700
Electronic joystick

Joystick series 700 combines proportional electric outputs with switches, rockers and push button. The above functions can be implemented on many different types of handles. Electrical outputs are full programmable for voltage, current, PWM and CANBus.

The electronic circuit is fully protected against water and any kind of contaminants. Thanks to its particular enclosure, IP67 is guaranteed for the whole electronic circuits and environmental contamination is minimized.
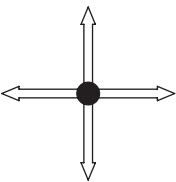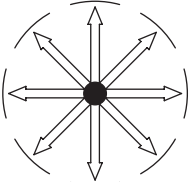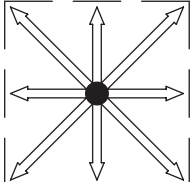
Measuring position is through Hall effect sensors which guarantee a precise proportional control in the whole working area with programmable reaction time for any kind of movement of the joystick's lever.

Programming via PC guarantees full flexibility in the setting of the interface profiles. Its strong structure guarantees long life operation also in case of misused conditions.

The joystick is available in the versions:

• single axis
• dual axis (simple)
• dual axis with full range movements
• dual axis with limited crossed movements

Single axis	Dual axis with orthogonal crossed movements	Dual axis with movements limited on circle boundary	Dual axis with full range movements
Code: DDD=710	Code: DDD=720	Code: DDD=730	Code: DDD=740

It can be configured either for top or for bottom mounting; the base mechanism, combined with specific accessories produces different joystick versions:
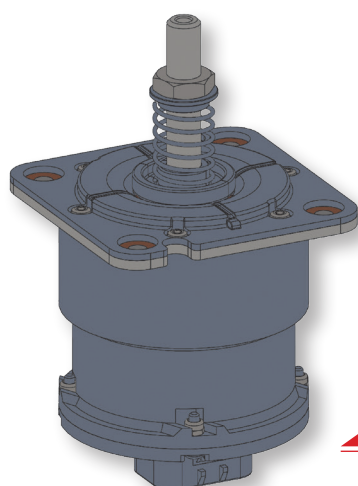
With simple knob, without push-button
 { Top mounting
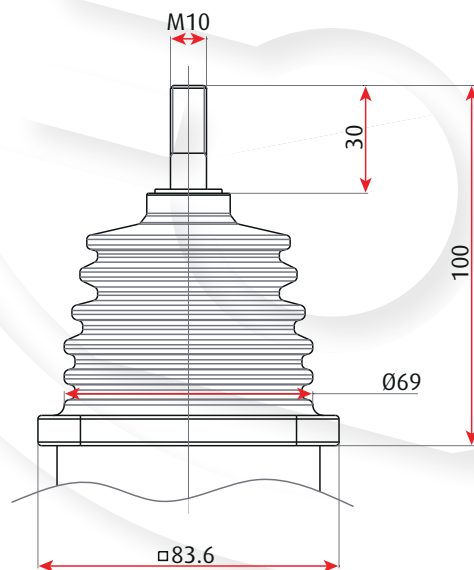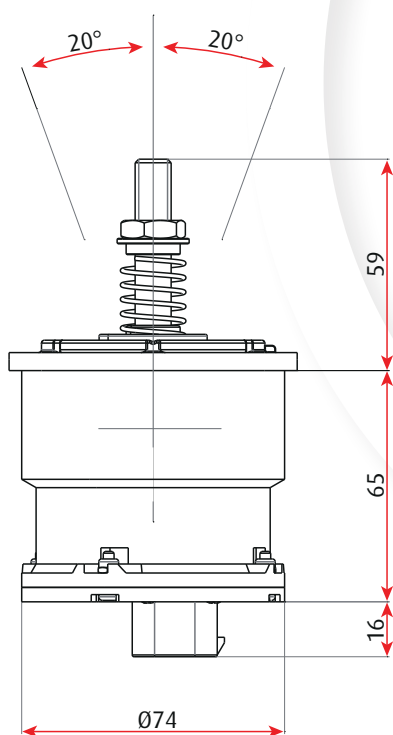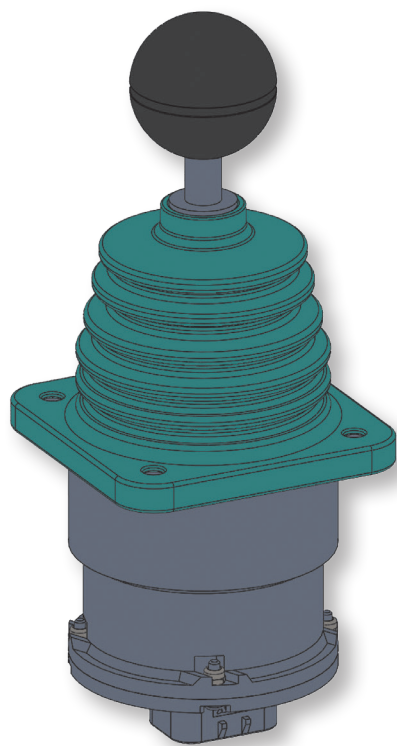 Bottom mounting

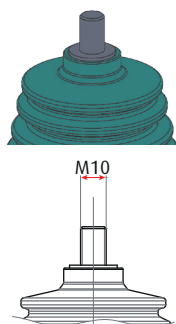With ergonomic handle, with push-buttons
 { Top mounting
 Bottom mounting

◀ Base mechanism

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DIMENSIONS & CONFIGURATIONS
Joystick with simple knob, without push-button

20° 20°

59
65
16
Ø74

M10
30
100
Ø69
□83.6

No knob, thread M10	Round knob	Ogival knob
M10	Ø40	36 / 46
Code: K=0	Code: K=1	Code: K=2

Top mounting	Bottom mounting
Deck — Ø5.5, □86, 92, 92	Deck — Ø5.5, Ø75, 60.8, 60.8
Code: J=0	Code: J=2

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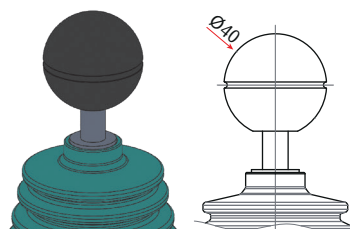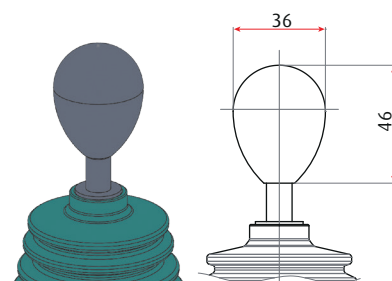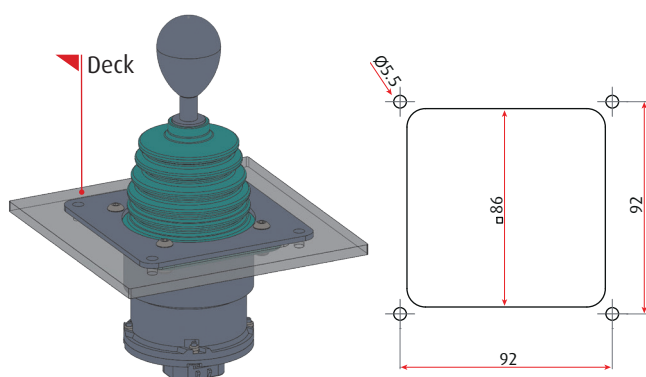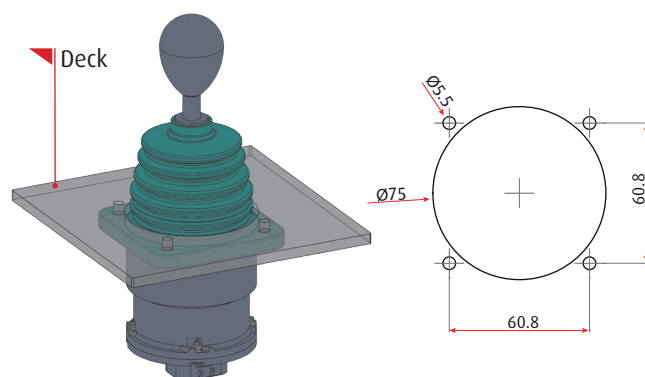
JOYSTICK WITH ERGONOMIC HANDLE

Handle type 1725

62

146

246
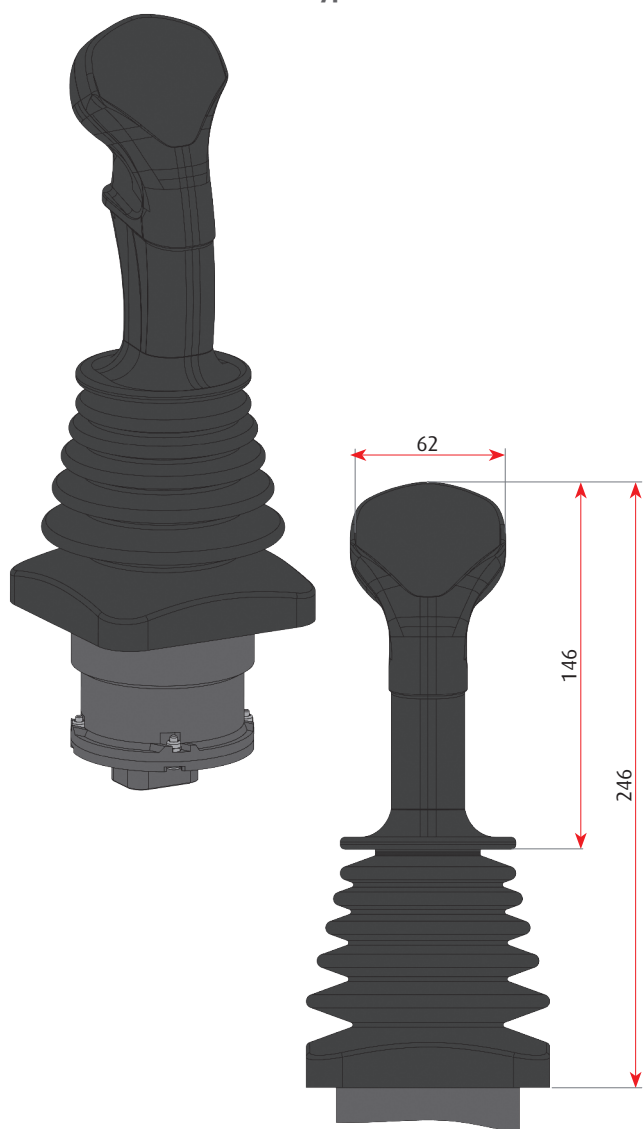
Code: K=3

Handle type 1730

98

161

261

Code: K=4

Top mounting

Deck

Ø5.5

Ø77

20.7

36

Ø11

60.8

60.8

Code: J=1

Bottom mounting

Deck

Ø5.5

□86

92

92

Code: J=3

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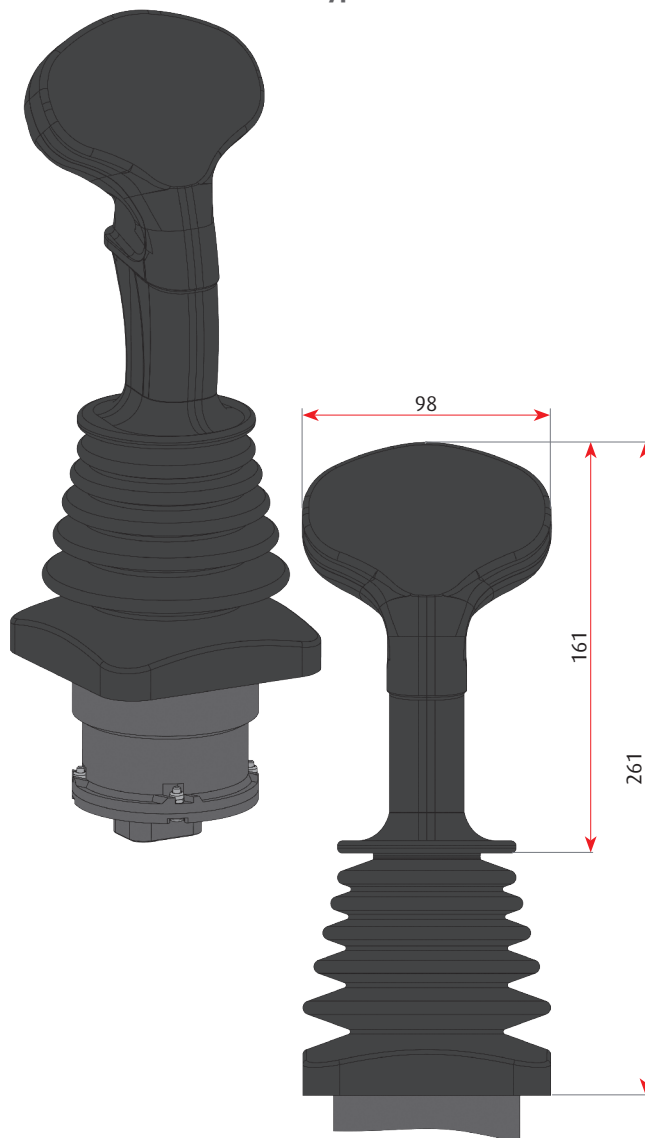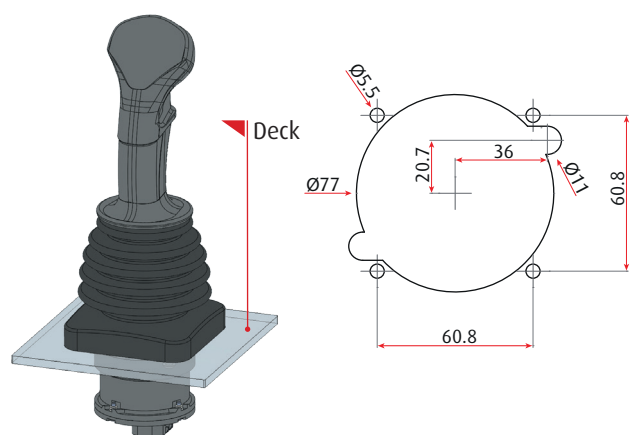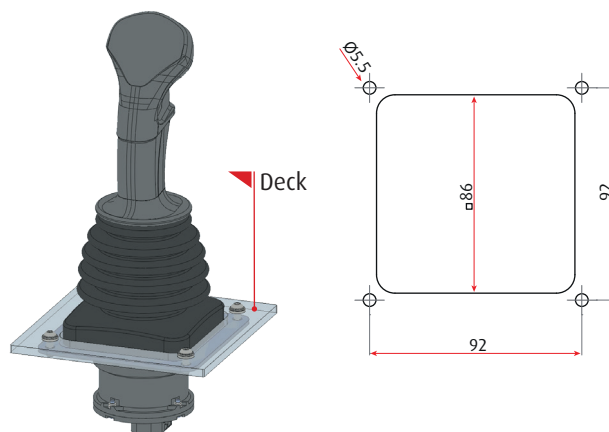
SPECIFICATION

MECHANICAL AND GENERAL SPECIFICATION	
Life	5 million cycles
Operating temperature	−40°C : 85°C
Protection	IP67
Travel on axis	20°
Travel at 45 °	28°
Force to come out of centre	600 gr
Force at 20 °	750 gr
Force at 28 °	900 gr
Max static load on X axis (190 mm from the rotation point)	1000 N
Max static load on Y axis (190 mm from the rotation point)	1000 N
Max static load on Z axis	500 N

ELECTRICAL SPECIFICATION	
Sensor	Hall effect
Supply voltage	8V to 30V
Maximum input current	180 mA at 24V
Output voltage range	0.5 : 5V (with 2.5V in neutral position)
Output current range (PWM option)	400 :1600 mA (12VDC); 200 : 800 mA (24VDC)
Electric signals	Galvanically insulated
Resolution and update rate	10 bit update rate 0.1 ms
Correlation in case of 2 signals	Better than 1% in the whole joystick range

CONNECTOR PINOUT

Electronic connector is placed under the base of the joystick body. This is a standard TE connector Vertical HDR for printed circuit board applications with 14 poles. It should be matched with TE connector code 776273-1 or similar.

According to the different electronic joystick versions, it follows the cabling:
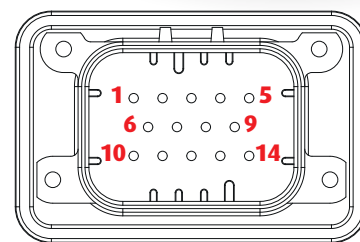
Pin	Joystick versions			
	DAC (Voltage)	PWM (Colis Driver)	CAN Bus 1.2	CAN Bus 2.0
1	Out 1 - South/North	Out - West (+)	PNP Din 1	NPN DIN 1
2	Out 1 - West/East	Out - East (+)	PNP Din 2	NPN DIN 2
3	Out 2 - South North		PNP Din 3	NPN Din 3
4	Out 2 - West/East		Can H	Can H
5		Out - West/East (–)	Can L	Can L
6	+V Supply (from 8 to 32 Vdc)			
7	Factory reserved - Do Not Connect			
8	Factory reserved - Do Not Connect			
9	GND			
10	D_{out}: out of death band E	Out - South (+)	PNP Din 4	NPN Din 4
11	D_{out}: out of death band W	Out - North (+)	PNP Din 5	NPN Din 5
12	D_{out}: out of death band N	D_{out}: out of death band WE	PNP Din 6	NPN Din 6
13	D_{out}: out of death band S	D_{out}: out of death band SN	PNP Din 7	NPN Din 7 - Pot 1
14	GND	Out - South/North (–)	PNP Din 8	NPN Din 8 - Pot 2

Notes:

- Inputs Din PNP have to be supplied from 5 to 24 V
- Inputs Din NPN have to be shorted to GND
- Outputs D_{out} are PNP at voltage of +V Supply, Imax = 100 mA

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CODING SYSTEM FOR ELECTRONIC JOYSTICK

DEVICE				MOUNTING		TYPE OF SIGNAL	HANDLE		PUSH BUTTONS			SPECIAL CUSTOM PROJECTS	
D	D	D	-	J	.	S	K	.	P1	P2	.	X	X

The code is composed of 10 digits which correspond to the following:

D	D	D

define the product and the joystick version:

DDD = 710 single axis
DDD = 720 dual axis with orthogonal crossed movements
DDD = 730 dual axis with movements limited on circle boundary
DDD = 740 dual axis with full range movements

J

defines the type of mounting:

J = 0 bottom
J = 1 top

S

defines the type of signal:

S = 0 voltage
S = 1 PWM
S = 2 4-20 mA
S = 3 Canbus

K

defines the type of handle
(for complete description of handles refer to Chapter 7 of the Industrial Catalogue):

K = 0 without handle
K = 1 simple knob, round
K = 2 simple knob, ogival
K = 3 handle type 1725 (ergonomic handle)
K = 4 handle type 1730 (ergonomic handle XL)

P1	P2

define the number, type and position of switches:

P1 = number of push buttons low current (200 mA)
P2 = number of push buttons high current (4 A)

X	X

A numbering system 0 to 99 is used to define special projects, cable length, number of poles, type of connector, special switches and their posission, dead man function, rocker, etc.

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THE JOYSTICK PROGRAMMER

With this PCtool you define the correlations between the lever and the output signals.

The two axis are completely independent; for each axis it is possible to define:

- the dead band around neutral detent
- signal profiles for north-south axis and respectively for east-west axis. Points which define the transfer function are:
  - starting point after dead band zone
  - value at medium travel
  - end of travel
- ramp-up time (in ms)

If the electronic joystick is connected to the PC, through the Joystick Programmer you can verify the results of your programming and eventually change the parameters and verify runtime the effect of the new setting.
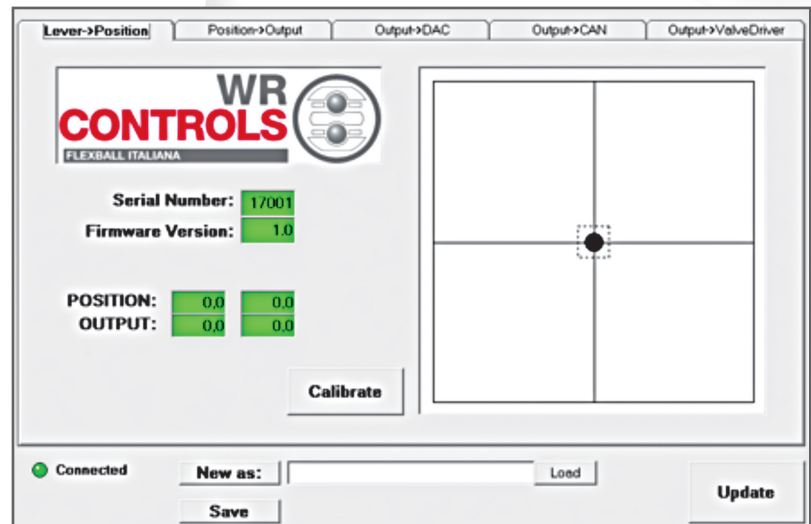
VOLTAGE

There are available 4 analogue and 4 digital signals. The analogue signal is fully programmable within the range 0-5 V and can represent:

1. either a half stroke (from centre of axis to one of the poles)

2. or a full stroke from one pole to its opposite (from e.g. South to North pole or for West to East pole).

In case 1, there is only one analogue signal per each half stroke.

In case 2, are available two voltage signals per every full stroke. From programming it is possible to keep the programming of the 2 axis completely independent or to make setting of axis WE (West -East) equal to SN (South-North).

The 4 digital signals detect the out of centre position. Centre or Dead band position is fully programmable as described at previous page. Each out of centre position signal can withstand a current of 500 mA and its profile is according to the drawing here below.

Out of centre signal
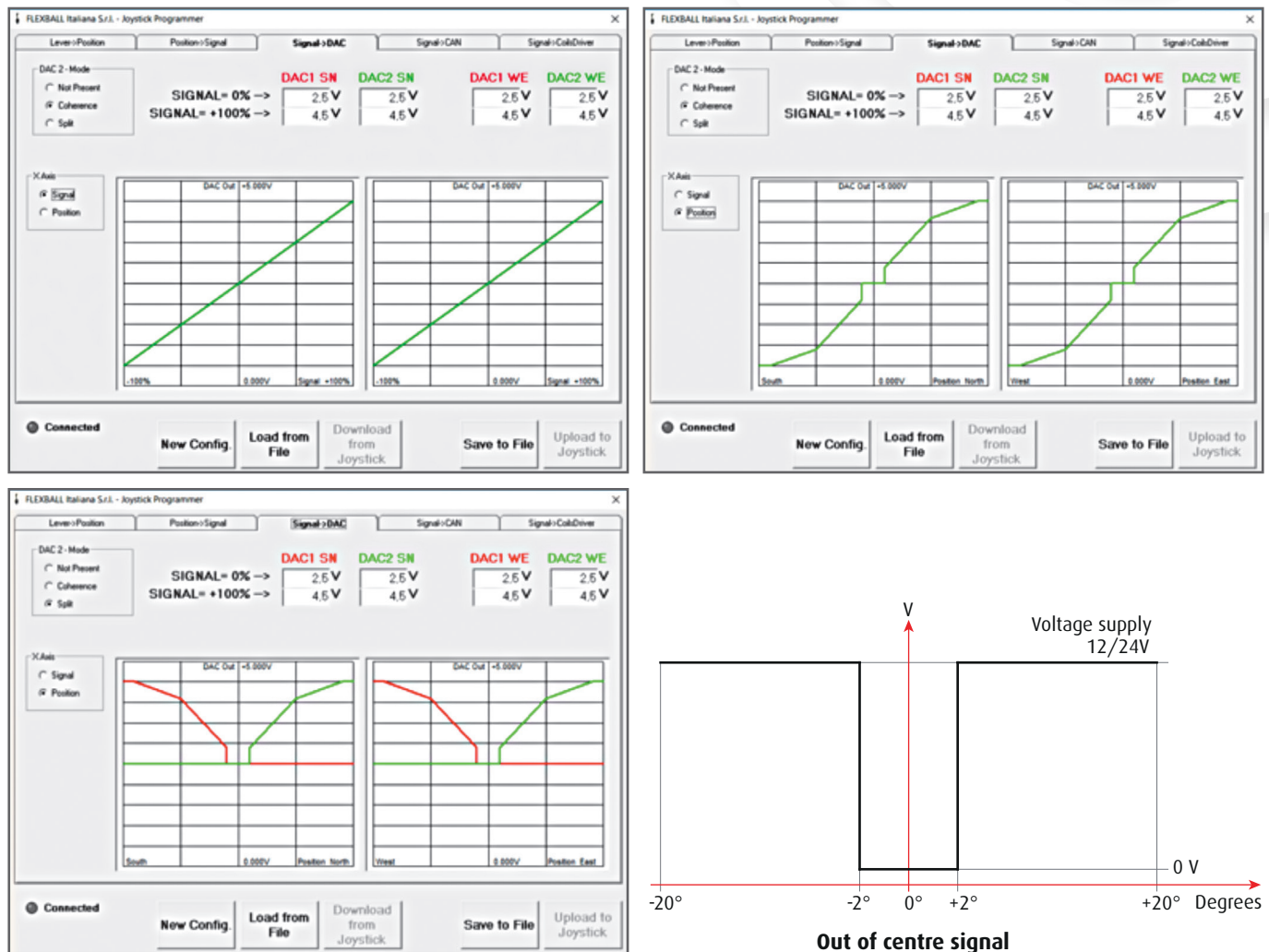
PWM

There are available 4 PWM and 4 digital signals.

Each PWM signal is fully programmable within the range 0-100% and represents the half stroke from centre of axis to the pole.

The 4 digital signals detect the Out of centre position. Dead band position is fully programmable as previously described.

Each out of centre position signal can generate a current of 500 mA and its profile is according to the drawing here below.

Out of centre signal
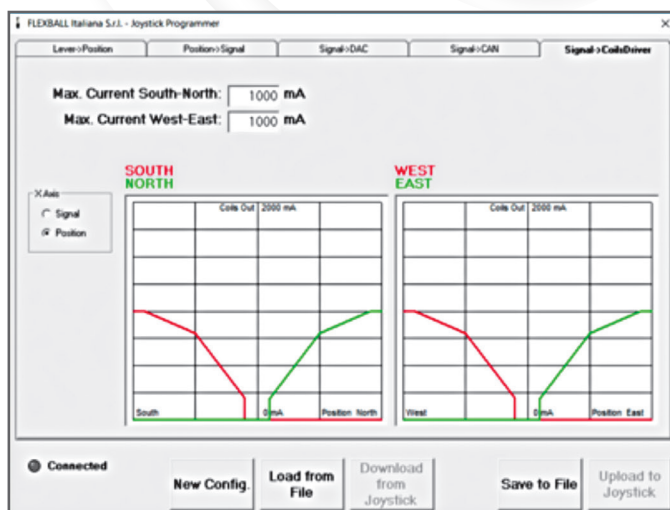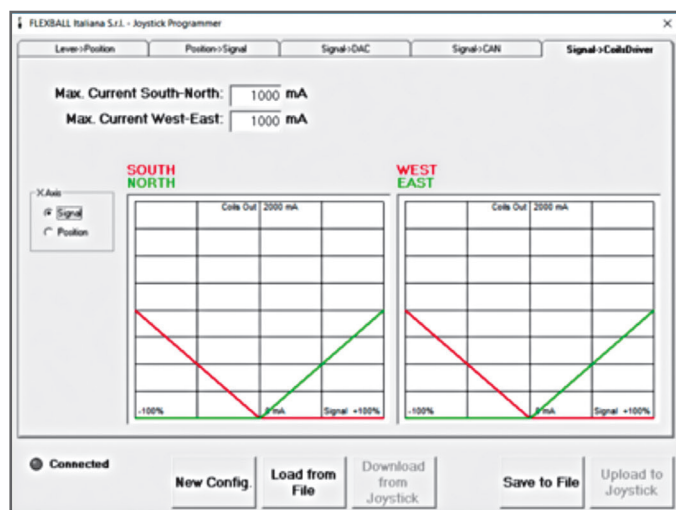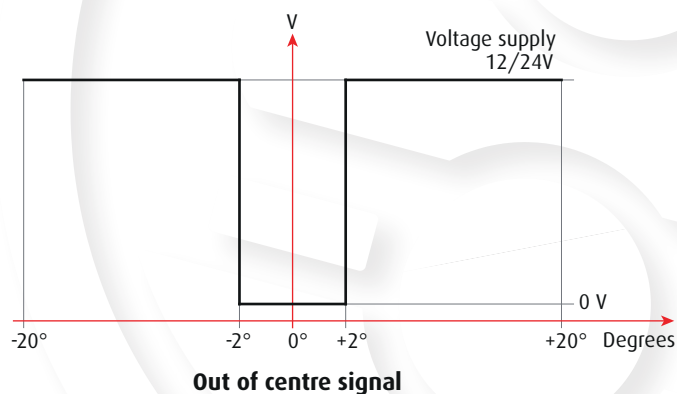
CANBUS IS ACCORDING TO SAE J1939

From here you have full programming access. In the red frame are depicted the parameters and function for the general setting of the communication.

Parameter/function	Range/number/configuration
Baudrate	From 125 Kbit/s to 1 Mbit/s
End of line/0hm termination	120 0hm
Accuracy of position signal of axis X and Y	From 100 to 10.000 bit with the possibility to invert the signal
Analogue input (for e.g. potentiometer, max 2)	From 100 to 10.000 bit with the possibility to invert the signal
Switches or digital input (max 8)	Momentary – Toggle – Negate – Hand on (for only switch 1)

Analog and digital signals come from the potentiometers, pushbuttons, switches, capacitive switches which are mounted on the knob. Their signals enter into the joystick, are then converted and transmitted via the CANBus network.
In the yellow frame it is possible to configure further parameters and functions. It follows the list:

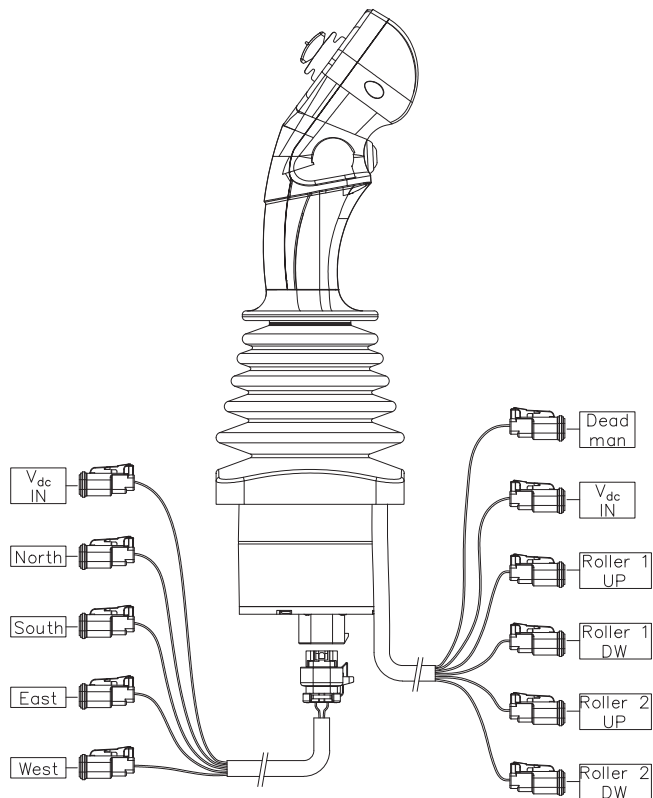| Parameter/function	Range/number/configuration
CANBus ID	HEX format
Transmission refesh time	From 10 to 1000 ms
Message package	8 bytes

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Communication is via messages of 8 bytes. Each byte is freely configurable. Here beside are reported some of the possible information that can be stored in each byte.

For the communication between the joystick and the other devices of the CANBus network you have available as standard 3 frames: TX1, TX2 and RX1.

	Tx1 = transmission frame (main frame)
	Tx2 = transmission frame; it is a second further frame
	Rx = receive frame, mainly used to control from remote (switch on/off) the LEDs on the knob

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APPLICATION EXAMPLES
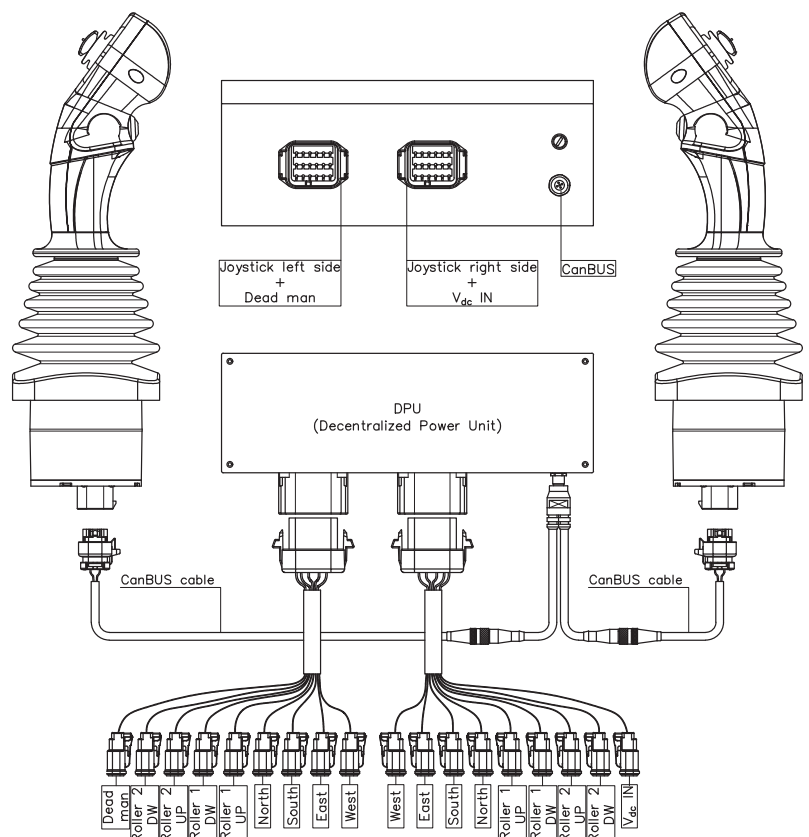

Stand alone solution

The joystick can directly command the proportional valves of an hydraulic distributor.

There 8 PWM signals:
- 4 signals are proportional to the joystick movements
- 4 signal are generated on the handle via proportional rollers.

Decentralized solution

The commands go from the joysticks to a Power Distribution Unit via a digital signal (CANBus). The Decentralized Power Unit generates the commands to the hydraulic distributor valves (power PWM signals). The distance between the joystick and the Decentralized Power Unit can be of any length, giving full flexibility to the installation.

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