

JOYSTICKS AND GRIPS



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FINGERTIP PROPORTIONAL CONTROL LEVERS AND SWITCHES

DESCRIPTION	ORDERING INFORMATION PAGE	TECHNICAL INFORMATION PAGE
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FTC PROPORTIONAL CONTROL LEVER

ORDERING INFORMATION

FTC - [] / - 0 - [] - []						
JOYSTICK FAMILY & TYPE	MAIN BODY CONFIGURATION	Y-Y AXIS CONTROL CONFIGURATION		POT. CONNECTOR TYPE		
FTC Mini fingertip control lever	L1S Single axis, unidirectional	3-pins rotary potentiometer	A Only potentiometer	IP Paddle type KC Cylindric type KC1 Cylindric type with "dead man" option	0 None (only pin, solder type)	
	L2S Single axis, bidirectional		B Pot & Center switch		1 4 poles electronic board on pot. AMP MODU I connector (AMP p/n 280610/1) Mating connector kit included	
	C Pot & Bidirect. switches		Z Pot & Bidirect. & Center switches		2 8 poles electronic board on pot. and bidirectional switch AMP MODU I connector (AMP p/n 280612/1) Mating connector kit included	
	D Only potentiometer		E Pot & Center switch			
	F Pot & Bidirect. switches		W Pot & Bidirect. & Center switches			
	G Only potentiometer		H Pot & Center switch			
	I Pot & Bidirect. switches	R Pot & Bidirect. & Center switches				
	L Only potentiometer	4-pins rotary potentiometer	M Pot & Center switch			
	N Pot & Bidirect. switches		X Pot & Bidirect. & Center switches			

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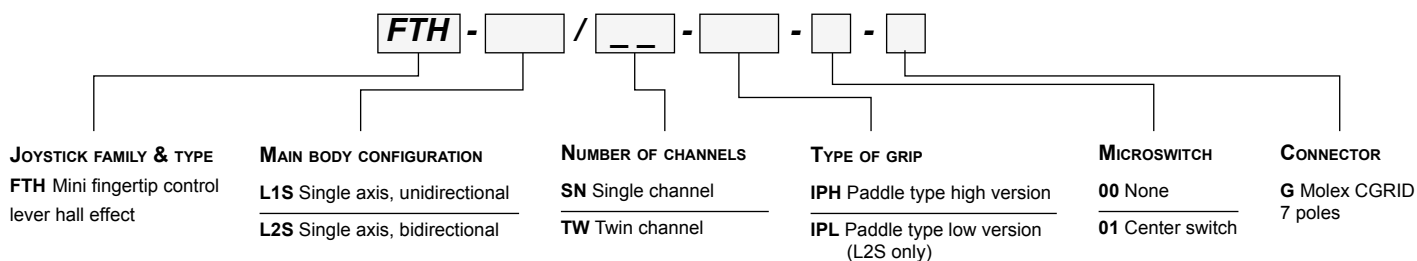
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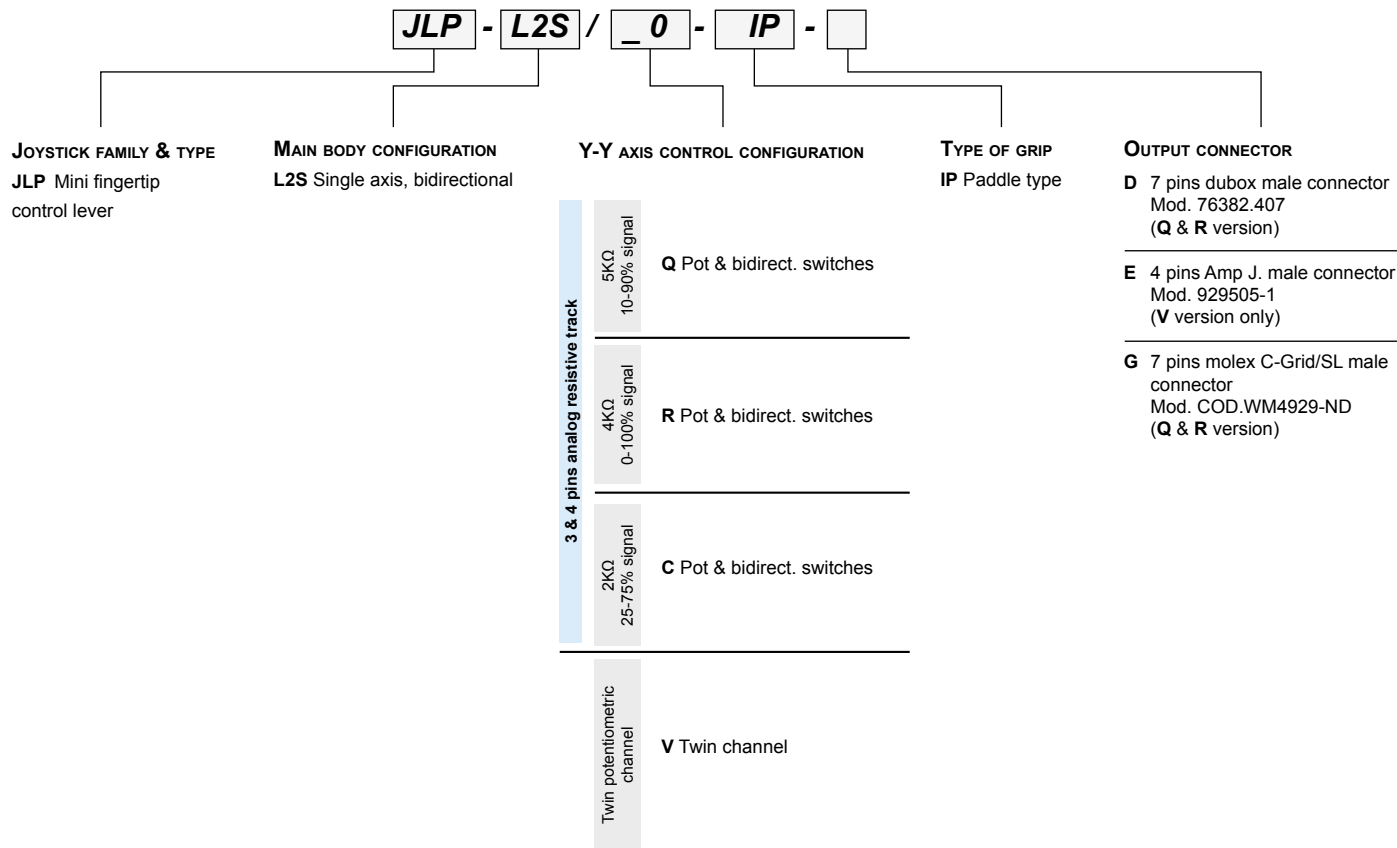
FTH CONTACTLESS PROPORTIONAL CONTROL LEVER

ORDERING INFORMATION



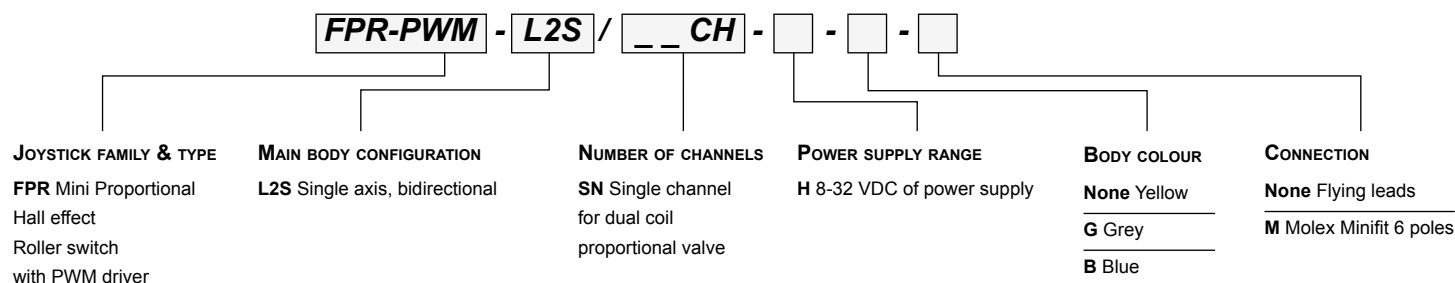
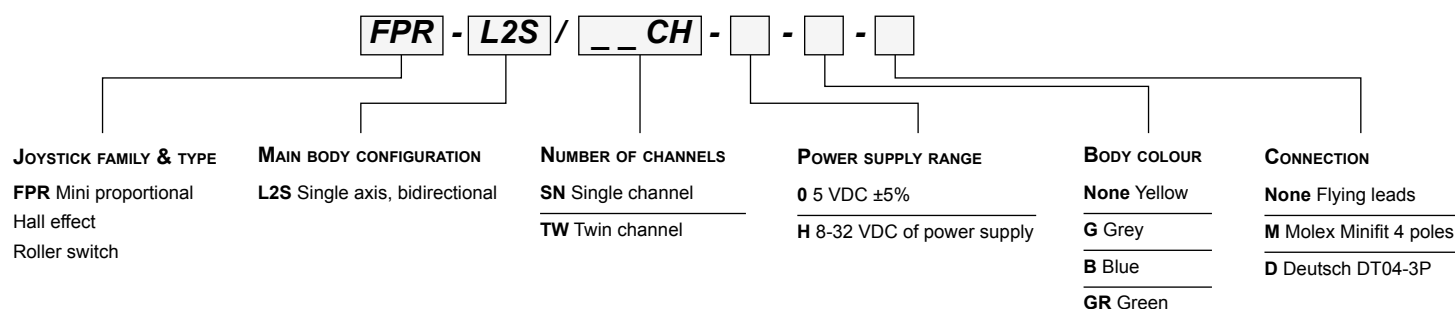
JLP PROPORTIONAL CONTROL LEVER

ORDERING INFORMATION

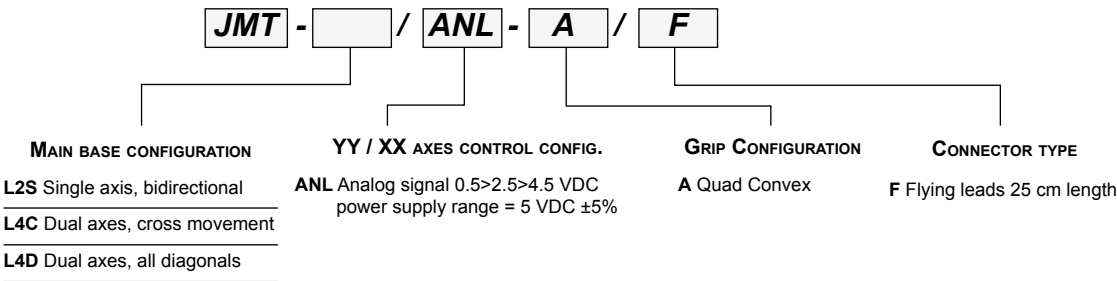


FPR FINGERTIP PROPORTIONAL SWITCHES

ORDERING INFORMATION



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**

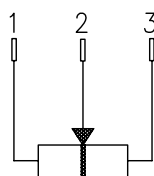
Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of Vin	1 kΩ ±20%
/ D = 90% of Vin	5 kΩ ±20%
Max. operating input voltage (Vin):	48 V or ±24 V
Min. load impedance on pin 2 (signal):	50 kΩ
Max. operating current on pin 2:	1 mA
Output voltage:	see graph
Linearity (resistive track):	2% 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)

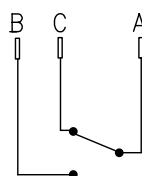
Contact:	silver plated (solder type)
Max. operating input voltage:	48 V or ±24 V
Max. operating current:	1.5 A / inductive
Neutral pos. switch threshold angle:	+4°
Protection class:	IP 55 (IP 67 available on request)

POTENTIOMETER & SWITCHES OPTIONS

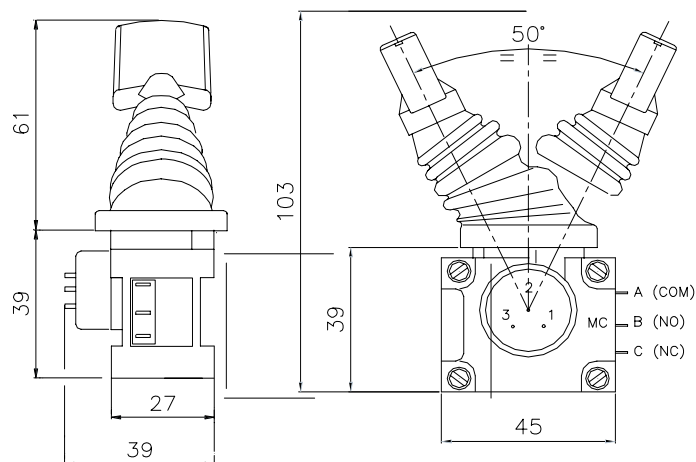
	Reference codes	
Output signal	S= 50% Vin	S= 90% Vin
3-pins pot	A (Std)	D
3-pins pot & enable switch	B	E

ELECTRICAL CONNECTIONS

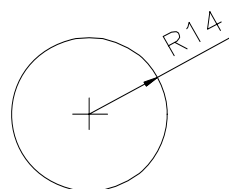
Potentiometer



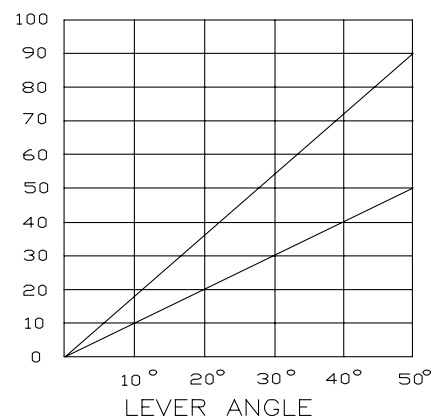
Neutral position switch MC

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

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**

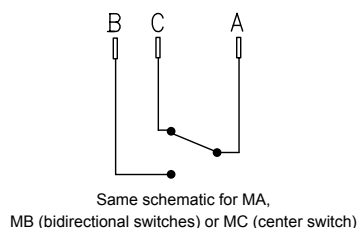
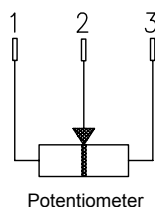
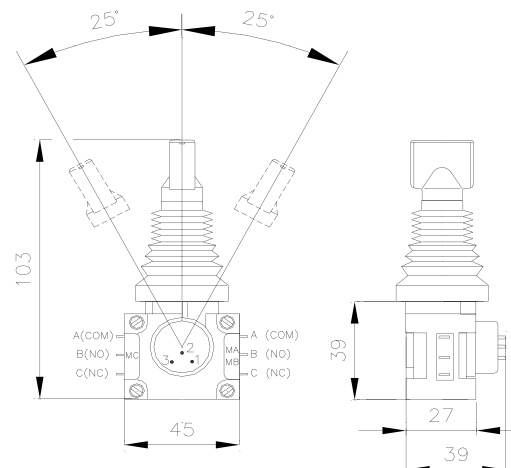
Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of V_{in}	1 k $\Omega \pm 20\%$
/ D = 90% of V_{in}	5 k $\Omega \pm 20\%$
Max. operating input voltage (V_{in}):	48 V or ± 24 V
Min. load impedance on pin 2 (signal):	50 k Ω
Max. operating current on pin 2:	1 mA
Output voltage:	see graph
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)

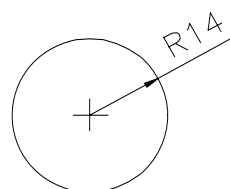
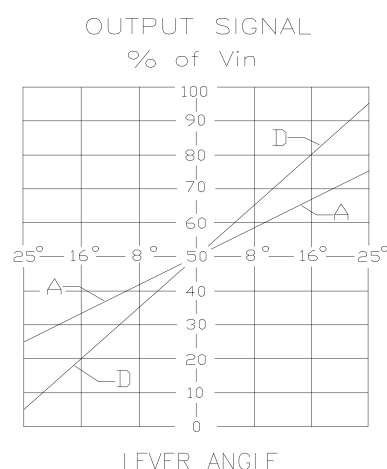
Contacts:	silver plated (solder type)
Max. operating input voltage:	48 V or ± 24 V
Max. operating current:	1.5 A/inductive
Neutral pos. switch threshold angle:	$+4^\circ$
Protection class:	IP 55

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:	$-25^\circ\text{C} / +80^\circ\text{C}$
Protection class:	IP 65 (above panel)
Life:	3 million cycles

ELECTRICAL SPECIFICATIONS**4-pins rotary potentiometer**

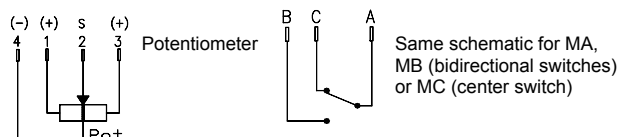
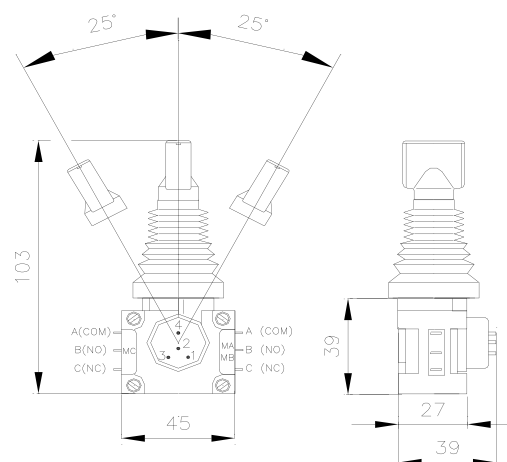
Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / G = 40% of V_{in}	$1\text{ k}\Omega \pm 20\%$
/ L = 100% of V_{in}	$5\text{ k}\Omega \pm 20\%$
Max. operating input voltage (V_{in}):	48 V or $\pm 24\text{ V}$
Min. load impedance on pin 2 (signal):	50 k Ω
Max. operating current on pin 2:	1 mA
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)

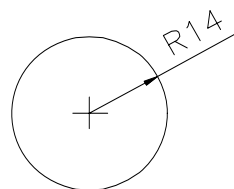
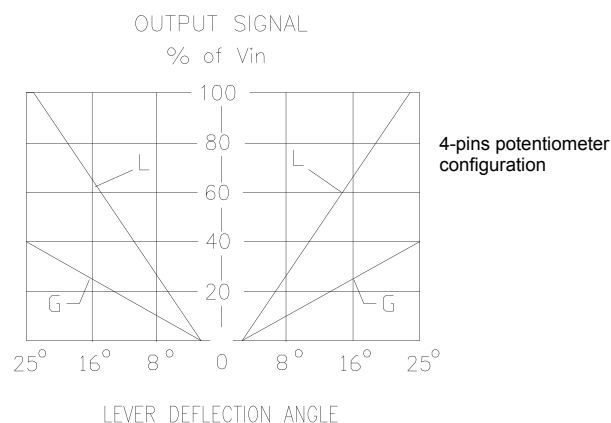
Contacts:	silver plated (solder type)
Max. operating input voltage:	48 V or $\pm 24\text{ V}$
Max. operating current:	1.5 A/inductive
Neutral pos. switch threshold angle:	$+4^\circ$
Protection class:	IP 55 (IP 67 available on request)

POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S= 40% V_{in}	S= 100% V_{in}
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

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**

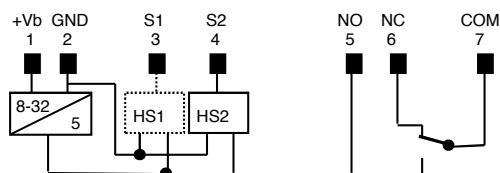
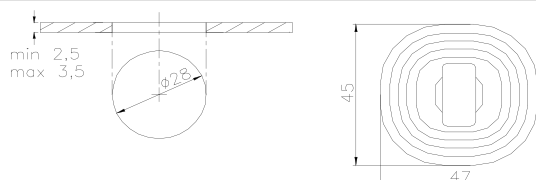
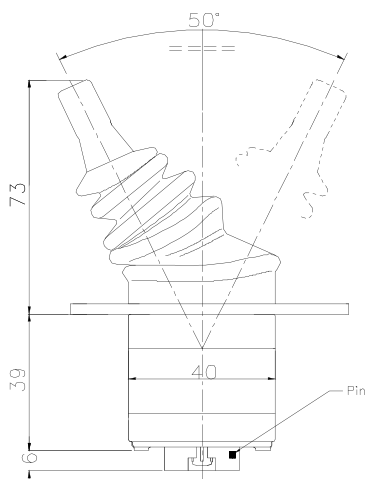
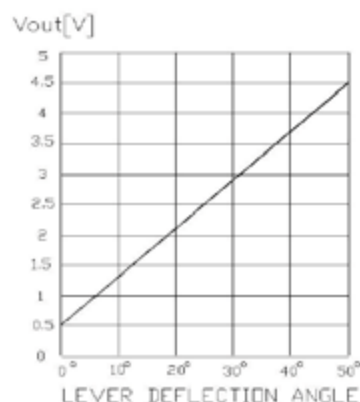
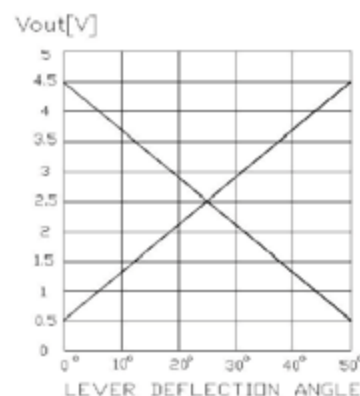
Power supply voltage:	8÷32 VDC
Current consumption:	< 15 mA (30 mA with 2 sensors)
Output signal in neutral:	< 0.1 V
Output signal range:	0.5 V ÷ 4.5 V
Tolerance on output signal:	±0.1 V
Linearity:	< 2%
Max. output current:	1 mA
Directional switch operating voltage:	< 48 VDC
Directional switch max. current: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

HS1: optional

**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:	$-25^\circ\text{C} / +85^\circ\text{C}$
Protection class:	IP 67
Life:	> 3 million cycles (without switch)
Connector:	molex CGRID/SL, 7 male pins

ELECTRICAL SPECIFICATIONS**Linear, hall-effect sensor**

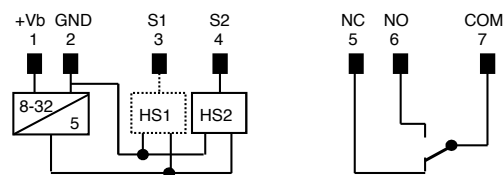
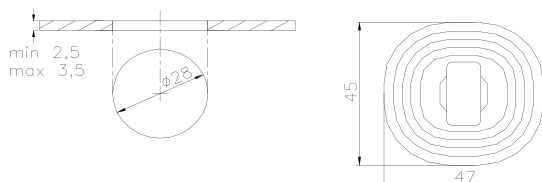
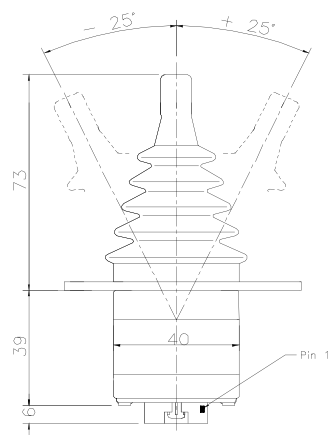
Power supply voltage:	8 $\pm$ 32 VDC
Current consumption:	< 15 mA (30 mA with 2 sensors)
Output signal in neutral:	2.50 V $\pm$ 0.1 V
Output signal range:	0.5 V $\div$ 4.5 V
Tolerance on output signal:	$\pm$ 0.1 V
Linearity:	< 2%
Max. output current:	1 mA
Directional switch operating voltage:	< 48 VDC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

Neutral position switch (electromechanical type)

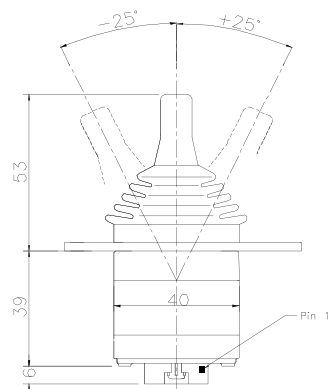
Contacts:	silver plated (solder type)
Max. operating input voltage:	48 V or $\pm$ 24 V
Max. operating current:	1 A
Neutral pos. switch threshold angle:	7°
Protection class:	IP 67

ELECTRICAL CONNECTIONS

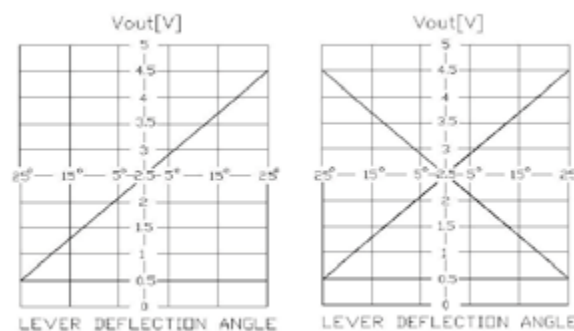
HS1: optional

**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**

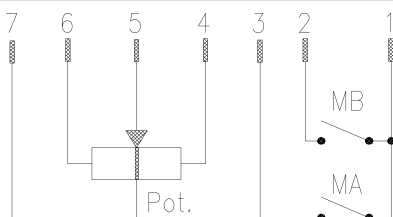
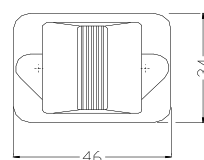
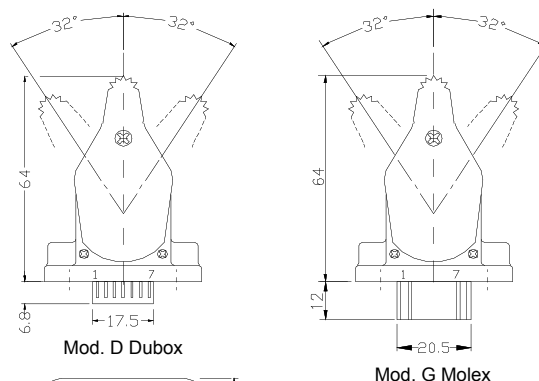
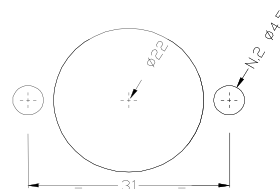
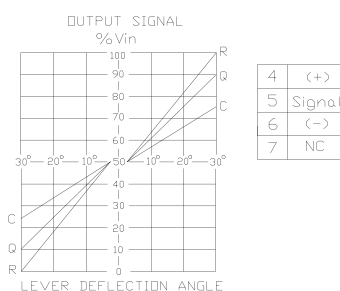
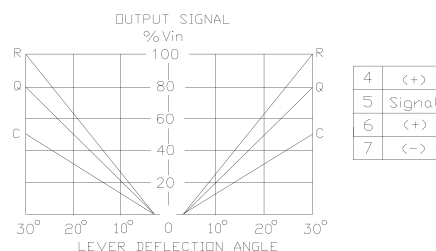
Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of V_{in}	8 k $\Omega \pm 20\%$
/ Q = 80% of V_{in}	5 k $\Omega \pm 20\%$
/ R = 100% of V_{in}	4 k $\Omega \pm 20\%$
Max. operating input voltage (V_{in}):	48 V or ± 24 V
Min. load impedance on pin 5 (signal):	50 k Ω
Max. operating current 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 wiring4-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:	$-25^\circ\text{C} / +85^\circ\text{C}$
Protection class:	IP 65 (above panel)
Life:	3 million cycles
Fixing screws included:	2 - M4x16

ELECTRICAL SPECIFICATIONS**Potentiometer**

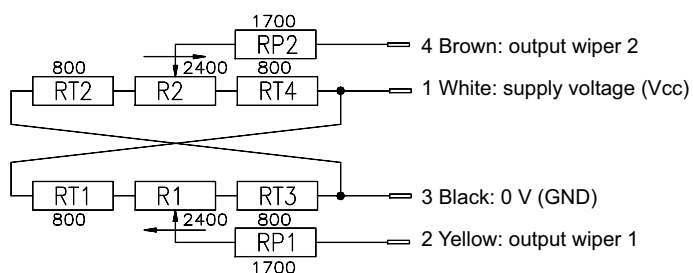
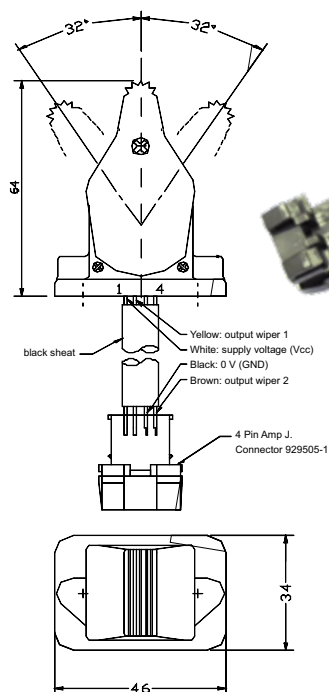
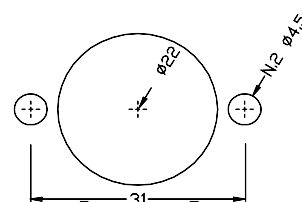
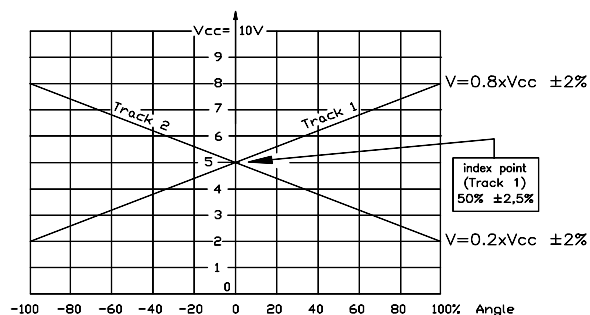
Electrical power rating:	0.25 W @ 25°C
Total resistance between pin 1 and 3:	2 k Ω $\pm 20\%$
Nominal voltage supply (V _{in}):	10 V
Tolerance between track 1 and 2:	$\pm 4\%$ of V _{cc}
Output voltage:	see graph
Load resistance:	100 k Ω - nominal 50 k Ω - minimum
Linearity (resistive track):	2% or better
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:	$\pm 30^\circ$
Body material:	acetal resin / teflon compound
Colours available:	grey, blue, green, yellow
Rubber gaiter material:	EPDM / 35-45 shore - A
Operating temperature range:	$-25^\circ\text{C} / +85^\circ\text{C}$
Environmental protection:	IP 68 (above panel)
Life:	> 5.000.000 cycles

ELECTRICAL SPECIFICATIONS

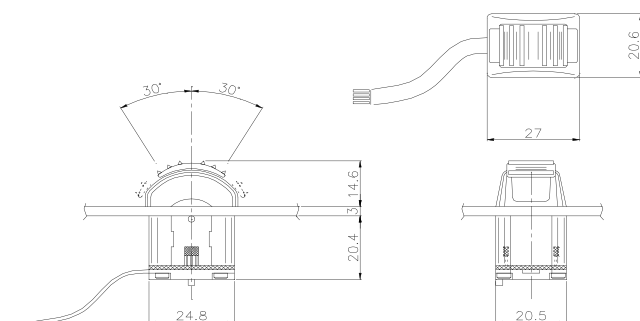
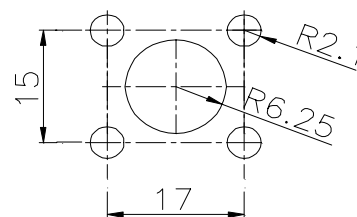
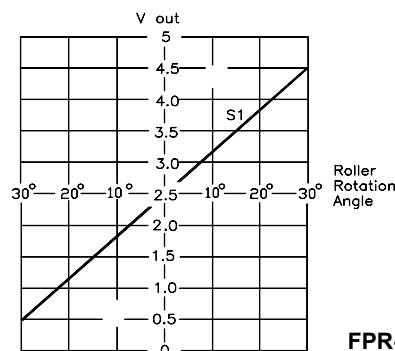
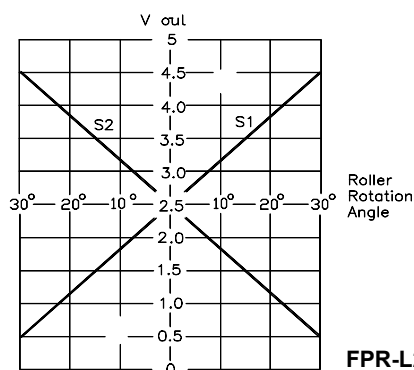
Signal output @ rest:	2.5 VDC ± 0.1 V
Supply voltage:	H - Version = $8 \div 32$ VDC 0 - Version = 5 VDC $\pm 5\%$
Full output signal range:	0.5 - 4.5 V, ± 0.2 V
Current consumption at rest:	SNCH (S1 only) 15 mA TWCH (S1/S2) 25 mA
Rated output current:	1 mA
Connection type: flying leads = coloured flat 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.)**

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

FPR - L2S - TWCH (twin chan.)

- (1) Yellow: + 5 VDC
- (2) Orange: (-) ground
- (3) Red: output 1 (S1)
- (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

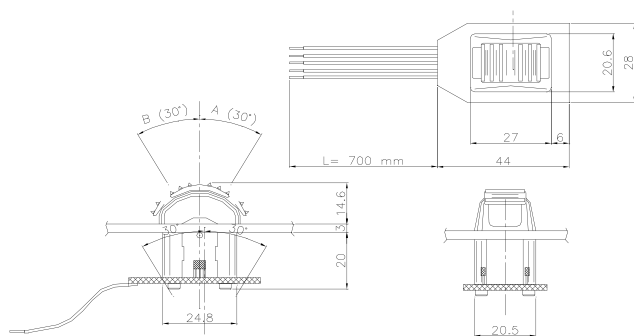
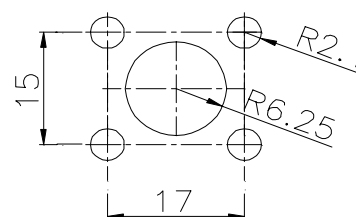
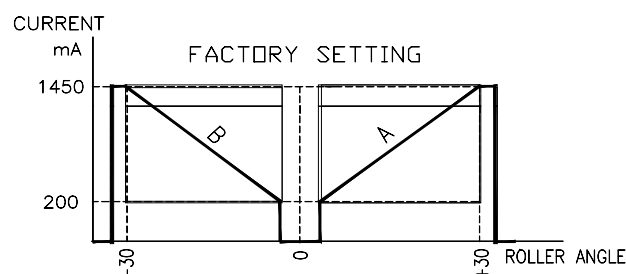
Rotation angle:	$\pm 30^\circ$
Main body material:	acetal resin / teflon compound
Colours available:	yellow, grey, blue
Rubber gaiter material:	EPDM / 35-45 shore - A
Operating temperature range:	-25°C / +85°C
Environmental protection:	IP 68 (above panel)
Life:	> 5.000.000 cycles

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	

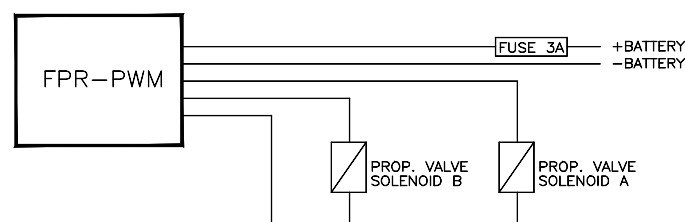
ELECTRICAL CONNECTIONS

- (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:

- Imin (minimum output current)
- Imax (maximum output current)
- Dither

APPLICATION EXAMPLE**Ordering Code**

23.0409.160 (Imin = 200mA, Imax = 1500mA, PWM = 100Hz)

JMT PROPORTIONAL MULTI-AXIS HALL EFFECT THUMB JOYSTICK**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:	$23^{\circ} \pm 2^{\circ}$
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:	$-40^{\circ}\text{C} / +85^{\circ}\text{C}$

ELECTRICAL SPECIFICATIONS

Sensor technology:	Hall effect
Supply Voltage:	ANL = 5 VDC $\pm 5\%$
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:	< 0.15V
Output voltage tolerance at full travel:	< 0.20V
Sealing (fully potted electronics):	IP69K

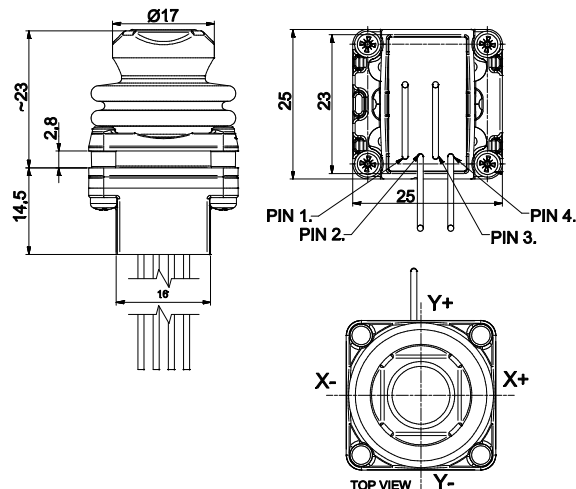
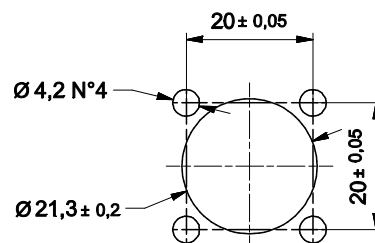
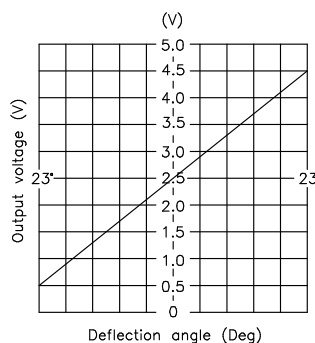
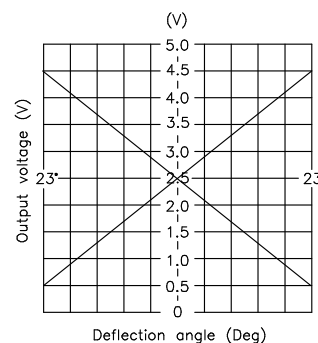
ELECTRICAL CONNECTIONS**JMT - L2S - single axis**

- (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****SINGLE OUTPUT****OUTPUTS WITH REDUNDANCY****JMT ORDERING INFORMATION: see page JK8**

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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.

JMF HEAVY DUTY MULTI-AXIS JOYSTICK

ORDERING INFORMATION

JOYSTICK FAMILY & TYPE	MAIN BASE CONFIGURATION	YY / XX AXES CONTROL CONFIG.		TYPE OF GRIP	GRIP CONFIGURATION	POT. CONNECTOR TYPE
		0 No Pot. & switches on Y/X axis	2 Only Bidir. switches on Y/X axis			
JMF Heavy duty / Multi-axis joystick controller	L1SF Single axis, unidirectional with friction lock	3-pins rotary potentiometer	A Only potentiometer 1 KΩ 5%-95% signal	IL Cylindrical knob	Refer to the Grip ordering information for zz e kk axes (push-buttons & proportional controls on grips)	0 Flying leads 25 cm length 1 4 poles electronic board on potentiometer AMP MODU I connector (AMP p/n 280610/1) mating connector kit included
	L2S Single axis, bidirectional		C Pot. & Bidirect. switches 5 KΩ 25%-75% signal	IC Cylindrical		
	L2SF Single axis, bidirectional with friction lock		D Only potentiometer	IE Multi-function ergonomic		
	L4C Dual axes, cross movement		F Pot. & Bidirect. switches	MS Multi-function ergonomic symmetric		
	L4D Dual axes, all diagonals	4-pins rotary potentiometer	G Only potentiometer 10 KΩ 0%-40% signal	MG Multi-Function ergonomic right hand		
			I Pot. & Bidirect. switches	HL Multi-function ergonomic left hand		
			L Only potentiometer 5 KΩ 0%-100% signal	HR Multi-function ergonomic right hand		
			N Pot. & Bidirect. switches			

EXAMPLE:



JMF-L4C/NN
BASE

+



MG/A6P9/0000/R000-0
GRIP

=

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

JHM HEAVY DUTY MULTI-AXIS JOYSTICK

ORDERING INFORMATION

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

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



EXAMPLE:

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.

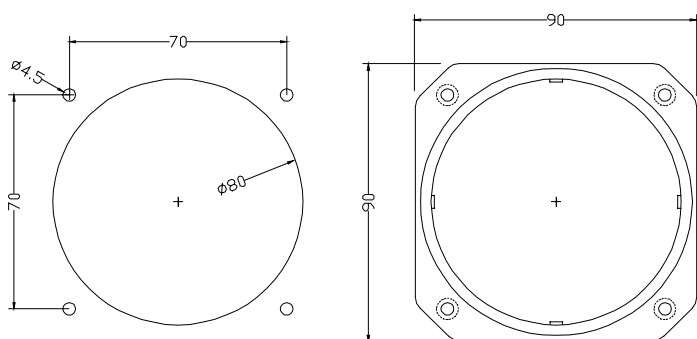
MECHANICAL SPECIFICATIONS

Lever deflection angle:	$\pm 25^\circ \pm 1^\circ$
Electrical angle:	$\pm 25^\circ \pm 1^\circ$
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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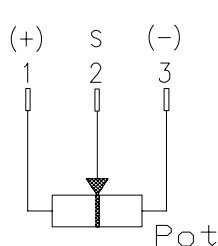
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JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK (JOYSTICK BASE ONLY)**ELECTRICAL SPECIFICATIONS****Directional switches (electromechanical type)**

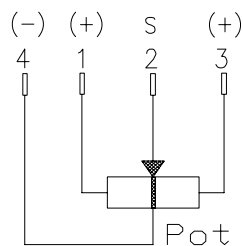
Contacts:	silver plated
Max. operating input voltage:	125/250 Vac
Max. operating current:	16 A (5 A on request)*
Pot. connector type:	0 = None (solder type) 1 = AMP Modu I/4 poles
Neutral pos. switch threshold angle:	$\pm 10^\circ$ ($\pm 5^\circ$ on request)*
Protection class:	IP 55 (specials available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

Rotary potentiometer

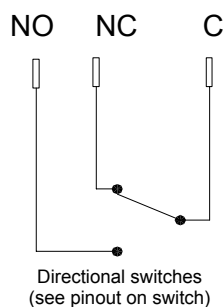
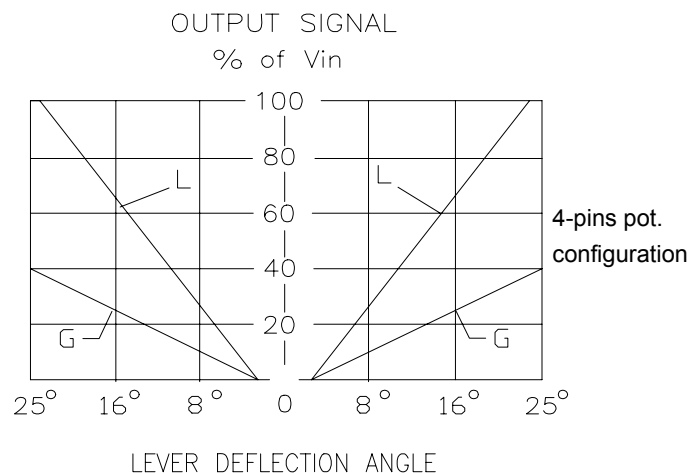
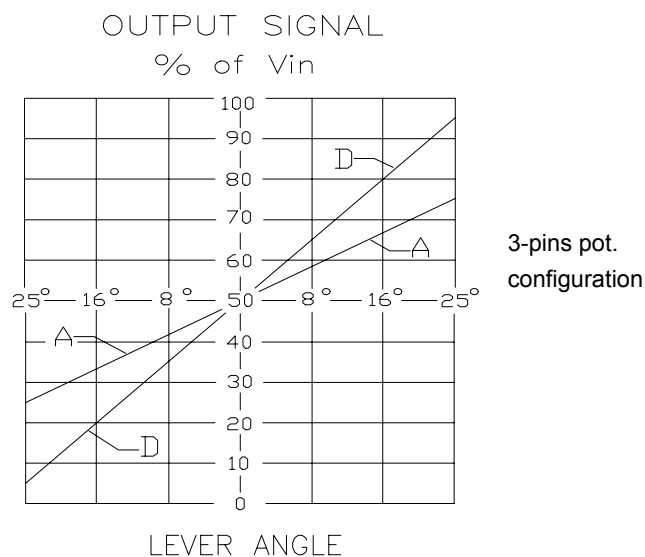
Electrical power rating:	0.25 W @ 25°C
Ohmic resistance: / A = 50% of V_{in} (3-pins version) / D = 90% of V_{in}	1 k Ω $\pm 20\%$ 5 k Ω $\pm 20\%$
Ohmic resistance: / G = 40% of V_{in} (4-pins version) / L = 100% of V_{in}	10 k Ω $\pm 20\%$ 5 k Ω $\pm 20\%$
Max. operating input voltage (V_{in}):	48 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

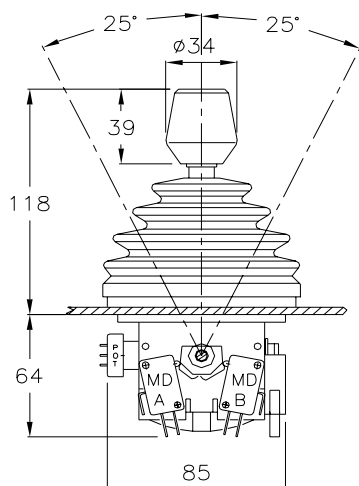
ELECTRICAL CONNECTIONS (for solder type connector)

3-pins potentiometer

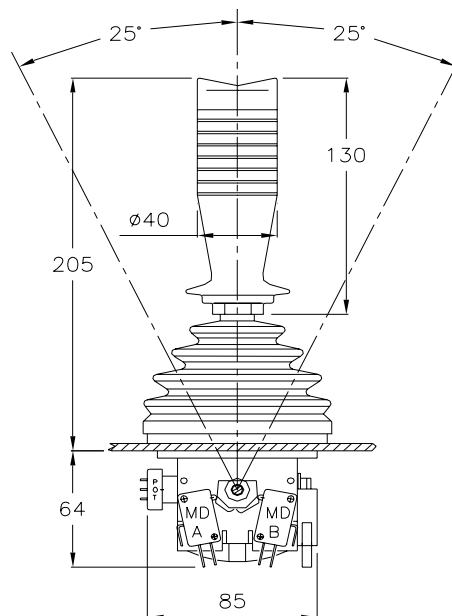


4-pins potentiometer

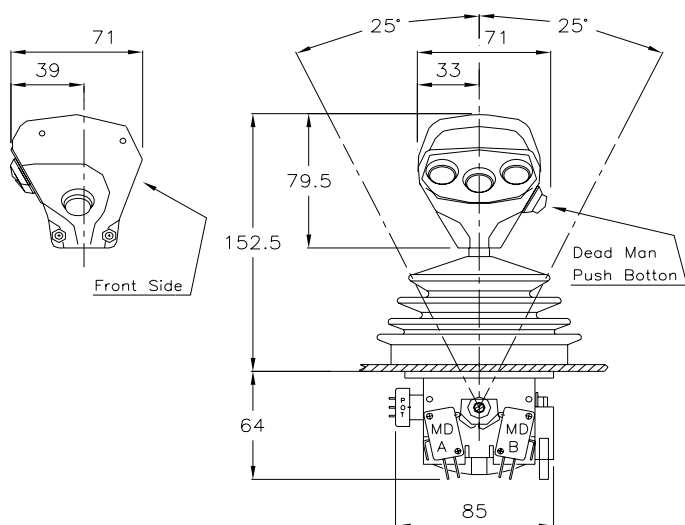
**OUTPUT SIGNAL CONTROL CHARACTERISTICS****JMF ORDERING INFORMATION:** see page JK20

JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK**JMF joystick with grips - configuration examples with overall dimensions**

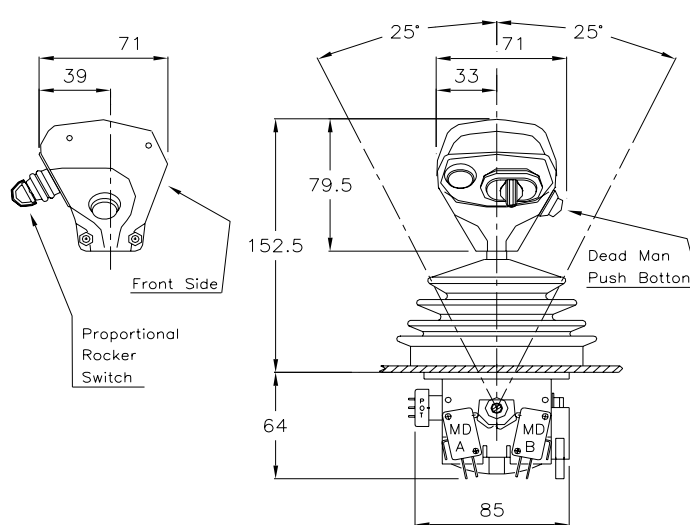
JMF base with IL handle
Complete code: **JMF-L4C/NN-IL 0000**



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**

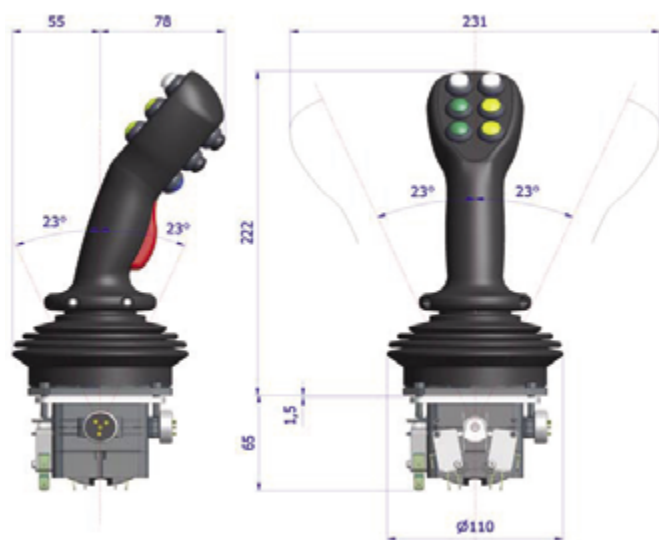
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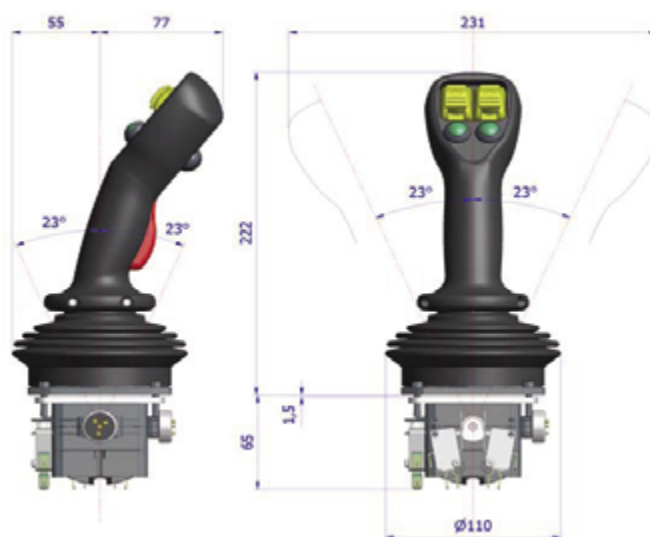
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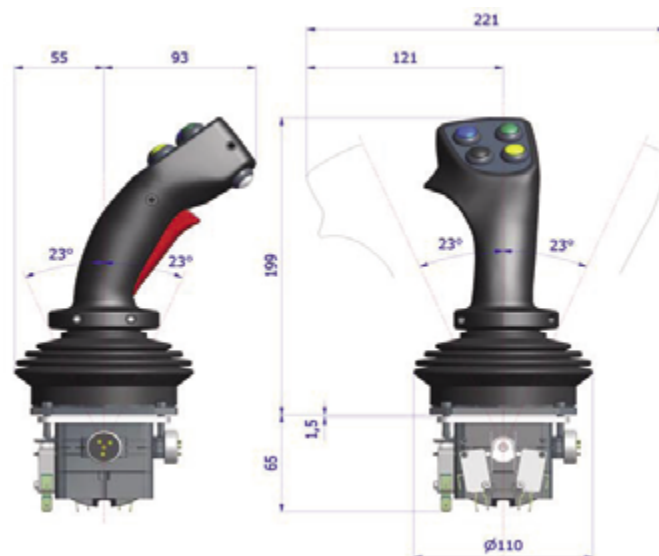
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JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK*JMF joystick with grips - configuration examples with overall dimensions*

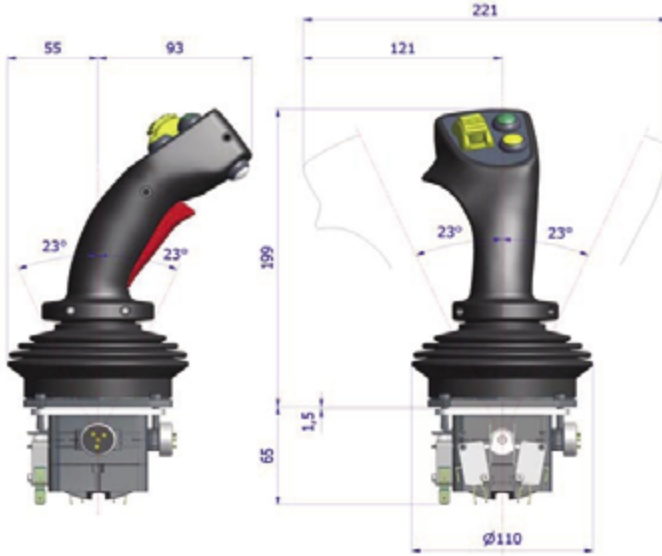
JMF base with MS type handle
Complete code: **JMF-L4C/NN-MS A6P9 R3P9**



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



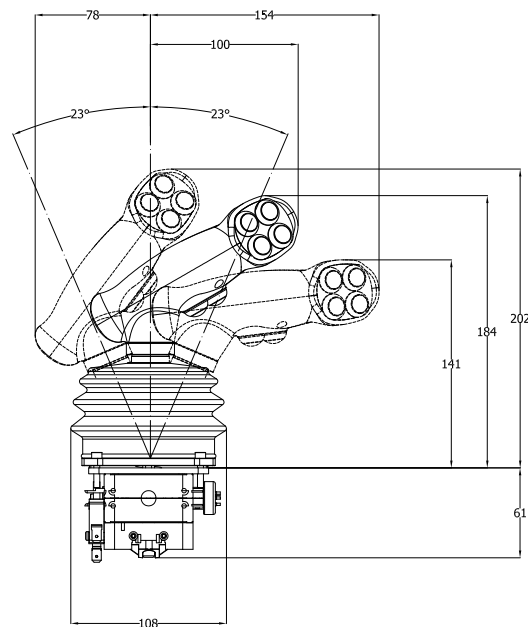
JMF base with MG type handle
Complete code: **JMF-L4C/NN-MG A4P9 R1P9**



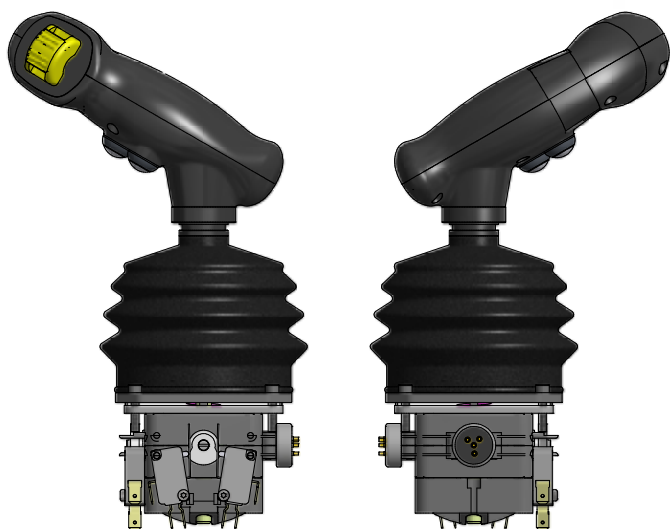
JMF base with MG type handle
Complete code: **JMF-L4C/NN-MG A2P9 1FPR R1P9**

JMF HEAVY DUTY MULTI-AXIS POTENTIOMETRIC JOYSTICK*HL joystick with grips - configuration examples with overall dimensions*

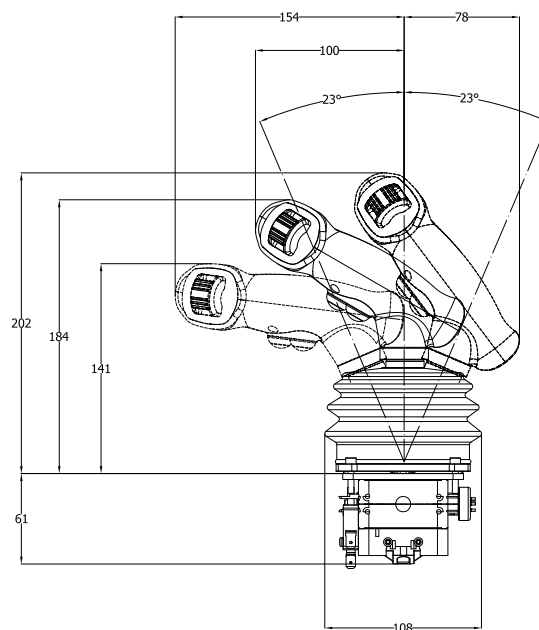
JMF base with HL type handle
Complete code: **JMF-L4C/NN-HL-04P9-2P9/RDFF**



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.

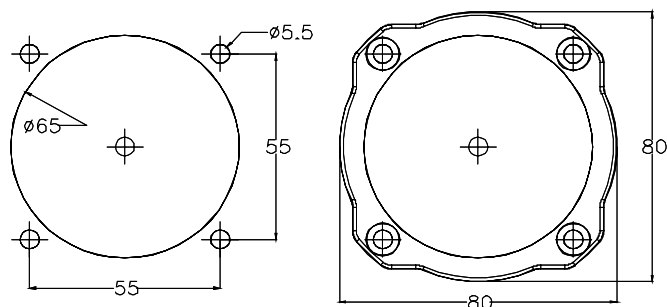
A magnetic position detent on the Y or X axis is also available as option.

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**

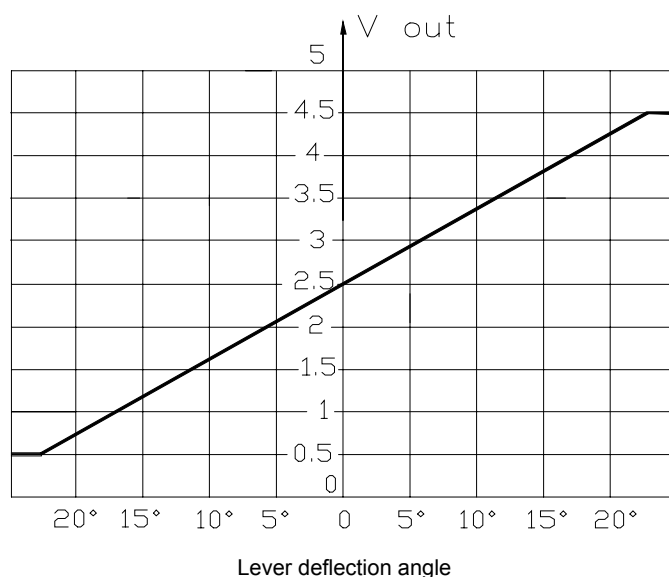
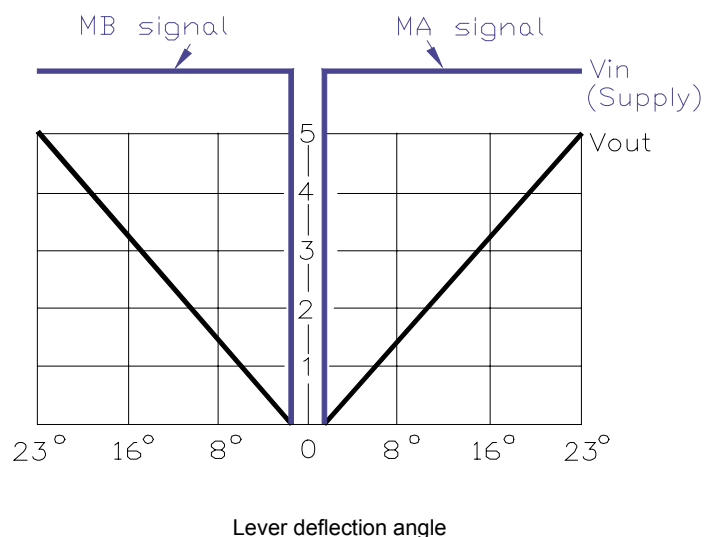
Current consumption @ rest:	< 25 mA (sensor only)
Supply voltage:	ANL version = 5 VDC $\pm 5\%$ ANH version = 8÷32 VDC
Signal output @ rest:	2.5 VDC ± 0.2 V
Output signal range:	0.5 ÷ 4.5 V ± 0.2 V (see graph)
Rated output current:	1 mA
Protections (ANH version):	overvoltage and reversed polarity

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

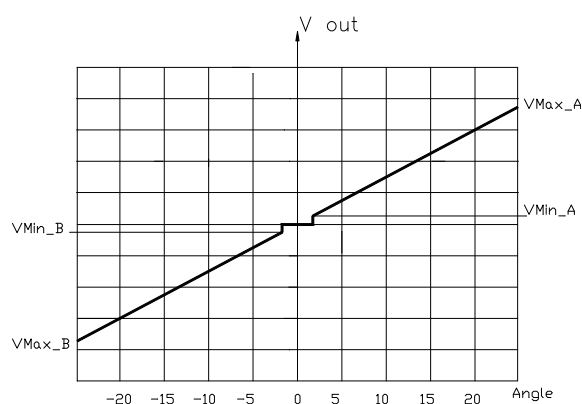
(MA and MB signals on graph)

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**

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:

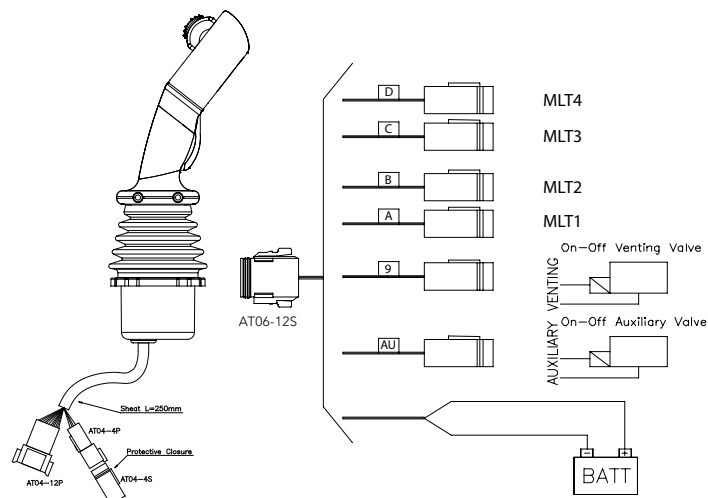
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Assignment for on-off auxiliary outputs.

By use of the calibration window:

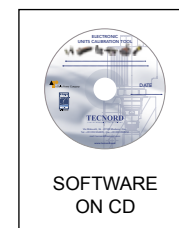
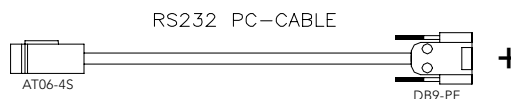
- Operating parameters: V_{min}, V_{max}, Ramp up, Ramp down.

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

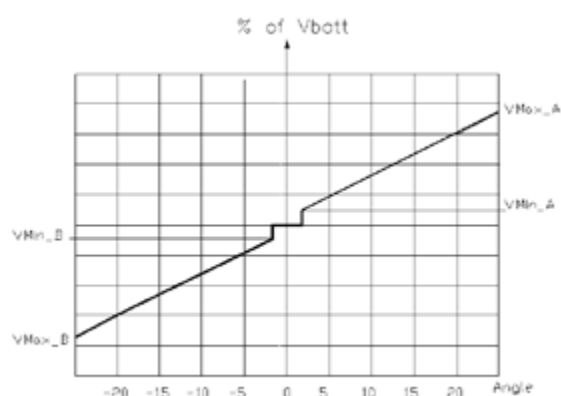
Output signal range: linear signal (adjustable)

25÷50÷75% of V_{batt}10÷50÷90% of V_{batt}

Rated output current: 15 mA

Power digital outputs: 4 (0.7 A)

Adjustments: via RS232 serial line

OUTPUT SIGNAL CONTROL CURVE**ADJUSTABLE PARAMETERS**

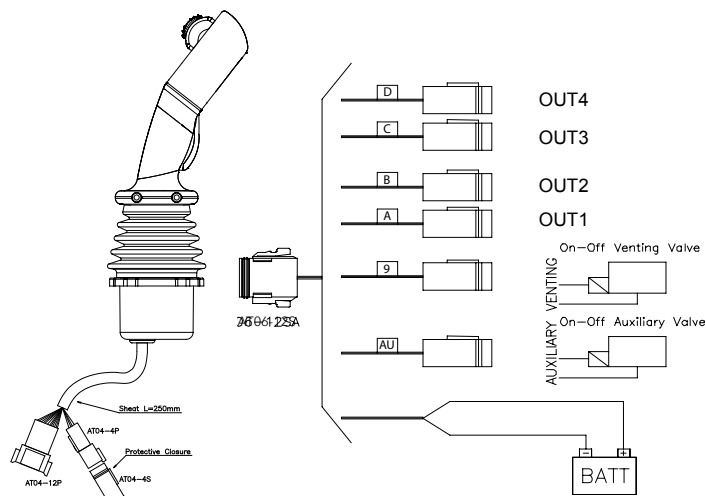
The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool.

By use of the configuration window:

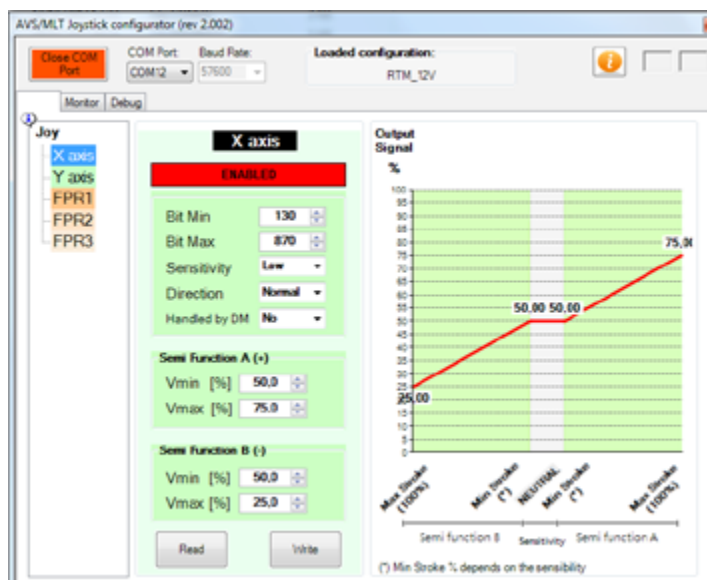
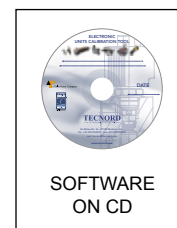
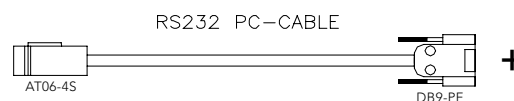
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse and enable, virtual cross movement.
- Output assignment on-off auxiliary valves.

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

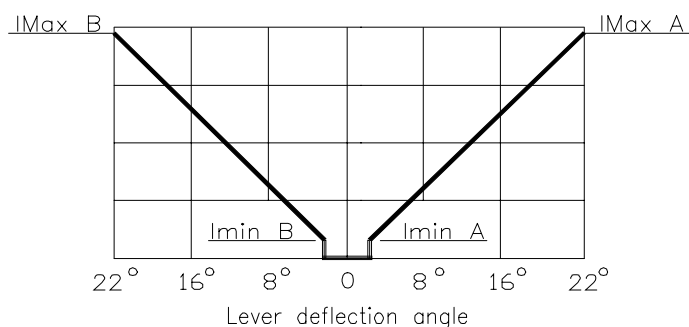


JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**PWM VERSION****2 PWM output channels**

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 Tecnomat 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:

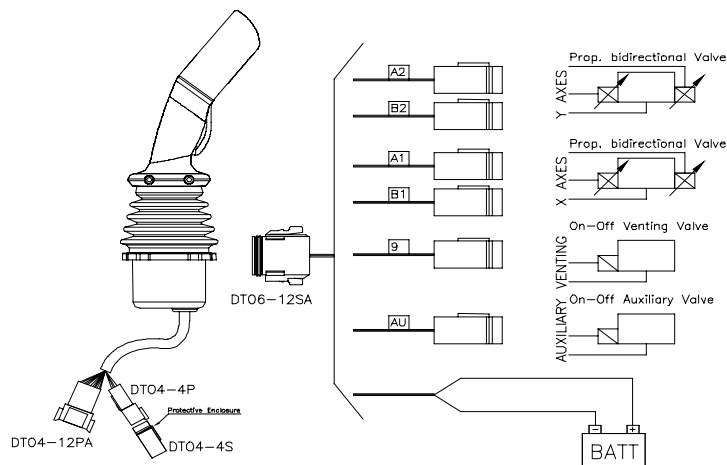
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse, virtual cross movement.
- Current setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.
- Digital directional output signals on both axes (N.O. or N.C. mode)

By use of the calibration window:

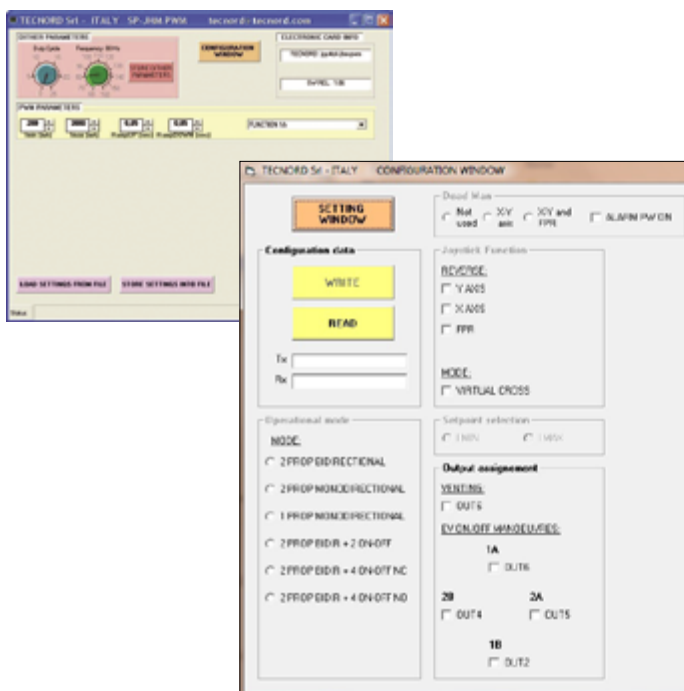
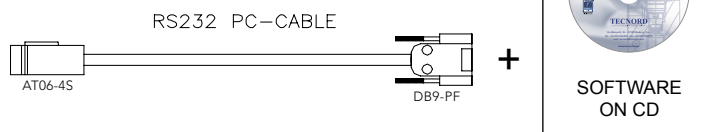
- Operating parameters: I_{min} , I_{max} , Ramp up and Ramp down times.

APPLICATION EXAMPLE

Shown with MS grip



For PC connection (optional)
ordering code: 21.0801.055



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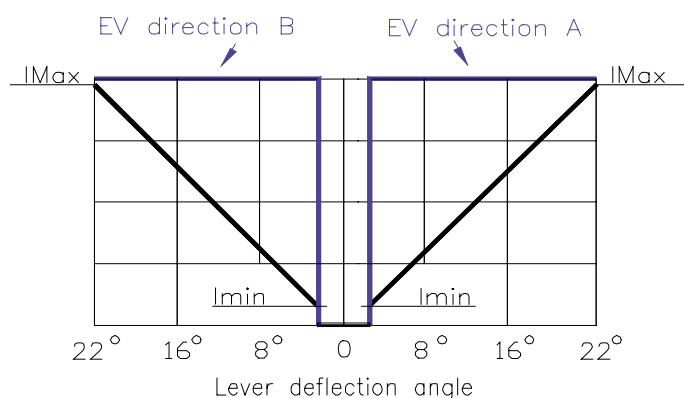
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JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**TCN VERSION** (special configuration of PWM version)**1 PWM output in combination with up to 5 on-off outputs**

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 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:

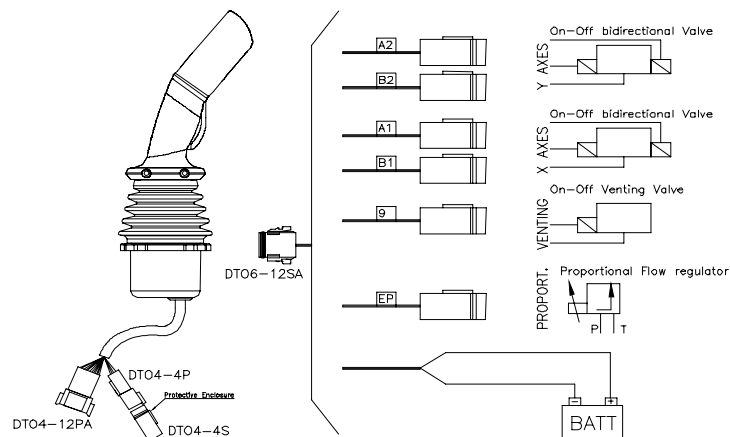
- Operation mode.
- Deadman push button enable.
- Joystick functions: axes reverse, virtual cross movement.
- Current setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.

By use of the calibration window:

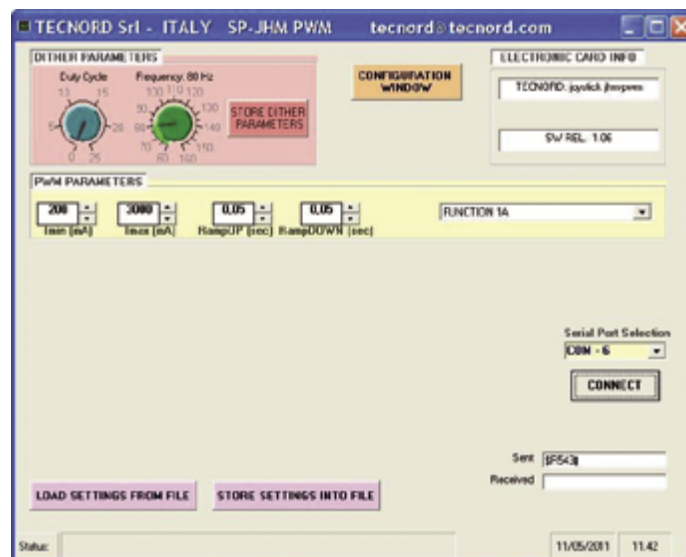
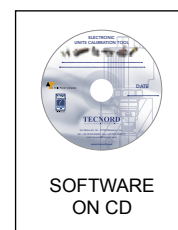
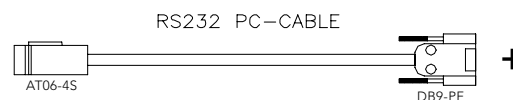
- Operating parameters: Imin, IMax, Ramps.

APPLICATION EXAMPLE

Shown with MS grip



For PC connection (optional)
ordering code: 21.0801.055

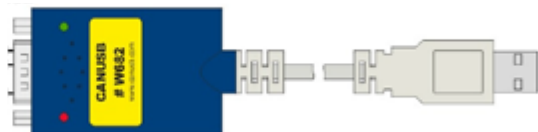
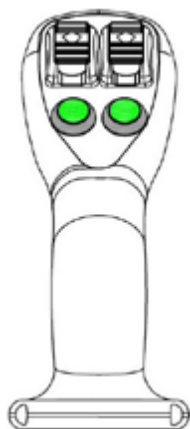


JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK (JOYSTICK BASE ONLY)**CANBUS VERSION**

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

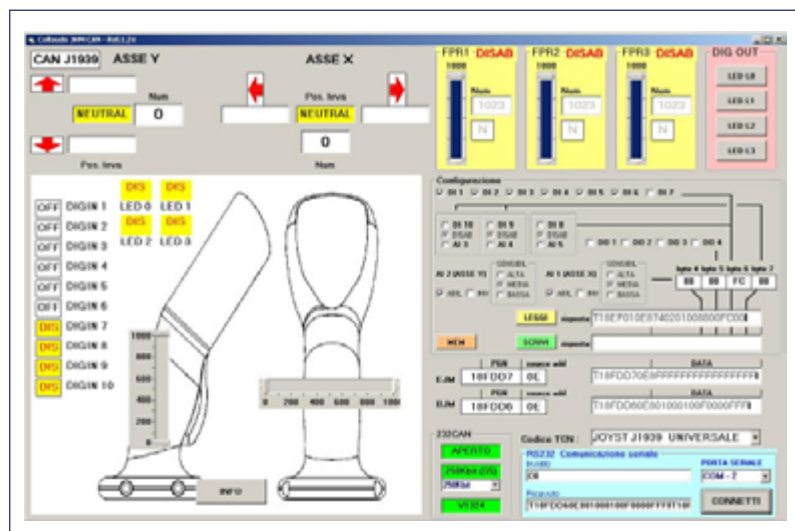
- Node ID

For J1939 version

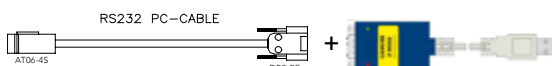
- Node ID

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

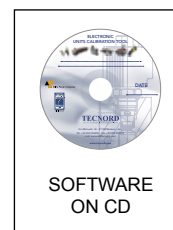
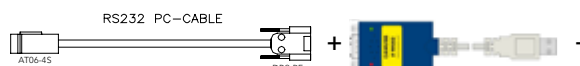
- Read joystick configuration
- Adjust X, Y axes sensibility and direction
- Enable /disable digital or analog inputs and digital outputs
- Change Node ID

FOR J1939 VERSION ONLY**CANOPEN VERSION ONLY**

ordering code: 21.0801.071

**J1939 VERSION ONLY**

ordering code: 21.0801.062



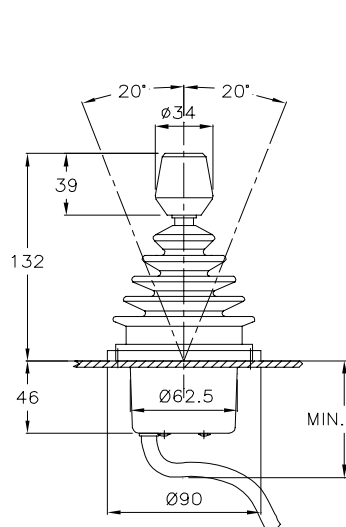
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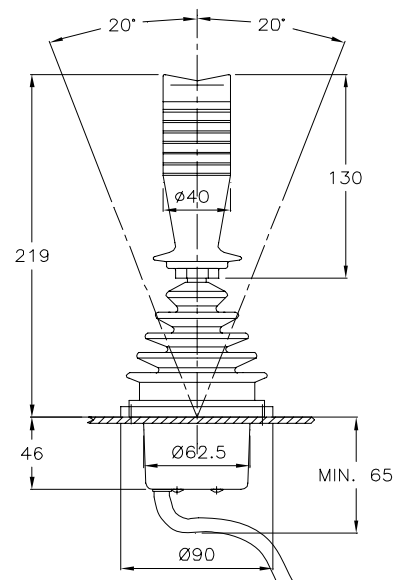
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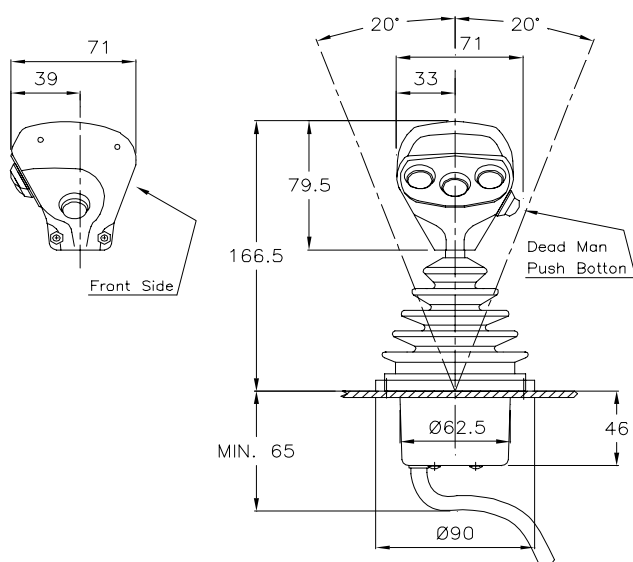
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JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK**JHM joystick with grips - configuration examples with overall dimensions**

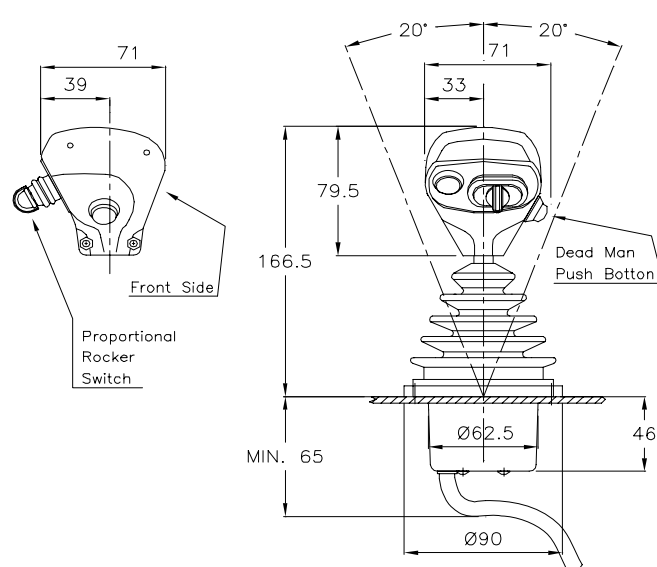
JHM base with IL handle
Complete code: **JHM-L4D/ANH-IL 0000**



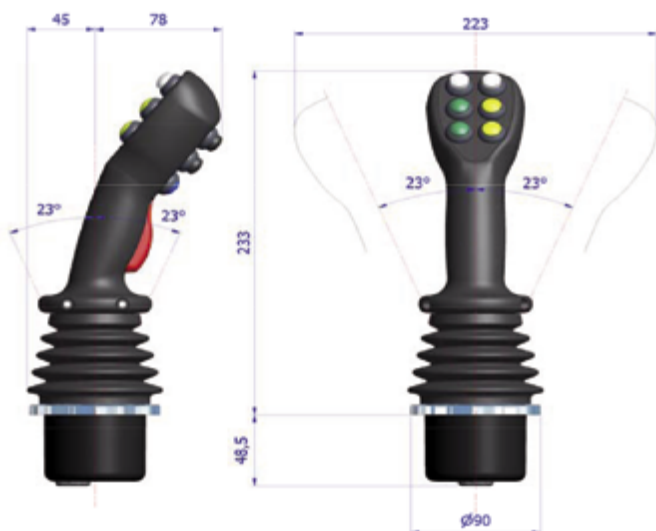
JHM base with IC handle
Complete code: **JHM-L4D/ANH-IC 0200**



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**

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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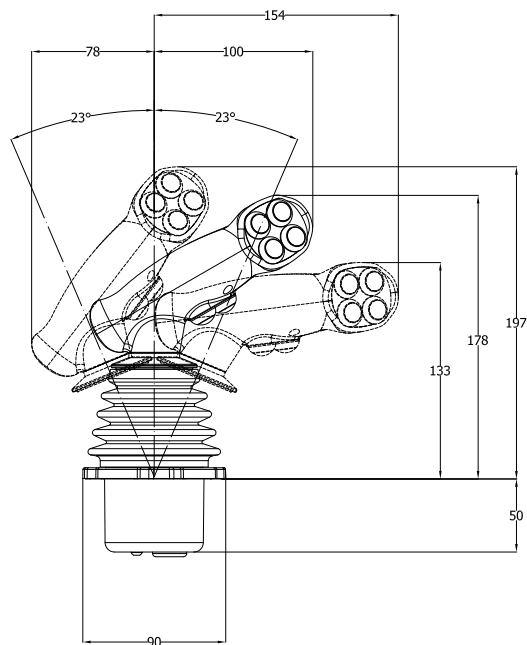
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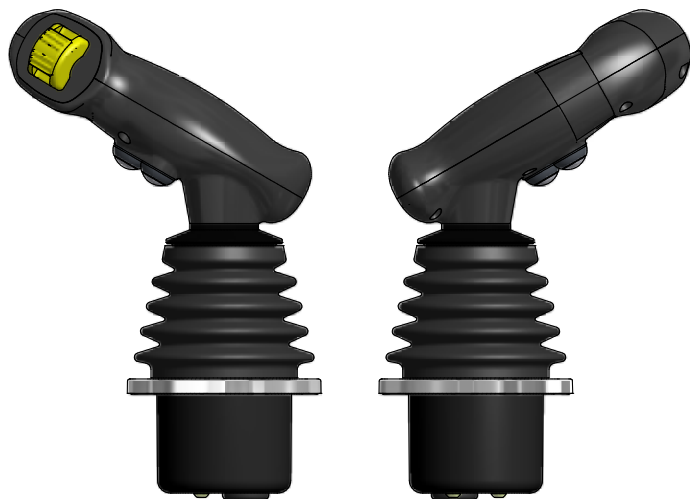
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JHM HEAVY DUTY MULTI-AXIS HALL EFFECT JOYSTICK***HR joystick with grips - configuration examples with overall dimensions***

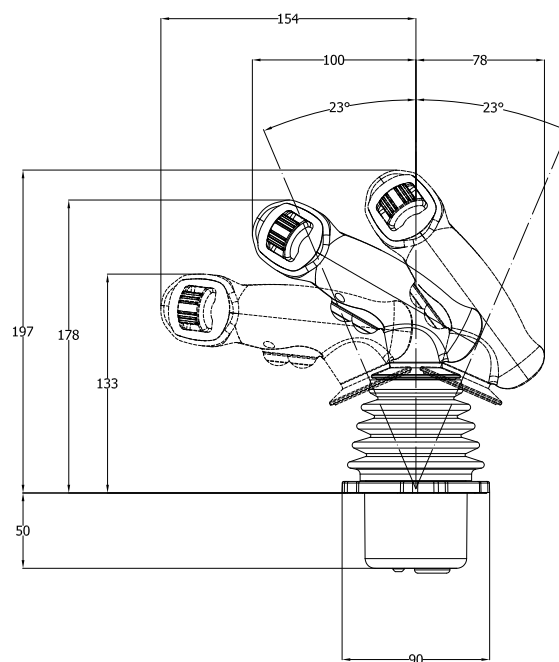
JHM base with HL type handle
Complete code: **JHM-L4D/ANH-HL-04P9-2P9/RDFF**



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**

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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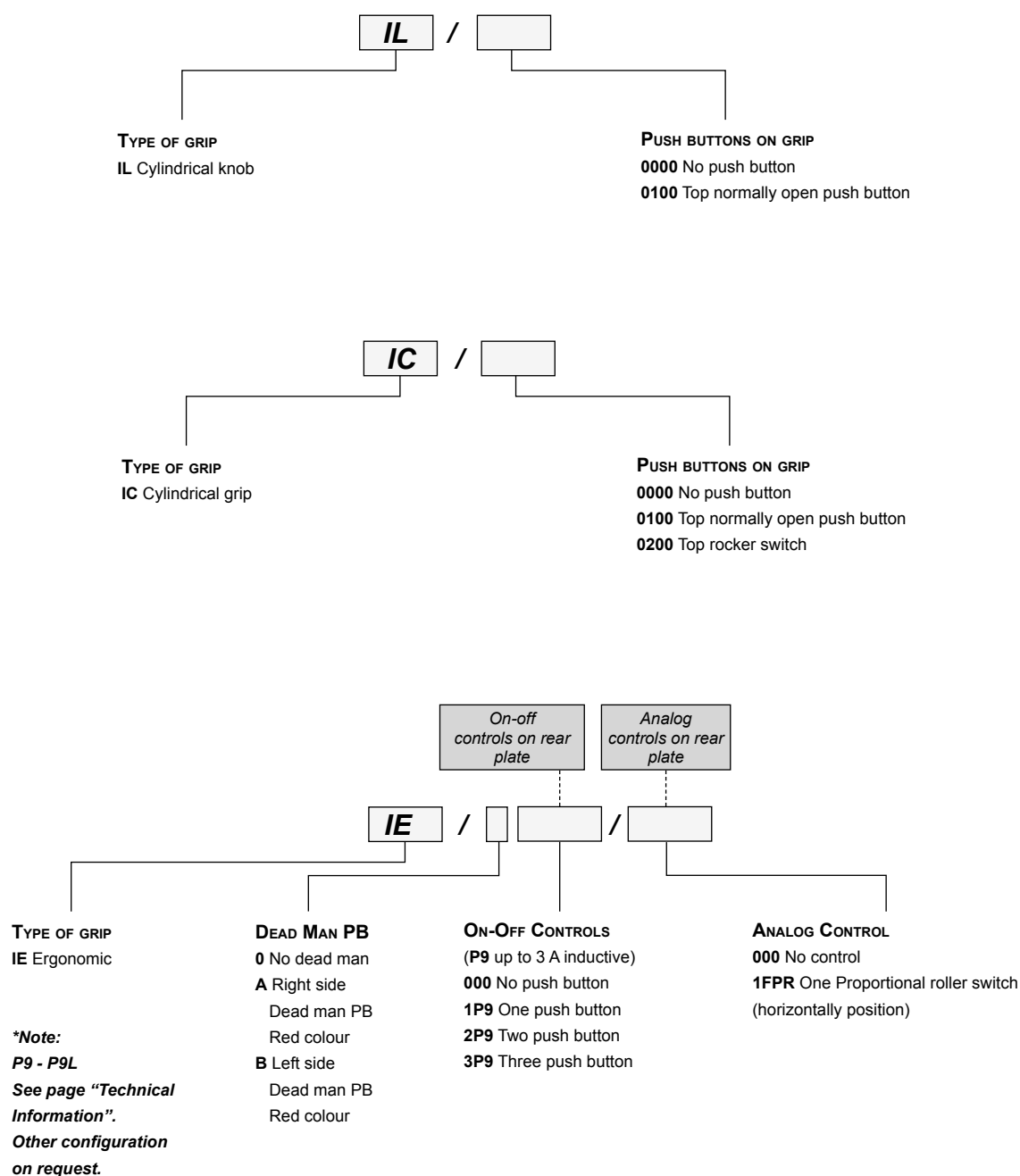
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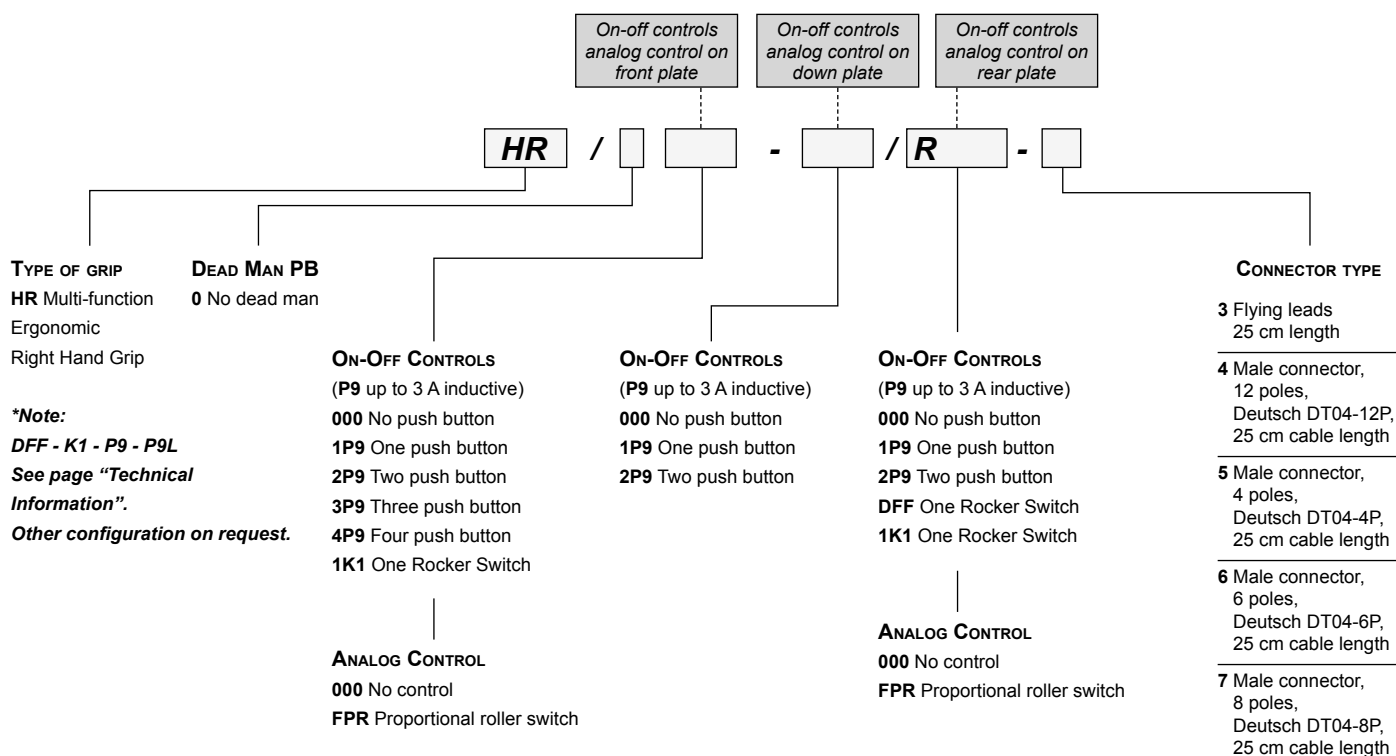
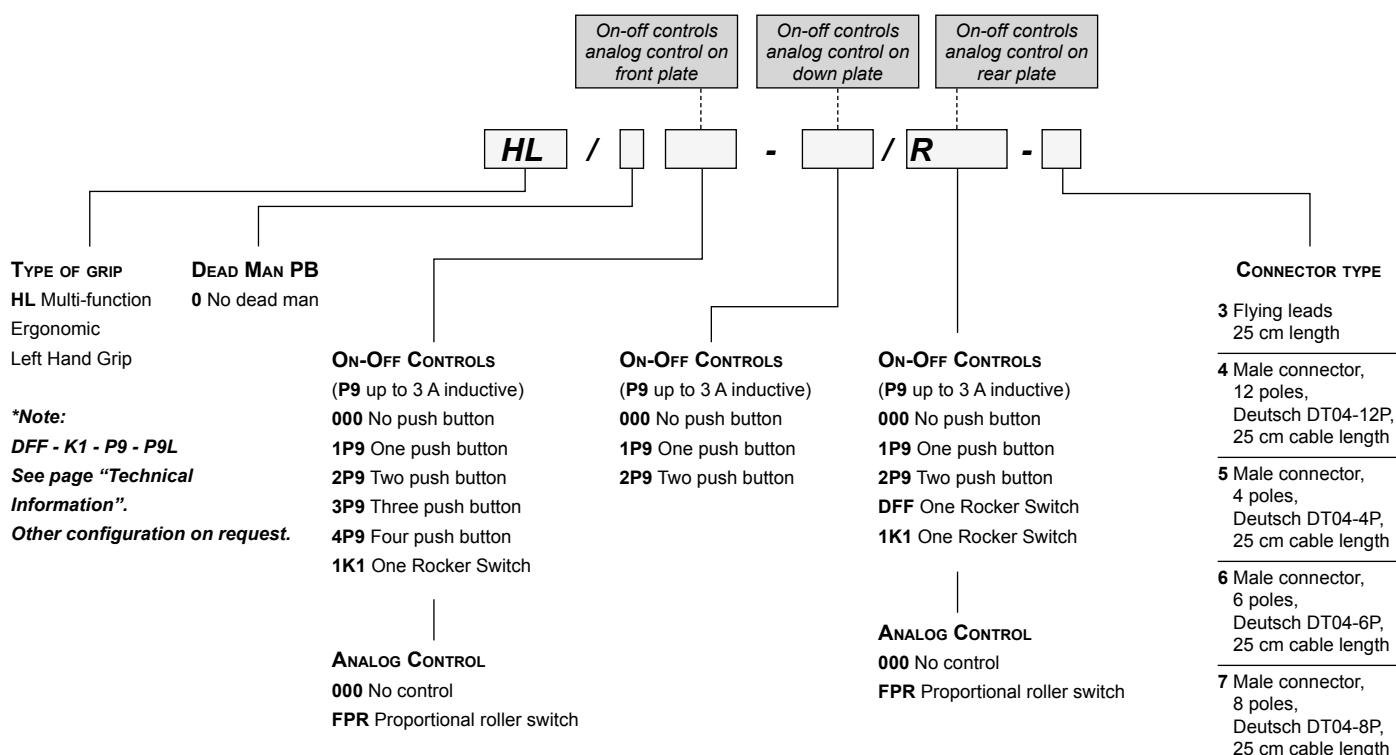
IL / IC / IE GRIPS

ORDERING INFORMATION



HL / HR ERGONOMIC GRIP

ORDERING INFORMATION



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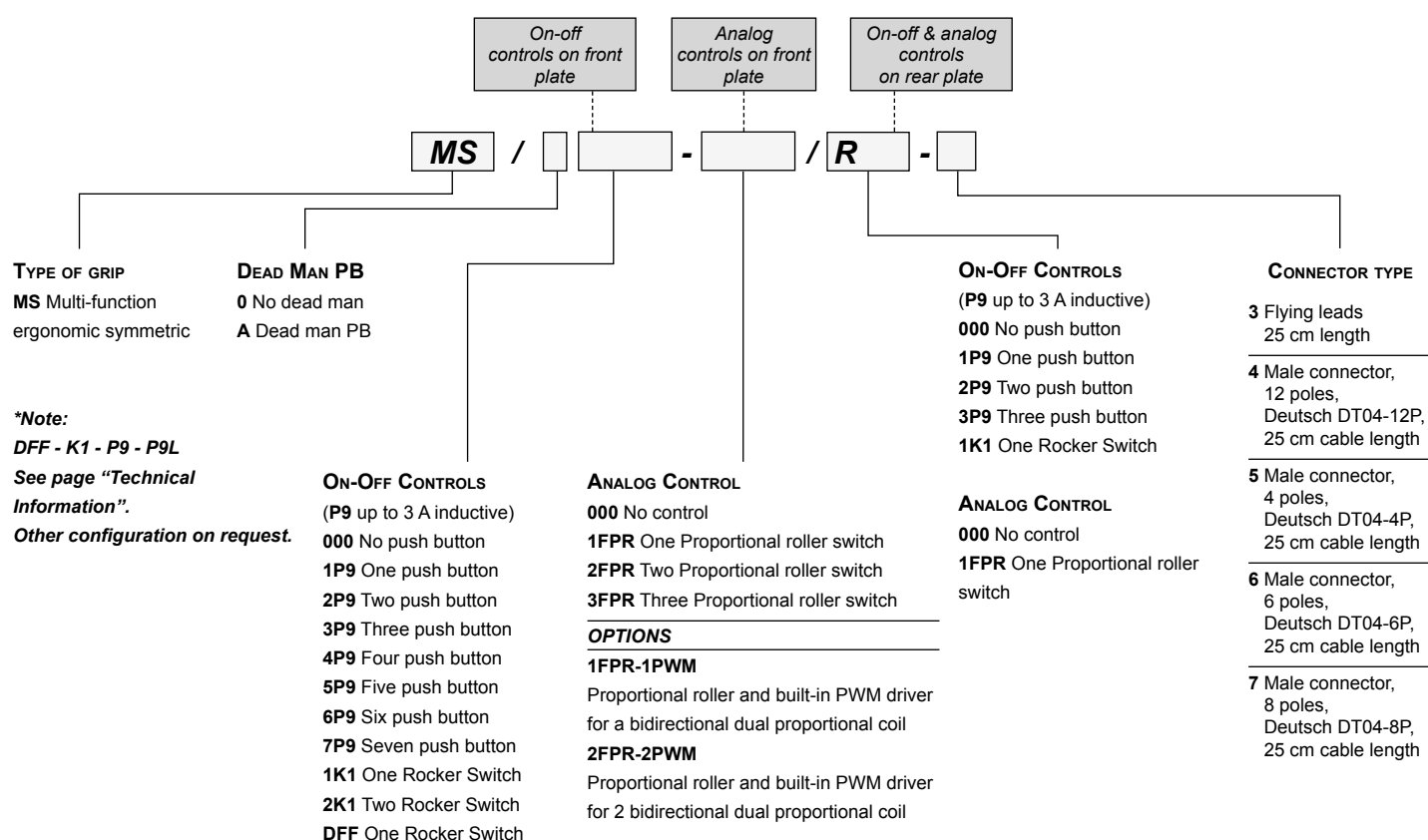
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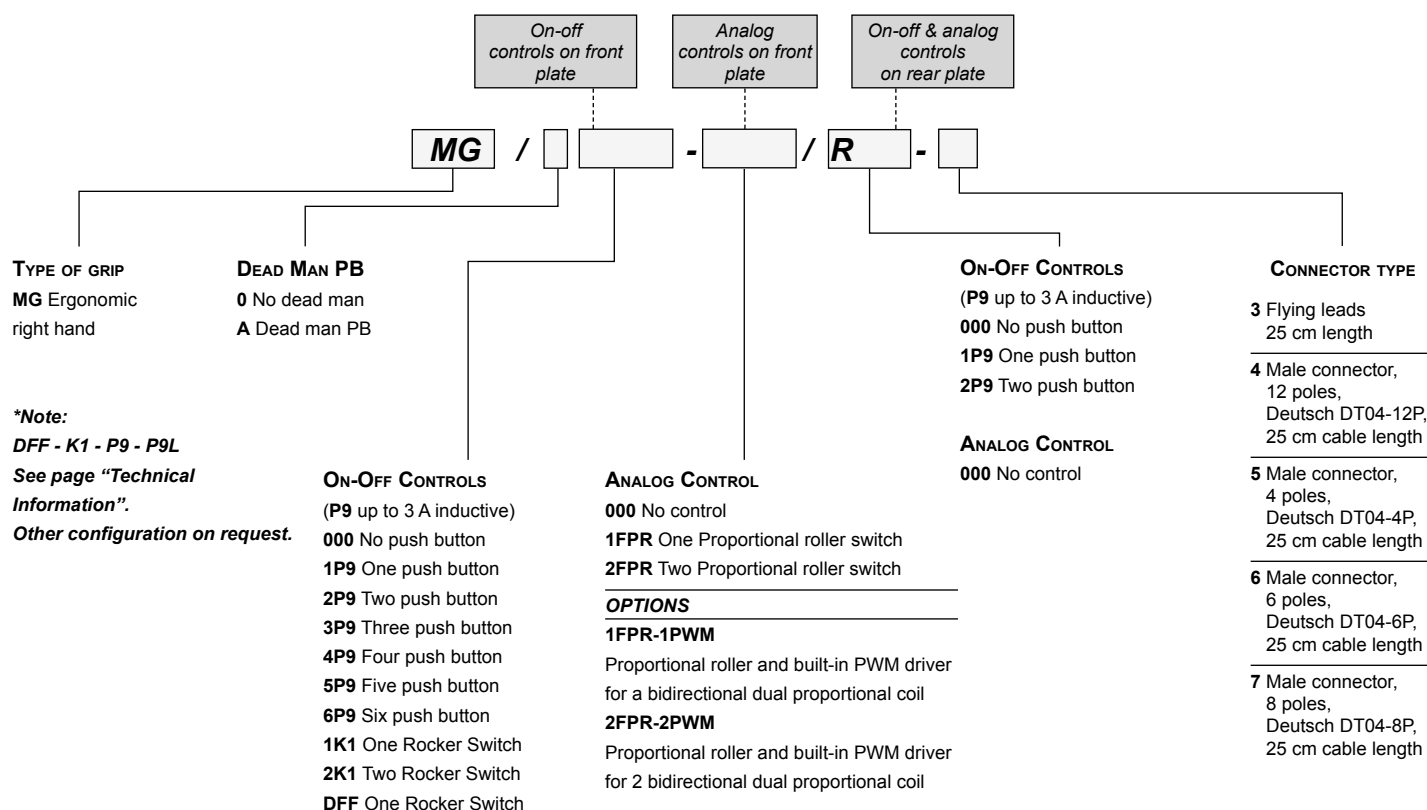
MS ERGONOMIC SYMMETRIC GRIP

ORDERING INFORMATION



MG ERGONOMIC GRIP

ORDERING INFORMATION



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

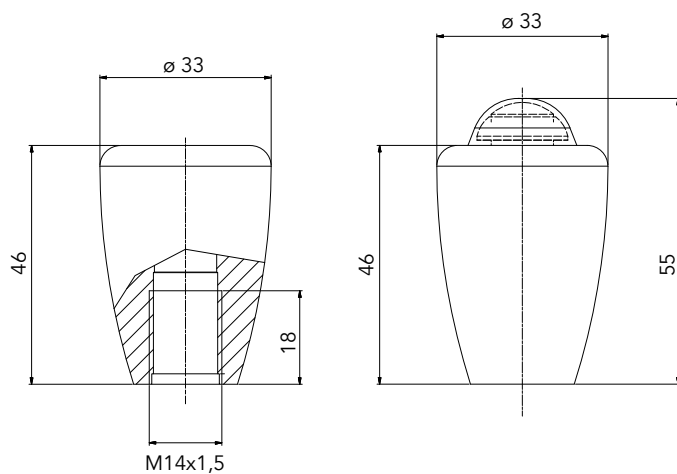
Body material:	Thermoplastic elastomer
Colour:	black
Operating temperature range:	-20°C / +60°C
Connecting hub:	female thread / M14 x 1.5

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**

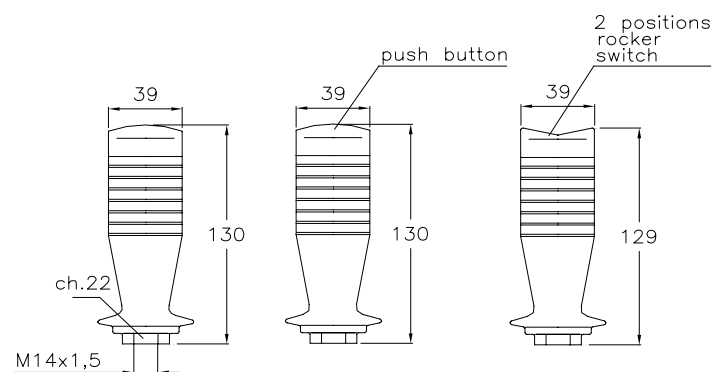
Body material:	nylon
Bottom rubber material:	neoprene
Colour:	black
Operating temperature range:	-20°C / +60°C
Connecting hub:	female thread / M14 x 1.5

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

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

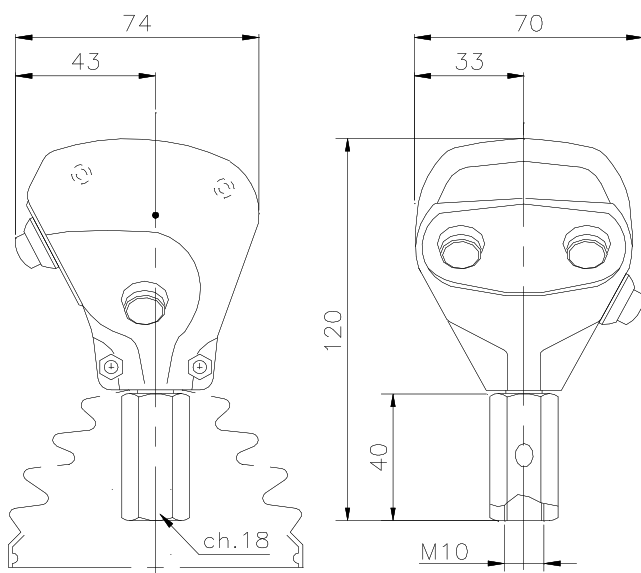
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Connecting hub:	female thread / M10 x 1.5
Protection class:	IP 65 (plain grip)

ELECTRICAL SPECIFICATIONS

Prewired exit cable:	250 mm
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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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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

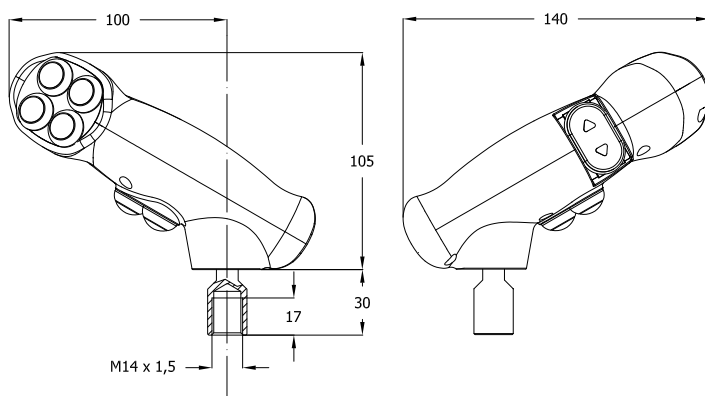
Prewired exit cable:	250 mm
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Available push buttons and switches

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 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**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

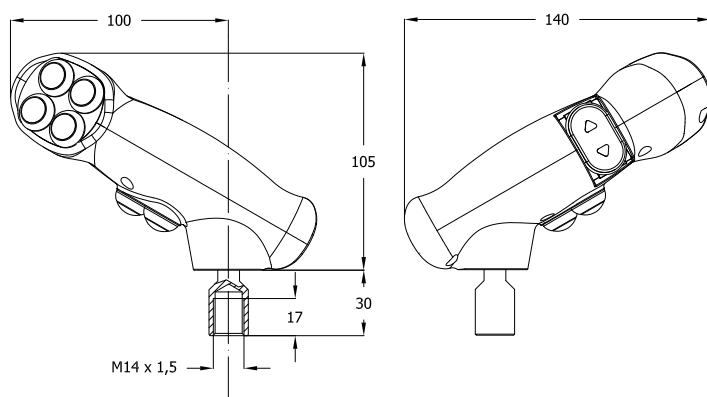
Prewired exit cable:	250 mm
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Available push buttons and switches

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

**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**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

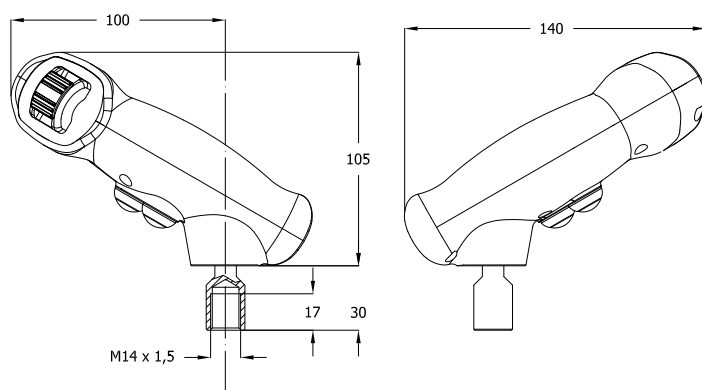
Prewired exit cable:	250 mm
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Available push buttons and switches

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

**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/RFPFR	0	0	1xFPR
HR/0FPR-000/RFPFR	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

HR ORDERING INFORMATION: see page JK40

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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

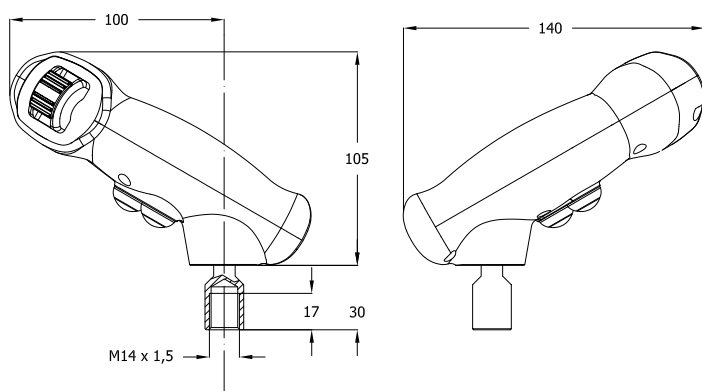
Prewired exit cable:	250 mm
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Available push buttons and switches

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

**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

DFF - Rocker Switch: see page JK60 Technical Info

K1 - Rocker Switch: see page JK60 Technical Info

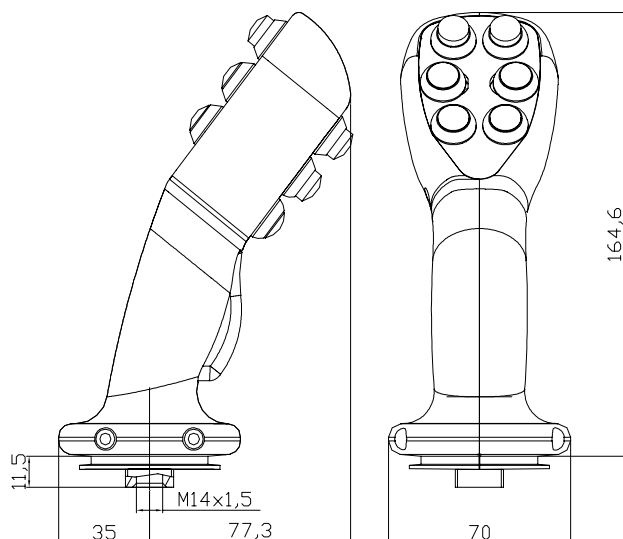
P9 - P9L - Push buttons: see page JK61 Technical Info

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

DFF - Rocker Switch: see page JK60 Technical Info

K1 - Rocker Switch: see page JK60 Technical Info

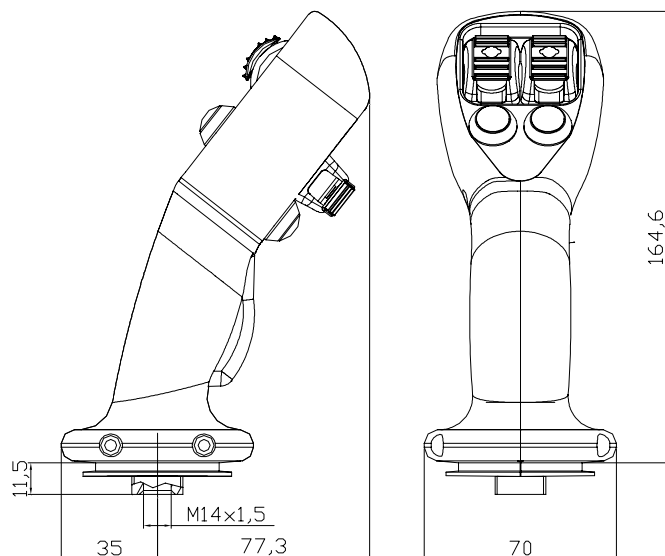
P9 - P9L - Push buttons: see page JK61 Technical Info

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	

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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
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Available push buttons and switches

A - Dead man push button

Rated amperage: up to 3 A inductive

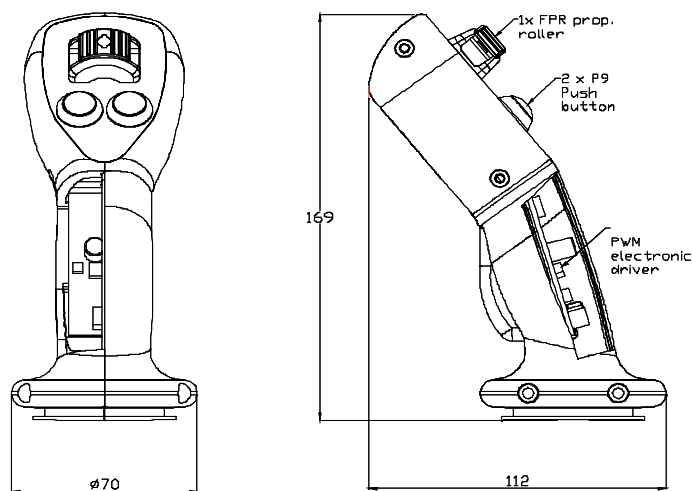
Protection class (microswitch): IP 67

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

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

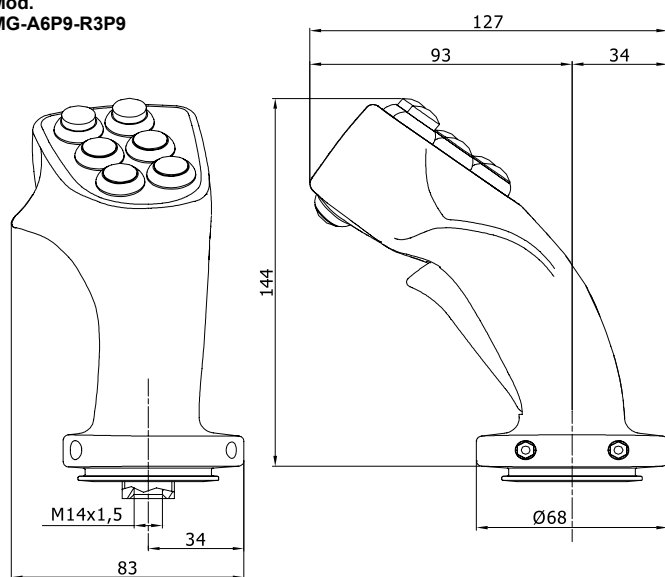
P9 - P9L - Push buttons: see page JK61 Technical Info

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

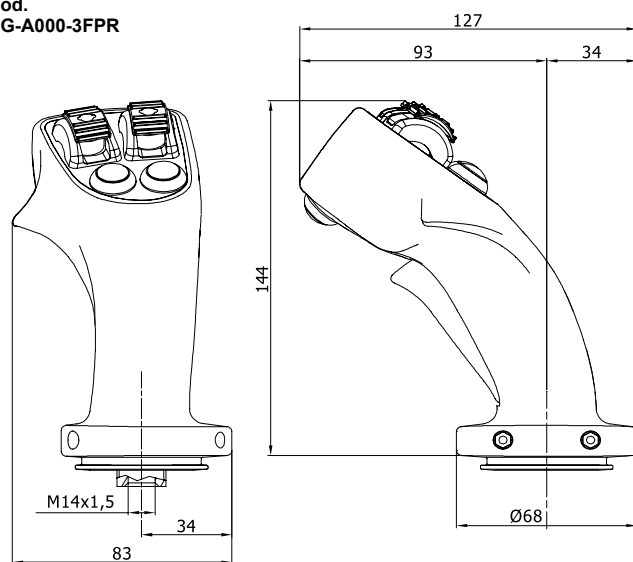
P9 - P9L - Push buttons: see page JK61 Technical Info

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	

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

- Optimum ergonomic design.
- Internal PWM driver.

MECHANICAL SPECIFICATIONS

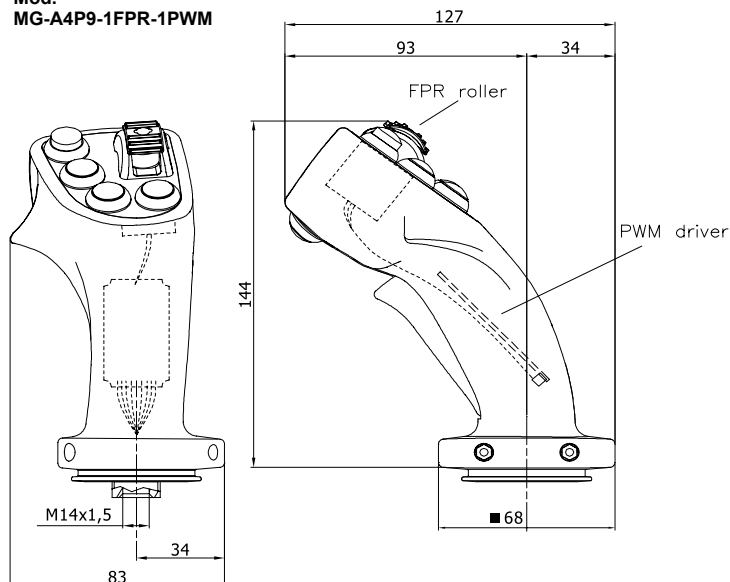
Material:	thermoplastic
Colour:	black
Operating temperature range:	-25°C / +85°C
Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
Connecting hub:	female thread / M14 x 1.5

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**

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 INFORMATION - 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 INFORMATION - 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 INFORMATION - OPERATORS FOR GRIP ASSEMBLING

APL - LATCHING PUSH BUTTONS

Switch Operation: On-Off Latching

Case Color	Led	Ordering code	Characteristics	
Red	X	50.1301.407	Operational life	up to 1.000.000 cycles
Red	Red	50.1301.414	Rated amperage	up to 5 A resistive
Yellow	Red	50.1301.415		up to 3 A inductive
Yellow	X	50.1301.416	Protection class	IP 67
Green	X	50.1301.417	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: $4.7k\Omega \pm 20^\circ$

Electrical travel: $270^\circ \pm 10^\circ$

ORDERING CODE: 50.1501.025



KNOB POTENTIOMETER TYPE P16

Ohmic value: $10k\Omega \pm 20^\circ$

Electrical travel: $270^\circ \pm 10^\circ$

ORDERING CODE: 50.1501.031



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