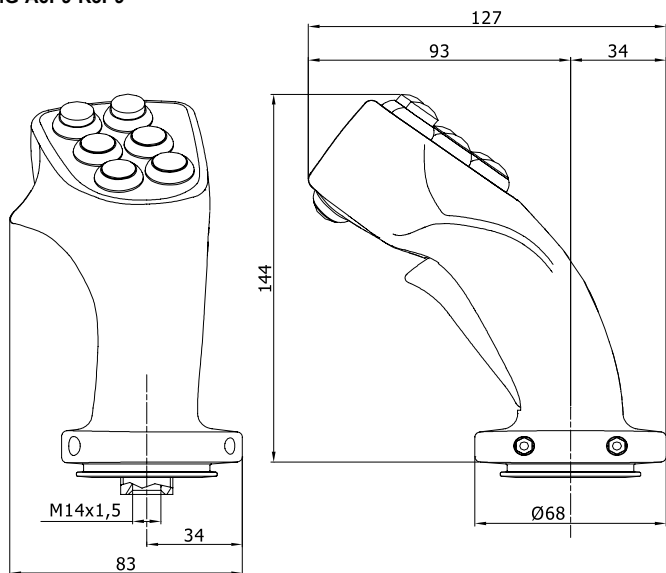
**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
<b>Available push buttons and switches</b>	
A - Dead man push button	
Rated amperage:	up to 3 A inductive
Protection class (microswitch):	IP 67
DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor



**OVERALL DIMENSIONS**

Mod.  
MG-A6P9-R3P9



**CONFIGURATION EXAMPLES**

	D-man P/B	Front P/B	Rear P/B
MG/0000/0000	0	0	
MG/A000/0000/0000	yes	0	
MG/A1P9/0000/0000	yes	1xP9	
MG/A2P9/0000/0000	yes	2xP9	
MG/A3P9/0000/0000	yes	3xP9	
MG/A4P9/0000/0000	yes	4xP9	
MG/A5P9/0000/0000	yes	5xP9	
MG/A6P9/0000/0000	yes	6xP9	
MG/A6P9/0000/R1P9	yes	6xP9	1xP9
MG/A6P9/0000/R2P9	yes	6xP9	2xP9
MG/A6P9/0000/R3P9	yes	6xP9	3xP9

**MG ORDERING INFORMATION:** see page JK41

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**MG MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP****FEATURES**

- Optimum ergonomic design.
- High performance switches.

**MECHANICAL SPECIFICATIONS**

Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable: 250 mm

**Available push buttons and switches**

A - Dead man push button

Rated amperage: up to 3 A inductive

Protection class (microswitch): IP 67

DFE - Rocker Switch: see page JK60 Technical Info

K1 - Rocker Switch: see page JK60 Technical Info

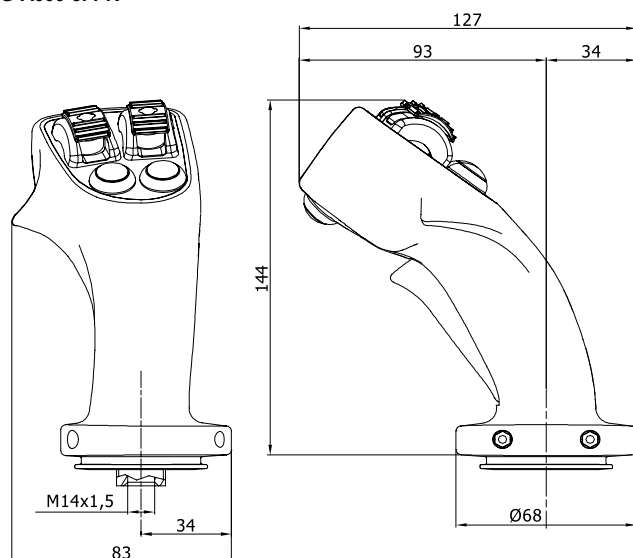
P9 - P9L - Push buttons: see page JK61 Technical Info

FPR - Proportional roller: see FPR data sheet

Output signal: 3-pins connection  
hall effect contactless sensor

**OVERALL DIMENSIONS**

Mod.  
MG-A000-3FPR

**CONFIGURATION EXAMPLES**

	D-man P/B	Front P/B	Front FPR	Rear P/B	Rear FPR
MG/01P9/1FPR/0000	0	1xP9	1xFPR		
MG/A2P9/1FPR/0000	yes	2xP9	1xFPR		
MG/A3P9/1FPR/R1P9	yes	3xP9	1xFPR	1xP9	
MG/A4P9/1FPR/R2P9	yes	4xP9	1xFPR	2xP9	
MG/A4P9/1FPR/F1P9	yes	4xP9	1xFPR	1xP9	1xFPR
MG/A4P9/1FPR/F2P9	yes	4xP9	1xFPR	2xP9	1xFPR
MG/A2P9/2FPR/0000	yes	2xP9	2xFPR	0	
MG/A2P9/2FPR/R1P9	yes	2xP9	2xFPR	1xP9	
MG/A2P9/2FPR/R2P9	yes	2xP9	2xFPR	2xP9	
MG/A2P9/2FPR/F1P9	yes	2xP9	2xFPR	1xP9	1xFPR
MG/A2P9/2FPR/F2P9	yes	2xP9	2xFPR	2xP9	1xFPR
MG/A000/3FPR/0000	yes	0	3xFPR	0	
MG/A000/3FPR/R1P9	yes	0	3xFPR	1xP9	
MG/A000/3FPR/R2P9	yes	0	3xFPR	2xP9	

**MG ORDERING INFORMATION:** see page JK41

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**Delta Power Company**

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**MG MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP**

**FEATURES**

- Optimum ergonomic design.
- Internal PWM driver.

**MECHANICAL SPECIFICATIONS**

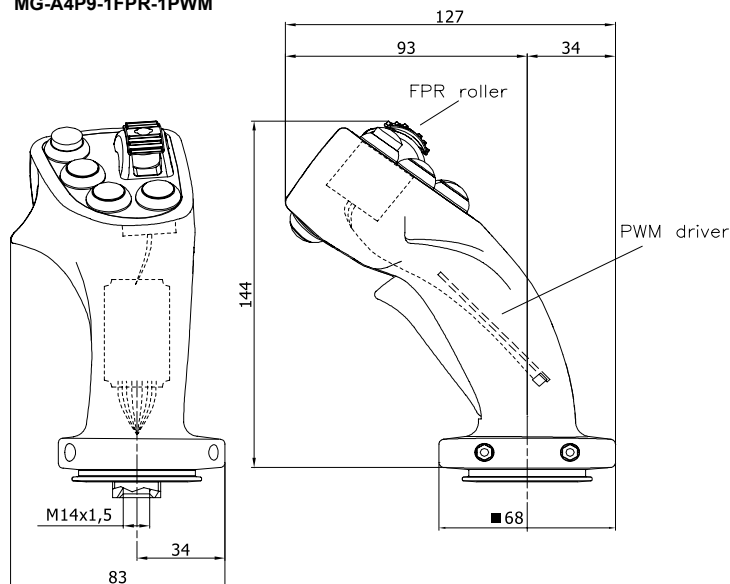
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

**ELECTRICAL SPECIFICATIONS**

Prewired exit cable:	250 mm
<b>Available push buttons and switches</b>	
A - Dead man push button	
Rated amperage:	up to 3 A inductive
Protection class (microswitch):	IP 67
DFF - Rocker Switch:	see page JK60 Technical Info
K1 - Rocker Switch:	see page JK60 Technical Info
P9 - P9L - Push buttons:	see page JK61 Technical Info
FPR - Proportional roller:	see FPR data sheet
Output signal:	3-pins connection hall effect contactless sensor

**OVERALL DIMENSIONS**

Mod.  
MG-A4P9-1FPR-1PWM



**PWM - Pulse width modulated output current driver for a dual coil proportional valve**

Supply voltage:	8-32 Volt
Max. current draw:	100 mA
Current output range:	factory set btw 0 and 1500 mA
PWM dither frequency:	100 Hz
Operating temperature range:	-25°C / +85°C

**CONFIGURATION EXAMPLES**

	D-man P/B	Front P/B	Front FPR	PWM	Rear P/B
<b>MG/01P9/1FPR/1PWM</b>	0	1xP9	1xFPR	1xPWM	
<b>MG/A2P9/1FPR/1PWM</b>	yes	2xP9	1xFPR	1xPWM	
<b>MG/A3P9/1FPR/1PWM</b>	yes	3xP9	1xFPR	1xPWM	
<b>MG/A4P9/1FPR/1PWM</b>	yes	4xP9	1xFPR	1xPWM	
<b>MG/A4P9/1FPR/1PWM/R1P9</b>	yes	4xP9	1xFPR	1xPWM	1xP9
<b>MG/A4P9/1FPR/1PWM/R2P9</b>	yes	4xP9	1xFPR	1xPWM	2xP9

**MG ORDERING INFORMATION:** see page JK41

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## ACCESSORIES

MODEL	DESCRIPTION	PAGE
Joystick connections	Connector kits	JK56
Joystick calibration tool	Software calibration tool linking cables	JK58
Technical informations Operators for Grip Assembling	Rocker switches, push buttons knob potentiometer	JK60



## CONNECTOR KITS

**7 POLES DUBOX CONNECTOR****Kit includes:** male connector, female contacts**Available for joystick:** JLP-L2S**ORDERING CODE: 13.0310.046****7 POLES C-GRID CONNECTOR****Kit includes:** male connector, female contacts**Available for joystick:** JLP-L2S, FTH**ORDERING CODE: 13.0310.591****7 POLES DUBOX CONNECTOR WITH WIRES****Kit includes:** male connector, with inserted wires section 0.22 mm<sup>2</sup>**Available for joystick:** JLP-L2S

3 wires 80 cm length

**ORDERING CODE: 13.0310.206**

7 wires 150 cm length

**ORDERING CODE: 13.0310.313****4 POLES MINIFIT CONNECTOR****Kit includes:** male connector, female contacts**Available for joystick:** FPR**ORDERING CODE: 13.0310.640****6 POLES MINIFIT CONNECTOR****Kit includes:** male connector, female contacts**Available for joystick:** FPR-PWM**ORDERING CODE: 13.0310.654**

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## CONNECTOR KITS

**3 POLES DEUTSCH DT06-3S****Kit includes:** male connector, female contacts, secondary lock**Available for joystick:** FPR**ORDERING CODE: 13.0310.394****4 POLES DEUTSCH DT06-4S****Kit includes:** male connector, female contacts, secondary lock**Available for joystick:** JHM-CAN**ORDERING CODE: 13.0310.132****6 POLES DEUTSCH DT06-6S****Kit includes:** male connector, female contacts, secondary lock and fillers**Available for joystick:** JHM**ORDERING CODE: 13.0310.467****8 POLES DEUTSCH DT06-8S****Kit includes:** male connector, female contacts, secondary lock and fillers**Available for joystick:** JHM**ORDERING CODE: 13.0310.432****12 POLES DEUTSCH DT06-12S****Kit includes:** male connector, female contacts, secondary lock and fillers**Available for joystick:** JHM**ORDERING CODE: 13.0310.441**

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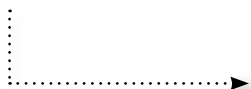
## CALIBRATION TOOL

### TECNORD SOFTWARE JOYSTICK CALIBRATION TOOL

Tecnord joysticks, with electronic control unit inside, are supplied with operation parameters standard programming, which satisfies most applications. For special application SCT calibration software allows some of the parameters for proportional solenoid valve control to be modified via computer; for example the minimum and maximum current or ramp up and ramp down parameters may be defined. The linking cable shown in the following page (optional, to be ordered separately) is necessary for the computer connection.



SOFTWARE  
INSTALLATION



### MINIMUM SYSTEM REQUIREMENTS

- Windows XP® operating system or higher.
- Intel® Pentium processor.
- 32 Mb RAM.
- CD player unit.
- Connecting through a standard RS232 serial port, DB9 connection; alternatively, a USB-RS232 converter can be used.

### PROGRAM INSTALLATION

To install the SCT software onto a personal computer, simply execute the file *setup.exe*.

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**CALIBRATION LINKING CABLES****DEUTSCH-DB9 LINKING CABLE (with software calibration tool)**

Available for joysticks: JHM-PWM, JHM-MLT

**ORDERING CODE: 21.0801.055**

**RS232 - USB CONVERTER**

It allows Tecnord joysticks to Personal Computer connection when the latter is unprovided of serial port; for installation follow the instruction enclosed with the converter

**ORDERING CODE: 21.0801.039**

**CAN - USB CONVERTER**

It allows Tecnord CAN joysticks to Personal Computer connection with a USB port; for installation follow the instruction enclosed with the interface device

**ORDERING CODE: 21.0801.040**

**CAN - USB CALIBRATION TOOL**

It allows modification of specific parameters on Tecnord CAN joysticks following calibration tool program on CD Rom; for installation follow the instruction enclosed with the interface device

**ORDERING CODE: 21.0801.062**



## TECHNICAL INFORMATIONS - OPERATORS FOR GRIP ASSEMBLING

**DFF - ROCKER SWITCH TYPE****Switch Operation:** On-Off-On**Ordering code:** 50.1301.500**Characteristics**

Inrush current (capacitive)	16A 250 VAC (contact pair Ag / Cu and basic type 1838)
Contact resistance (new condition)	< 100 mOhm (1 A 12 VDC)
Insulation resistance (new condition)	> 100 mOhm (500 VDC)
Protection type	IP67 1E6 mechanical life endurance
Ambient temperature	terminal side -20°C/+105°C actuating side -20°C/+55°C

**K1 - ROCKER SWITCH TYPE****Switch Operation:**    **Ordering code:**On-Off-On            **50.1301.501**On-Off                **50.1301.502**Mom-Off-Mom       **50.1301.503**Fwd-Neu-Rev        **50.1301.504****Characteristics**

Load	28 VDC or 125/250 VAC, 60Hz	Cycles
Resistive	10A	50.000
Inductive	10A	25.000

**Mechanical life**            100.000 cycles**Seal**                            IP68S**Operating temp. range**    -30°C to +85°C**Materials**                    Thermoplastic

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## TECHNICAL INFORMATIONS - OPERATORS FOR GRIP ASSEMBLING

### P9 - PUSH BUTTONS

Switch Operation: On-Off

Case Flush Color	Ordering code
Red	13.0310.549
Blue	13.0310.551
Yellow	13.0310.535
Black	13.0310.555
Green	13.0310.553
White	13.0310.547
Purple	13.0310.559
Grey	13.0310.561
Orange	13.0310.557

Case Raised Color	Ordering code
Red	13.0310.550
Blue	13.0310.552
Yellow	13.0310.528
Black	13.0310.556
Green	13.0310.554
White	13.0310.548
Purple	13.0310.560
Grey	13.0310.562
Orange	13.0310.558

#### Characteristics

Operational life	up to 1.000.000 cycles
Rated amperage	up to 5 A resistive up to 3 A inductive
Protection class	IP 64 (IP 68S available)
Operating temp. range	-40°C to +85°C
Button and bezel material	thermoplastic
Contacts	gold plated silver alloy



#### Characteristics

Operational life	up to 1.000.000 cycles
Rated amperage	up to 5 A resistive up to 3 A inductive
Protection class	IP 64 (IP 68S available)
Operating temp. range	-40°C to +85°C
Button and bezel material	thermoplastic
Contacts	gold plated silver alloy



### P9L - PUSH BUTTONS WITH LED (12 VDC)

Switch Operation: On-Off

Case Flush Color	Led	Ordering code
Green	Green	50.1301.328
Red	Red	50.1301.329
Orange	Amber	50.1301.330
Yellow	White	50.1301.331
Blue	Blue	50.1301.332
White	Red	50.1301.348
Black	Red	50.1301.345

Case Raised Color	Led	Ordering code
Green	Green	50.1301.324
Red	Red	50.1301.325

#### Characteristics

Operational life	up to 1.000.000 cycles
Rated amperage	up to 5 A resistive at 28VDC
Protection class	IP67 (70.000 cycles)
Operating temp. range	-40°C to +85°C
Button and bezel material	thermoplastic
Contacts	gold plated silver





## TECHNICAL INFORMATIONS - OPERATORS FOR GRIP ASSEMBLING

**APL - LATCHING PUSH BUTTONS**

Switch Operation: On-Off Latching

Case Color	Led	Ordering code
Red	X	50.1301.407
Red	Red	50.1301.414
Yellow	Red	50.1301.415
Yellow	X	50.1301.416
Green	X	50.1301.417

**Characteristics**

Operational life	up to 1.000.000 cycles
Rated amperage	up to 5 A resistive up to 3 A inductive
Protection class	IP 67
Operating temp. range	-40°C to +85°C
Button and bezel material	polyamide 6/6
Contacts	gold plated silver

**SEALING BOOTS**

For raised dome

**ORDERING CODE: 50.1301.326****SEALING BOOTS**

For flush dome

**ORDERING CODE: 50.1301.327****KNOB POTENTIOMETER TYPE P16**Ohmic value: 5k $\Omega$  10%Electrical travel: 270°  $\pm$ 10°**ORDERING CODE: 50.1501.025**

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