

JOYSTICKS AND GRIPS



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FINGERTIP PROPORTIONAL CONTROL LEVERS AND SWITCHES

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JLP proportional control lever	JK6	JK14
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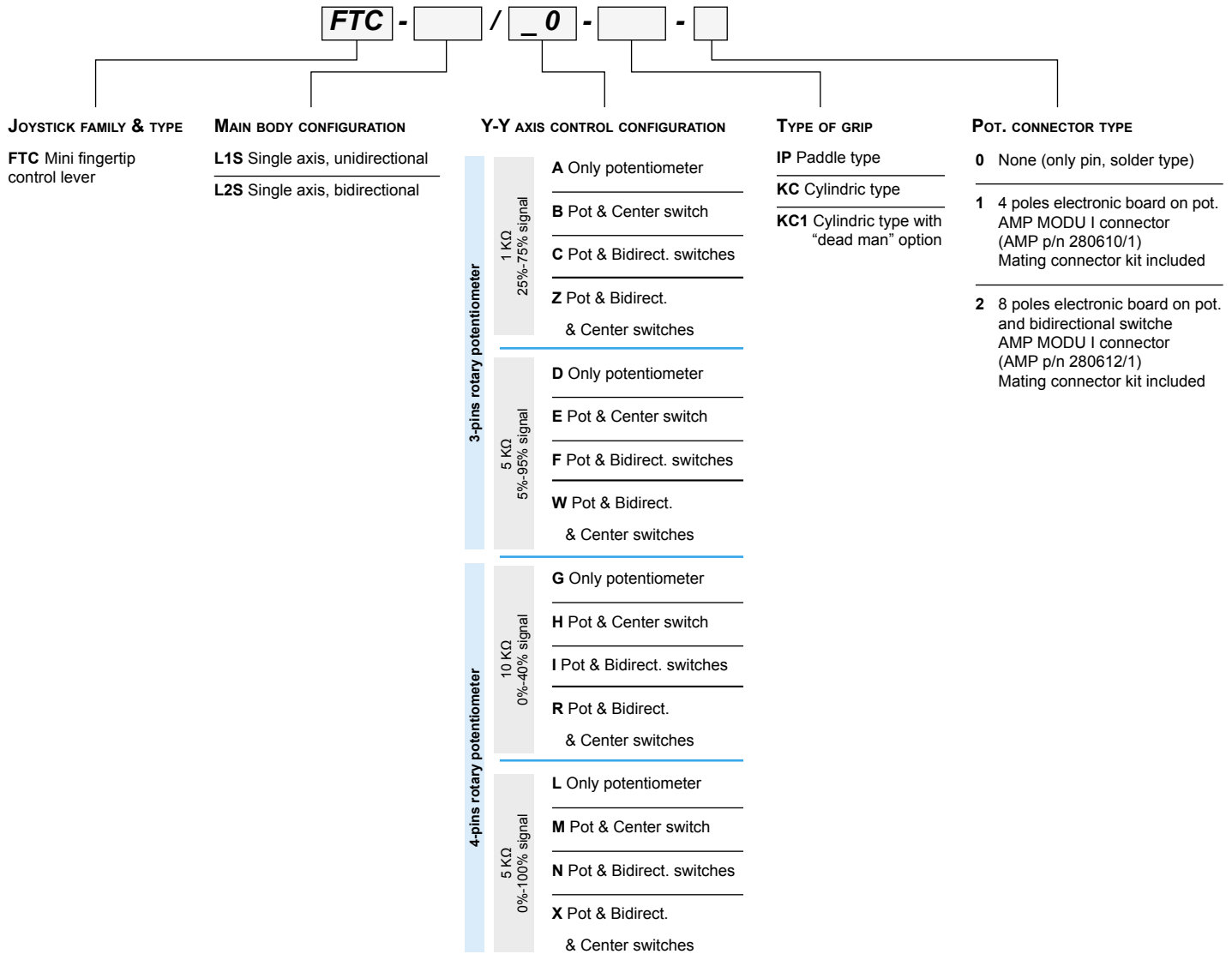
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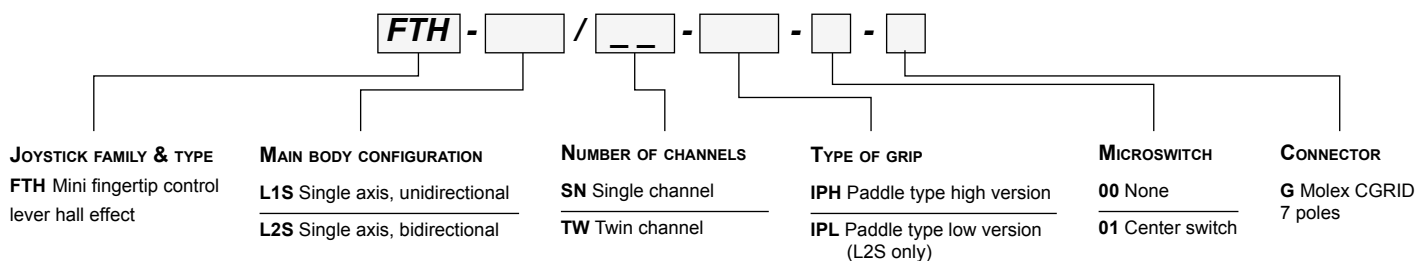


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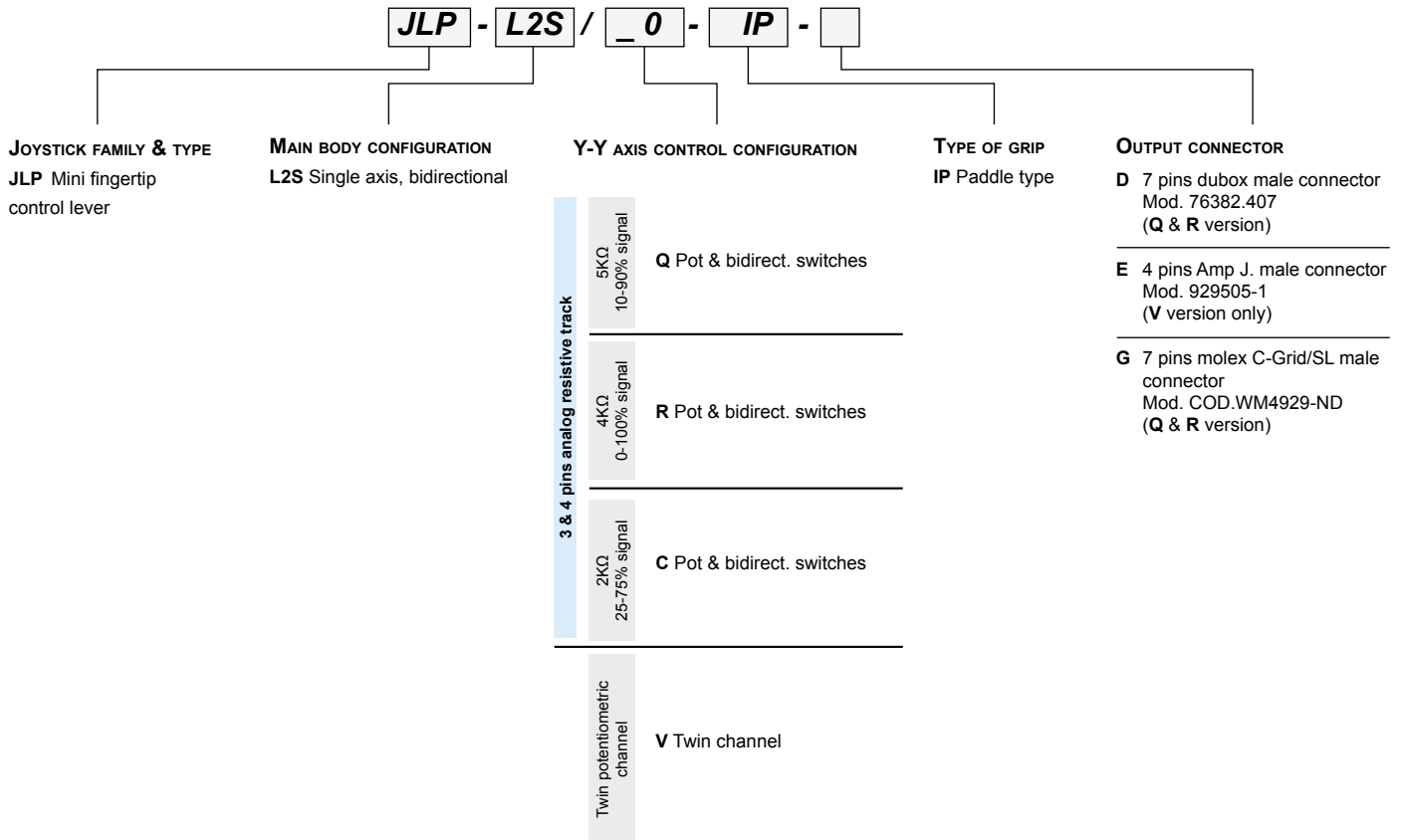
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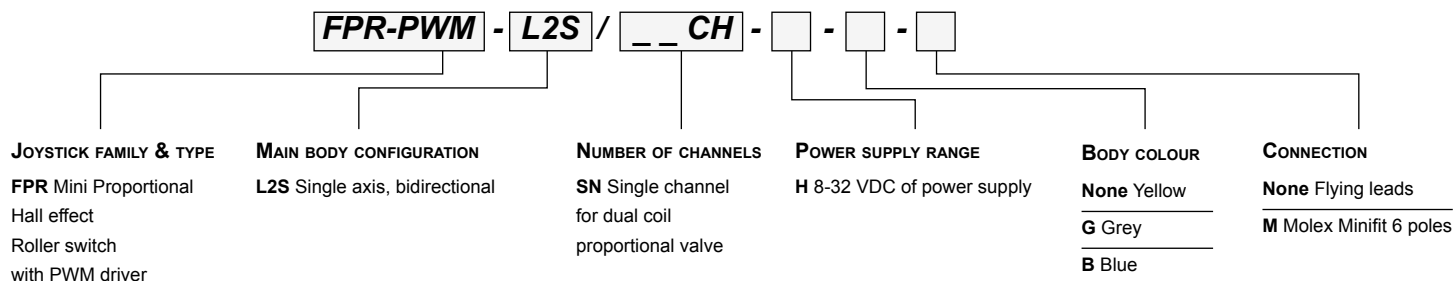
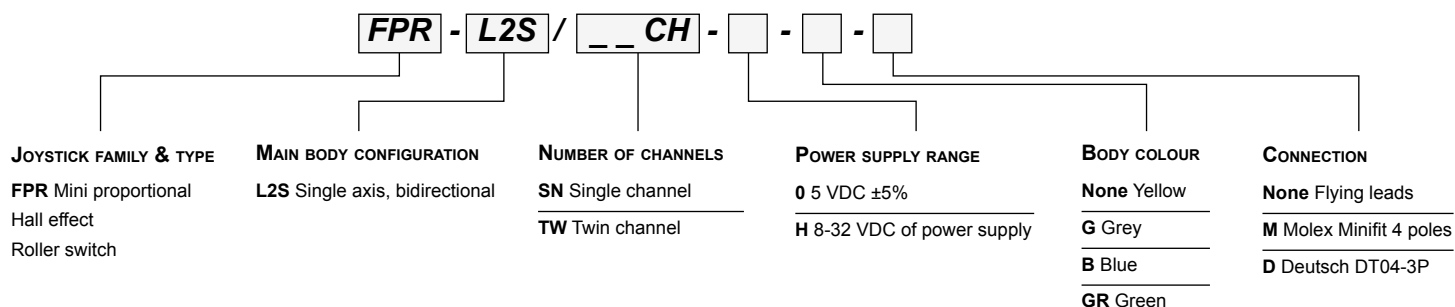
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FPR FINGERTIP PROPORTIONAL SWITCHES

ORDERING INFORMATION



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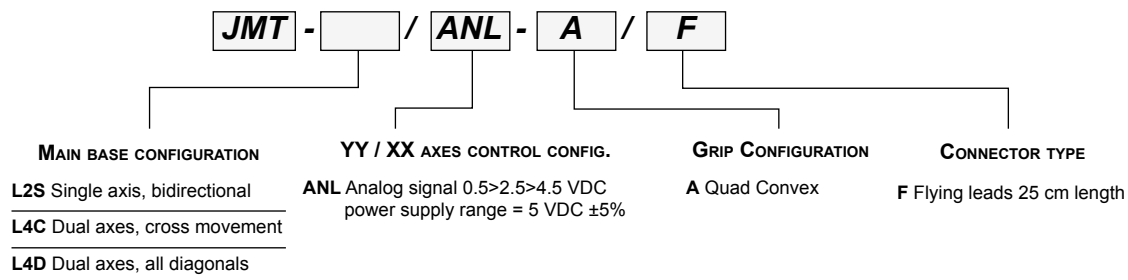


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JMT PROPORTIONAL MULTI-AXIS HALL EFFECT THUMB JOYSTICK



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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)

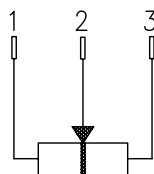
Neutral position switch (electromechanical type)

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)

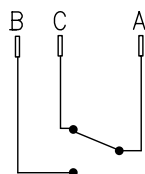
POTENTIOMETER & SWITCHES OPTIONS

	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

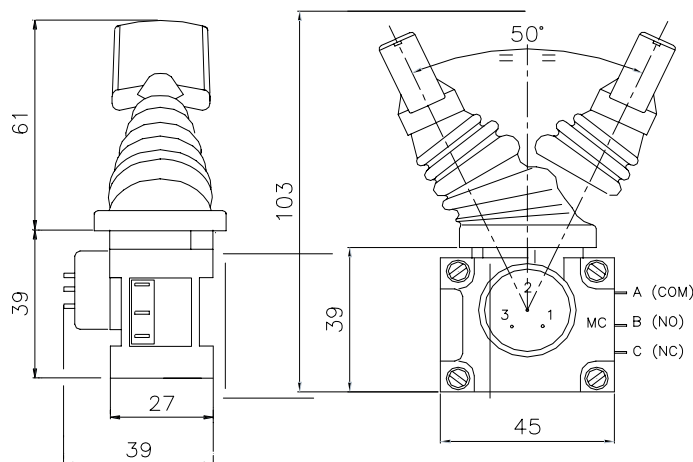


Potentiometer



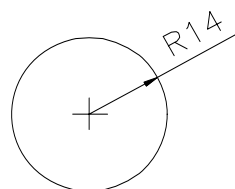
Neutral position switch MC

OVERALL DIMENSIONS



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

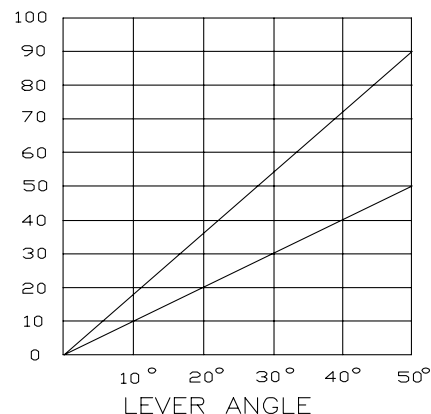
PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC

OUTPUT SIGNAL

% of Vin



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 Ω $\pm 20\%$
/ D = 90% of V_{in}	5 k Ω $\pm 20\%$
Max. operating input voltage (V_{in}):	48 V or ± 24 V
Min. load impedance on pin 2 (signal):	50 k Ω
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)

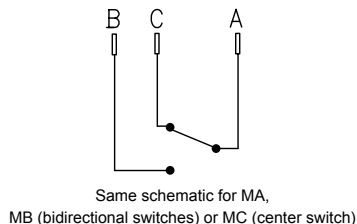
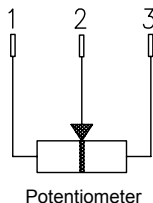
Center / bidirectional switches (electromechanical type)

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:	$+4^\circ$
Protection class:	IP 55

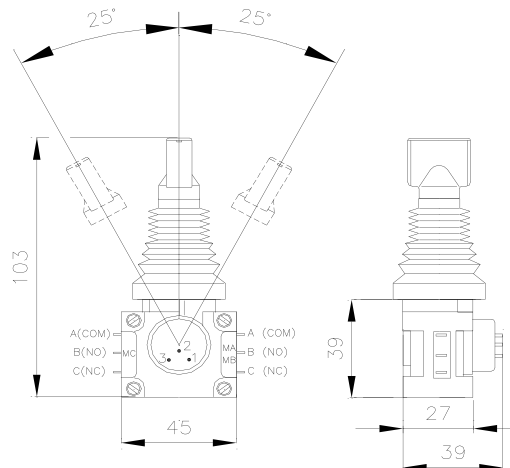
POTENTIOMETER & SWITCHES OPTIONS

	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

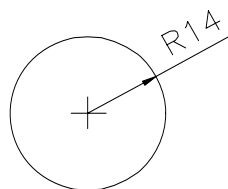


OVERALL DIMENSIONS

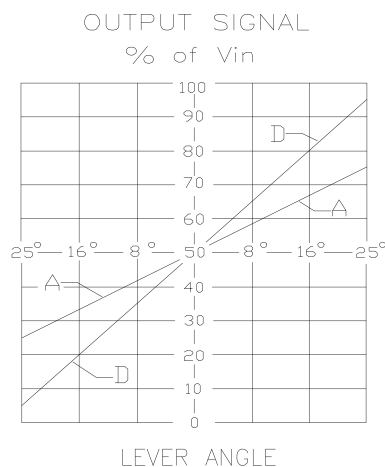


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

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)

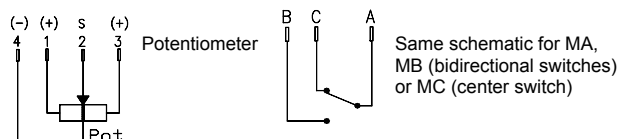
Center / bidirectional switches (electromechanical type)

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)

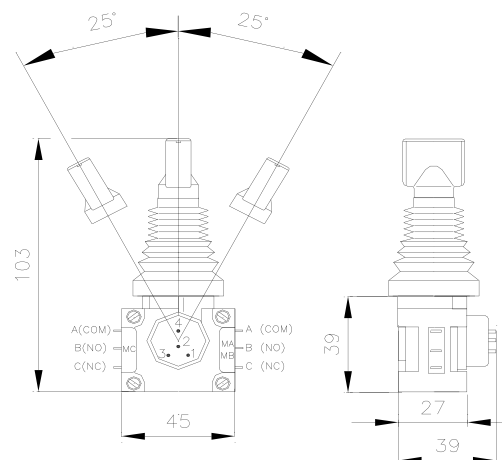
POTENTIOMETER & SWITCHES OPTIONS

	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

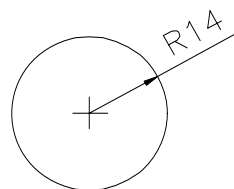


OVERALL DIMENSIONS

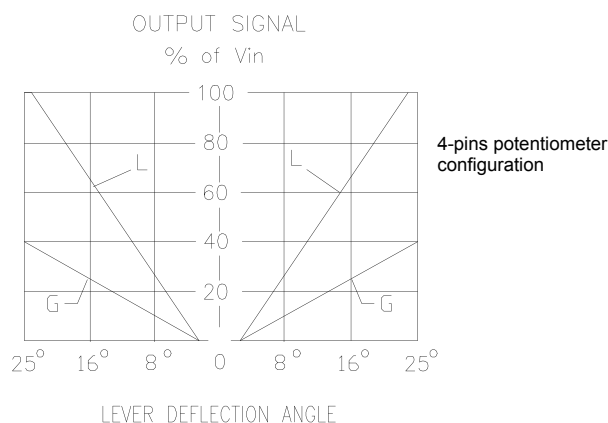


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

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

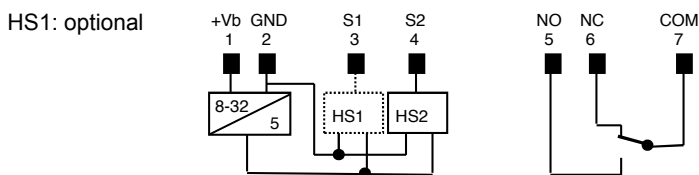
Linear, hall-effect sensor

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

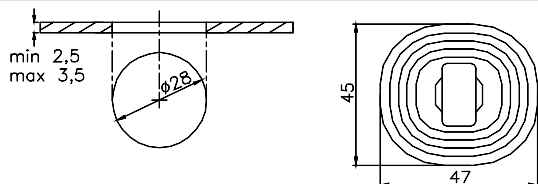
Neutral position switch (electromechanical type)

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

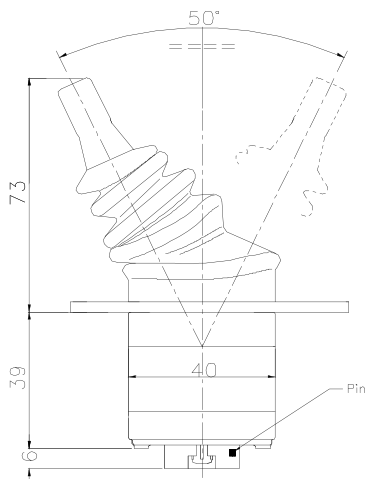
ELECTRICAL CONNECTIONS



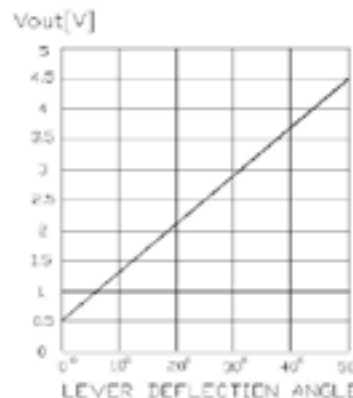
PANEL CUT-OUT AND MOUNTING



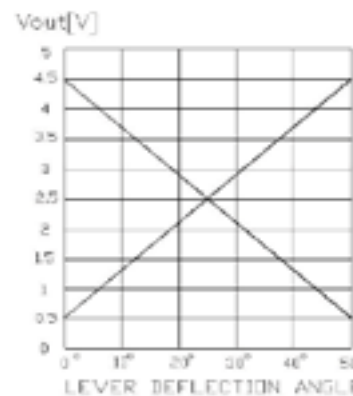
OVERALL DIMENSIONS



OUTPUT SIGNAL CONTROL CHARACTERISTIC



FTH-L1S/SN
(single channel)



FTH-L1S/TW
(dual channel)

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

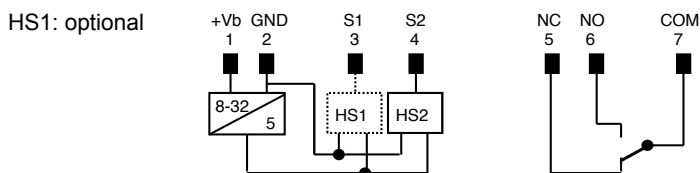
Linear, hall-effect sensor

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

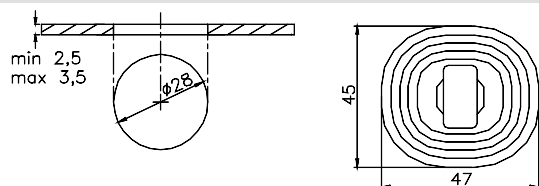
Neutral position switch (electromechanical type)

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

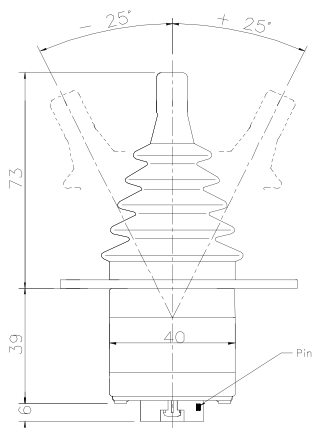
ELECTRICAL CONNECTIONS



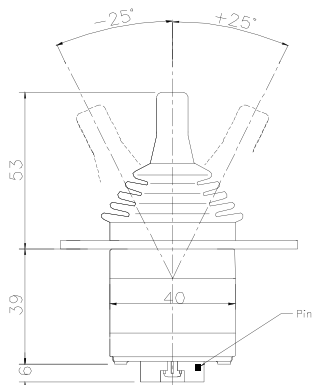
PANEL CUT-OUT AND MOUNTING



OVERALL DIMENSIONS



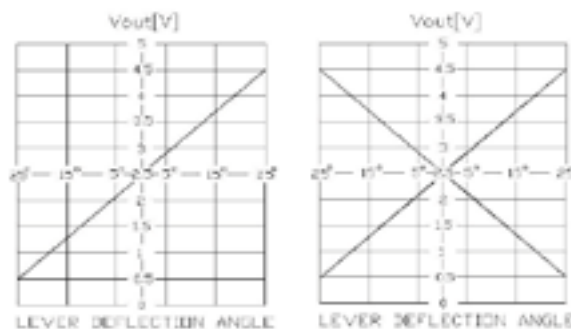
Paddle type high



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 Ω $\pm 20\%$
/ Q = 80% of V_{in}	5 k Ω $\pm 20\%$
/ R = 100% of V_{in}	4 k Ω $\pm 20\%$
Max. operating input voltage (V_{in}):	48 V or ± 24 V
Min. load impedance on pin 5 (signal):	50 k Ω
Max. operating current on pin 5:	1 mA
Output voltage:	see graph
Linearity (resistive track):	2% or better

Directional switches

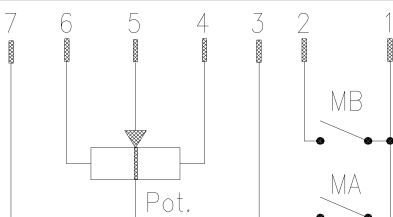
Typical track resistance:	150 Ohm
Max. operating input voltage:	48 V or ± 24 V
Min. load impedance on pins 2&3:	50 k Ω
Max. operating current on pins 2&3:	1 mA
Directional switches threshold angle:	$\pm 4^\circ$
Connector type: Mod. D Dubox = P.N. 76382.407 wiring	
Mod. G Molex = C-Grid P.N. 50-57-9407	

POTENTIOMETER & SWITCHES OPTIONS

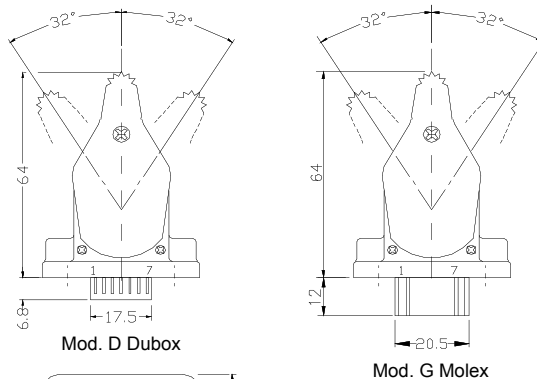
Reference codes

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

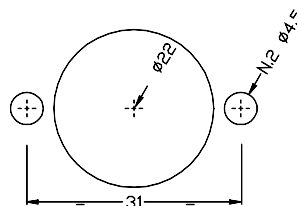
ELECTRICAL CONNECTIONS



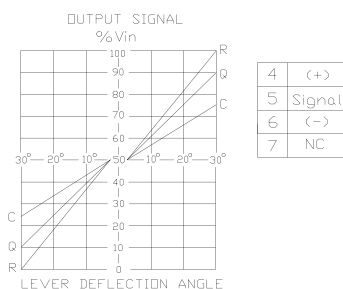
OVERALL DIMENSIONS



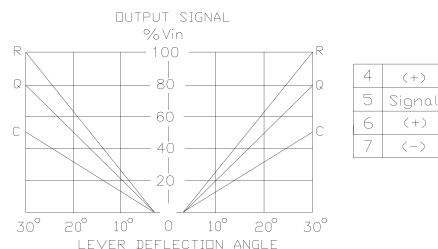
PANEL CUT-OUT



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

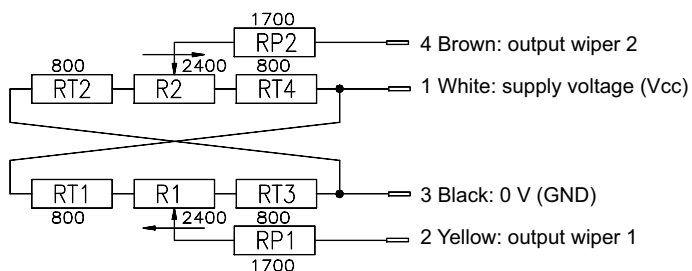
Electrical power rating:	0.25 W @ 25°C
Total resistance between pin 1 and 3:	2 kΩ $\pm 20\%$
Nominal voltage supply (V _{in}):	10 V
Tolerance between track 1 and 2:	$\pm 4\%$ of V _{cc}
Output voltage:	see graph
Load resistance:	100 kΩ - nominal 50 kΩ - minimum
Linearity (resistive track):	2% or better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

POTENTIOMETER & SWITCHES OPTIONS

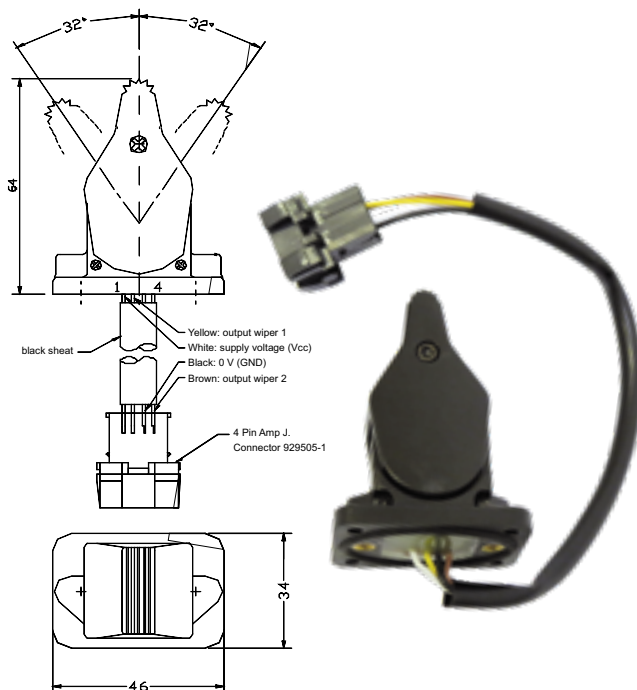
	Reference codes
Output signal	S= 60% V _{in}
3 pins potentiometer	V

ELECTRICAL CONNECTIONS

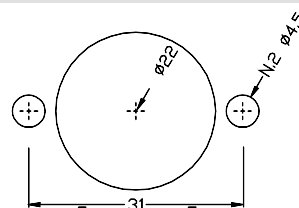
Pinout



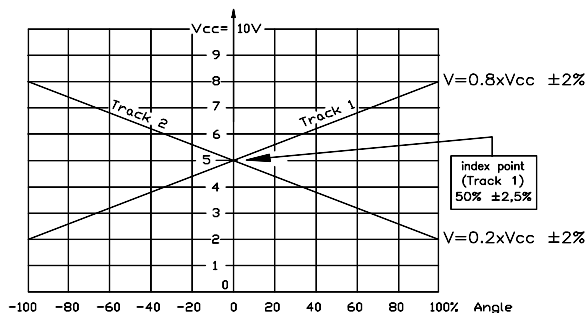
OVERALL DIMENSIONS



PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



JLP ORDERING INFORMATION: see page JK6

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FPR-L2S 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

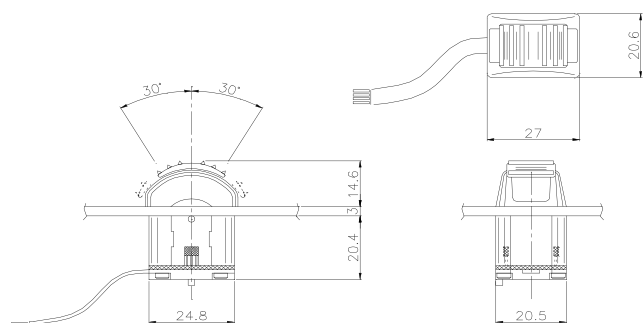
Signal output @ rest:	2.5 VDC ±0.1 V
Supply voltage:	H - Version = 8+32 VDC 0 - Version = 5 VDC ±5%
Full output signal range:	0.5 - 4.5 V, ±0.2 V
Current consumption at rest:	SNCH (S1 only) 15 mA TWCH (S1/S2) 25 mA
Rated output current:	1 mA
Connection type: flying leads =	coloured flat cable 100 mm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

ELECTRICAL CONNECTIONS

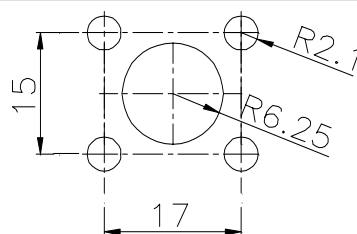
FPR - L2S - SNCH (single chan.) FPR - L2S - TWCH (twin chan.)

- | | |
|------------------------|--------------------------|
| (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) |

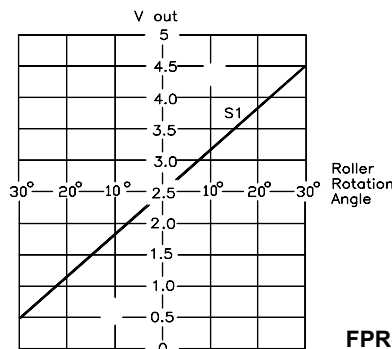
OVERALL DIMENSIONS



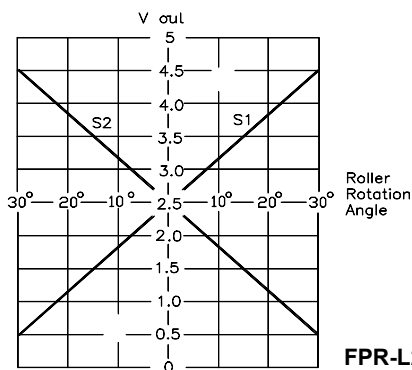
PANEL CUT-OUT



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-L2S 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

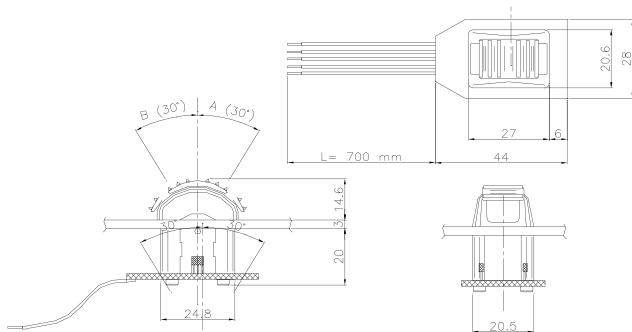
ELECTRICAL SPECIFICATIONS

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

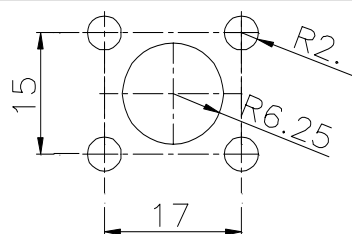
OVERALL DIMENSIONS



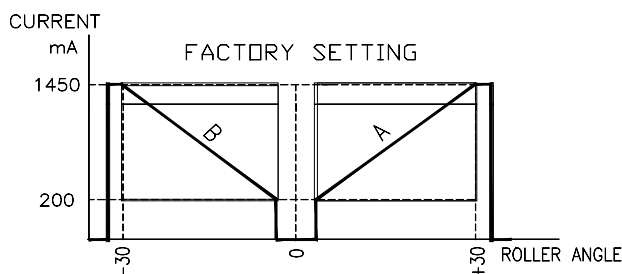
FPR ORDERING INFORMATION: see page JK7



PANEL CUT-OUT



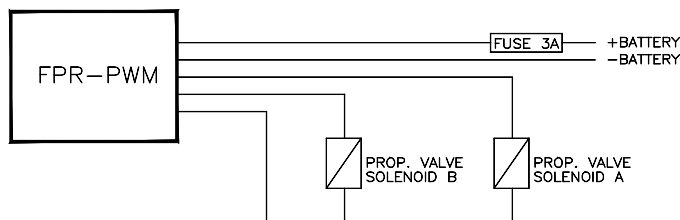
PWM OUTPUT CHARACTERISTIC EXAMPLE



The following values are factory set:

- I_{min} (minimum output current)
- I_{max} (maximum output current)
- Dither

APPLICATION EXAMPLE



Ordering Code

23.0409.160 (I_{min} = 200mA, I_{max} = 1500mA, PWM = 100Hz)

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JMT PROPORTIONAL MULTI-AXIS HALL EFFECT THUMB JOYSTICK**new****FEATURES**

- Mini proportional thumb joystick with ergonomic design for panel mounting.
- High performance hall effect sensor circuitry.
- Suitable for grips, controls panels, armrests or belly boxes.
- Analog voltage outputs, factory pre-set.
- One/two axis gated or 360°.
- 1 million cycle mechanical life.

MECHANICAL SPECIFICATIONS

Type of movement:	single, cross or omnidirectional square type
Travel angle:	23°±2°
Operating force with boot:	2-3 N
Maximum vertical/horizontal load:	200 N / 150 N
Life:	1.000.000 cycles
Case material:	Thermoplastic, black
Boot material:	EPDM - UV proof, black
Operating temperature range:	-40°C / +85°C

ELECTRICAL SPECIFICATIONS

Sensor technology:	Hall effect
Supply Voltage:	ANL = 5 VDC ±5%
Protection:	reversed voltage, overvoltage, short circuit on outputs
Current consumption:	< 20 mA
Output signal ratiometric (ref. to 5.0V):	0.5-4.5V
Output voltage tolerance at center:	< 0.25V
Output voltage tolerance at full travel:	< 0.25V
Sealing (fully potted electronics):	IP69K

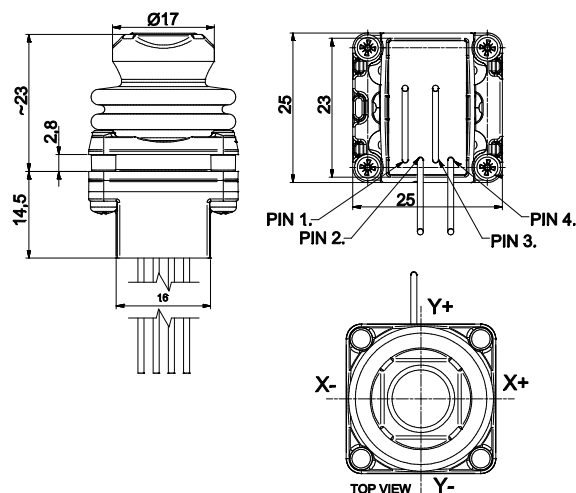
ELECTRICAL CONNECTIONS**JMT - L2S - single axis**

- (1) Red: +5 VDC
- (2) Black: (-) ground
- (3) Yellow: output Y
- (4) Blue: not used

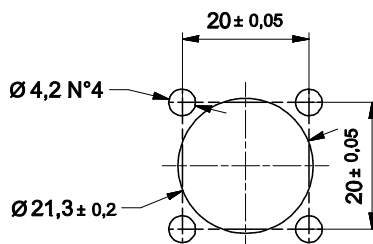
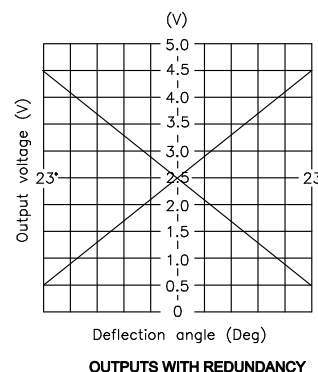
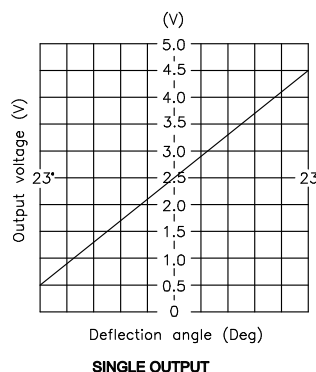
JMT - L4C/D - dual axis

- (1) Red: +5 VDC
- (2) Black: (-) ground
- (3) Yellow: output Y
- (4) Blue: output X

Wires Coloured AWG 24

OVERALL DIMENSIONS**PANEL CUT-OUT****Cutout dimensions**

Max panel thickness: 3+/-0.2 mm

**OUTPUT SIGNAL CONTROL CHARACTERISTIC**

JMT ORDERING INFORMATION: see page JK8

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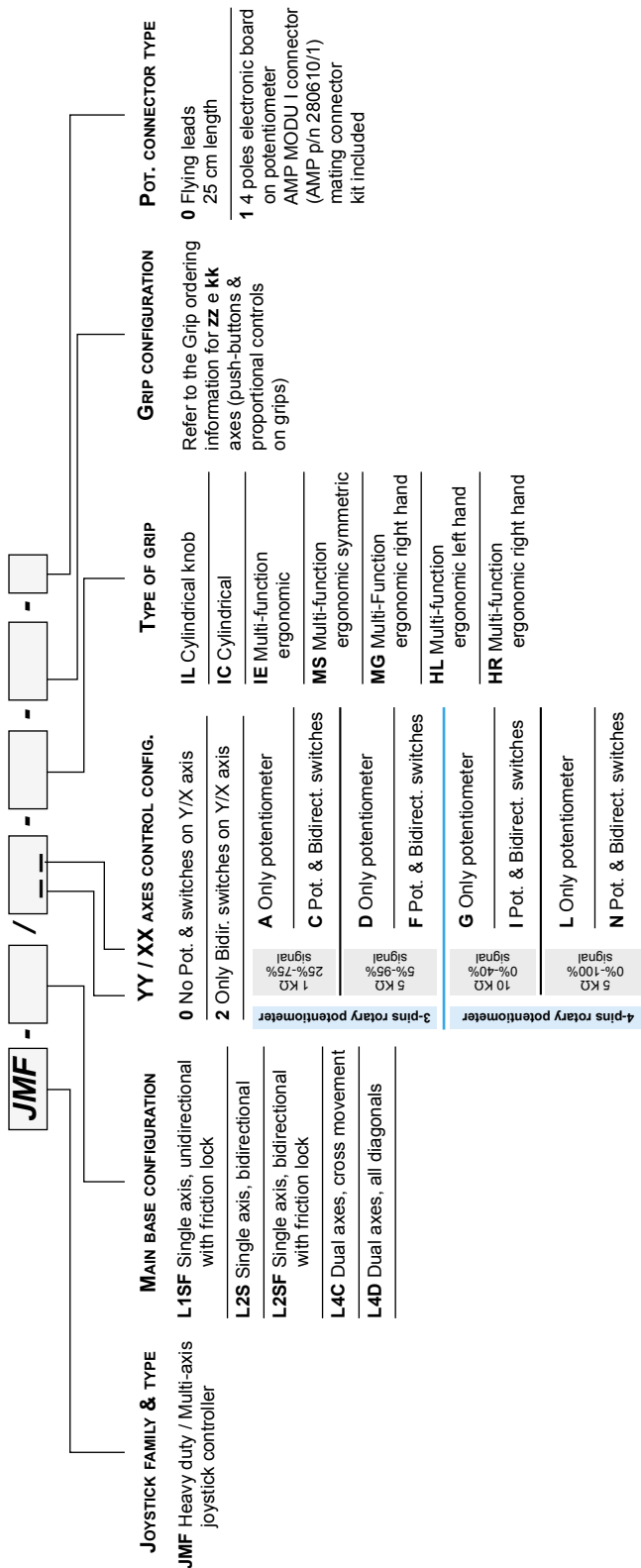
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HEAVY DUTY MULTI-AXIS JOYSTICKS

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)

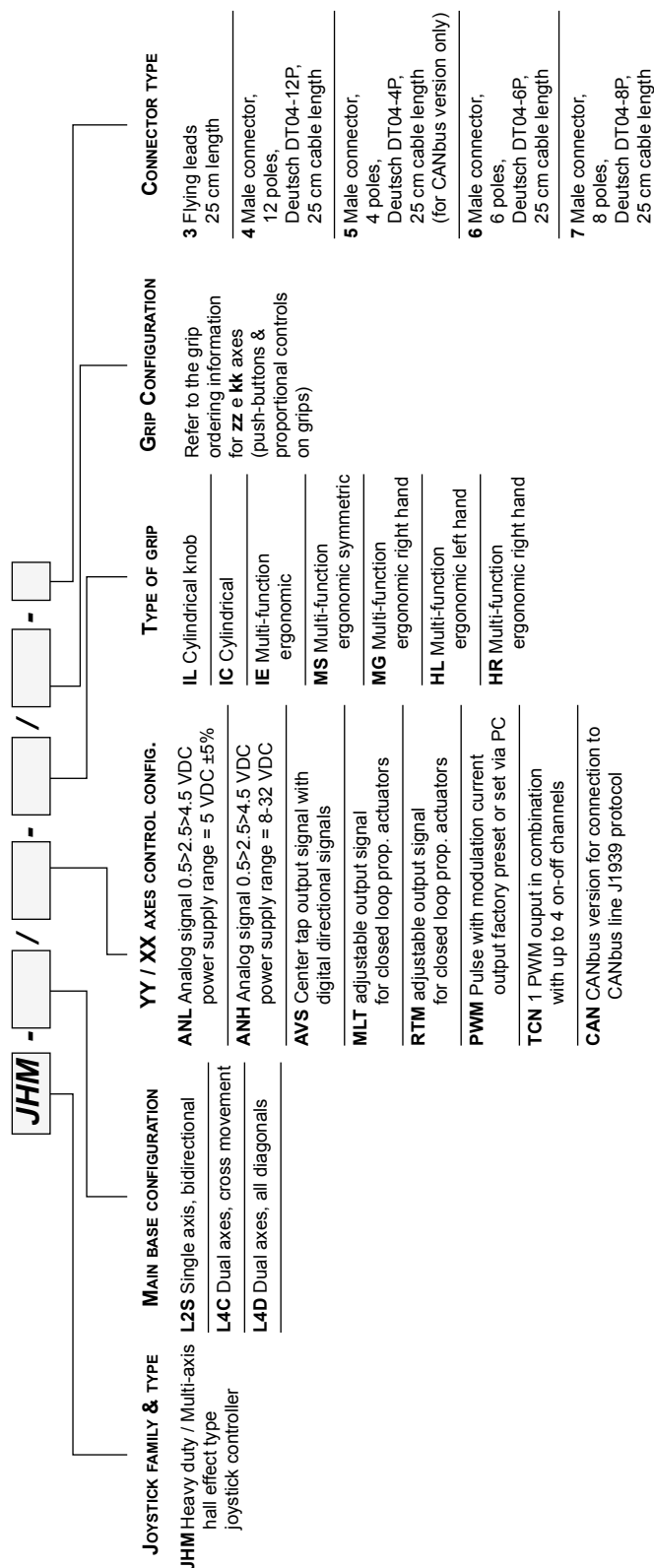
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Note:
for TCN, PWM and MLT versions, a 4 poles Deutsch DT04-4P connector is always included

EXAMPLE:

JHM-L4D/ANH-6 BASE + **MS/0000/2FPR/R000** GRIP = **JHM-L4D/ANH-MS/0000/2FPR/R000-6** COMPLETE JOYSTICK (with 6 poles Deutsch connector)

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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

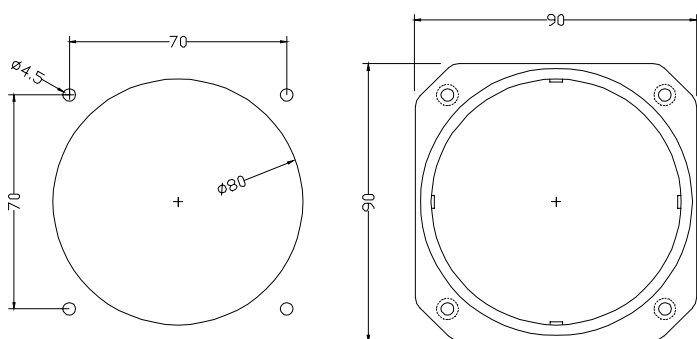
Lever deflection angle:	±22° ±1°
Electrical angle:	±22° ±1°
Operating temperature range:	-25°C / +80°C
Protection class (above panel):	up to IP 67, depending on grip
Life:	3 million cycles

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

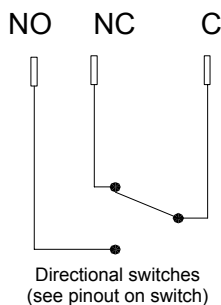
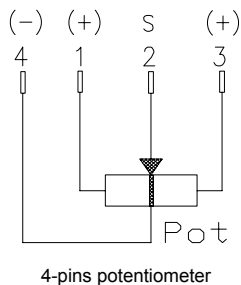
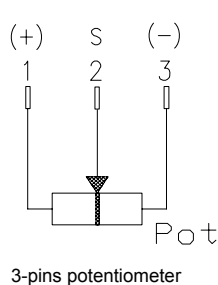
Directional switches (electromechanical type)

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)

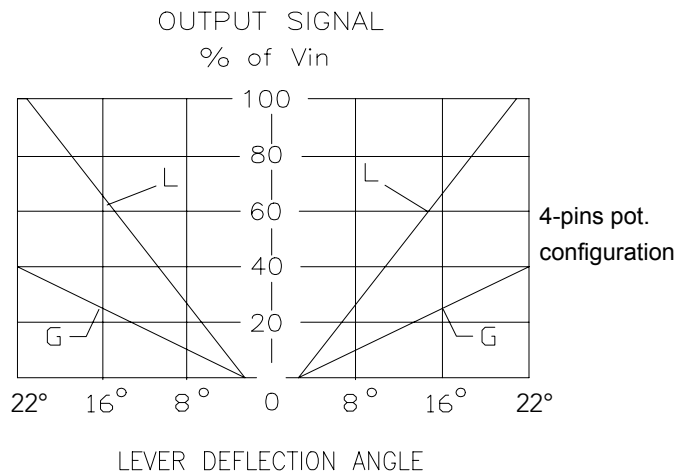
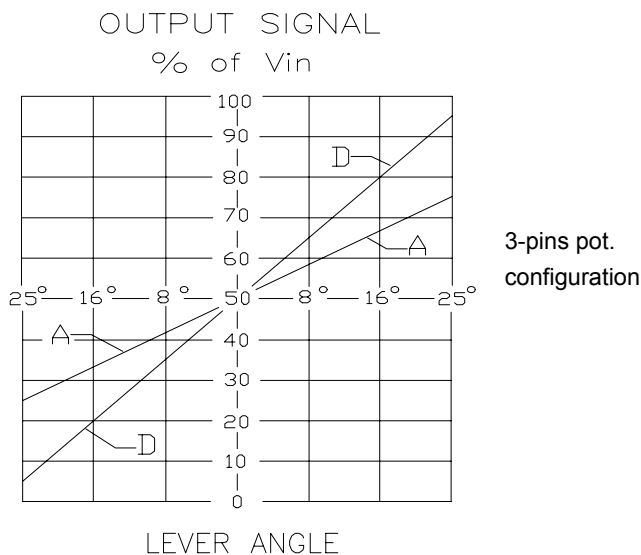
Rotary potentiometer

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 Ω $\pm 20\%$ 5 k Ω $\pm 20\%$
Ohmic resistance: / G = 40% of V_{in} (4-pins version) / L = 100% of V_{in}	10 k Ω $\pm 20\%$ 5 k Ω $\pm 20\%$
Max. operating input voltage (V_{in}):	48 V or ± 24 V
Min. load impedance on pin 2 (signal):	50 k Ω
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



JMF ORDERING INFORMATION: see page JK20

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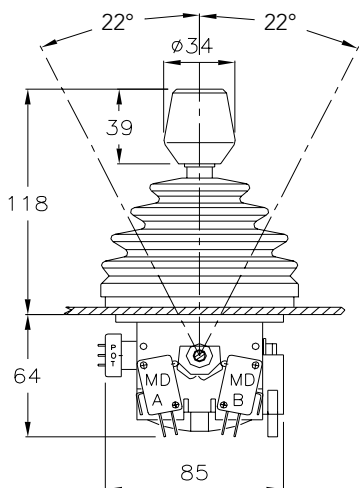
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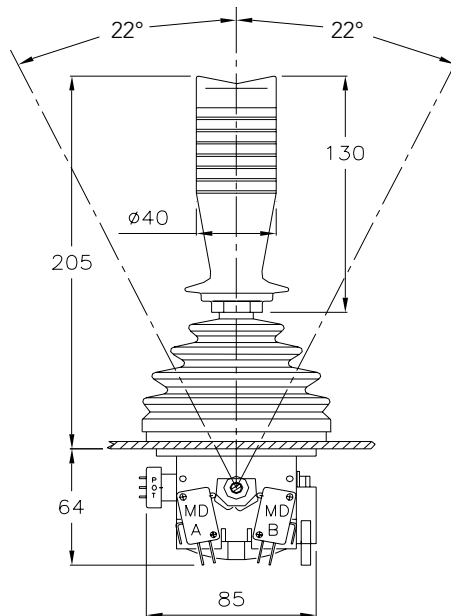
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JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK

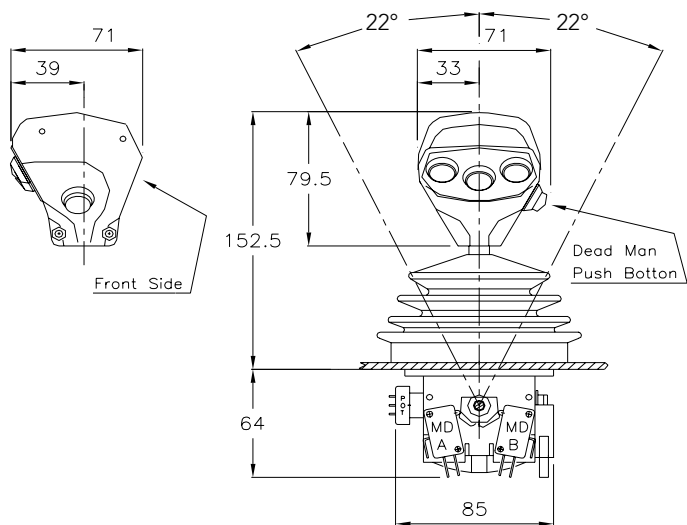
JMF joystick with grips - configuration examples with overall dimensions



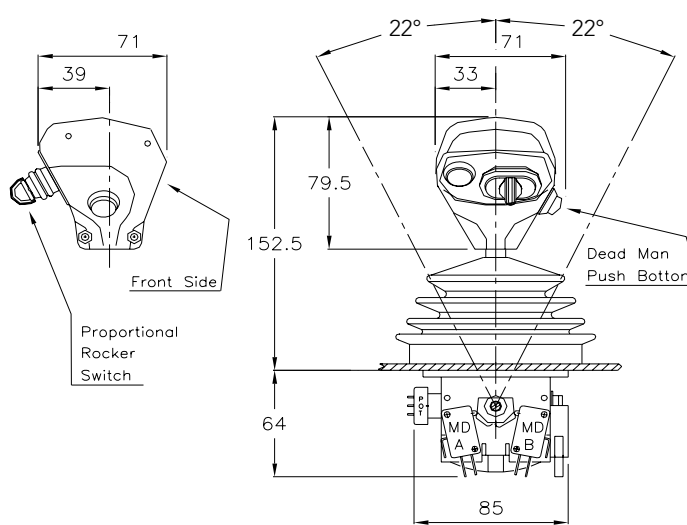
JMF base with IL handle
Complete code: **JMF-L4C/NN-IL 0000**



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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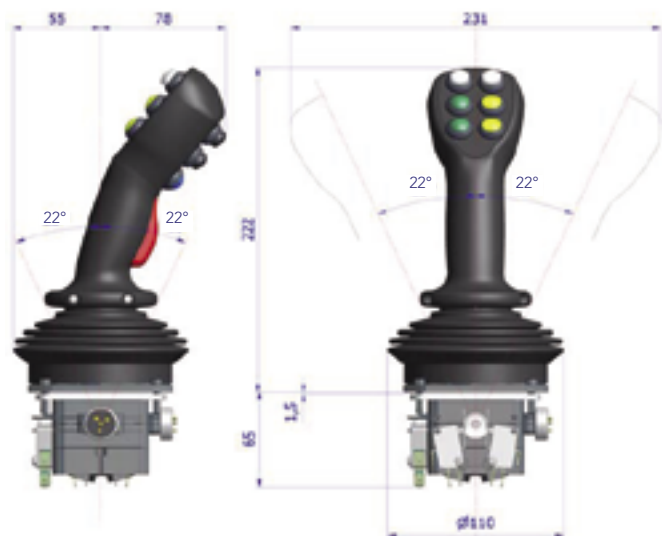
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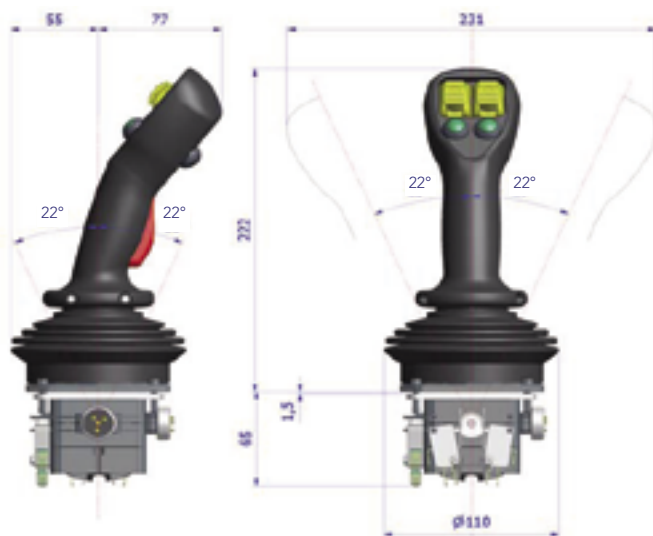
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mail: tecnord@tecnord.com • www.tecnord.com

JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK

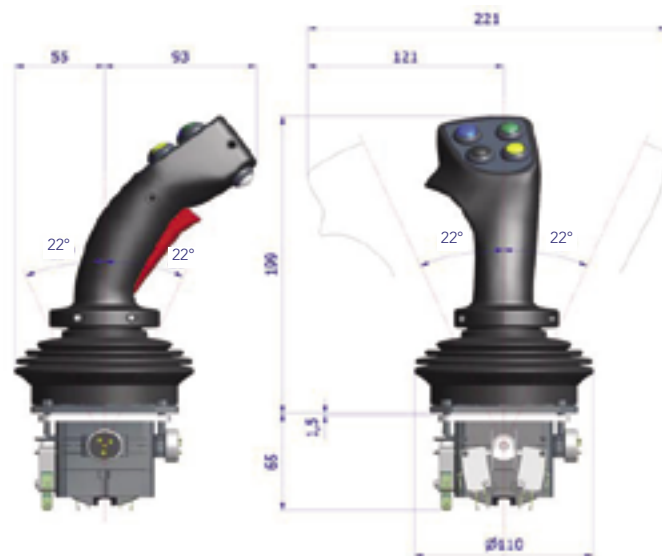
JMF joystick with grips - configuration examples with overall dimensions



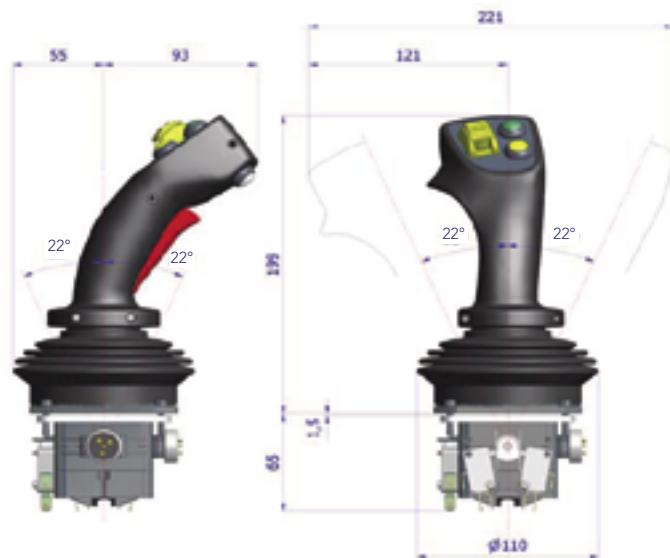
JMF base with MS type handle
Complete code: **JMF-L4C/NN-MS A6P9 R3P9**



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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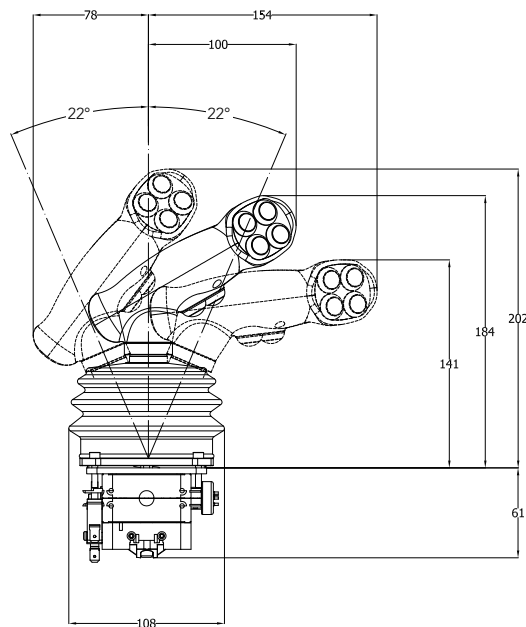
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JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK

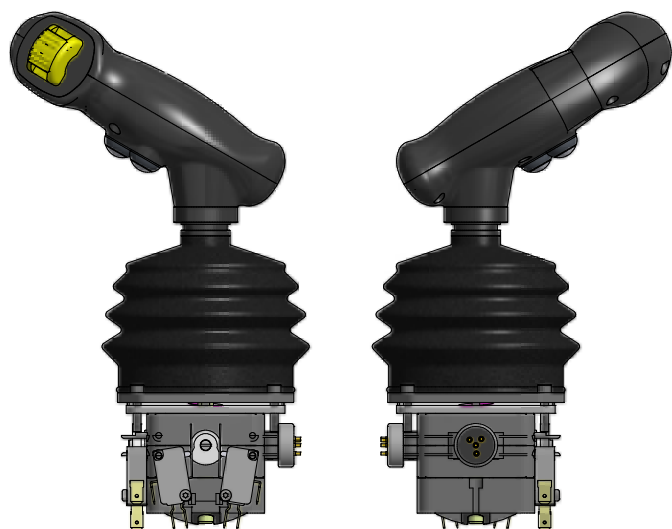
HL joystick with grips - configuration examples with overall dimensions



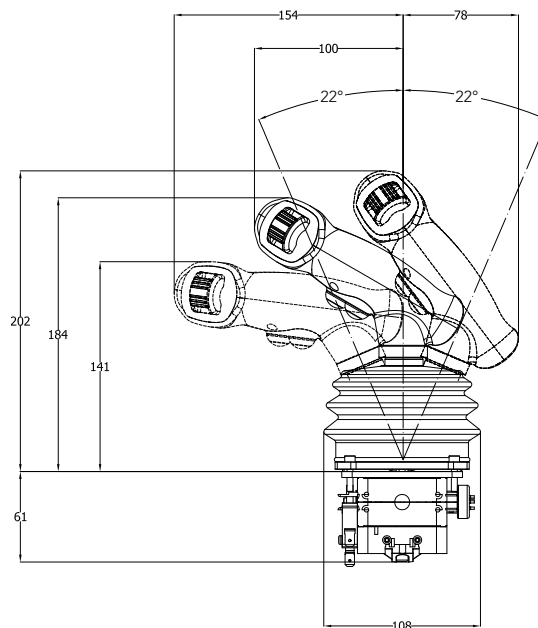
JMF base with HL type handle
Complete code: **JMF-L4C/NN-HL-04P9-2P9/RDFF**



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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TECNORD

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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.

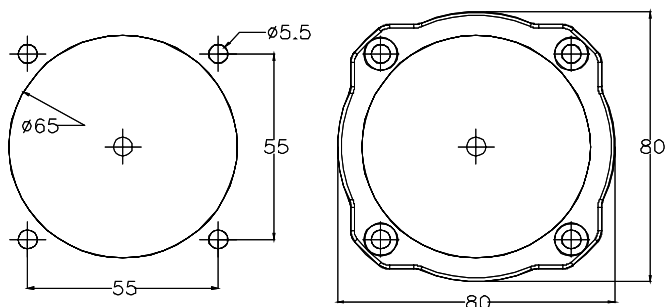
A magnetic position detent on the Y or X axis is also available as option.

MECHANICAL SPECIFICATIONS

Main body material:	aluminium
Boot material:	EPDM - 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**

Option L2S	Single axis control / Bidirectional
Option L4C	Cross axis control / Bidirectional
Option L4D	Multi axis control / Bidirectional



Shown with MS grip

JHM ORDERING INFORMATION: see page JK21

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

ANL & ANH VERSION

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 VERSIONS

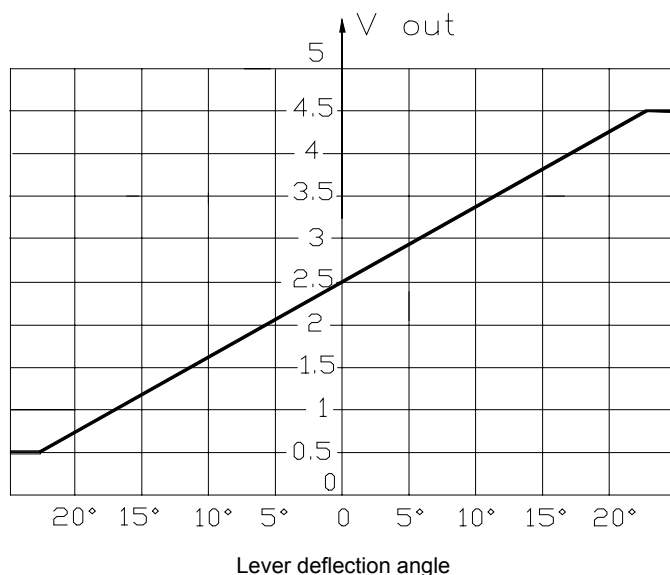
Center tap output signal with digital directional signals

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

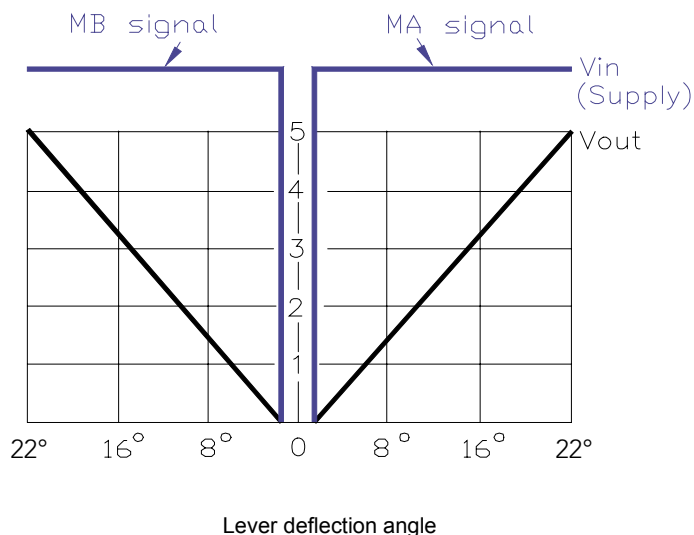
(MA and MB signals on graph)

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



W/11 / 2020

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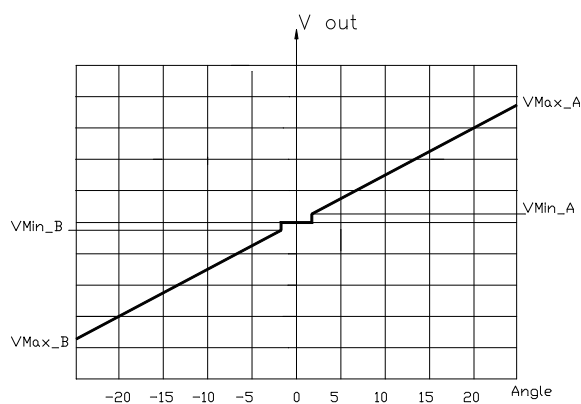
JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)

MLT VERSION

Adjustable output signal for closed loop proportional actuators

Supply voltage:	8÷32 VDC
Current consumption @ rest:	250 mA
Analog outputs:	5
Output signal range:	linear signal (adjustable)
	0.5÷4.5 V
	0.9÷4.1 V
	2.0÷6.0 V
Rated output current:	15 mA
Power digital outputs:	4 (0.7 A)
Adjustments:	via RS232 serial line

OUTPUT SIGNAL CONTROL CURVE



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:

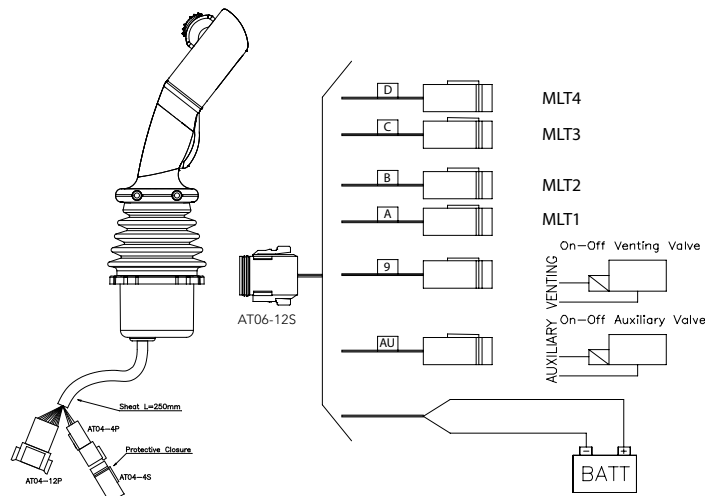
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Assignment for on-off auxiliary outputs.

By use of the calibration window:

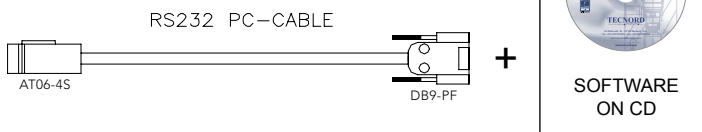
- Operating parameters: Vmin, Vmax, Ramp up, Ramp down.

APPLICATION EXAMPLE

Shown with MS grip



For PC connection (optional)
ordering code: 21.0801.055



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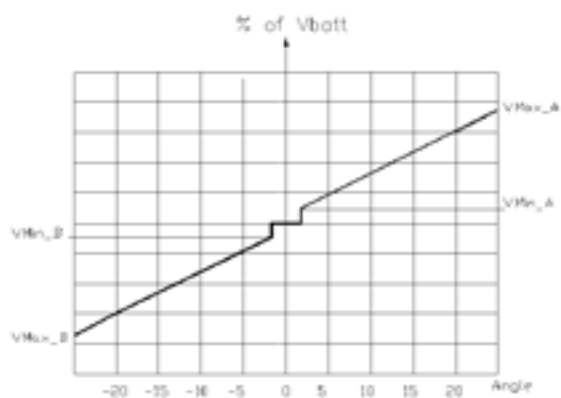
JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)

RTM VERSION

Ratiometric adjustable output signal for closed loop proportional actuators

Supply voltage:	8÷32 VDC
Current consumption @ rest:	250 mA
Analog outputs:	5
Output signal range:	linear signal (adjustable) 25÷50÷75% of Vbatt 10÷50÷90% of Vbatt
Rated output current:	15 mA
Power digital outputs:	4 (0.7 A)
Adjustments:	via RS232 serial line

OUTPUT SIGNAL CONTROL CURVE



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:

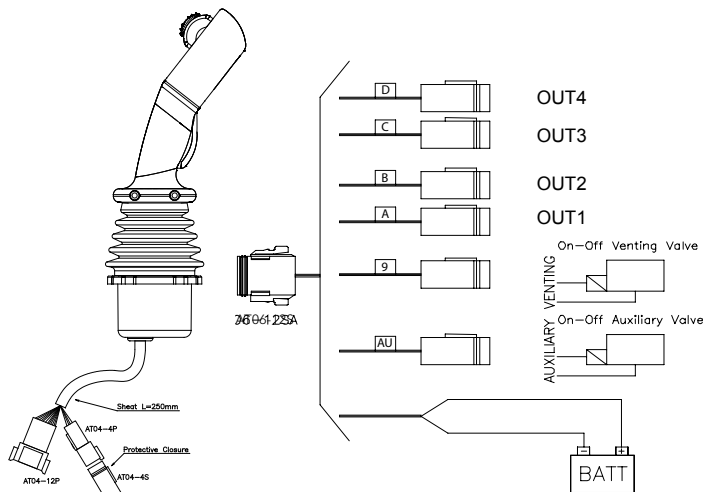
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Output assignment on-off auxiliary valves.

By use of the calibration window:

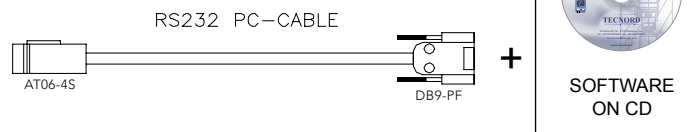
- Operating parameters: Vmin, Vmax, Ramp up, Ramp down.

APPLICATION EXAMPLE

Shown with MS grip



For PC connection (optional)
ordering code: 21.0801.055



W/11/2020

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

PWM VERSION

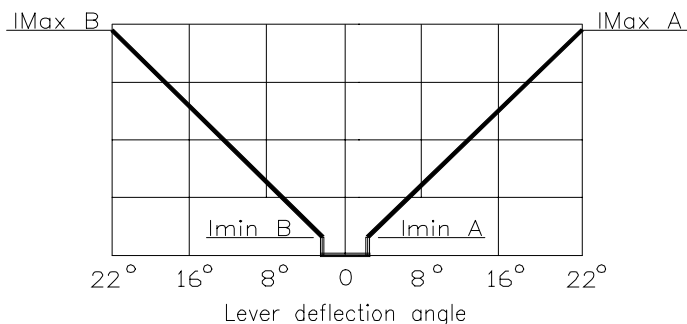
2 PWM output channels

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_{max} = 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:

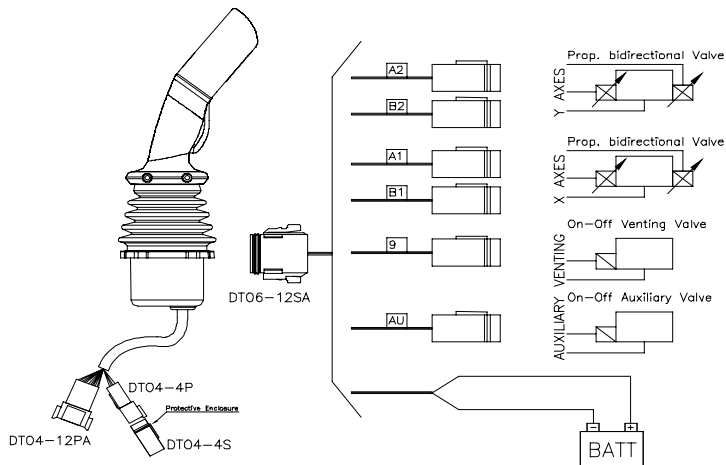
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse, virtual cross movement.
- Current setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.
- Digital directional output signals on both axes (N.O. or N.C. mode)

By use of the calibration window:

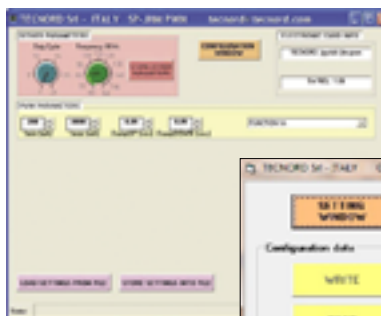
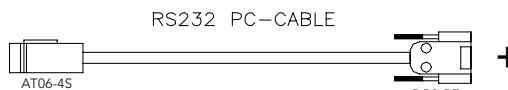
- Operating parameters: I_{min}, I_{max}, Ramp up and Ramp down times.

APPLICATION EXAMPLE

Shown with MS grip



For PC connection (optional)
ordering code: 21.0801.055



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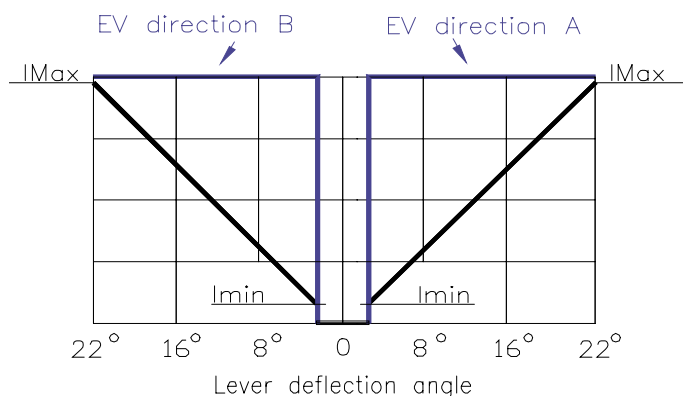
JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)

TCN VERSION (special configuration of PWM version)

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 Tecnard 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:

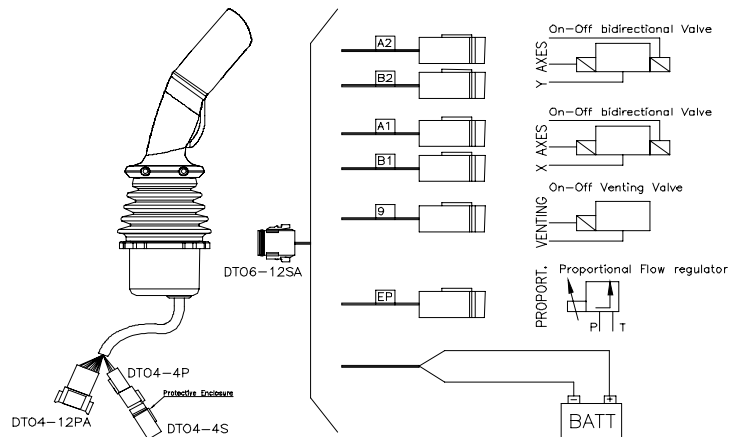
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse, virtual cross movement.
- Current setpoint selection (for 360° movement only).
- Output assignment on-off auxiliary valves.

By use of the calibration window:

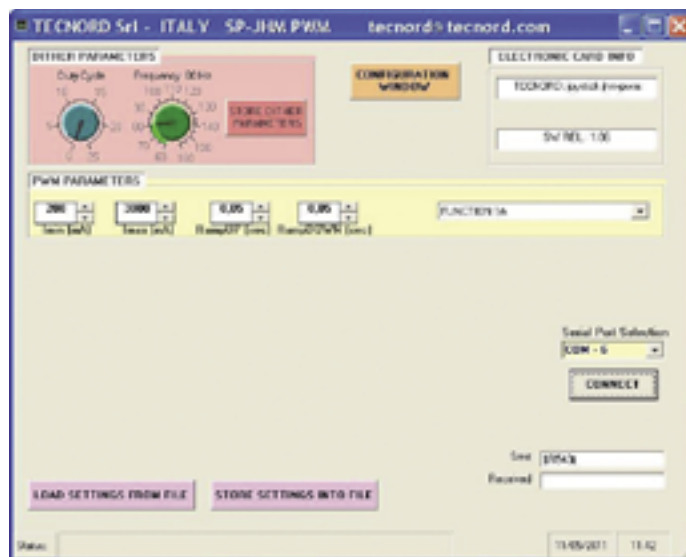
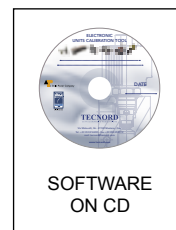
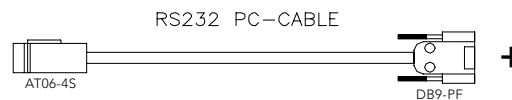
- Operating parameters: Imin, Imax, Ramps.

APPLICATION EXAMPLE

Shown with MS grip



For PC connection (optional)
ordering code: 21.0801.055



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

CANBUS VERSION

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:

For CANopen version

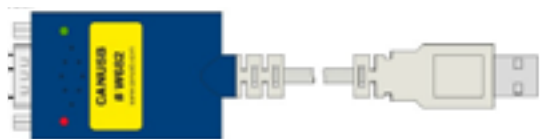
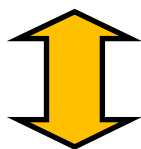
- Node ID

For J1939 version

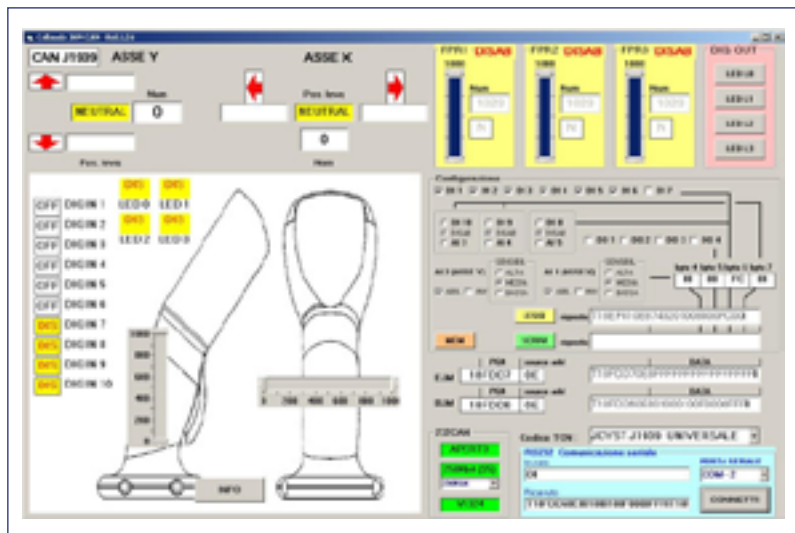
- Node ID

In addition, with the specific "Calibration and Configuration PC Tool" and the CAN/USB hardware interface device (see picture below) is possible:

- Read joystick configuration
- Adjust X, Y axes sensibility and direction
- Enable /disable digital or analog inputs and digital outputs
- Change Node ID

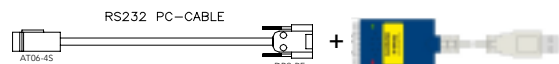


FOR J1939 VERSION ONLY



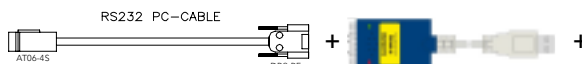
CANOPEN VERSION ONLY

ordering code: 21.0801.071



J1939 VERSION ONLY

ordering code: 21.0801.062



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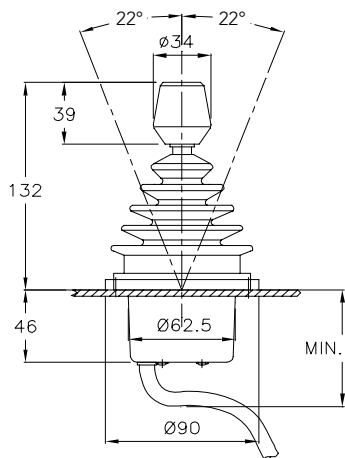
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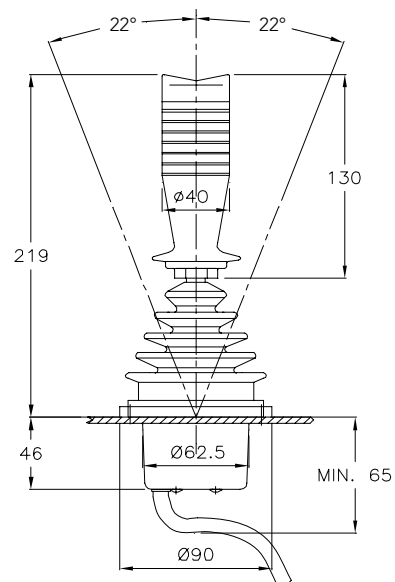
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JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK

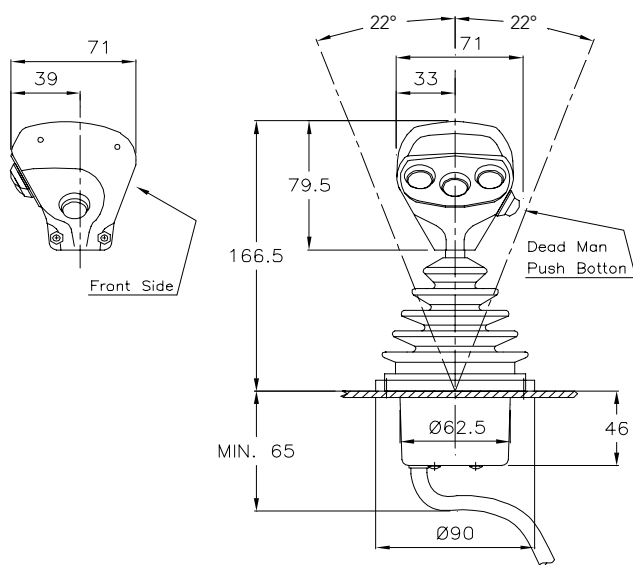
JHM joystick with grips - configuration examples with overall dimensions



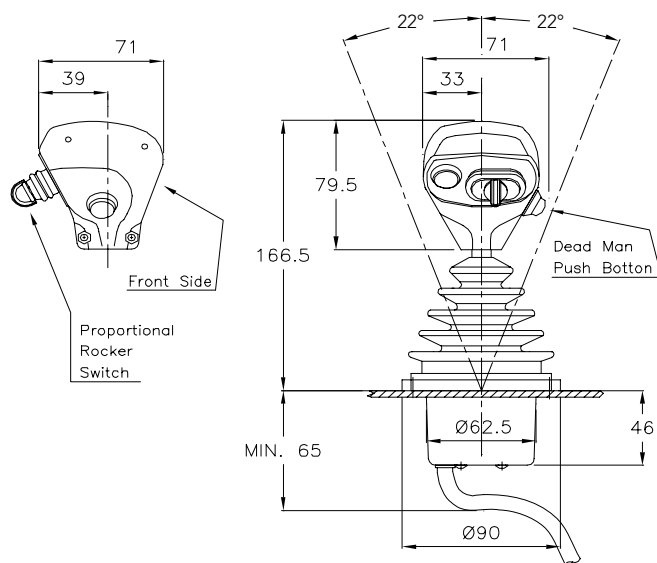
JHM base with IL handle
Complete code: **JHM-L4D/ANH-IL 0000**



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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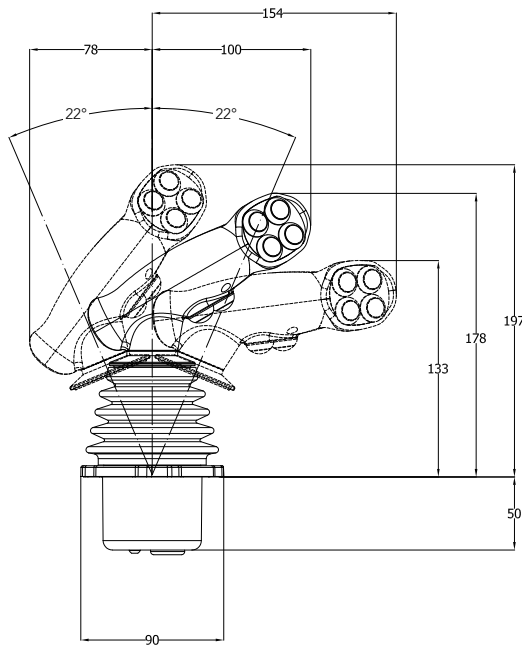
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JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK

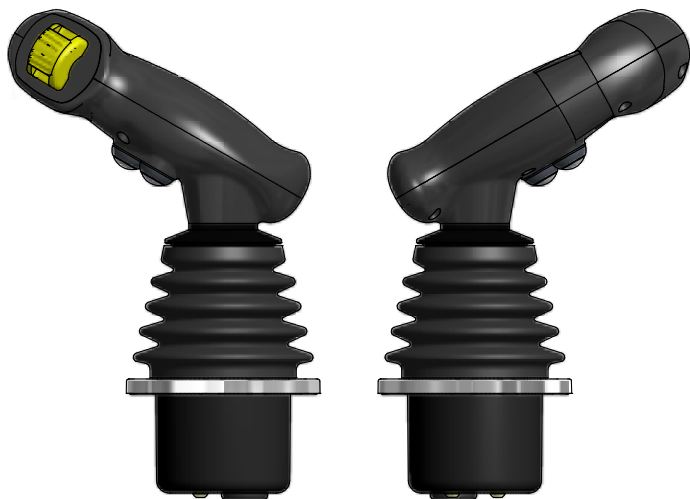
JHM joystick with HL – HR grips - configuration examples with overall dimensions



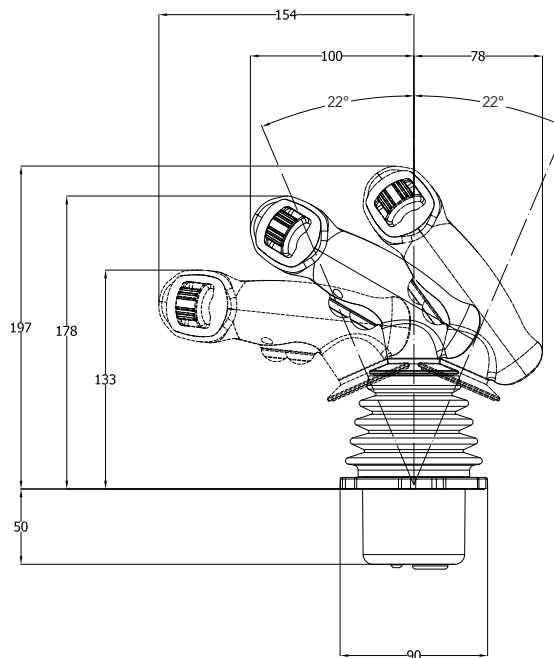
JHM base with HL type handle
Complete code: **JHM-L4D/ANH-HL-04P9-2P9/RDFF**



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
IL cylindrical knob IC cylindrical	JK39	JK43
IE ergonomic, gear type, multi-functions	JK39	JK44
HL multi-function ergonomic left hand grip	JK40	JK45
HR multi-function ergonomic right hand grip	JK40	JK47
MS ergonomic, symmetric, multi-functions	JK41	JK49
MG ergonomic, right hand, multi-functions	JK42	JK52

- 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.

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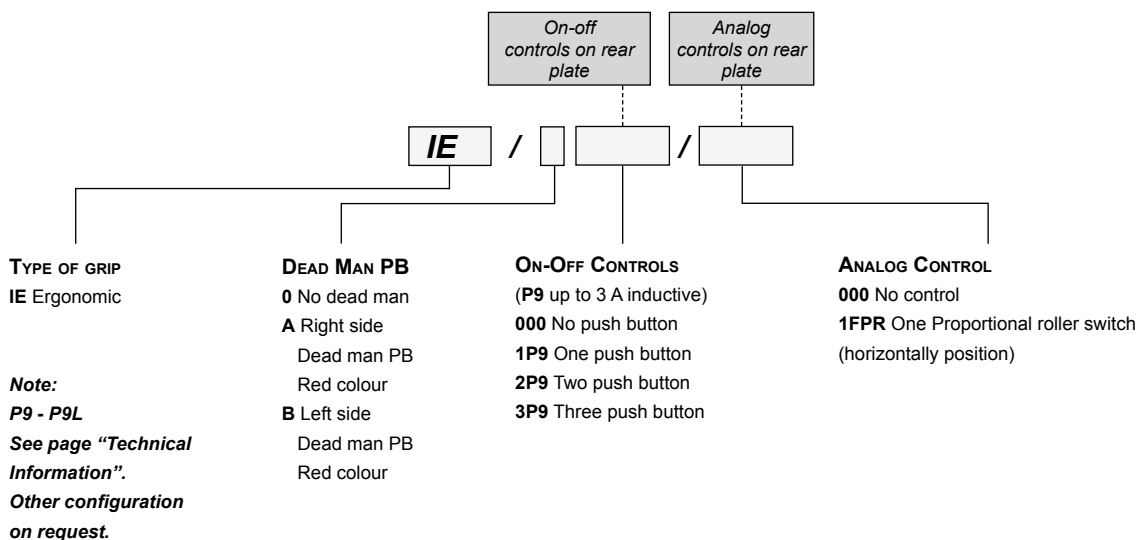
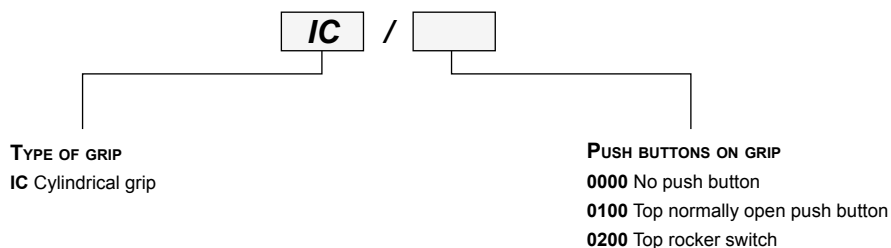
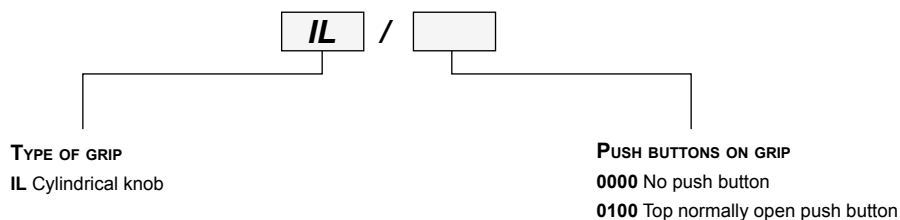
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IL / IC / IE GRIPS

ORDERING INFORMATION



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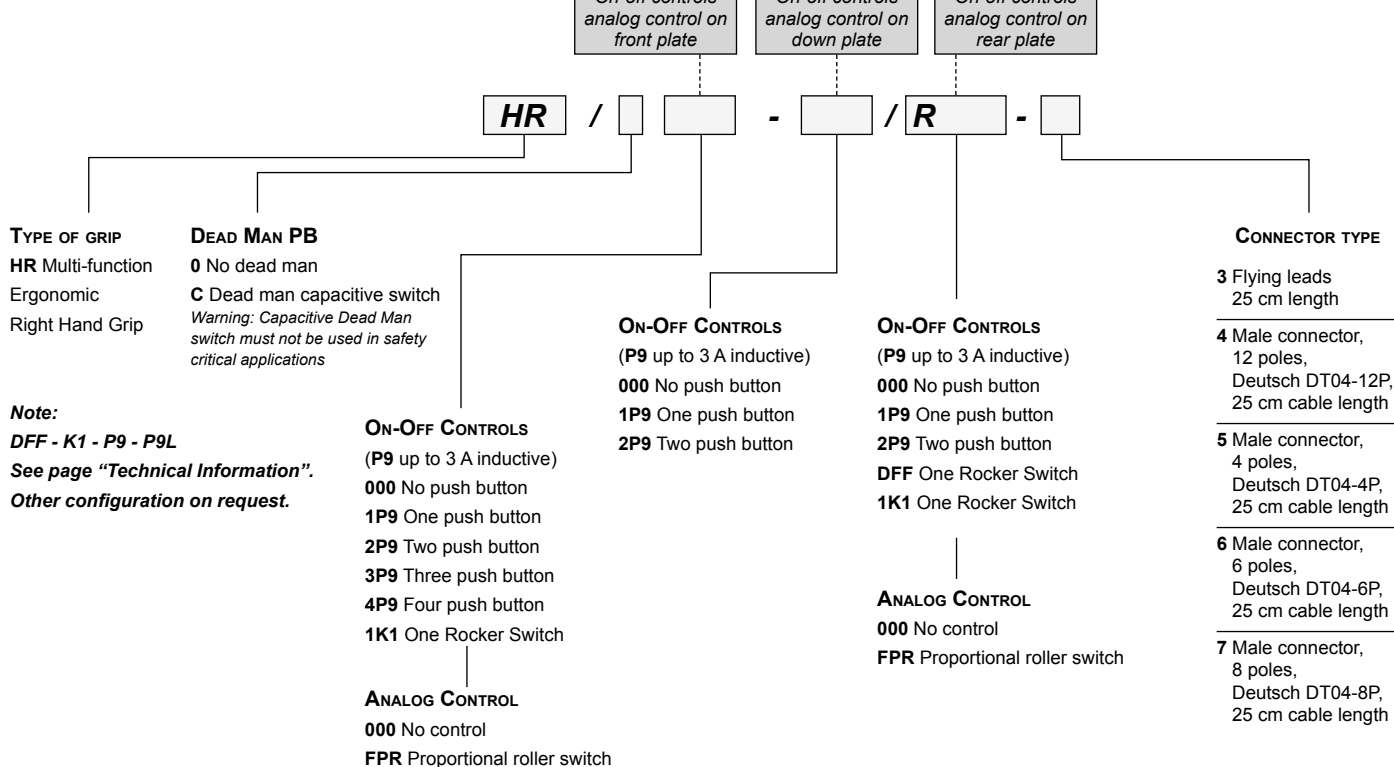
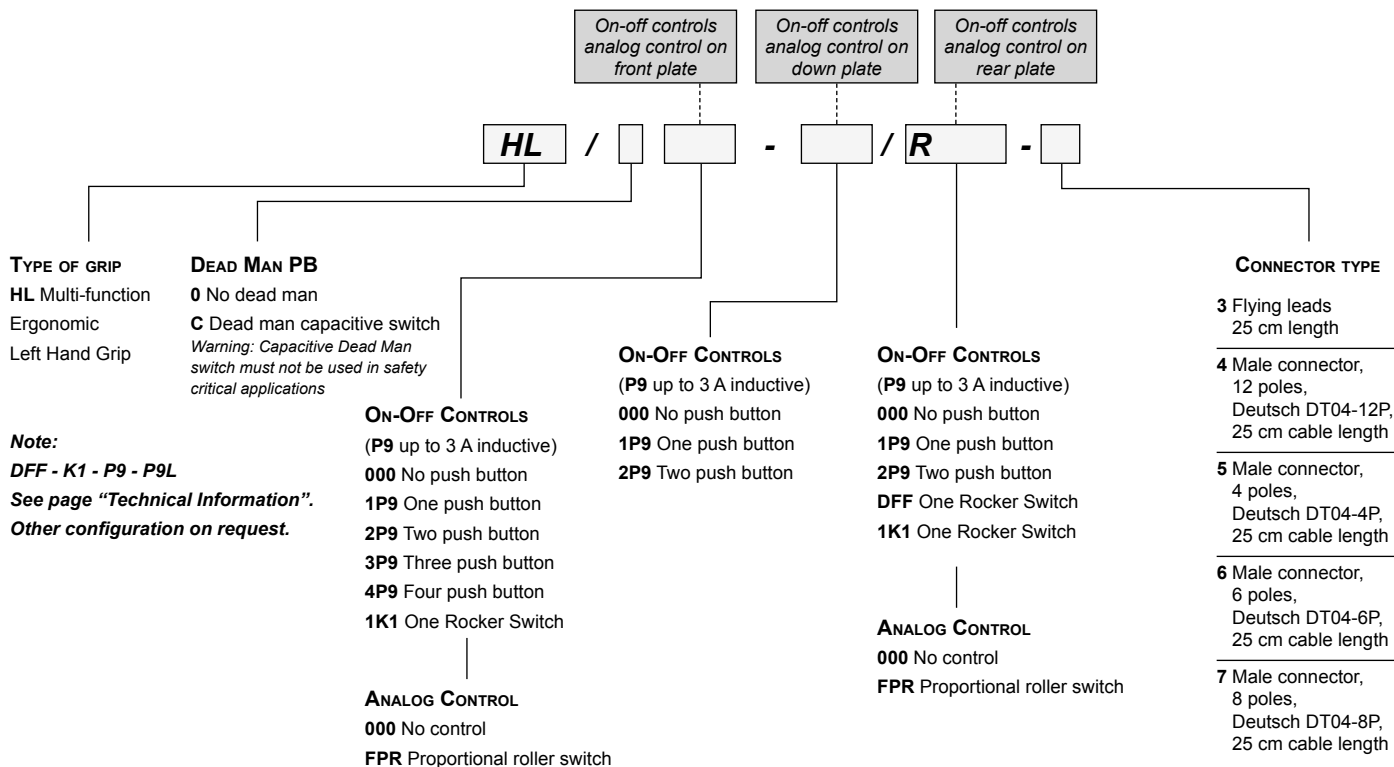
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HL / HR ERGONOMIC GRIP

ORDERING INFORMATION



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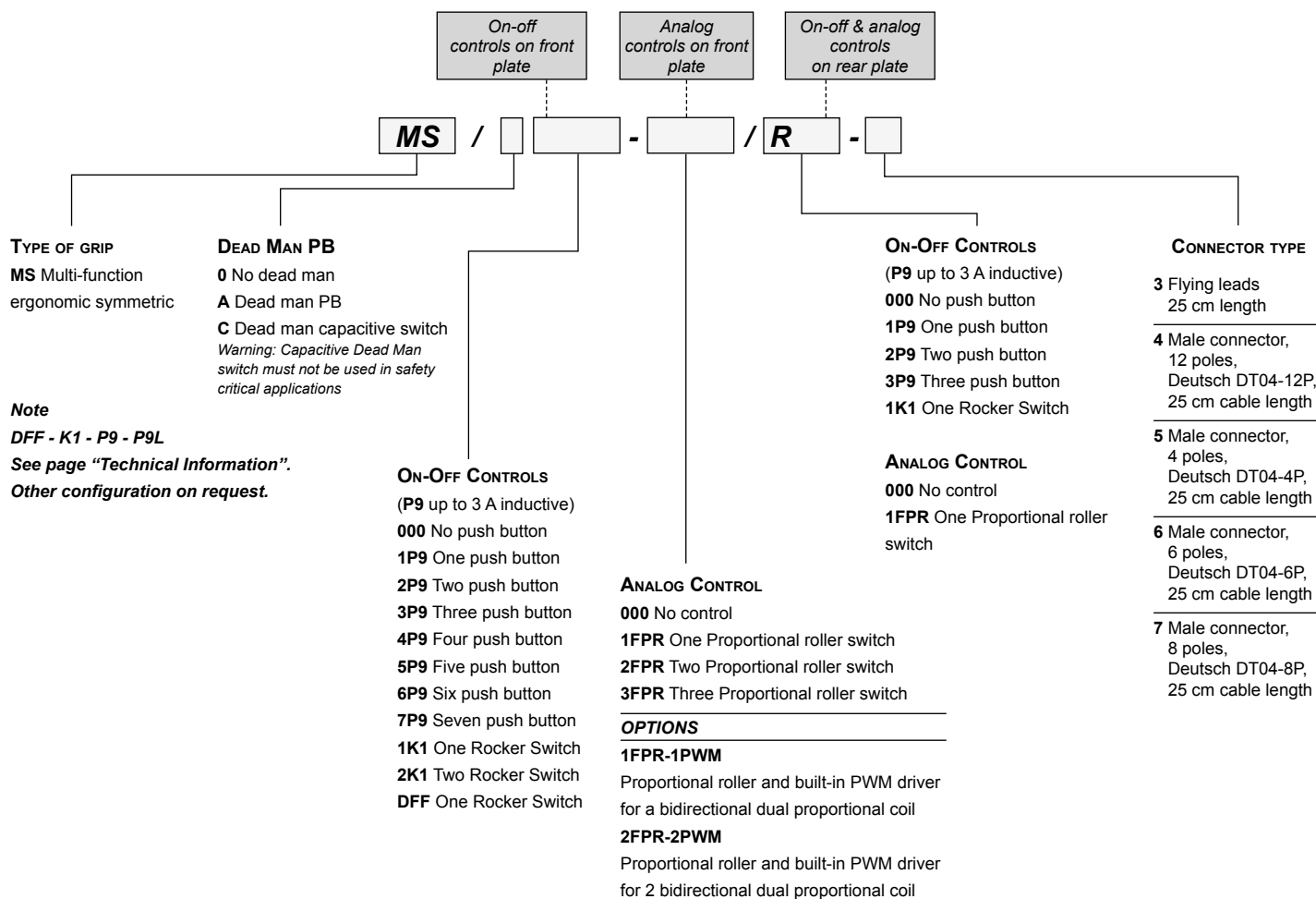


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Note
DFF - K1 - P9 - P9L
 See page "Technical Information".
 Other configuration on request.

W/11 / 2020

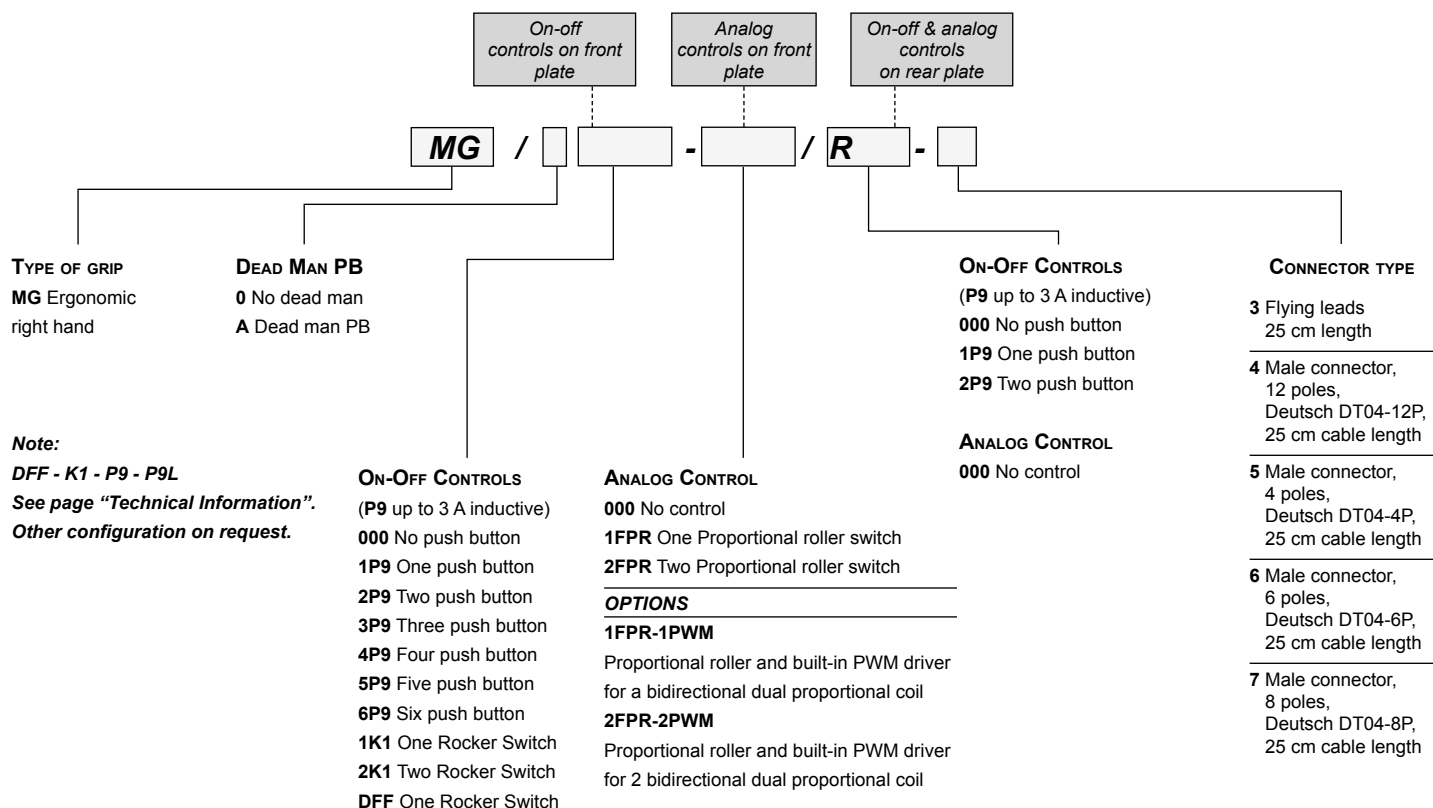
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Note:
DFF - K1 - P9 - P9L
See page "Technical Information".
Other configuration on request.

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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

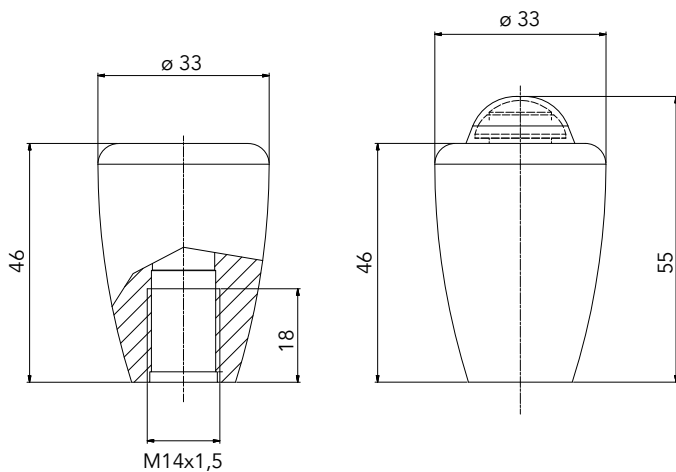
ELECTRICAL SPECIFICATIONS

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

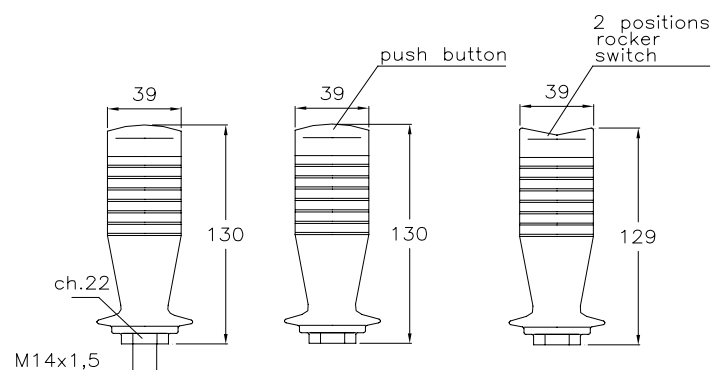
ELECTRICAL SPECIFICATIONS

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 JK39

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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)

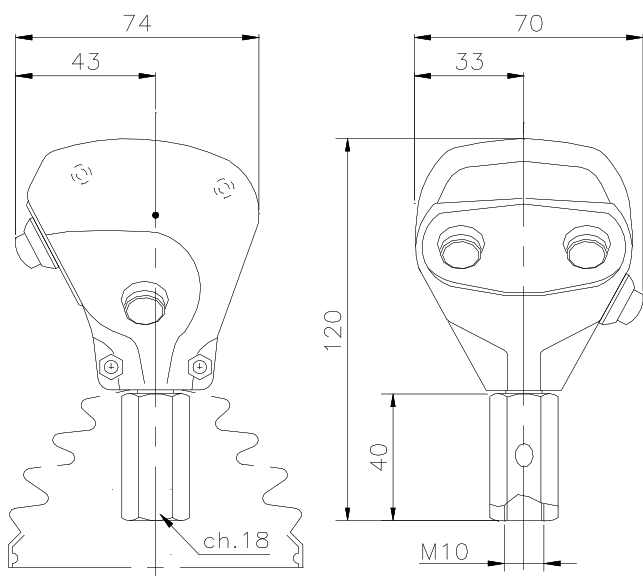
ELECTRICAL SPECIFICATIONS

Prewired exit cable:	250 mm
----------------------	--------

Available push buttons and switches

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 JK39

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new**HL MULTI-FUNCTION ERGONOMIC LEFT 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

C - Dead man capacitive switch

SPST contact, Normally Open Contact rating 1A



DFF - Rocker Switch: see page JK60 Technical Info

K1 - Rocker Switch: see page JK60 Technical Info

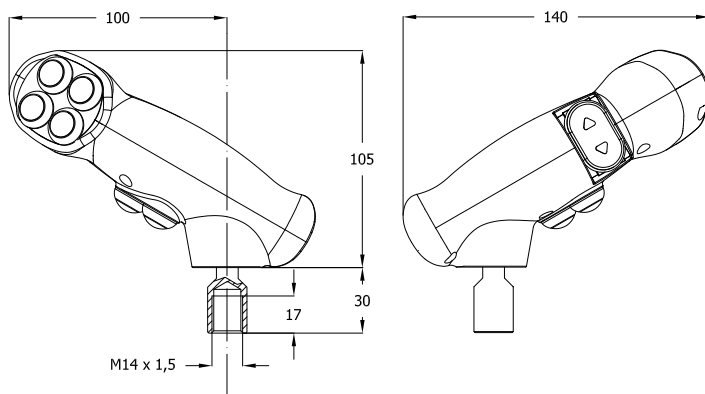
P9 - P9L - Push buttons: see page JK61 Technical Info

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 JK40



FRONT VIEW - LEFT HAND

CONFIGURATION EXAMPLES

	FRONT P/B	BOTTOM 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

HL MULTI-FUNCTION ERGONOMIC LEFT 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

C - Dead man capacitive switch

SPST contact, Normally Open Contact rating 1A



DFF - Rocker Switch: see page JK60 Technical Info

K1 - Rocker Switch: see page JK60 Technical Info

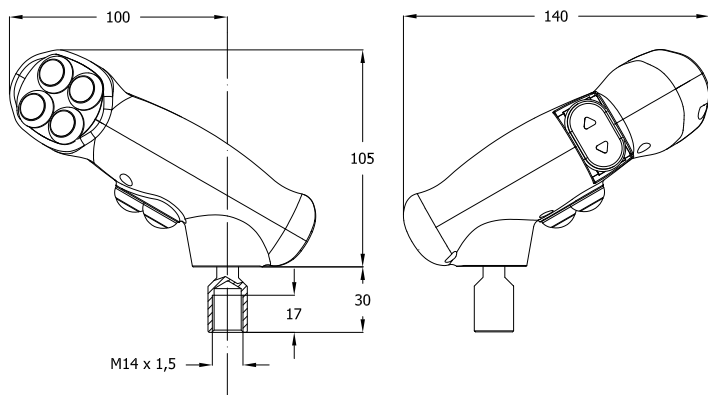
P9 - P9L - Push buttons: see page JK61 Technical Info

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	BOTTOM 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

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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

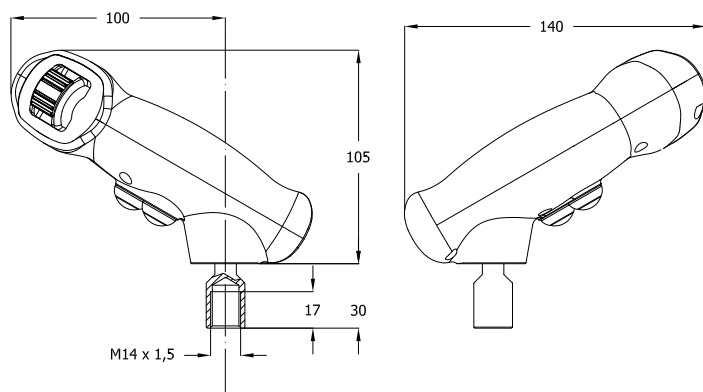
Prewired exit cable: 250 mm

Available push buttons and switches

C - Dead man capacitive switch SPST contact, Normally Open Contact rating 1A	
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 JK40



FRONT VIEW - RIGHT HAND

CONFIGURATION EXAMPLES

	FRONT P/B	BOTTOM 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/RFPR	0	0	1xFPR
HR/0FPR-000/RFPR	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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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

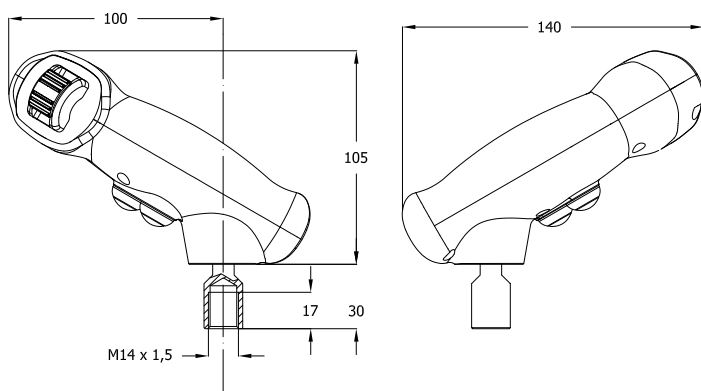
Prewired exit cable:	250 mm
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Available push buttons and switches

C - Dead man capacitive switch SPST contact, Normally Open Contact rating 1A	
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



REAR VIEW - RIGHT HAND

CONFIGURATION EXAMPLES

	FRONT P/B	BOTTOM 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

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MS MULTI-FUNCTION ERGONOMIC SYMMETRIC GRIP


FEATURES

- Optimum ergonomic design.
- High performance switches.

MECHANICAL SPECIFICATIONS

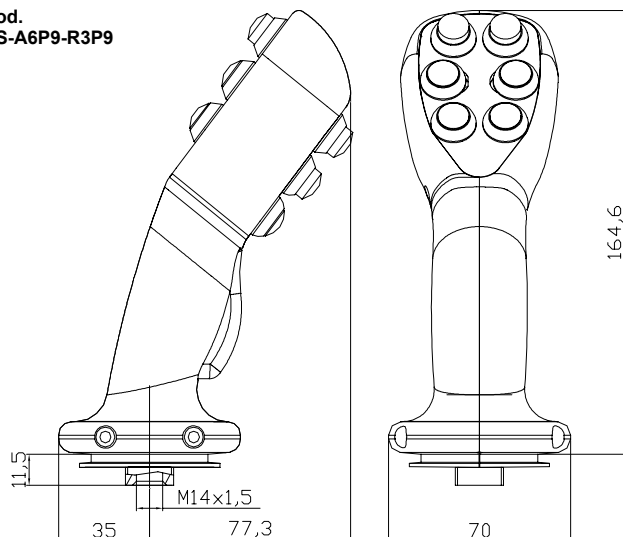
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

Prewired exit cable:	250 mm
Available push buttons and switches	
A - Dead man push button	
Rated amperage:	up to 3 A inductive
Protection class (microswitch):	IP 67
C - Dead man capacitive switch	
SPST contact, Normally Open Contact rating 1A	
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 JK41

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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

Available push buttons and switches

A - Dead man push button

Rated amperage: up to 3 A inductive

Protection class (microswitch): IP 67

C - Dead man capacitive switch

SPST contact, Normally Open Contact rating 1A



DFF - Rocker Switch: see page JK60 Technical Info

K1 - Rocker Switch: see page JK60 Technical Info

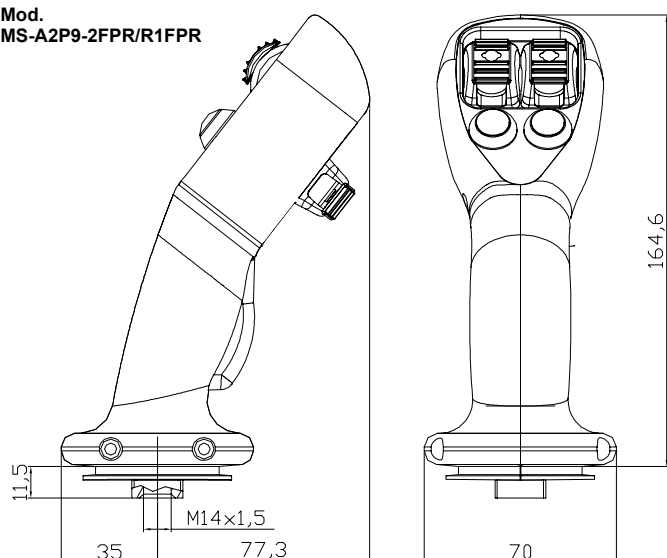
P9 - P9L - Push buttons: see page JK61 Technical Info

FPR - Proportional roller: see FPR data sheet

Output signal: 3-pins connection
hall effect contactless sensor

OVERALL DIMENSIONS

Mod.
MS-A2P9-2FPR/R1FPR

**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/R1FPR	yes	4xP9	1xFPR		1xFPR
MS/A4P9/1FPR/R1FPR-2P9	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/R1FPR-1P9	yes	2xP9	2xFPR	1xP9	1xFPR
MS/A2P9/2FPR/R1FPR-2P9	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	

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MS MULTI-FUNCTION ERGONOMIC SYMMETRIC GRIP

FEATURES

- Optimum ergonomic design.
- Internal PWM driver.

MECHANICAL SPECIFICATIONS

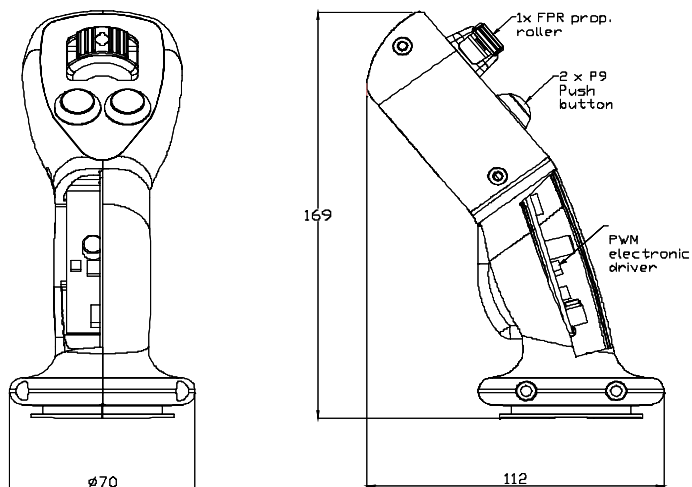
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

Prewired exit cable:	250 mm
Available push buttons and switches	
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

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MG MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP

FEATURES

- Optimum ergonomic design.
- High performance switches.

MECHANICAL SPECIFICATIONS

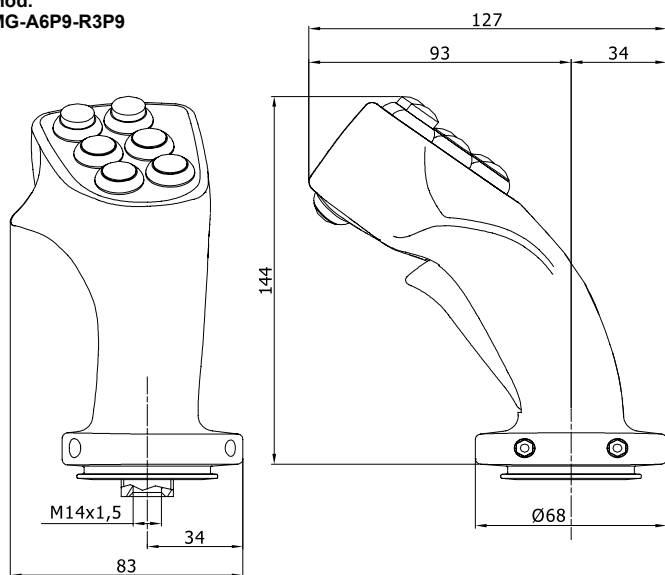
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

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
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 JK42

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MG MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP

FEATURES

- Optimum ergonomic design.
- High performance switches.

MECHANICAL SPECIFICATIONS

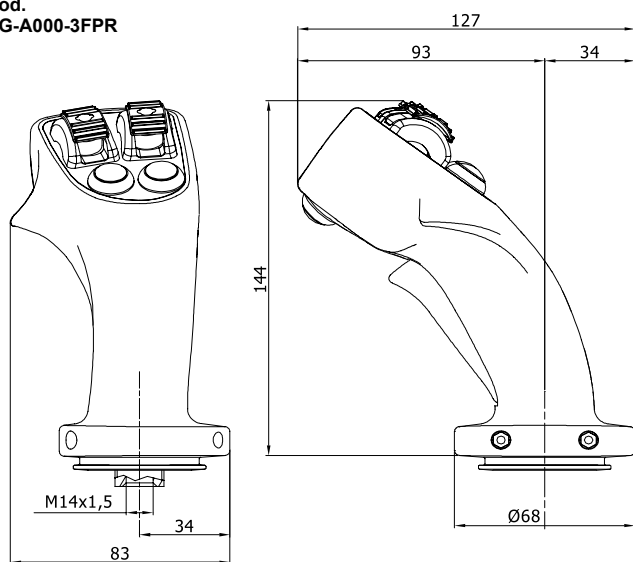
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

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
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-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/A2P9/2FPR/0000	yes	2xP9	2xFPR	0	
MG/A2P9/2FPR/R1P9	yes	2xP9	2xFPR	1xP9	
MG/A2P9/2FPR/R2P9	yes	2xP9	2xFPR	2xP9	
MG/A000/3FPR/0000	yes	0	3xFPR	0	
MG/A000/3FPR/R1P9	yes	0	3xFPR	1xP9	
MG/A000/3FPR/R2P9	yes	0	3xFPR	2xP9	

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MG MULTI-FUNCTION ERGONOMIC RIGHT HAND GRIP

FEATURES

- Optimum ergonomic design.
- Internal PWM driver.

MECHANICAL SPECIFICATIONS

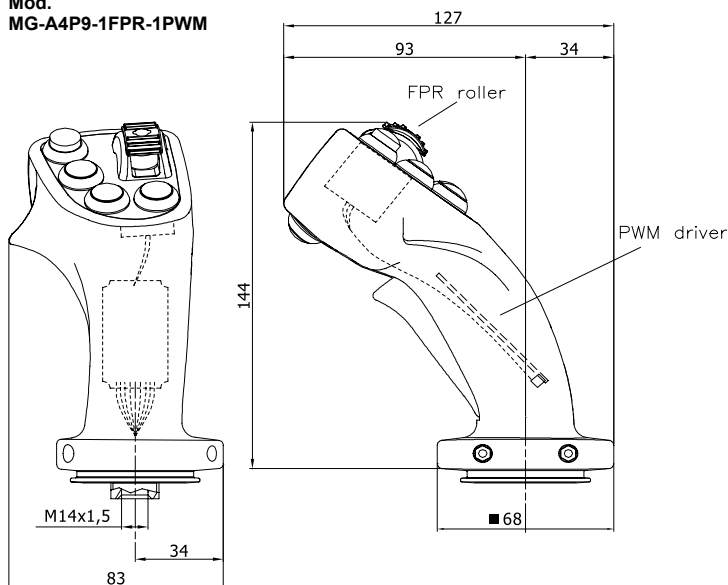
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

Prewired exit cable:	250 mm
Available push buttons and switches	
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
MG/01P9/1FPR/1PWM	0	1xP9	1xFPR	1xPWM	
MG/A2P9/1FPR/1PWM	yes	2xP9	1xFPR	1xPWM	
MG/A3P9/1FPR/1PWM	yes	3xP9	1xFPR	1xPWM	
MG/A4P9/1FPR/1PWM	yes	4xP9	1xFPR	1xPWM	
MG/A4P9/1FPR/1PWM/R1P9	yes	4xP9	1xFPR	1xPWM	1xP9
MG/A4P9/1FPR/1PWM/R2P9	yes	4xP9	1xFPR	1xPWM	2xP9

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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 mm²**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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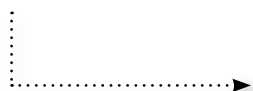
CALIBRATION TOOL

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**JHM-PWM, JHM-MLT - SOFTWARE CALIBRATION TOOL**

With Deutsch-DB9 linking cable.

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 CONVERTER WITH DEUTSCH-DB9 LINKING CABLE**

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: 21.0801.071

**CAN J1939 - SOFTWARE CALIBRATION TOOL**

With CAN-USB converter and Deutsch-DB9 linking cable. 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



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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

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



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



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

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



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

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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: 4.7kΩ ±20°

Electrical travel: 270° ±10°

ORDERING CODE: 50.1501.025



KNOB POTENTIOMETER TYPE P16

Ohmic value: 10kΩ ±20°

Electrical travel: 270° ±10°

ORDERING CODE: 50.1501.031



WARNING: the specifications/application data shown in our catalogs and data sheets are intended only as a general guide for the product described (herein). Any specific application should not be undertaken without independent study, evaluation, and testing for suitability.



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