Index chapter 6

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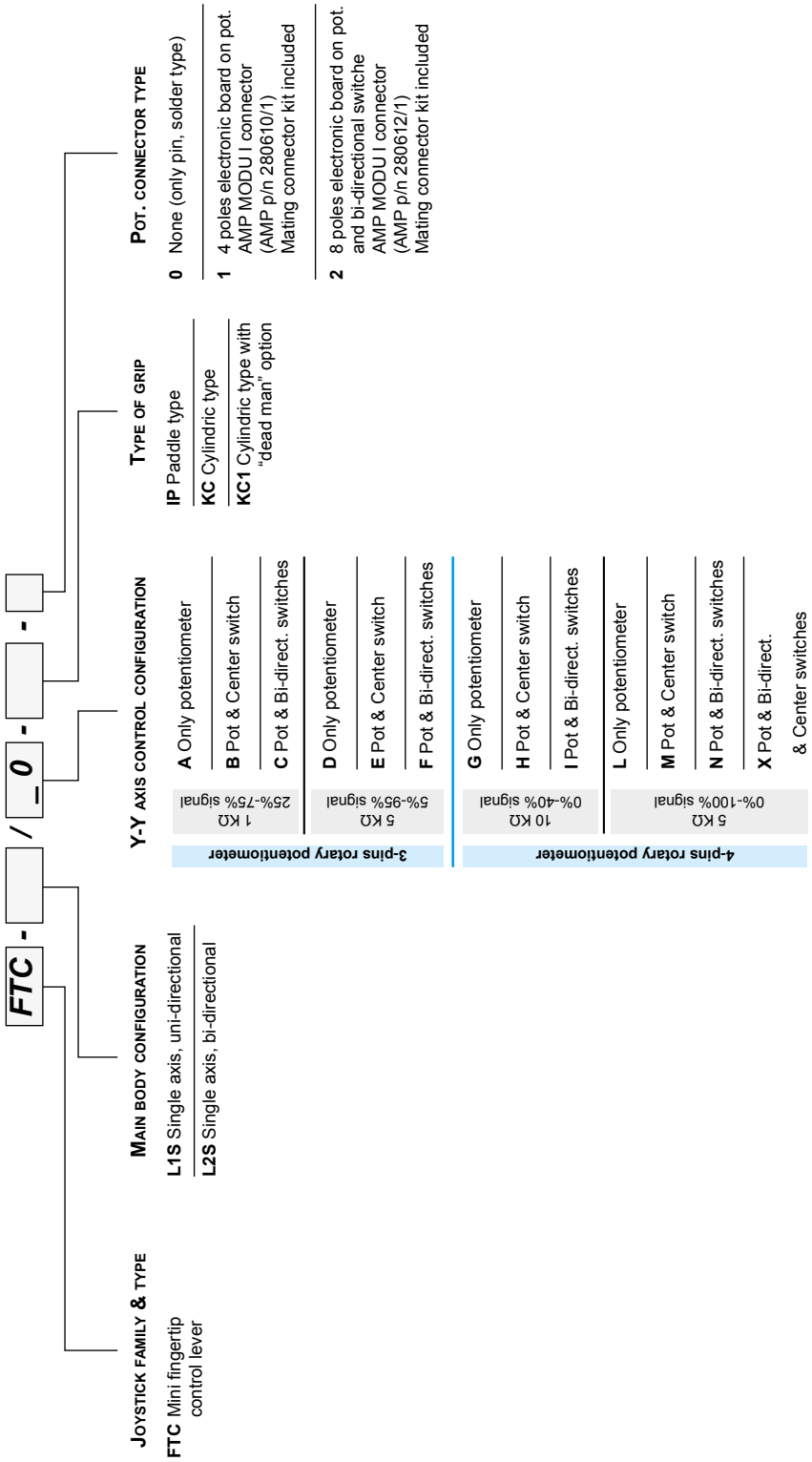
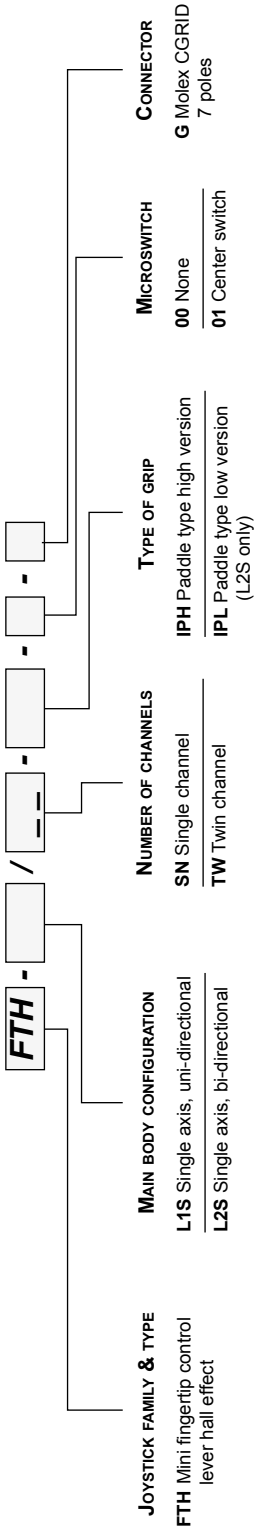
Fingertip Proportional Control Levers and Switches

Description	Ordering information page	Technical information page
FTC proportional control lever	4	9
FTH contactless proportional control lever	5	12
JLP proportional control lever	6	14
FPR proportional roller switch	7	16

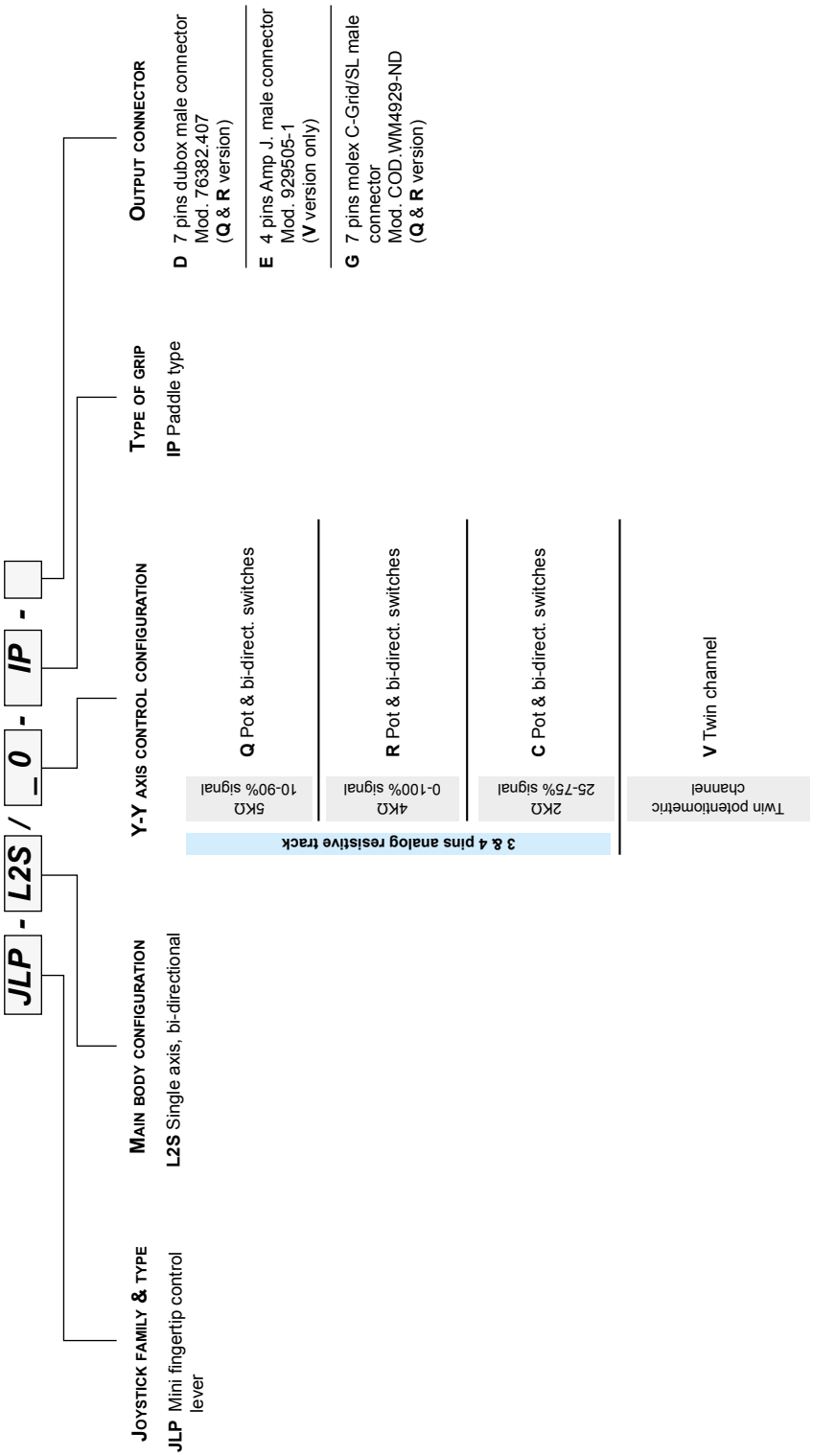
FTC Proportional Control Lever *Ordering Information*



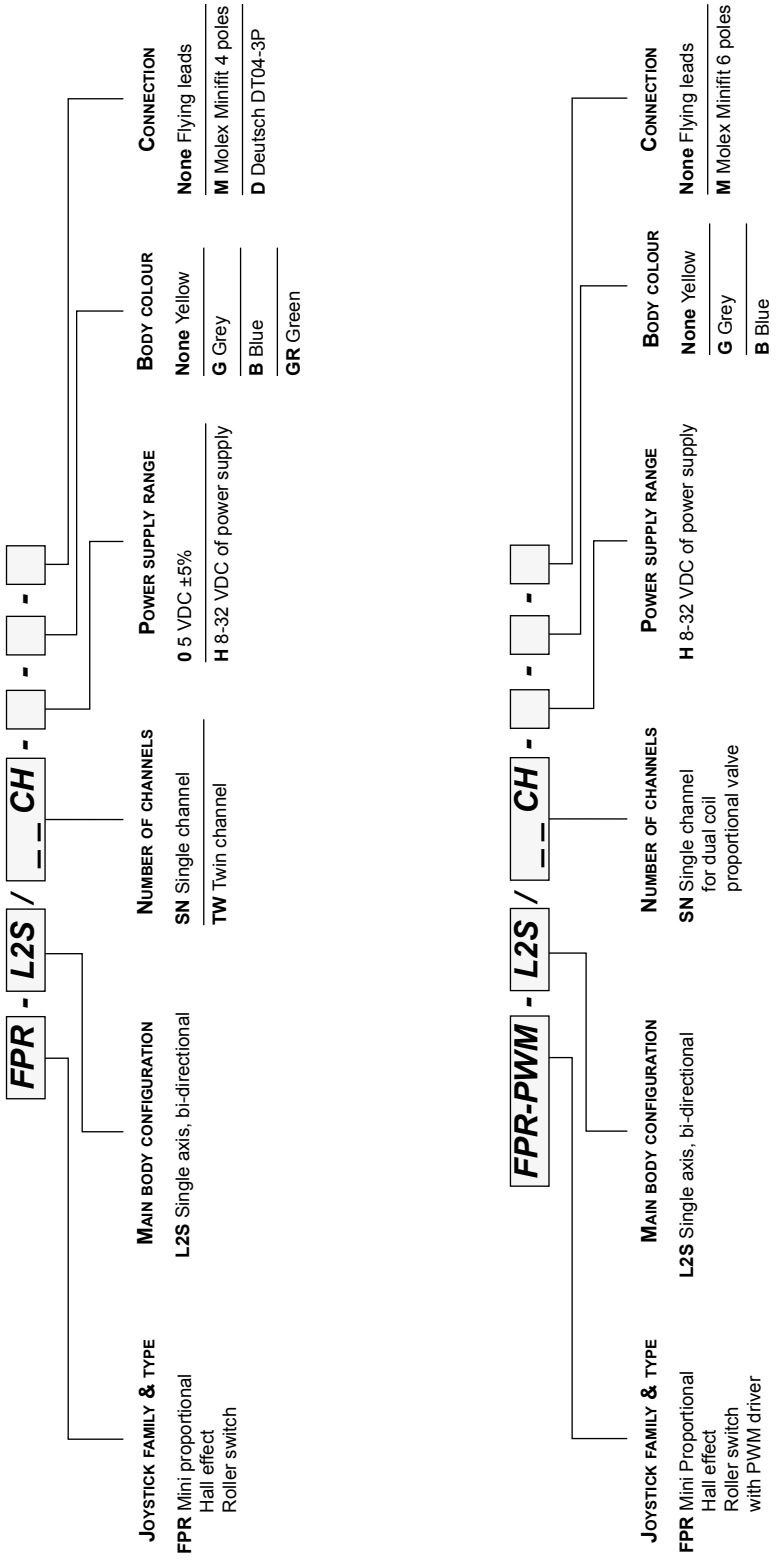
FTH Contactless Proportional Control Lever *Ordering Information*



JLP Proportional Control Lever *Ordering Information*



FPR/PRS Fingertip Proportional Switches *Ordering Information*



FTC-L1S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / uni-directiional.
- 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 connector (mating connector kit included)

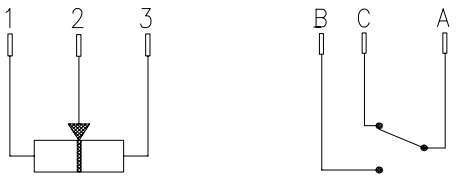
Neutral position switch (electromechanical type)

• Contact:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1.5 A / inductive
• Neutral position switch threashold 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-pin pot	A (Std)	D
3-pin pot & enable switch	B	E

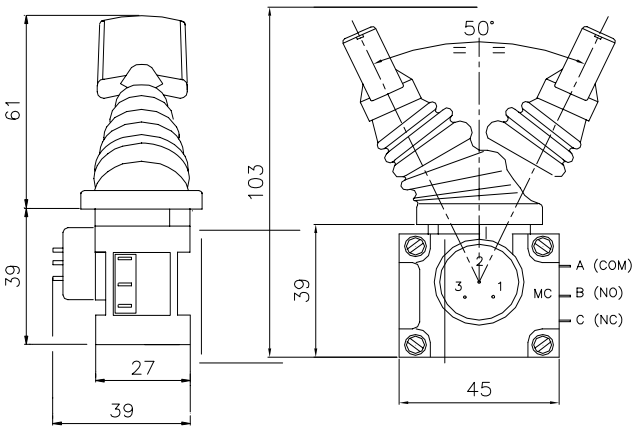
ELECTRICAL CONNECTIONS



Potentiometer

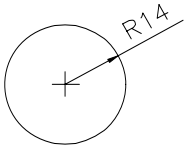
Neutral position switch MC

OVERALL DIMENSIONS

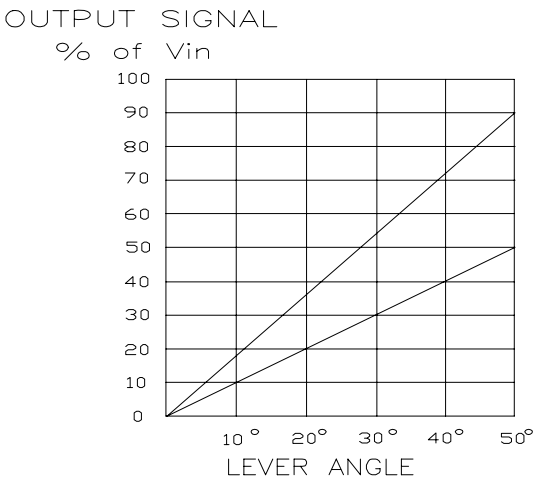


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

PANEL CUTOUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



>> ORDERING INFORMATION: see page 4

FTC-L2S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional.
- 3-pins rotary potentiometers.
- Optional center / power-off or bi-directional switches.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	±25° ±1°
• Electrical angle:	±25° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class:	IP 65 (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 connector
	(mating connector kit included)

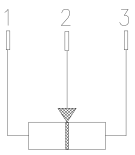
Center / bi-directional switches (electromechanical type)

• Contacts:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1.5 A/inductive
• Neutral position switch threashold angle:	+4°
• Protection class:	IP 55

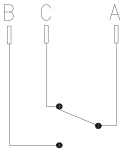
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S = 50% Vin	S = 90% Vin
3-pin potentiometer	A	D
3-pin pot & center switch	B	E (Std)
3-pin pot & bi-directional switch	C	F

ELECTRICAL CONNECTIONS

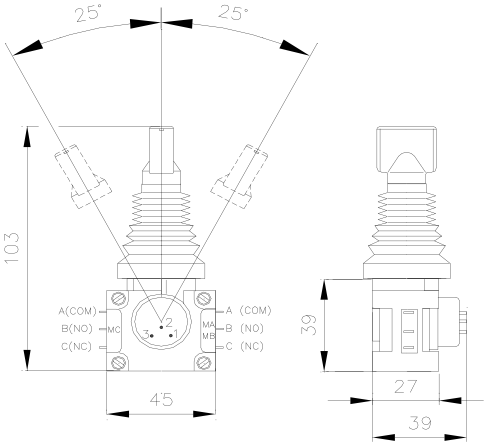


Potentiometer



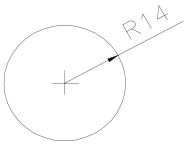
Same schematic for MA, MB (bi-directional switches) or MC (center switch)

OVERALL DIMENSIONS

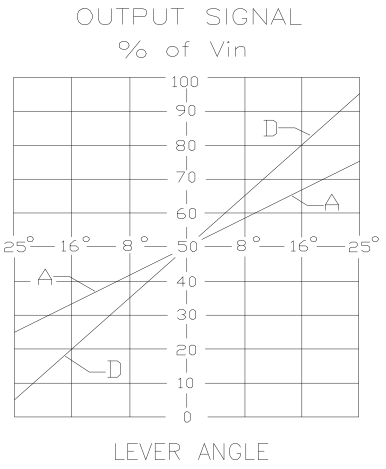


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



3-pins potentiometer configuration

*>> **ORDERING INFORMATION:** see page 4*

FTC-L2S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional.
- 4-pins rotary potentiometer.
- Optional center / power-off or bi-directional switches.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	± 25° ±1°
• Electrical angle:	± 25° ±1°
• Operating temperature range:	-25°C / +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: / 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 connector (mating connector kit included)

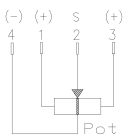
Center / bi-directional switches (electromechanical type)

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

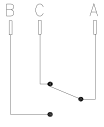
POTENTIOMETER & SWITCHES OPTIONS

	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 & bi-directional switchs	I	N (Std)
4-pin pot & bi-dir. switchs & center switch	None	X

ELECTRICAL CONNECTIONS

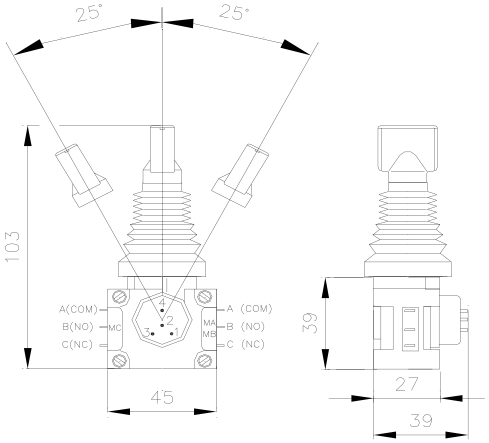


Potentiometer



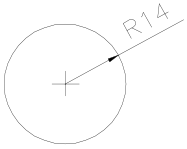
Same schematic for MA, MB (bi-directional switches) or MC (center switch)

OVERALL DIMENSIONS

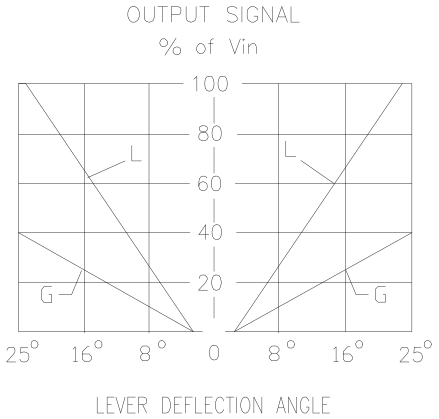


Shown with paddle type grip. Small cylindrical grip KC type also available, with optional dead man push button.

PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



4-pins potentiometer configuration

>> ***ORDERING INFORMATION:*** *see page 4*

FTH-L1S *Contactless Fingertip Proportional Control Lever*

FEATURES

- Single axis / uni-directiional.
- 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

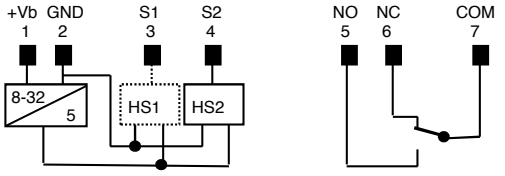
• Power supply voltage:	8 ÷ 32 VDC
• Current consumption:	< 15 mA (30 mA with 2 sensors)
• Output signal in neutral:	< 0.1 V
• Output signal range:	0.5 V ÷ 4.5 V
• Tolerance on output signal:	±0.1 V
• Linearity:	< 2%
• Max. output current:	1 mA
• Directional switch operating voltage:	< 48 VDC
• Directional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

Neutral position switch (electromechanical type)

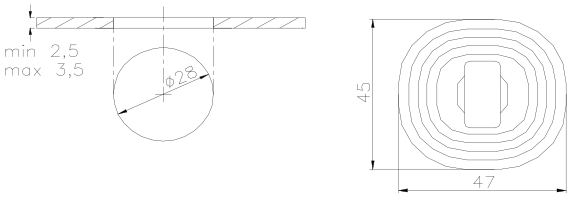
• Contacts:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1 A
• Neutral position switch threashold angle:	7°
• Protection class:	IP 67

ELECTRICAL CONNECTIONS

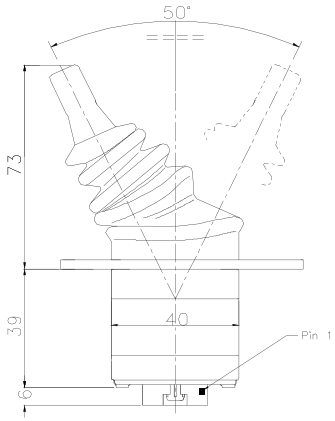
(HS1: optional)



PANEL CUT-OUT AND MOUNTING

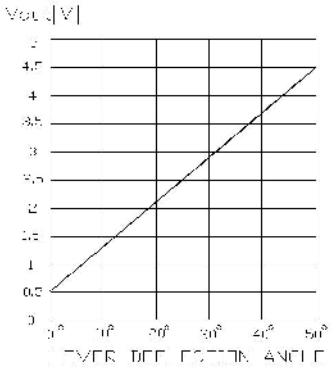


OVERALL DIMENSIONS

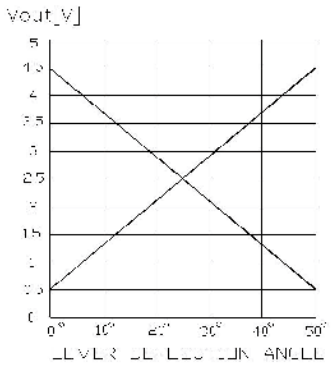


OUTPUT SIGNAL CONTROL CHARACTERISTIC

FTH-L1S / SN (single channel)



FTH-L1S / TW (dual channel)



*>> **ORDERING INFORMATION:** see page 5*

FTH-L2S *Contactless Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional.
- Contactless, hall effect sensor.
- Optional “out of neutral” switch.
- Optional dual sensor (redundant).

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	±25° ±1°
• Electrical angle:	±25° ±1°
• 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

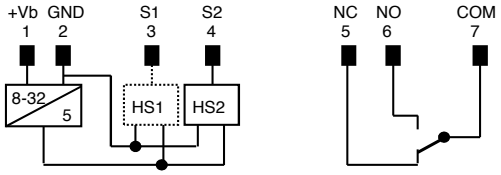
• Power supply voltage:	8 ÷ 32 VDC
• Current consumption:	< 15 mA (30 mA with 2 sensors)
• Output signal in neutral:	2.50 V ±0.1 V
• Output signal range:	0.5 V ÷ 4.5 V
• Tolerance on output signal:	±0.1 V
• Linearity:	< 2%
• Max. output current:	1 mA
• Directional switch operating voltage:	< 48 VDC
•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

Neutral position switch (electromechanical type)

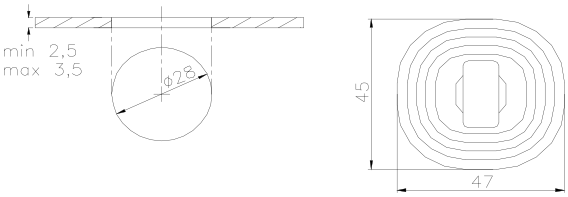
• Contacts:	silver plated (solder type)
• Max. operating input voltage:	48 V or ±24 V
• Max. operating current:	1 A
• Neutral position switch threashold angle:	7°
• Protection class:	IP 67

ELECTRICAL CONNECTIONS

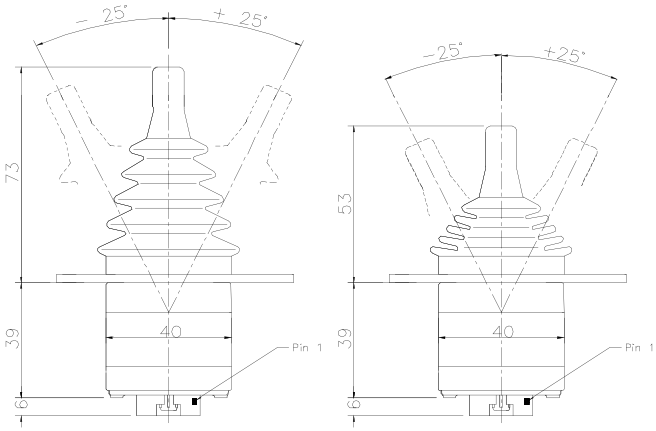
(HS1: optional)



PANEL CUT-OUT AND MOUNTING



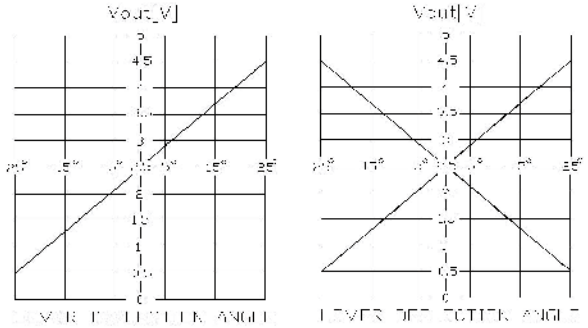
OVERALL DIMENSIONS



Paddle type high ***Paddle type low***

OUTPUT SIGNAL CONTROL CHARACTERISTIC

FTH-L2S / SN (single channel) ***FTH-L2S / TW (dual channel)***



>> ORDERING INFORMATION: see page 5

JLP-L2S *Fingertip Proportional Control Lever*

FEATURES

- Single axis / bi-directiional, panel mounting style.
- 3 & 4-pins potentiometer configuration.
- Bi-directional switches.

MECHANICAL SPECIFICATIONS

• Lever deflection angle:	±32° ±1°
• Electrical angle:	±30° ±1°
• 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
• Ohmic resistance: / A = 50% of Vin	8 kΩ ±20%
/ Q = 80% of Vin	5 kΩ ±20%
/ R = 100% of Vin	4 kΩ ±20%
• Max. operating input voltage (Vin):	48 V or ±24 V
• Min. load impedance on pin 5 (signal):	50 kΩ
• Max. operating current on pin 5:	1 mA
• Output voltage:	see graph
• Linearity (resistive track):	2% or better

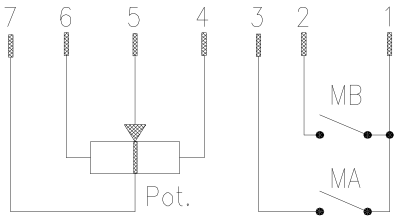
Directional switches

• Typical track resistance:	150 Ohm
• Max. operating input voltage:	48 V or ±24 V
• Min. load impedance on pins 2&3:	50 kΩ
• Max. operating current on pins 2&3:	1 mA
• Directional switches threashold angle:	±4°
• Connector type: Mod. D Dubox	P.N. 76382.407 wiring
Mod. G Molex	C-Grid P.N. 50-57-9407

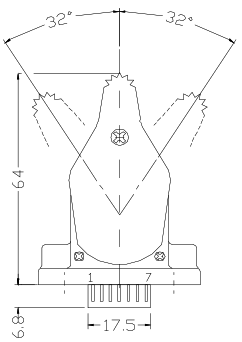
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes		
Output signal	S = 80% Vin	S = 100% Vin	S = 50% Vin
3-4 pins pot & bi-dir. switch	Q	R	C

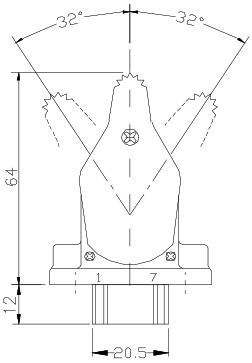
ELECTRICAL CONNECTIONS



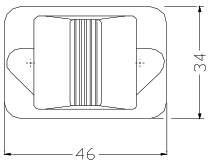
OVERALL DIMENSIONS



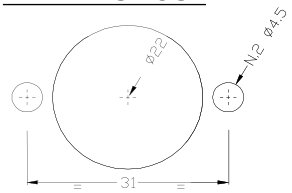
Mod. D Dubox



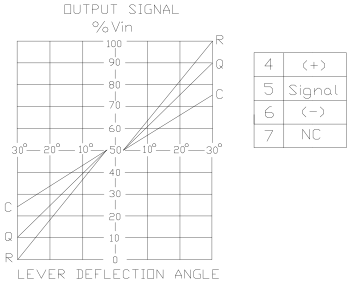
Mod. G Molex



PANEL CUT-OUT

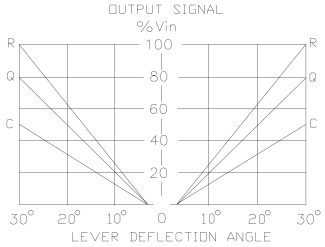


OUTPUT SIGNAL CONTROL CHARACTERISTIC



4	(+)
5	Signal
6	(-)
7	NC

3-pins configuration wiring



4	(+)
5	Signal
6	(+)
7	(-)

4-pins configuration wiring

>> ORDERING INFORMATION: see page 6

JLP-L2S Twin Channel *Fingertip Proportional Control Lever*

FEATURES

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

MECHANICAL SPECIFICATIONS

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

ELECTRICAL SPECIFICATIONS

Potentiometer

• Electrical power rating:	0.25 W @ 25°C
• Total resistance between pin 1 and 3:	2 kΩ ±20%
• Nominal voltage supply (Vin):	10 V
• Tolerance between track 1 and 2:	± 4% of Vcc
• Output voltage:	see graph
• Load resistance:	100 kΩ - nominal 50 kΩ - minimum
• Linearity (resistive track):	2% or better

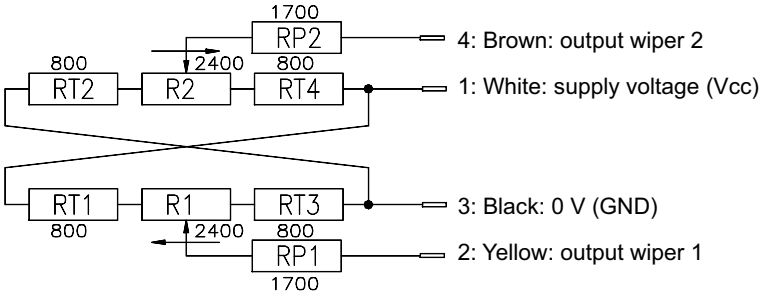
POTENTIOMETER & SWITCHES OPTIONS

	Reference codes	
Output signal	S = 60% Vin	
3 pins potentiometer	V	

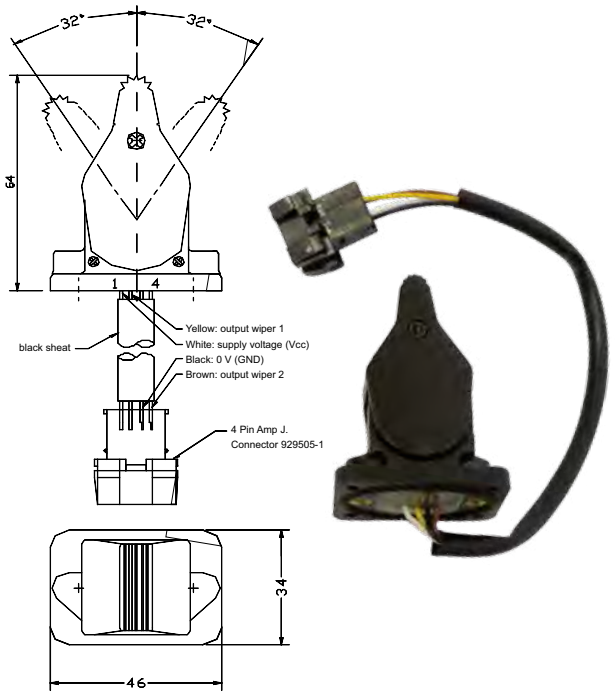
• Connector type:	AMP JPT P.N. 929505-1

ELECTRICAL CONNECTIONS

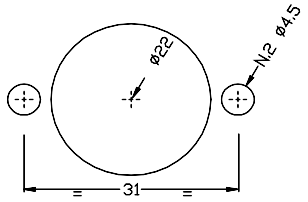
(pinout)



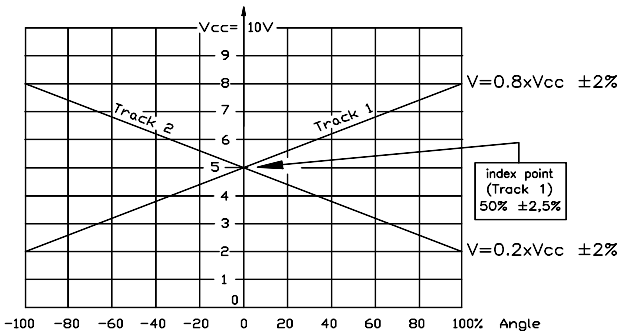
OVERALL DIMENSIONS



PANEL CUT-OUT



OUTPUT SIGNAL CONTROL CHARACTERISTIC



>> ORDERING INFORMATION: see page 6

FPR *Proportional Roller Switch with Hall Effect Sensor*

FEATURES

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

MECHANICAL SPECIFICATIONS

• Rotation angle:	±30°
• Body material:	acetal resin / teflon compound
• Colours available:	yellow, grey, blue, green
• 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	
	connector:	Deutsch 3 poles P.N. DTO4-3P	

ELECTRICAL CONNECTIONS

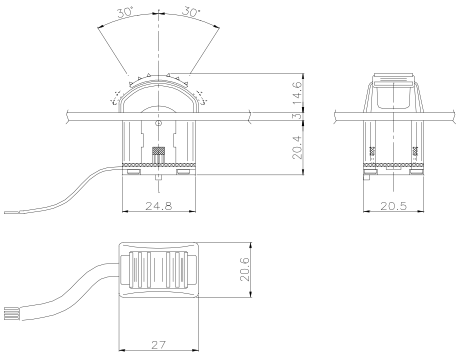
FPR - L2S - SNCH (single chan.)

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

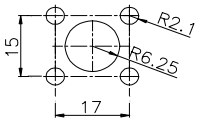
FPR - L2S - TWCH (twin chan.)

(1) Yellow:	+ 5 VDC
(2) Orange:	(-) ground
(3) Red:	output 1 (S1)
(4) Brown:	output 1 (S2)

OVERALL DIMENSIONS

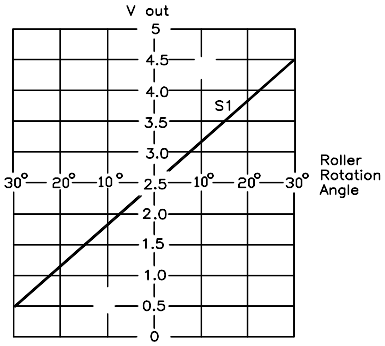


PANEL CUT-OUT

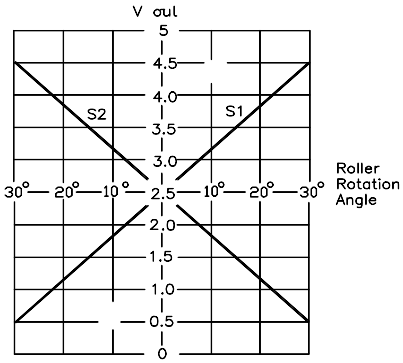


OUTPUT SIGNAL CONTROL CHARACTERISTIC

FPR - L2S - SNCH (single channel)



FPR - L2S - TWCH (twin channel)



>> ORDERING INFORMATION: see page 7

FPR-PWM *Proportional Roller Switch with PWM Driver*

FEATURES

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

MECHANICAL SPECIFICATIONS

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

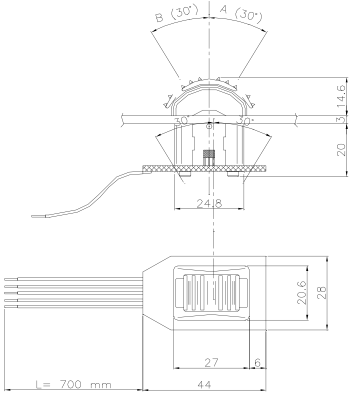
ELECTRICAL SPECIFICATIONS

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

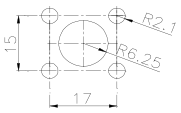
ELECTRICAL CONNECTIONS

(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

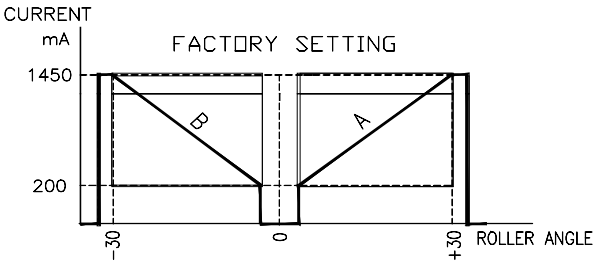
OVERALL DIMENSIONS



PANEL CUT-OUT



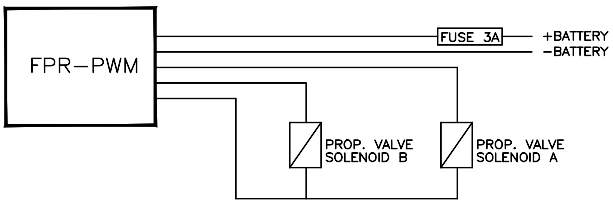
PWM OUTPUT CHARACTERISTIC EXAMPLE



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)

*>> **ORDERING INFORMATION:** see page 7*

Via Malavolti, 36 - 41122 Modena - Italy - Phone +39 059/254895 - Fax +39 059/253512 - www.tecnord.com - mail: tecnord@tecnord.com

TECNORD
a Delta Power Company

Heavy Duty Multi-Axis Joysticks

Description	Ordering information page	Technical information page
JMF Type (potentiometric joystick body)	**20**	**22**
JHM Type (hall effect joystick body)	**21**	**26**

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

JMF Heavy Duty Multi-Axis Joystick *Ordering Information*

JMF - ___ / __ - ___ - ___ - ___

Joystick family & type	Main base configuration	YY / XX axes control config.		Type of grip	Grip configuration	Pot. connector type
JMF Heavy duty / Multi-axis joystick controller	**L1SF** Single axis, uni-directional with friction lock	**0** No Pot & switches on Y/X axis		**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
	L2S Single axis, bi-directional	**2** Only Bi-dir. switches on Y/X axis		**IC** Cylindrical		**1** 4 poles electronic board on potentiometer AMP MODU I connector (AMP p/n 280610/1) mating connector kit included
	L2SF Single axis, bi-directional with friction lock	3-pins rotary potentiometer	**A** Only potentiometer 1 KΩ signal 25%-75%	**IE** Multi-function ergonomic		
	L4C Dual axes, cross movement		**C** Pot & Bi-direct. switches 1 KΩ signal 25%-75%	**MS** Multi-function ergonomic symmetric		
	L4D Dual axes, all diagonals		**D** Only potentiometer 5 KΩ signal 5%-95%	**MG** Multi-Function ergonomic right hand		
			F Pot & Bi-direct. switches 5 KΩ signal 5%-95%			
		4-pins rotary potentiometer	**G** Only potentiometer 10 KΩ signal 0%-40%			
			I Pot & Bi-direct. switches 10 KΩ signal 0%-40%			
			L Only potentiometer 5 KΩ signal 0%-100%			
			N Pot & Bi-direct. switches 5 KΩ signal 0%-100%			

EXAMPLE:

JMF-L4C/NN
BASE

+

MG/A6P9/0000/R000-0
GRIP

=

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

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.*

JHM Heavy Duty Multi-Axis Joystick *Ordering Information*

JHM - ____ / ____ - ____ / ____ - ____

JOYSTICK FAMILY & TYPE

JHM Heavy duty / Multi-axis hall effect type joystick controller

MAIN BASE CONFIGURATION

L2S Single axis, bi-directional

L4C Dual axes, cross movement

L4D Dual axes, all diagonals

YY / XX AXES CONTROL CONFIG.

ANL Analog signal 0.5>2.5>4.5 VDC power supply range = 5 VDC ±5%

ANH Analog signal 0.5>2.5>4.5 VDC power supply range = 8-32 VDC

AVS Center tap output signal with digital directional signals

TCN 1 PWM ouput in combination with up to 4 on-off channels

PWM Pulse with modulation current output factory preset or set via PC

MLT adjustable output signal for closed loop prop. actuators

CAN CANbus version for connection to CANbus line J1939 protocol

TYPE OF GRIP

IL Cylindrical knob

IC Cylindrical

IE Multi-function ergonomic

MS Multi-function ergonomic symmetric

MG Multi-function ergonomic right hand

GRIP CONFIGURATION

Refer to the grip ordering information for **zz** e **kk** axes (push-buttons & proportional controls on grips).

POT. CONNECTOR TYPE

3 Flying leads 25 cm length

4 Male connector, 12 poles, Deutsch DT04-12P, 25 cm cable length

5 Male connector, 4 poles, Deutsch DT04-4P, 25 cm cable length (for CANbus version only)

6 Male connector, 6 poles, Deutsch DT04-6P, 25 cm cable length

7 Male connector, 8 poles, Deutsch DT04-8P, 25 cm cable length

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

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)

JMF *Heavy Duty Multi-Axis Potentiometric Joystick (joystick base only)*

FEATURES

The JMF potentiometeric joystick controller has been designed for use in mobile and industrial field application. The potentiometer in use, available with 3 or 4-pins configuration, grants precision and a long working life. When coupled with an **M** range of ergonomic multi-function handles, up to 5 proportional axes and 9 on-off push buttons can be integrated in the same joystick. Power directional switches are available.

MECHANICAL SPECIFICATIONS

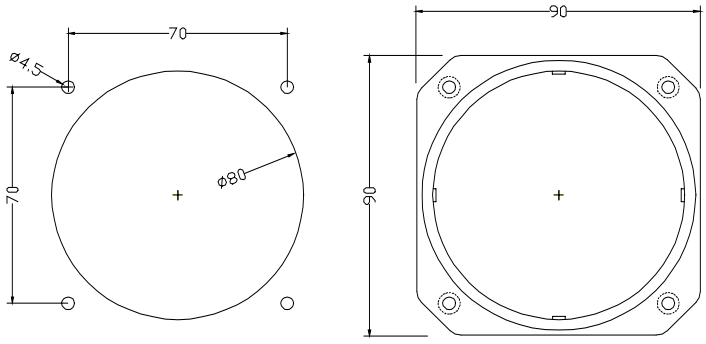
• Lever deflection angle:	±25° ±1°
• Electrical angle:	±25° ±1°
• Operating temperature range:	-25°C / +80°C
• Protection class (above panel):	up to IP 67, depending on grip
• Life:	3 million cycles

POTENTIOMETER & SWITCHES OPTIONS (Y-Y and X-X Axis)

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

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

PANEL CUT-OUT AND MOUNTING



AVAILABLE JOYSTICK MOVEMENTS

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

** friction lock option available for L1S and L2S*

Shown with IC grip

JMF *Heavy Duty Multi-Axis Potentiometric Joystick (joystick base only)*

ELECTRICAL SPECIFICATIONS

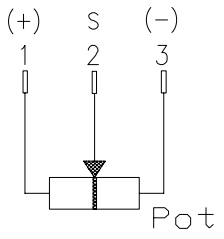
Directional switches (electromechanical type)

• 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 position switch threashold angle:	±10°	(±5° on request)*
• Protection class:	IP 55 (specials available on request)	

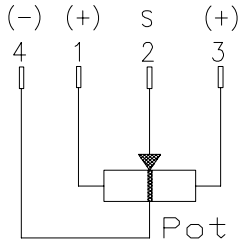
Rotary potentiometer

• Electrical power rating:	0.25 W @ 25°C	
• Ohmic resistance: / A = 50% of Vin (3-pins version) / D = 90% of Vin	1 kΩ ±20% 5 kΩ ±20%	
• Ohmic resistance: / G = 40% of Vin (4-pins version) / L = 100% of Vin	10 kΩ ±20% 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 graphs	
• Linearity (resistive track):	2% or better	
• Protection class:	IP 67	

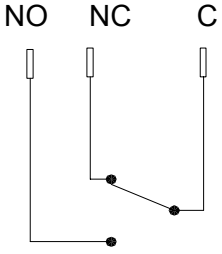
ELECTRICAL CONNECTIONS (for solder type connector)



3-pins potentiometer

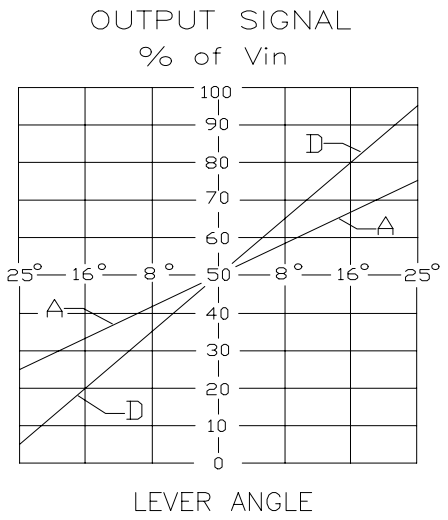


4-pins potentiometer

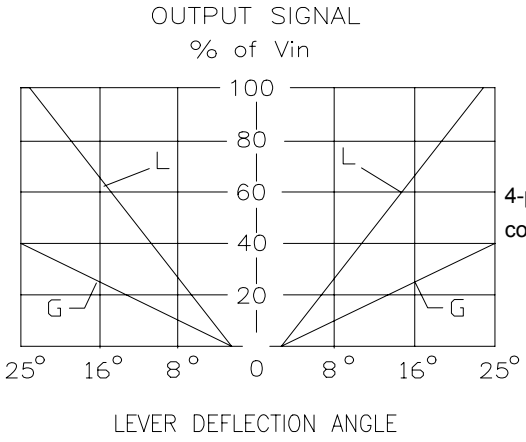


Directional switches
(see pinout on switch)

OUTPUT SIGNAL CONTROL CHARACTERISTICS



3-pins pot. configuration



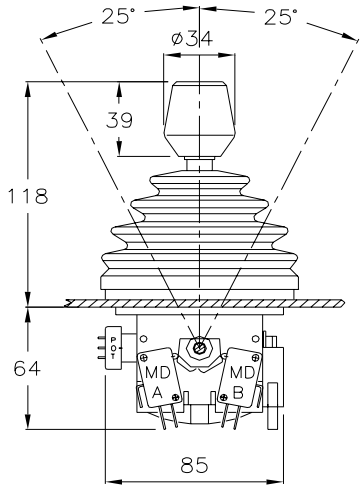
4-pins pot. configuration

>> ***AVAILABLE GRIPS:*** *see page 38*

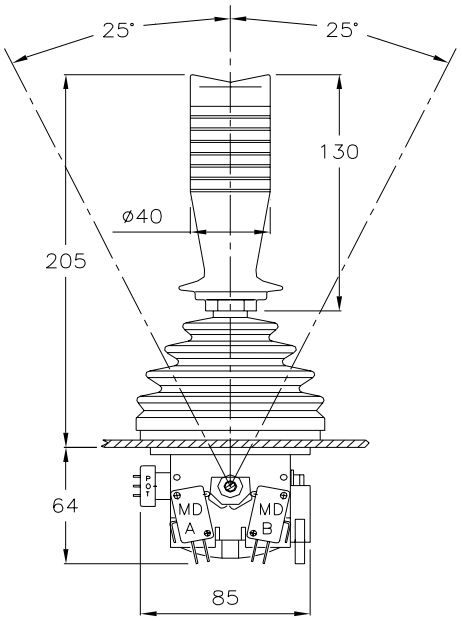
>> ***ORDERING INFORMATION:*** *see page 20*

JMF *Heavy Duty Multi-Axis Potentiometric Joystick*

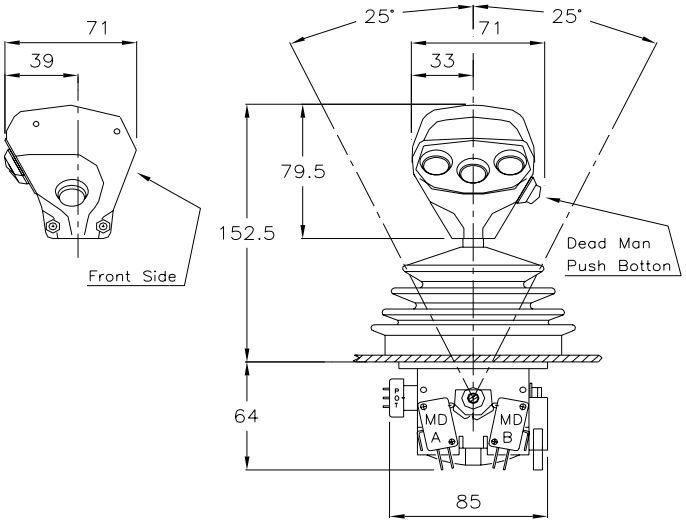
JMF joystick with grips - configuration examples with overall dimensions



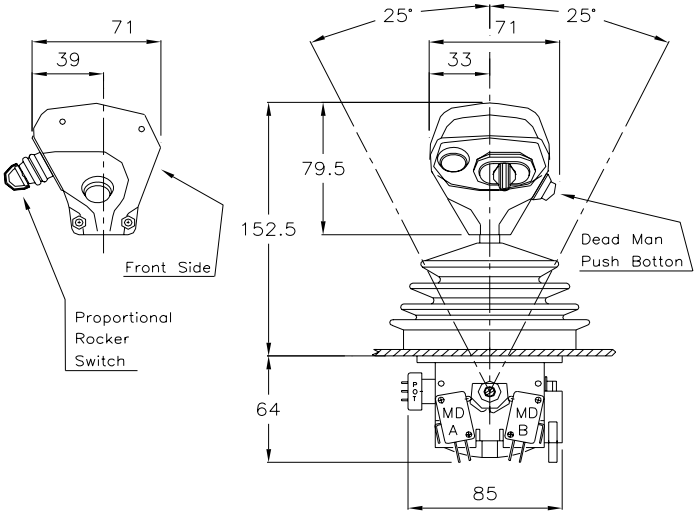
JMF base with IL handle
Complete code: **JMF-L4C/NN-IL 0000**



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



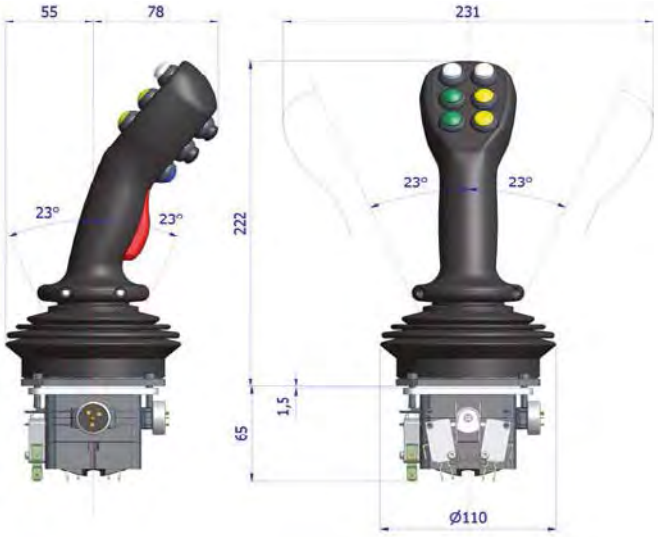
JMF base with IE type handle
Complete code: **JMF-L4C/NN-IE A3P9 0000**



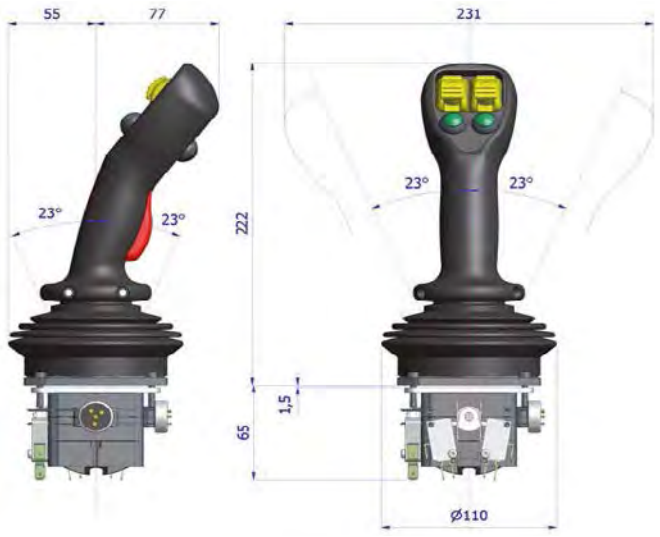
JMF base with IE type handle
Complete code: **JMF-L4C/NN-IE A1P9 1PRS**

JMF *Heavy Duty Multi-Axis Potentiometric Joystick*

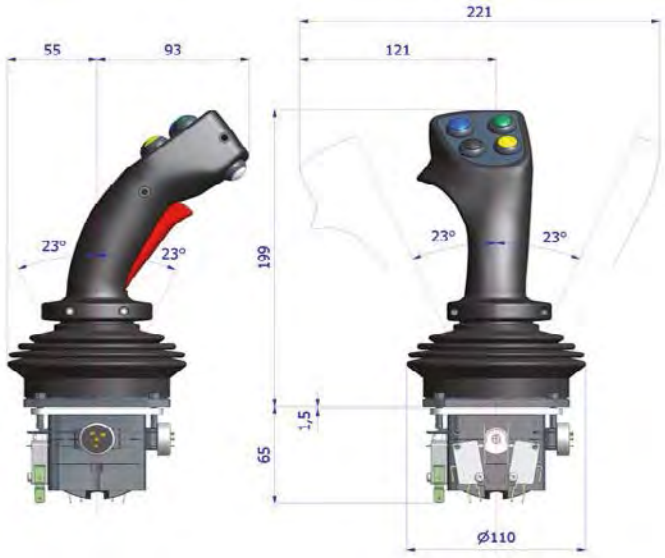
JMF joystick with grips - configuration examples with overall dimensions



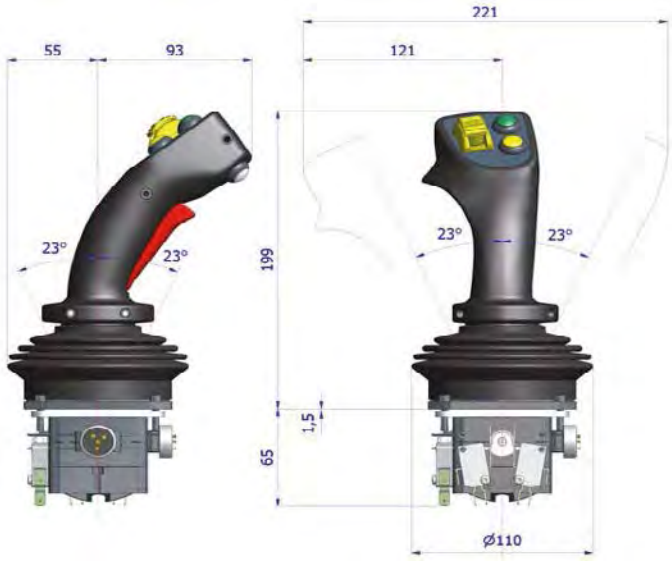
JMF base with MS type handle
Complete code: **JMF-L4C/NN-MS A6P9 R3P9**



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**

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 beetween moving electrical parts, improves overall resolution, precision and life. A complete line of built-in electronic drivers, generating on-off, proportional and CANbus control signals, guarantees the highest controllability of any type of electro-hydraulic system.
When coupled with an ergonomic multi-function handle of the **M** range, up to 5 proportional axes and 9 on-off push buttons can be integrated in the same joystick. As further option, the JHM is also available with a magnetic position detent on the Y - or X - axis.

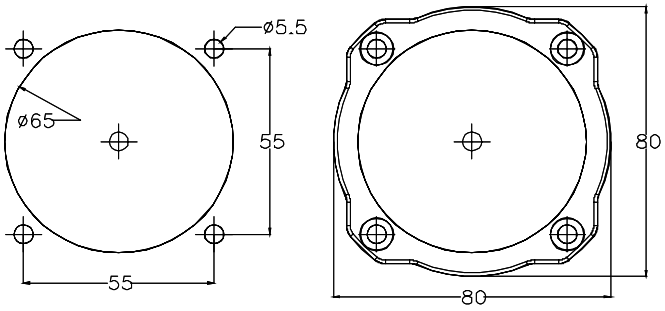
MECHANICAL SPECIFICATIONS

• Main body material:	aluminium
• Boot material:	NBR / Shore 50 - UV proof
• Lever deflection angle:	±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:	> 5 million cycles

ELECTRICAL SPECIFICATIONS

• Sensor:	hall effect contactless technology
• Supply voltage:	ANL version = 5 VDC ±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 / Bi-directional
Option L4C	Cross axis control / Bi-directional
Option L4D	Multi axis control / Bi-directional

Shown with MS grip

*>> **AVAILABLE GRIPS:** see page 38*

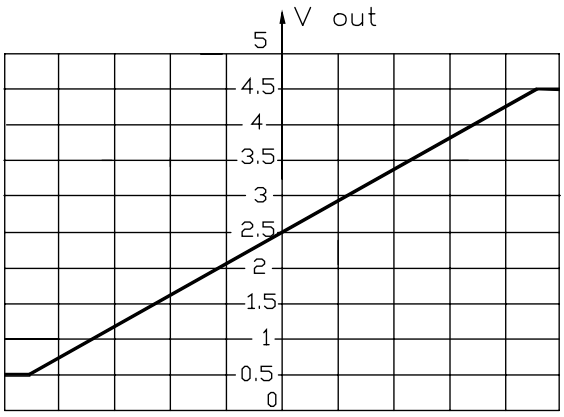
*>> **ORDERING INFORMATION:** see page 21*

JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

ANL & ANH VERSIONS
(basic version)

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

Output signal control characteristics



Lever deflection angle

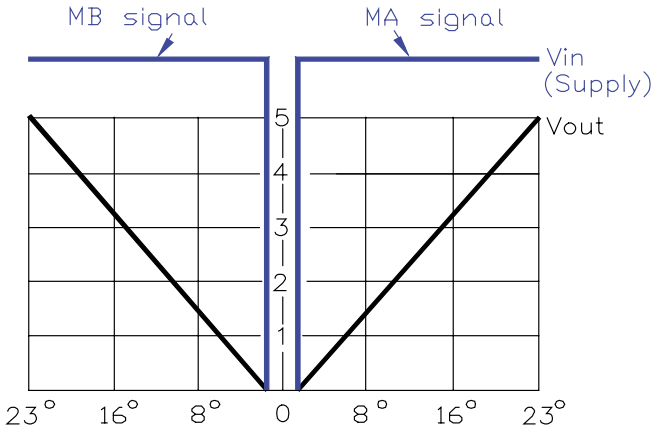
AVS VERSION
(center tap output signal with digital directional signals)

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

(MA and MB signals on graph)

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

Output signal control characteristics



Lever deflection angle

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.*

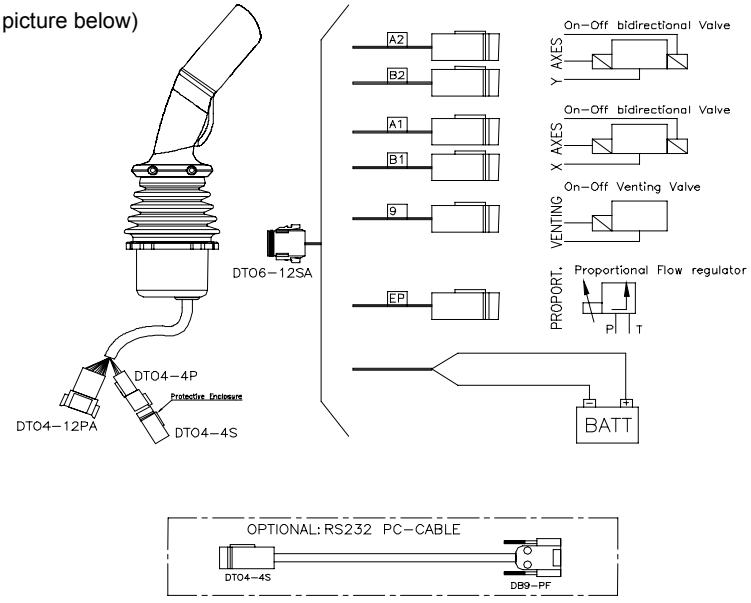
JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

TCN VERSION (1 PWM output in combination with up to 5 on-off outputs)

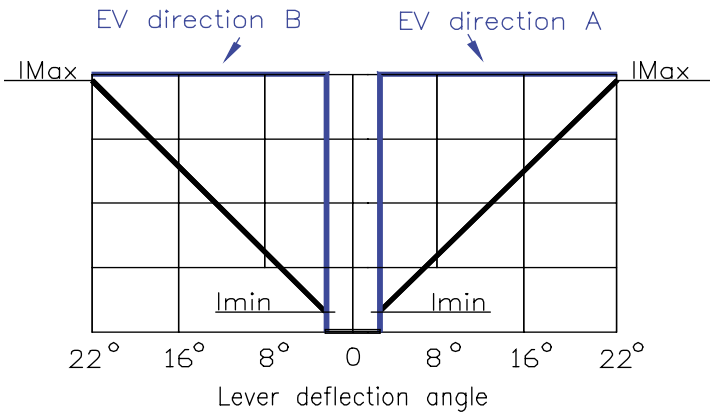
• Supply voltage:	8 ÷ 32 VDC
• Current consumption @ rest:	< 250 mA
• PWM output:	1 x single proportional solenoid valves
• Current output range (PWM):	100 to 1600 mA (3 A available on request)
• Dither frequency:	60 to 250 Hz (100 Hz factory preset)
• Adjustable ramp time:	0.05 to 5 s
• Power digital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

APPLICATION EXAMPLE

(shown with MS grip)



OUTPUT SIGNAL CONTROL CURVE



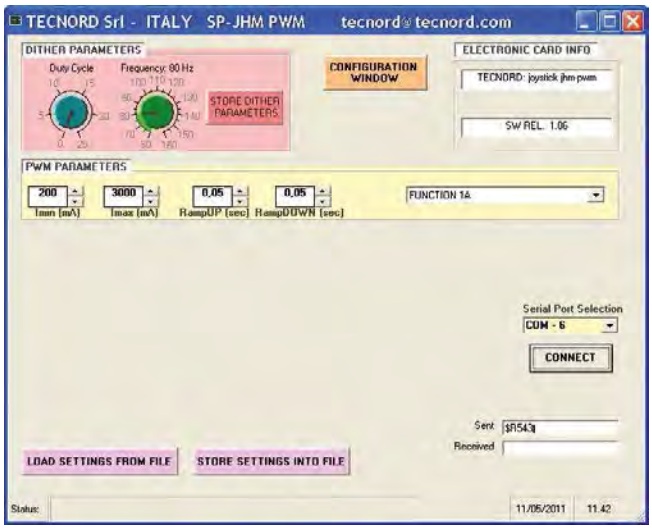
- Imin and digital outputs activation: between 2° and 5°

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 and enable, virtual cross movement.
- Setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.

By use of the calibration window:
- Operating parameters: Imin, Imax, Ramps.



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.*

JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

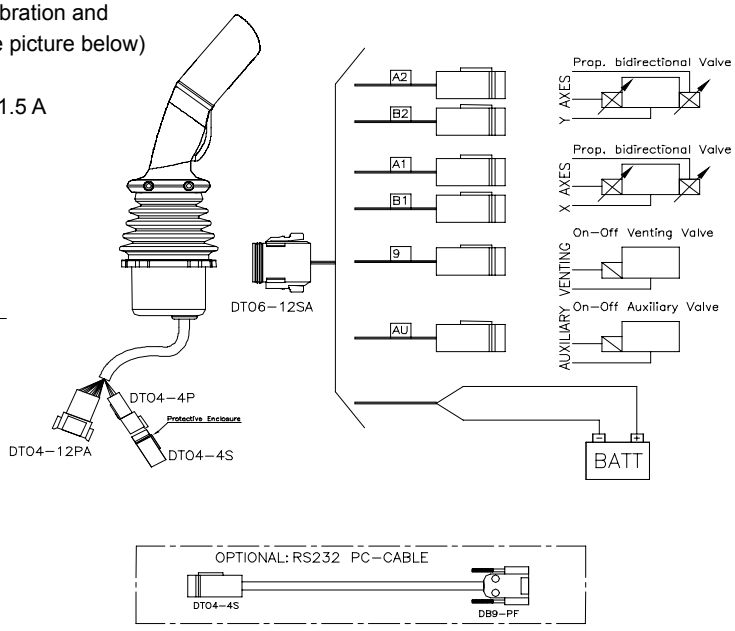
PWM VERSION (2 PWM output channels)

• 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)

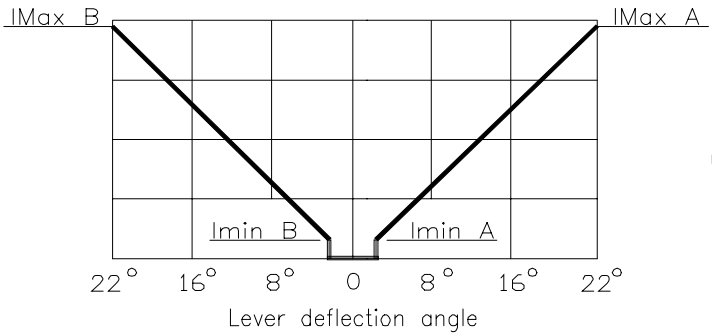
Notes: 1) 3rd axis available using FPR-PWM roller switch - Imax = 1.5 A
2) the base height is 60 mm instead of the standard 46 mm

APPLICATION EXAMPLE

(shown with MS grip)



OUTPUT SIGNAL CONTROL CURVE



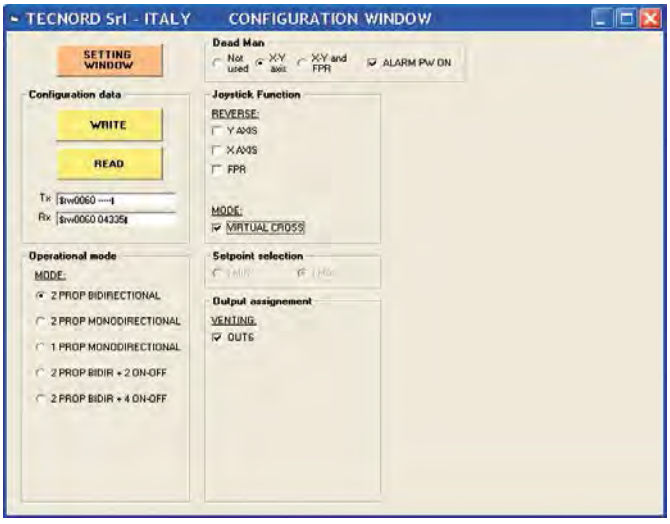
- Imin and venting valve activation: between 2° and 5°

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 and enable, virtual cross movement.
- Setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.

By use of the calibration window:
- Operating parameters: Imin, Imax, Ramps.



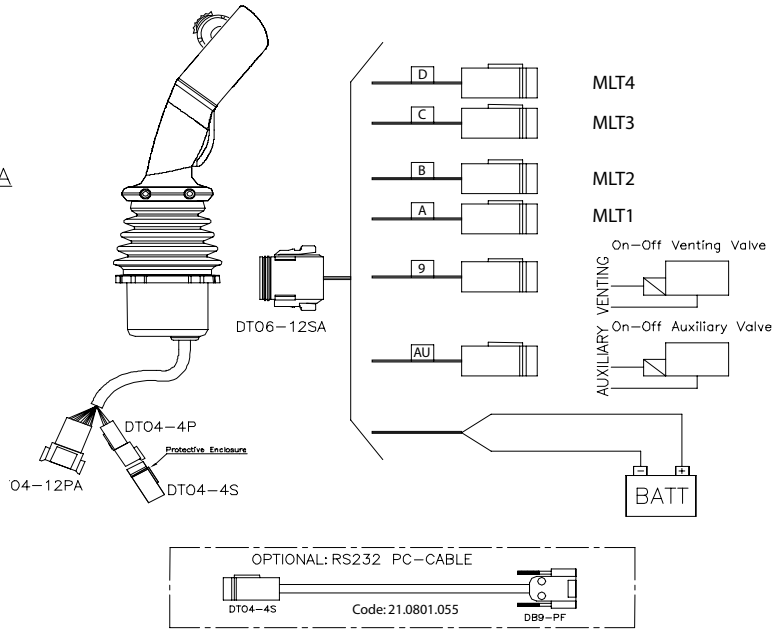
JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

MLT VERSION (output adjustable signal for closed loop proportional actuators)

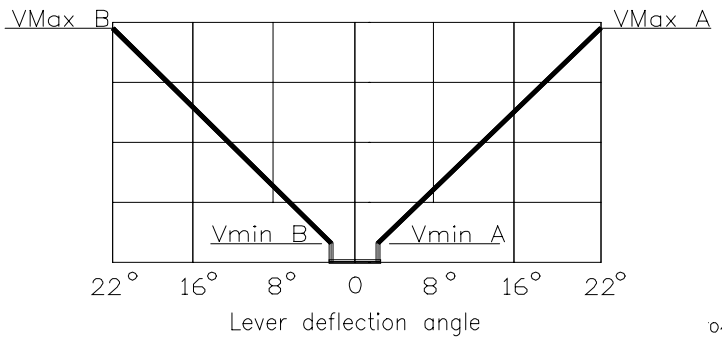
• Supply voltage:	8 ÷ 32 VDC
• Current consumption @ rest:	250 mA
• Analog outputs:	4
• Output signal range:	linear signal 0.9 ÷ 4.1 V 2 ÷ 6 V or ratiometric output available on request
• Rated output current:	15 mA
• Power digital outputs:	4 (0.7 A)
• Digital inputs available:	2
• Adjustments:	via RS232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

APPLICATION EXAMPLE

(shown with MS grip)



OUTPUT SIGNAL CONTROL CURVE



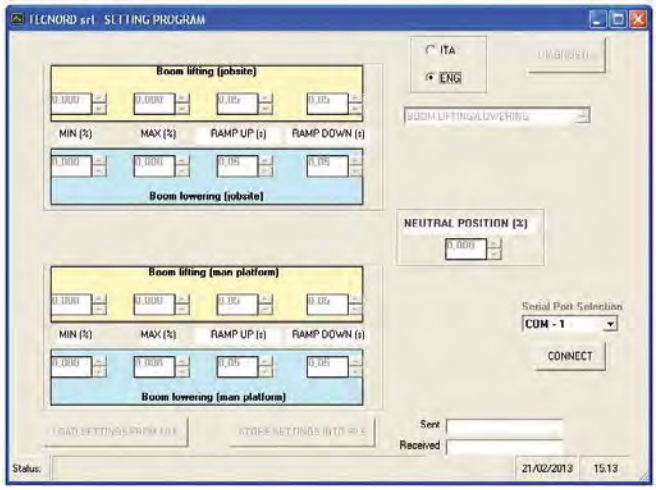
- Vmin and venting valve activation: between 2° and 5°

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 and enable, virtual cross movement.
- Setpoint selection (for 360° movement only).
- Output assignement on-off auxiliary valves.

By use of the calibration window:
- Operating parameters: Imin, Imax, Ramp up, Ramp down.



JHM *Heavy Duty Multi-Axis Hall Effect Joystick (joystick base only)*

CANBUS VERSION (with interface for CANbus line)

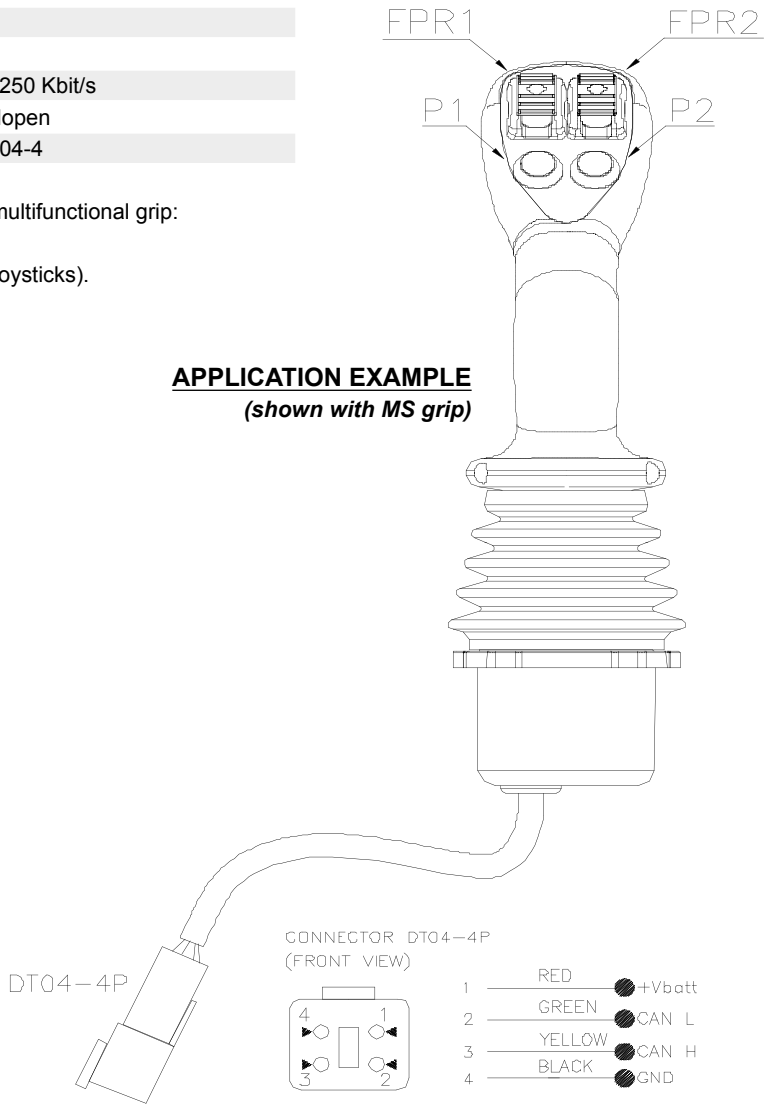
• Supply voltage:	8 ÷ 32 VDC
• Current consumption @ rest:	< 250 mA
• Physical layer:	ISO 11898, 250 Kbit/s
• Protocol:	J1939/ CANopen
• Connector type:	Deutsch DT04-4

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).

APPLICATION EXAMPLE

(shown with MS grip)



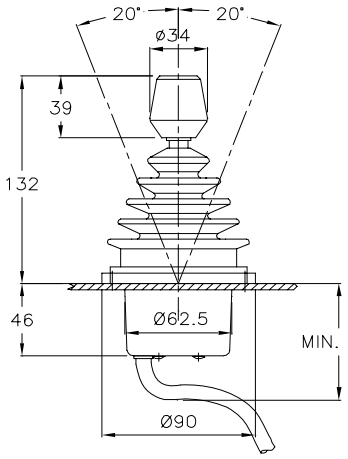
ADJUSTABLE PARAMETERS

The following parameters are adjustable via RS232 serial line by means of a specific calibration and configuration tool and an hardware interface device (see picture).
By use of the configuration window:

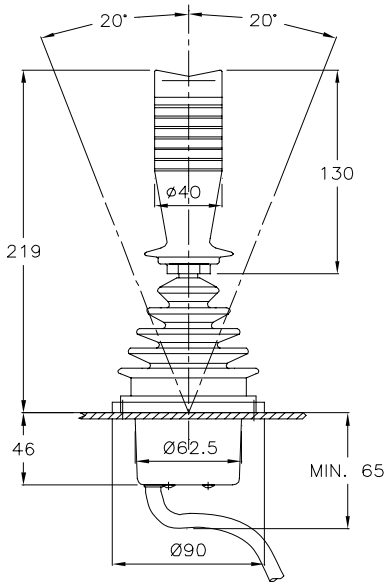
- Node ID

JHM *Heavy Duty Multi-Axis Hall Effect Joystick*

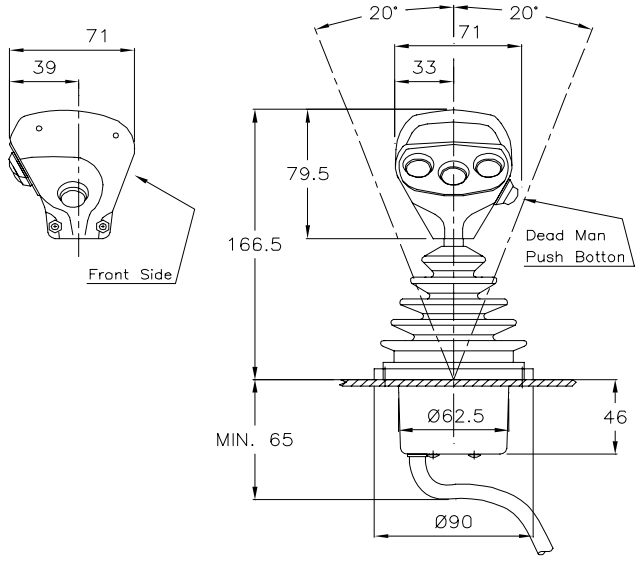
JHM joystick with grips - configuration examples with overall dimensions



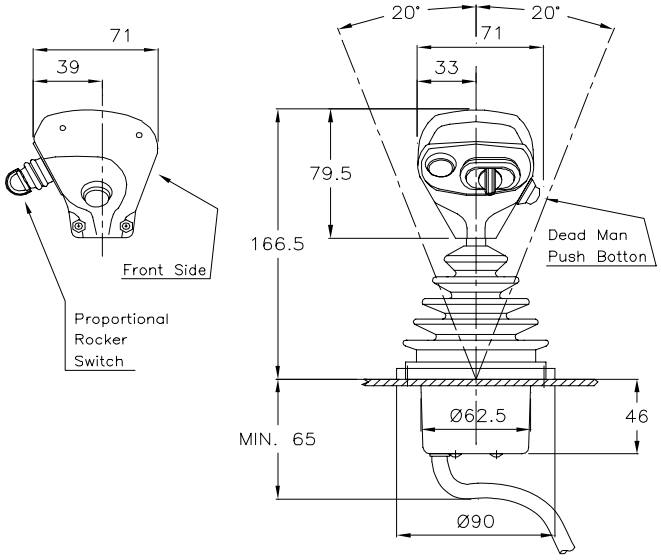
JHM base with IL handle
Complete code: **JHM-L4D/ANH-IL 0000**



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**



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

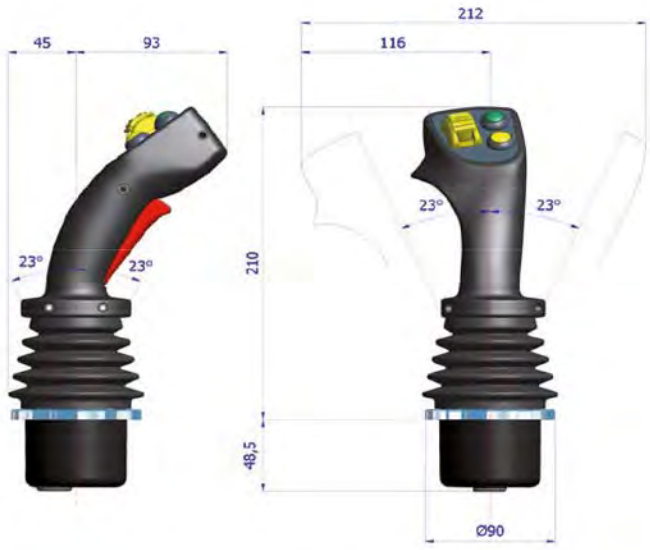
JHM *Heavy Duty Multi-Axis Hall Effect Joystick*

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**



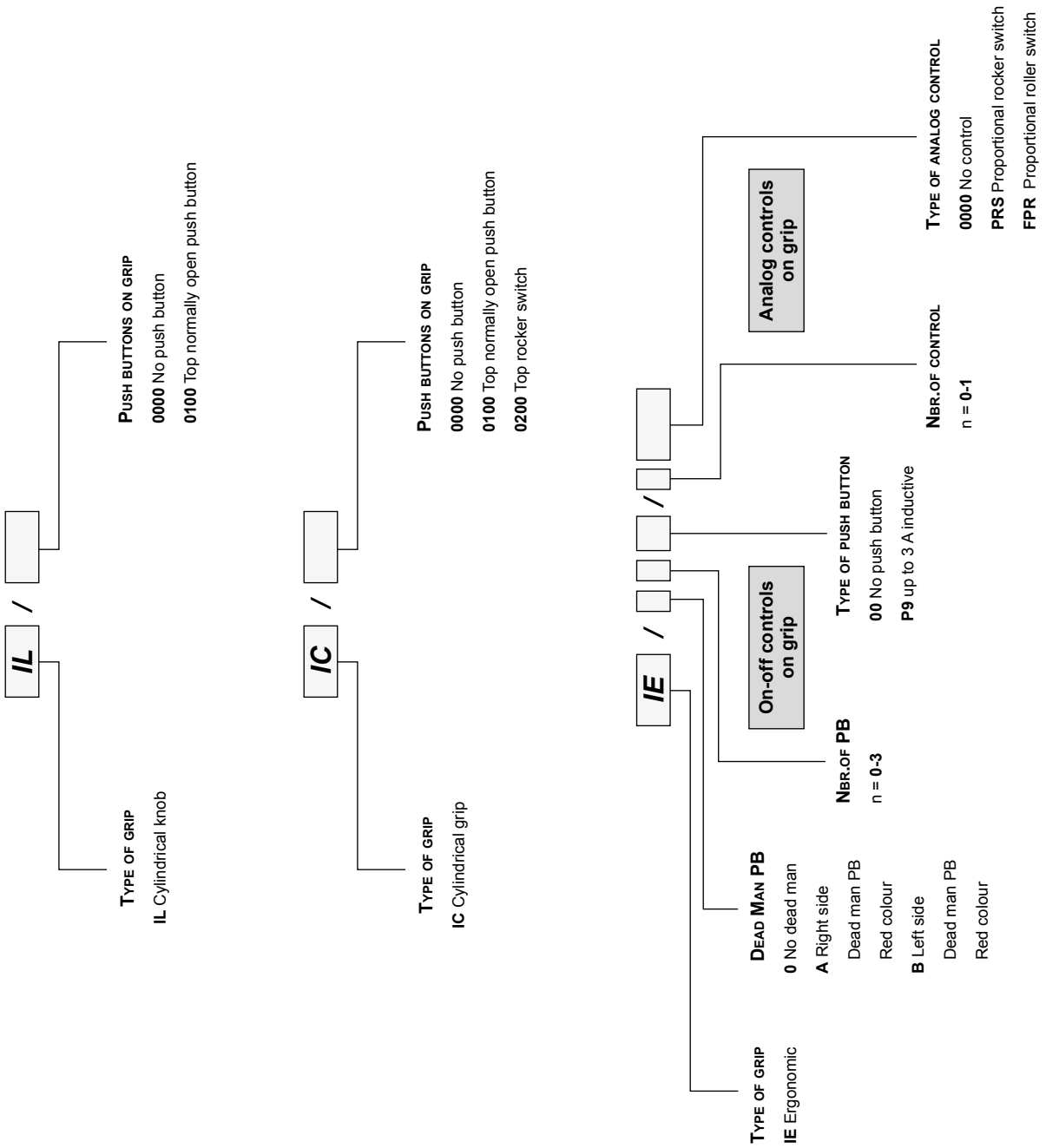
JHM base with MG type handle
Complete code: **JHM L4D/ANH-MG A2P9 1FPR 0000**

Ergonomic Grips

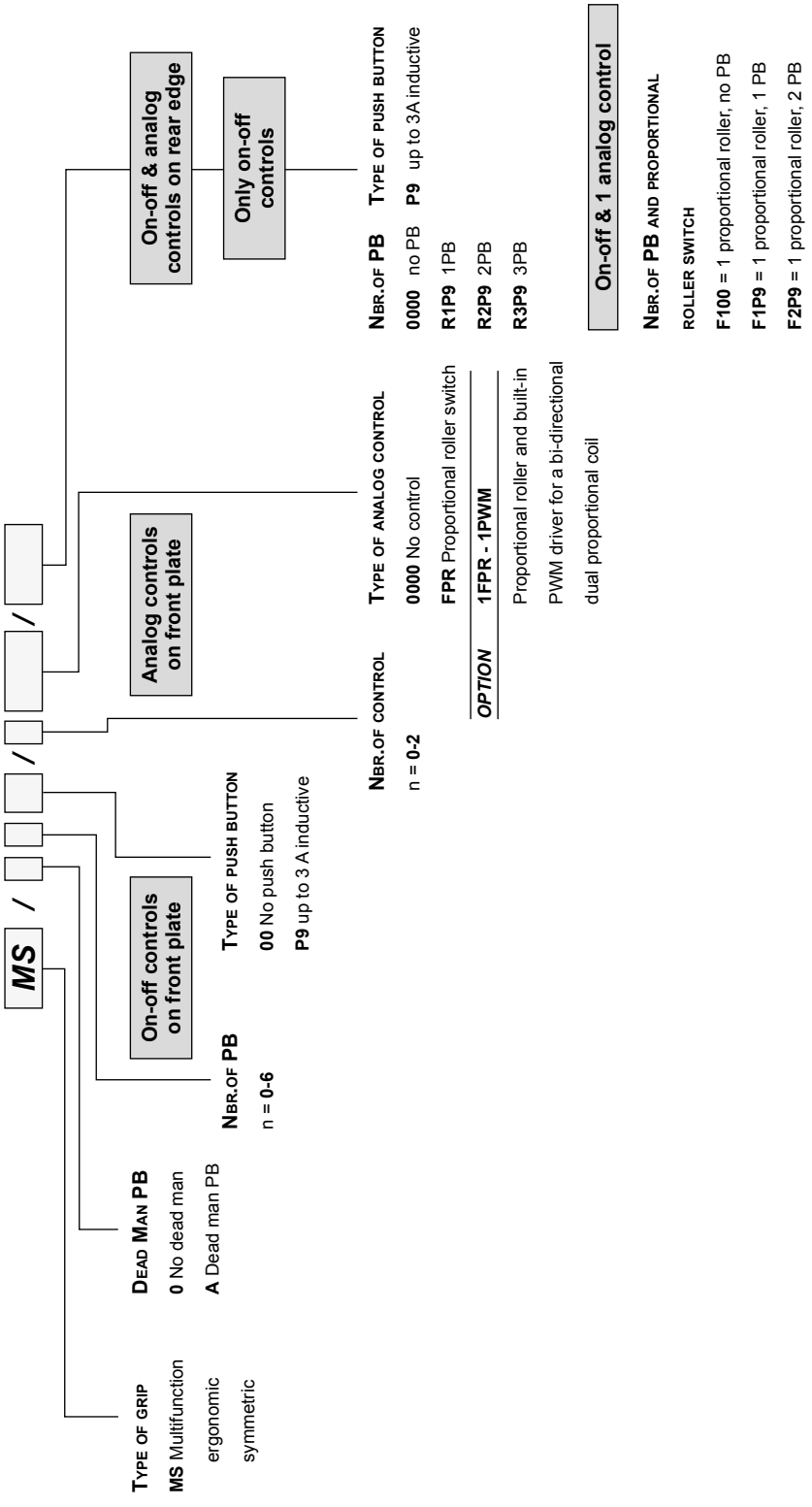
Description	Ordering information page	Technical information page
IL type (cylindrical knob)	**35**	**38**
IC type (cylindrical)	**35**	**38**
IE type (ergonomic, gear type, multi-functions)	**35**	**39**
MS type (ergonomic, symmetric, multi-functions)	**36**	**40**
MG type (ergonomic, right hand, multi-functions)	**37**	**43**

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

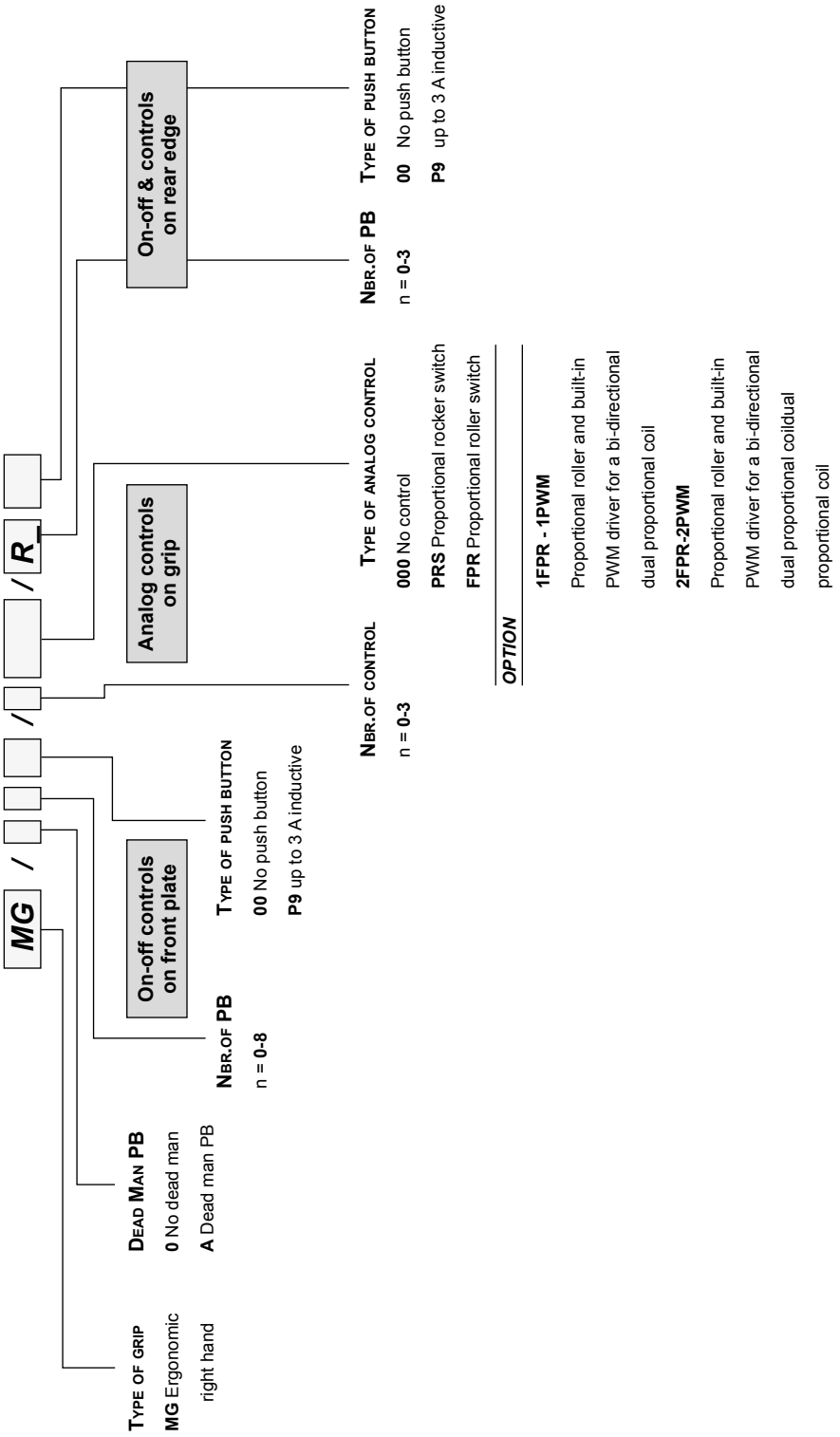
IL / IC / IE Grips *Ordering Information*



MS Ergonomic Symmetric Grip *Ordering Information*



MG Ergonomic Grip *Ordering Information*



IL - IC Grips

IL - CYLINDRICAL KNOB

MECHANICAL SPECIFICATIONS

• Body material:	bakelite
• 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

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

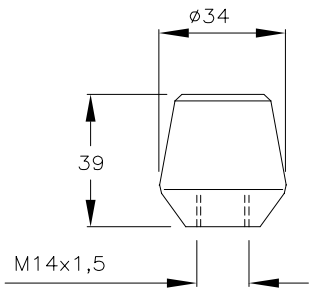
ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
• Insulating cable material:	PVC

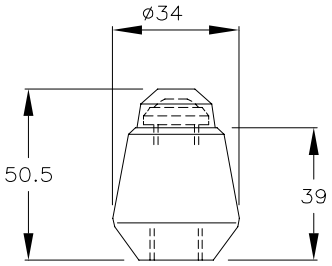
PUSH BUTTON AND ROCKER SWITCH

• 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

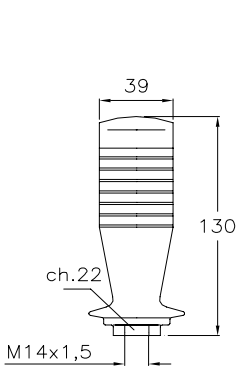


IL-0000
No push button

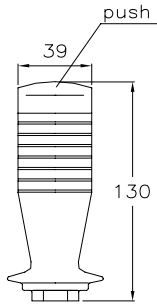


IL-0100
Top push button
(No circuit)

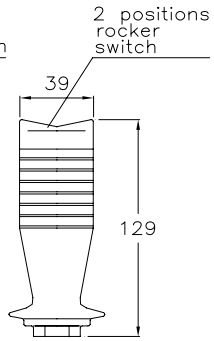
OVERALL DIMENSIONS



IC-0000
No push button



IC-0100
Top push button
(No circuit)



IC-0200
Top rocker switch

*>> **ORDERING INFORMATION:** see page 35*

IE Multi-Function Ergonomic Grip

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

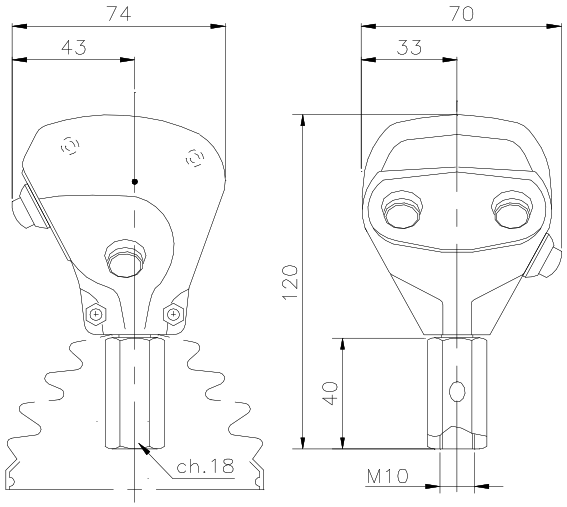
• Prewired exit cable:	250 mm

Available push buttons and switches

P9 - Push buttons

• No of push buttons on rear panel:	up to 3
• Rated amperage:	3 Amp inductive
• Life:	> 100.000 cycles
• Available colours:	red, blue, yellow, black, green, white
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
PRS - Proportional rocker switch	see PRS data sheet
• Output signal:	3-pins resistive pot 4-pins with bidirectional switches

OVERALL DIMENSIONS



FEATURES

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

CONFIGURATION EXAMPLES

	D-man P/B	Rear P/B	Rear PRS
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/0000/1PRS	0	0	1xPRS
IE-A1P9-1PRS	yes	1xP9	1xPRS
IE/0000/1FPR	0	0	1xFPR
IE-A1P9-1FPR	yes	1xP9	1xFPR

*>> **ORDERING INFORMATION:** see page 35*

MS *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance switches.

MECHANICAL SPECIFICATIONS

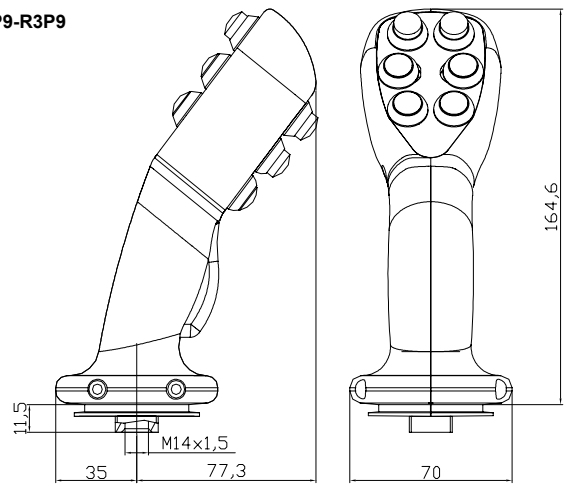
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	> 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy

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

*>> **ORDERING INFORMATION:** see page 36*

MS *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance switches.

MECHANICAL SPECIFICATIONS

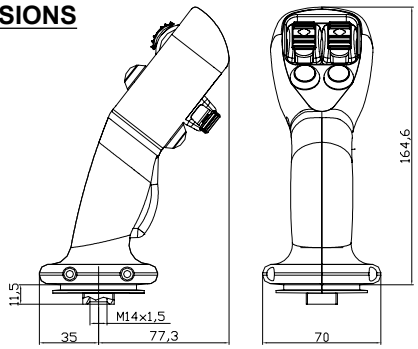
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	> 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
FPR - Proportional roller	see FPR data sheet
• Output signal:	3-pins connection hall effect contactless sensor
PRS - Proportional rocker switch	see PRS data sheet
• Output signal:	3-pins resistive pot 4-pins center tap

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	

*>> **ORDERING INFORMATION:** see page 36*

MS *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- Internal PWM driver.

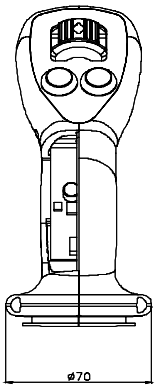
MECHANICAL SPECIFICATIONS

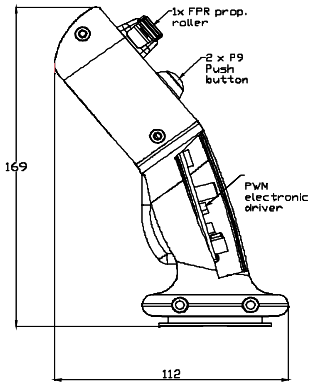
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	> 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
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

*>> **ORDERING INFORMATION:** see page 36*

MG *Multi-Function Ergonomic Symmetric Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance 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

A - Dead man push button

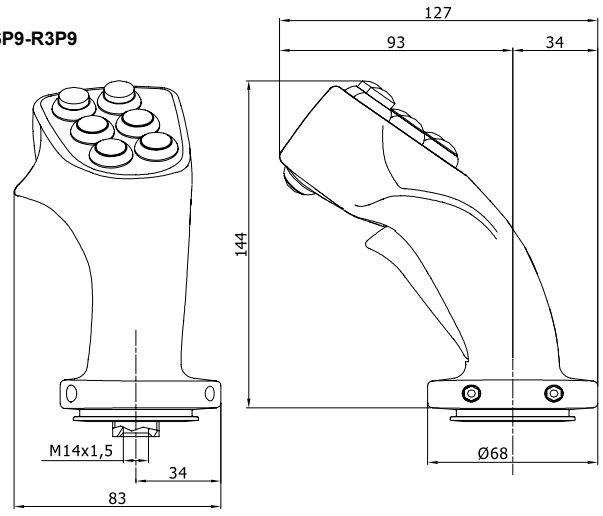
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67

P9 - Push buttons

• Operational life:	up to 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy

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

*>> **ORDERING INFORMATION:** see page 37*

MG *Multi-Function Ergonomic Right Hand Grip*

FEATURES

- Optimum ergonomic design.
- High perfomance switches.

MECHANICAL SPECIFICATIONS

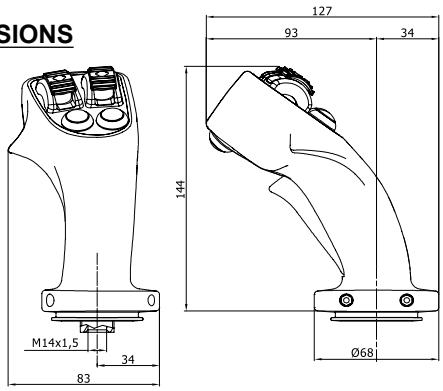
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	up to 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
FPR - Proportional roller	see FPR data sheet
• Output signal:	3-pins connection hall effect contactless sensor
PRS - Proportional rocker switch	see PRS data sheet
• Output signal:	3-pins resistive pot 4-pins center tap

OVERALL DIMENSIONS

Mod.
MG-A000-3FPR



CONFIGURATION EXAMPLES

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

*>> **ORDERING INFORMATION:** see page 37*

MG *Multi-Function Ergonomic Right Hand Grip*

FEATURES

- Optimum ergonomic design.
- Internal PWM driver.

MECHANICAL SPECIFICATIONS

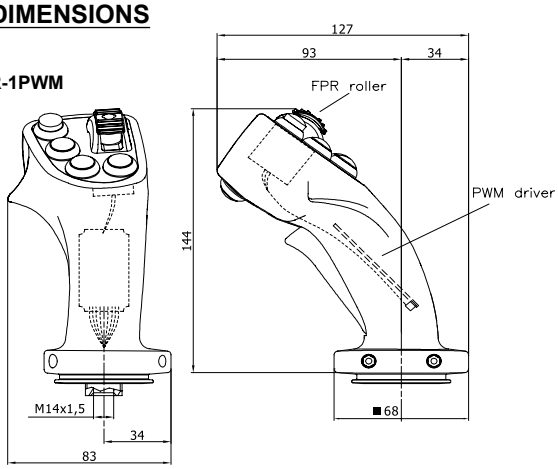
• Material:	thermoplastic
• Colour:	black
• Operating temperature range:	-25°C / +85°C
• Protection class:	IP 65 with plain grip (IP 67 with special assembly on request) IP 54 with dead man trigger option
• Connecting hub:	female thread / M14 x 1.5

ELECTRICAL SPECIFICATIONS

• Prewired exit cable:	250 mm
A - Dead man push button	
• Rated amperage:	up to 3 A inductive
• Protection class (microswitch):	IP 67
P9 - Push buttons	
• Operational life:	up to 100.000 cycles
• Rated amperage:	up to 5 A resistive up to 3 A inductive
• Protection class:	IP 64 (IP 68 available)
• Available colours:	red, blue, yellow, black, green, white
• Button and bezel material:	thermoplastic
• Contacts:	gold plated silver alloy
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

*>> **ORDERING INFORMATION:** see page 37*

Accessories

	Description	Page
Joystick connections	Connector kits	**48**
Joystick calibration tool	Software calibration tool linking cables	**50**
Operators for grip assembling	Rocker switches, pushbuttons knob potentiometer	**52**

Joystick - Connections *Accessories*

7 POLES DUBOX CONNECTOR

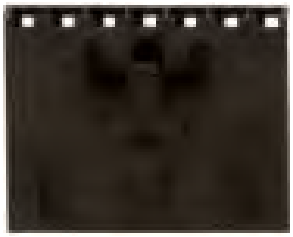
Kit includes: male connector, female contacts
Available for joystick: JLP-L2S

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

Joystick - Connections *Accessories*

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

Joystick - Calibration Tool *Accessories*

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*.

Joystick - Calibration Linking Cables *Accessories*

DEUTSCH-DB9 LINKING CABLE (with software calibration tool)

Available for joystiks: 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: 50.2205.227

CAN - RS232 CONVERTER

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

ORDERING CODE: 50.2205.228

Operators for Grip Assembling — *Accessories*

ROCKER SWITCH TYPE K1

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**

ROCKER SWITCH TYPE 1838.3901

Switch Operation: On-Off-On

ORDERING CODE: 50.1301.500

PUSH BUTTONS WITH LED

Switch Operation: On-Off

CASE COLOR	LED COLOR	ORDERING CODE
GREEN	GREEN	**50.1301.324**
RED	RED	**50.1301.325**
ORANGE	AMBER	**50.1301.330**
YELLOW	WHITE	**50.1301.331**
BLUE	BLUE	**50.1301.332**

LATCHING PUSH BUTTONS

Switch Operation: On-Off Latching

CASE COLOR	LED COLOR	ORDERING CODE
RED	X	**50.1301.407**
RED	RED	**50.1301.414**
ORANGE	RED	**50.1301.415**

Operators for Grip Assembling — *Accessories*

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: 5kΩ 10%
Electrical travel: 270° ±10°

ORDERING CODE: 50.1501.025