BUCHER hydraulics

Electrical Joystick Controllers

for mobile hydraulics

Reference: 100-P-700051-EN-05

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Contents

Page

1 Lever switches, FGE Series

1.1 Description

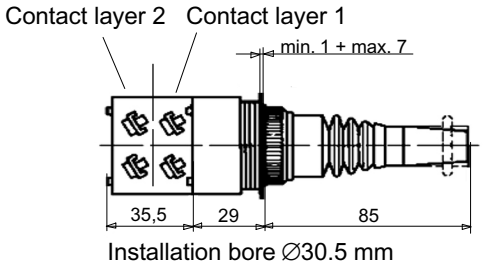
These lever switches are used for switching electrical power on and off. They are available with either 2 or 4 switch positions.

- ON / OFF switches
- Basic Design

1.1.1 Technical data

Description	Unit	Value
Max. continuous RMS current	A	10
AC	Hz	50 - 60 Cat. AC 11 (I.E.C. 337.1)
Rated voltage Ve	V DC	12 24 48 60 110 220 380 500 550 600
Rated current Ie (inductive load)	A	10 10 10 10 6 3 2 1.5 1.3 1.2
DC		Cat. DC 11 (I.E.C. 337.1)
Rated voltage Ve	V DC	12 24 48 60 110 220 380 500 550 600
Rated current Ie (inductive load)	A	8 5 2.7 2 1.1 0.55 0.3 0.25 0.22 0.2

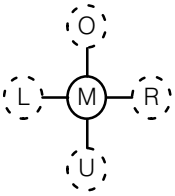
1.1.2 Dimensions



Installation bore ∅30.5 mm

1.1.3 Application

1.2 Ordering code

		2 switch positions		4 switch positions		
		Contact layer 1	Contact layer 2	Contact layer 1	Contact layer 2	
	Up (U)					
	Right (R)					
	Middle (M)					
	Down (D)					
	Left (L)					
Latched positions		R - L	-	O - R - U - L	-	L
Momentary positions		-	R - L	-	O - R - U - L	O - R - U
Type		FGE1-2R	FGE1-2T	FGE2-4R	FGE2-4T	FGE2-1R3T
Ordering code		100018189	100016726	100016728	100016727	100018191

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2 Joystick, FGE... / JC1 Series

2.1 Description

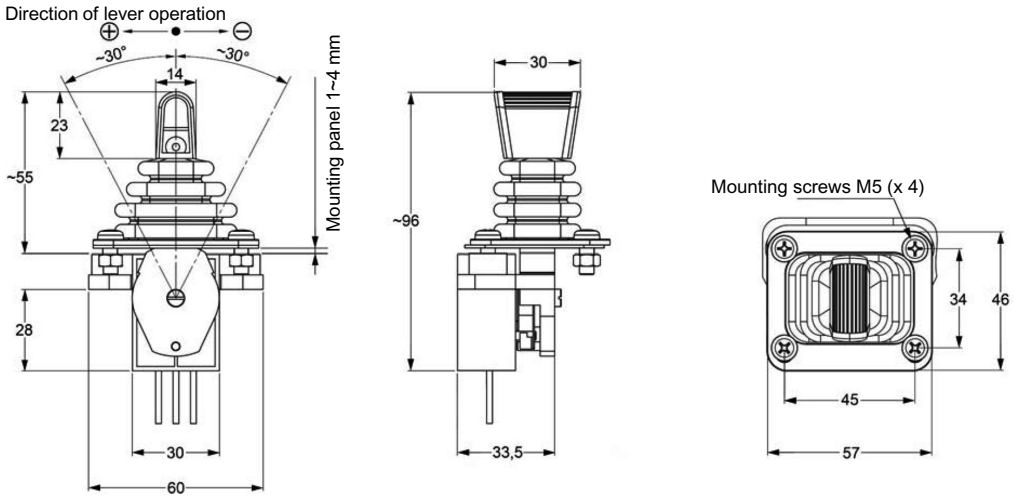
The FGE... / JC1 joystick converts the displacement of the hand lever into a voltage signal. The displacement is registered using a non-contact principle, with the result that the sensors do not wear. The integral mounting flange allows the joystick to be fitted in operating consoles, housings,etc.

- Non-contact position sensing
- Design with one axis
- Spring return device

2.1.1 Technical data

Description	Unit	Value
Supply voltage	V DC	5
Output voltage	V DC	4,5 ± 3,5 (for V_N = 9 V)
Switch rating - rocker switch	W	0,1
Maximum load resistance	kΩ	5kΩ ± 20%
Temperature range	°C	-20°C~+60°C
Enclosure protection	IP	65
Weight	kg	0,2
Actuation angle	°	±20°~±25°
Mid-position	°	± 2
Electrical connections	Clamped connection	

2.1.2 Dimensions



2.2 Ordering code

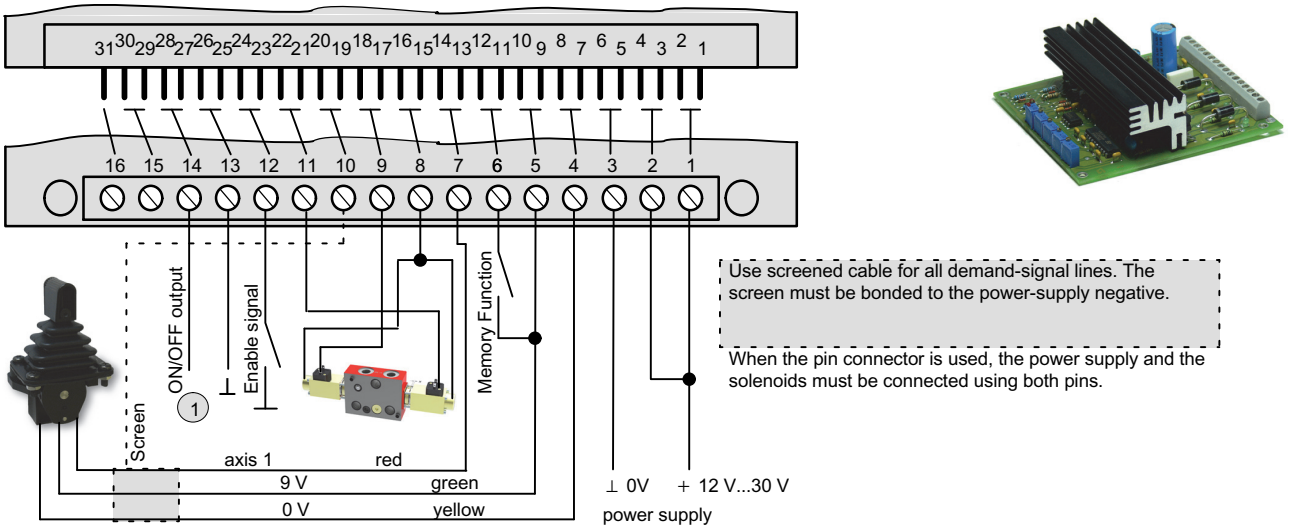
Description	Type	Ordering code
Style with one-axis gate	FGE1-**-G**/JC1	100020513

2.2.1 Available Electronics

Type	Series	Data sheet	Range	Ordering code
Plug-in card for 1 axis, potted, with screw terminals	ESSK107-81***	100-P-700033	4,5 ± 3,5 V	100024621
Plug-in card for 1 axis, not potted (standard), with screw terminals	ESSK107-91***	100-P-700033	4,5 ± 3,5 V	100021154
Proportional amplifier	EBM-300308-DS-MOBI	100-P-700146		100034752

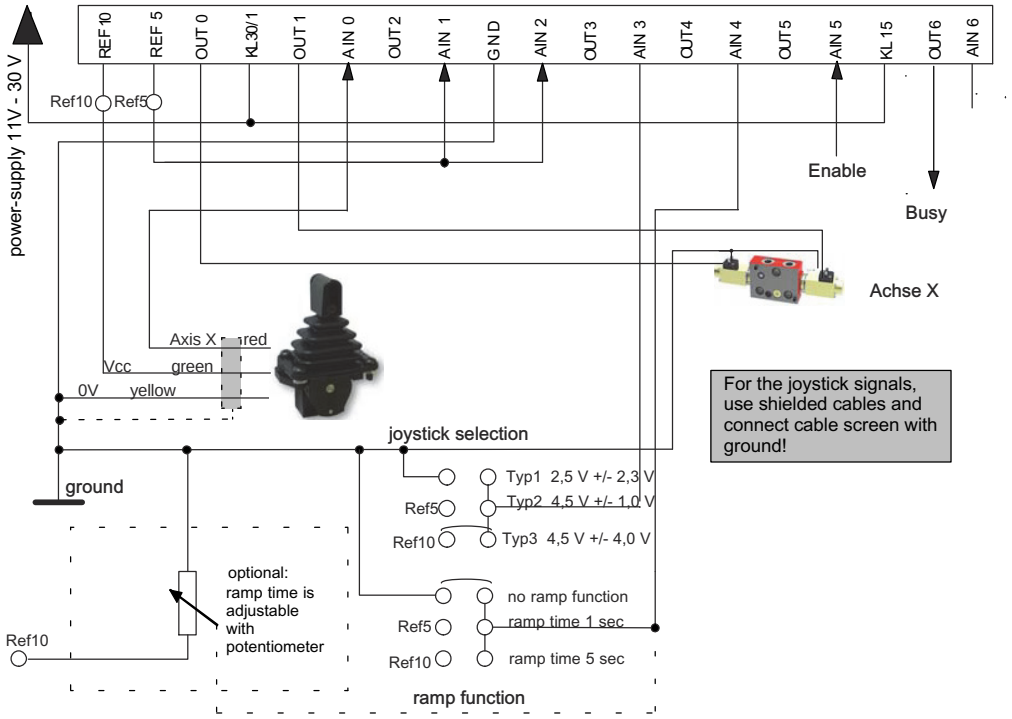
2.3 Connection diagrams

2.3.1 ESSK 107 series for 1 Axis (see data sheet 100-P-700033)



1	The ON/OFF signal is output in parallel to the joystick deflection (for both axes), either as a continuous signal or when required.

2.3.2 Connecting a type 3 joystick, e.g. FGE1-**G**JC1 at proportional amplifier EBM300308-DS-MOBI



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3 Joystick, FGE... / JS4 Series

3.1 Description

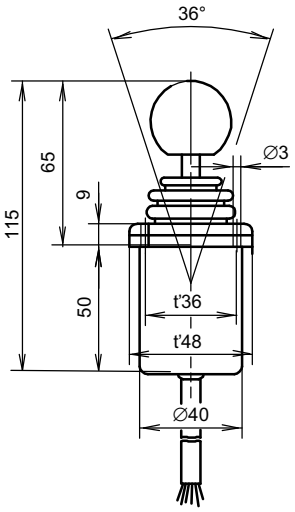
The FGE... / JC1 joystick converts the displacement of the hand lever into a voltage signal. The integral mounting flange allows the joystick to be fitted in operating consoles, housings,etc.

- Non-contact position sensing
- Voltage output
- Design with two axes

3.1.1 Technical data

Description	Unit	Value
Supply voltage	V DC	4.75 ... 15 DC, smoothed. Ripple < 10%
Output voltage	V DC	4,5 ± 0,7 (for V_N = 9 V)
Minimum load resistance	kΩ	18
Temperature range	°C	-20 ... +50
Enclosure protection	IP	IP54 above the mounting surface; IP 33 below the mounting surface
Weight	kg	0,14
Actuation angle	°	± 18°
Mid-position	°	± 2°
Electrical connections	200 mm cable; wire ends are tinned	

3.1.2 Dimensions



3.2 Ordering code

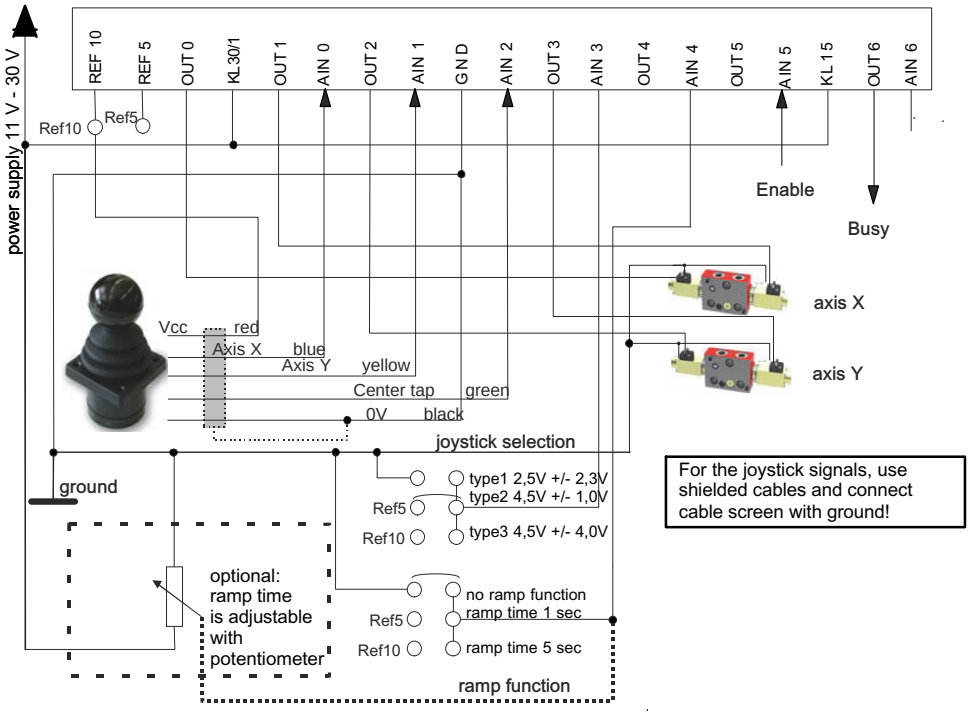
Description	Type	Ordering code
Style with two-axes not gated	FGE*-**-G12/JS4	100016362
Style with two-axes gated	FGE2-**-G12/JS4	100018348

3.2.1 Available Electronics

Type	Series	Data sheet	Ordering code
Proportional amplifier	EBM-300308-DS-MOBI	100-P-000146	100034752

3.3 Connection diagram

3.3.1 EBM-300308 -DS-MOBI series for 2 axes (see data sheet 100-P-000146)



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4 Joystick, FGE... / J2A7 Series

4.1 Description

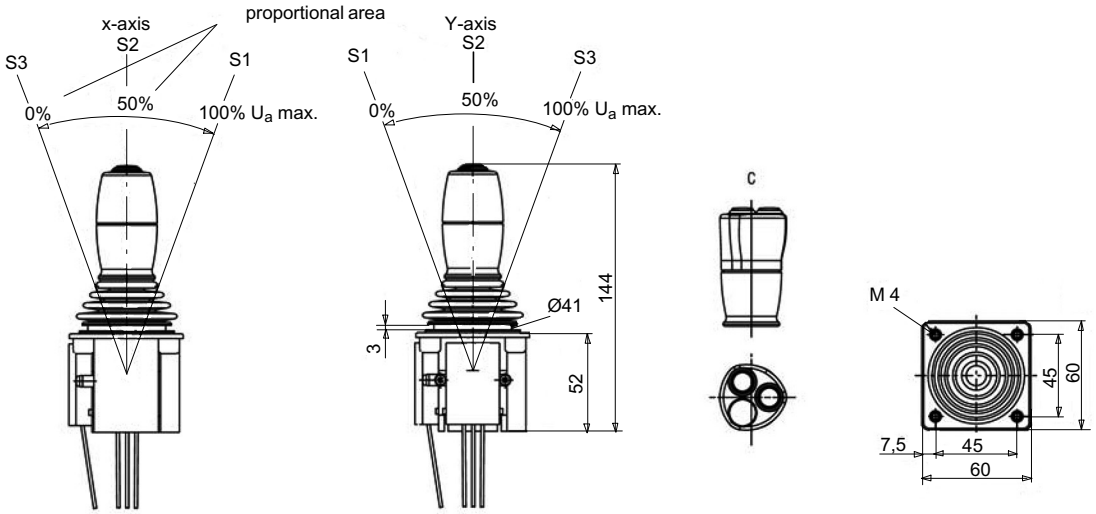
The operating principle is noncontacting: – analogue: rotating magnetic field over hall-sensor – digital: reed technique. Short circuit-proof with analogue version (short circuit duration: unlimited).

- Non-contact position sensing
- Basic Design

4.1.1 Technical data

Description	Unit	Value
Supply voltage	V DC	9 ... 30
Output voltage	V DC	2,5 ± 2
switching power	W/VA	max. 10
Maximum load resistance	kΩ	> 20
Temperature range	°C	-25... +75
Enclosure protection	IP	IP 67
Weight	kg	approximately 0,3
Actuation angle	°	± 20°
Mid-position	°	± 2°
Electrical connections	300 mm, 0,50 mm^2, cable; wire ends not tinned	

4.1.2 Dimensions



4.2 Ordering code

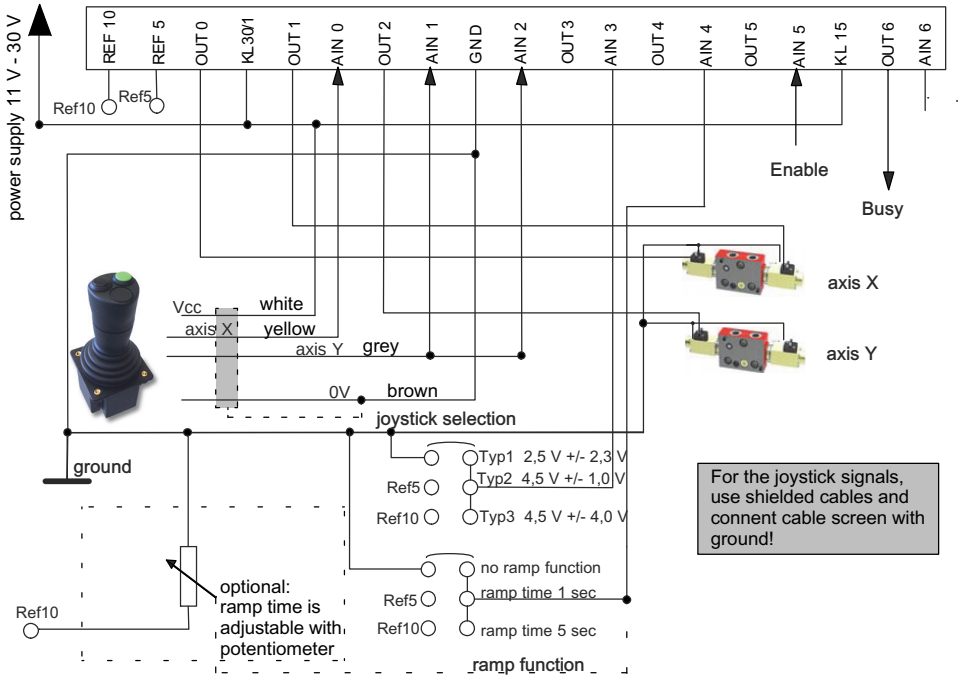
Description	Unit	Ordering code
Style with one-axis gate and knob with 2 push buttons	FGE*-*2-***/J2A7	100031751

4.2.1 Available Electronics

Type	Series	Data sheet	Ordering code
Proportional amplifier	EBM-300308-DS-MOBI	100-P-000146	100034752

4.3 Connection diagram

4.3.1 EBM-300308-DS-MOBI series for 2 axes (see data sheet 100-P-000146)



5 Joystick, FGE... / JS3 Series

5.1 Description

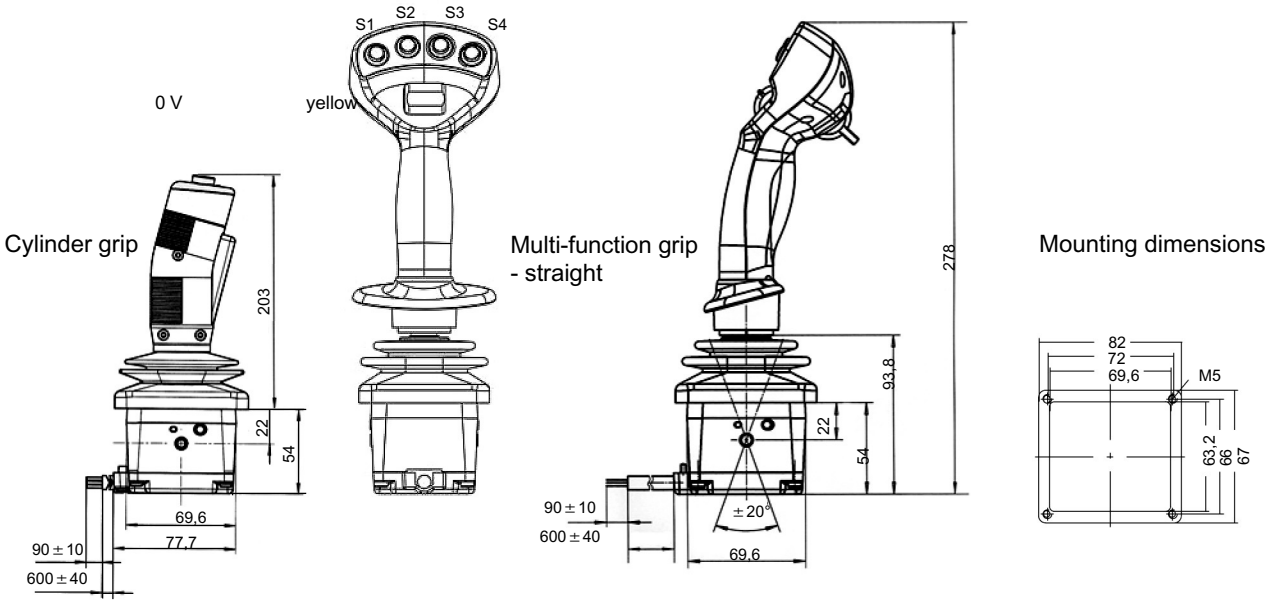
This joystick is an inductive signal source for 2 axes. It is compact and very robust. The handgrip is spring-centred. Error-detection is provided as standard.

- Non-contact position sensing
- Robust Design
- Suits left- or right-handed operation
- Within its temperature range, the joystick is tempera-ture-compensated

5.1.1 Technical data

Description	Unit	Value
Supply voltage	V DC	9 ... 30 (for V_N = 9 V)
Output voltage	V DC	2,5 ± 2 (for V_N = 9 V)
Switch rating - rocker switch	W	3
Maximum load resistance	mA	5
Temperature range	°C	-40 ... +85
Enclosure protection	IP	IP65 to DIN 40050 above the mounting surface
Weight	kg	0.35 without handgrip
Actuation angle	°	± 20°
Mid-position	°	± 2°
Electrical connections	600 mm cable; SUB-D Connector	

5.1.2 Dimensions



5.2 Ordering code

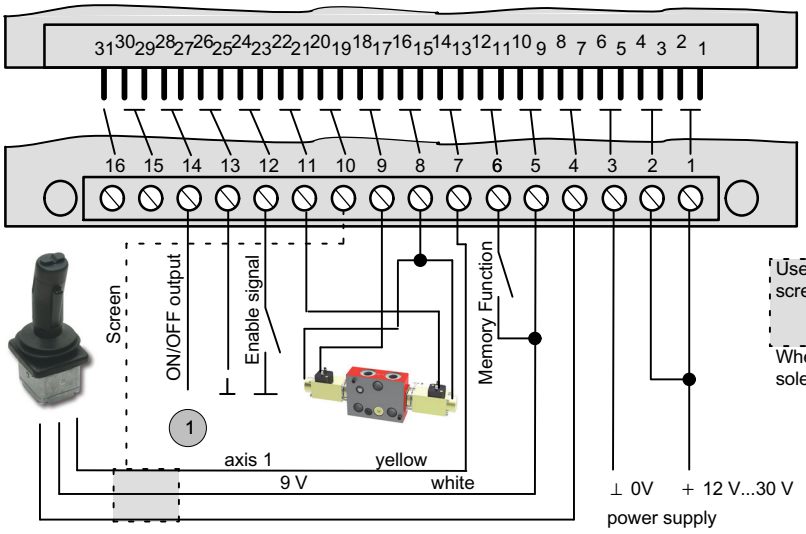
Description	Type	Ordering code
Style with cyl. grip, analogue rocker switch and enabel switch	FGE*-33-G**/JS3	100036914
Style with multi-function grip, 4 buttons, 1 front rocker switch, 1 rear rocker switch	FGE*-MA3HA1VG**/JS3	100031668
Style with with multi-function grip, 4 buttons, 1 front switch	FGE*-MT1V***G**/JS3	100029699

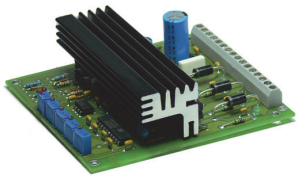
5.2.1 Available Electronics

Type	Series	Data sheet	Range	Ordering code
Plug-in card for 1 axis, potted, with screw terminals	ESSK107-81***/02	100-P-700033	2,5 ± 2 V	100030010
Plug-in card for 1 axis, not potted, with screw terminals	ESSK107 - 91***/02	100-P-700033	2,5 ± 2 V	100027336
Proportional amplifier	EBM-300308-DS-MOBI	100-P-000146		100034752

5.3 Connection diagram

5.3.1 ESSK107 series for 1 axe (see data sheet 100-P-000033)



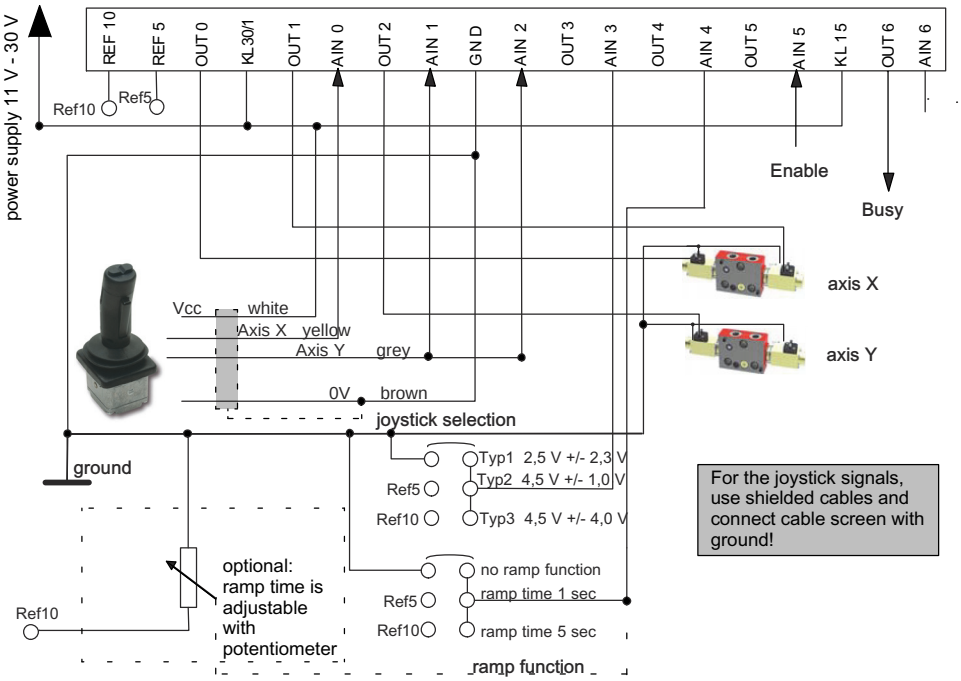


Use screened cable for all demand-signal lines. The screen must be bonded to the power-supply negative.

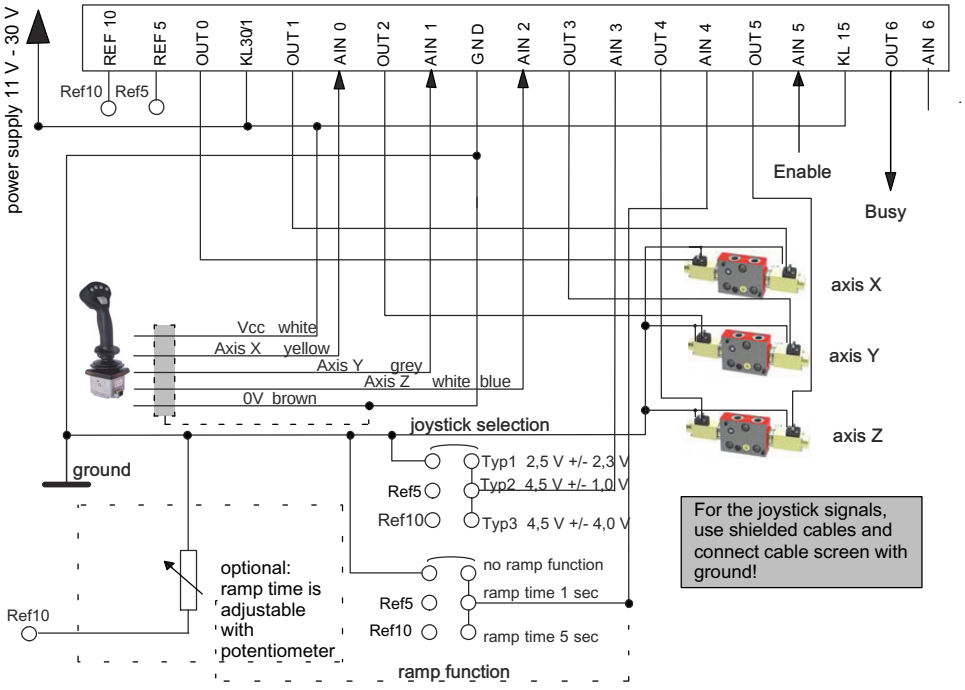
When the pin connector is used, the power supply and the solenoids must be connected using both pins.

1	The ON/OFF signal is output in parallel to the joystick deflection (for both axes), either as a continuous signal or when required.

5.3.2 EBM-300308-DS-MOBI series for 2 axes (see data sheet 100-P-000146)



5.3.3 EBM-300308-DS-MOBI series for 3 axes (see data sheet 100-P-000146)



6 Joystick, FSE-DP2-02/JG0-M4-02

6.1 Description

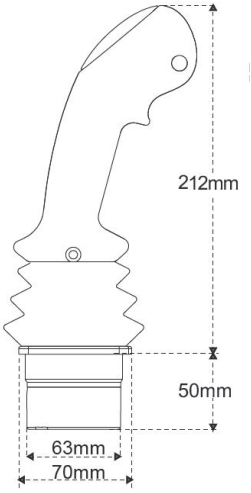
This rugged joystick has been designed for professional use in off-road, construction, agricultural and forestry machines as well as industrial materials-handling trucks. The electronics, which directly control two proportional directional valves by means of PWM, are fully integrated into the joystick.

- Fully on-board electronics
- Direct control of two proportional directional valves and two seat valves
- Four toggle switches and one rocker switch for operating on/off directional valves
- USB interface for configuring the joystick
- Minimal installation space is needed
- Reliable zero position
- Hall-sensor technology

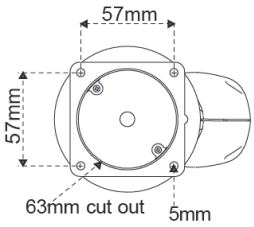
6.1.1 Technical data

Description	Min	Typ.	Max	Unit	Note
Electrical power supply					
Supply voltage	8	-	30	V DC	Reverse-polarity and overvoltage protection up to +/- 48 V DC
Current consumption (standby)	-	20	-	mA	
Current consumption (max.)	-	10	-	A	
PWM output					
Voltage, power output		V_{cc}			Short-circuit protected
Current, power output	0,3	-	2,5	A	
Dither frequency	33	200	400	Hz	
Ramp time	10	100	9999	ms	
Deadband setting	10	10	40	%	Defines the deflection range beyond which the outputs are switched on
Auxiliary output					
Voltage, auxiliary output		V_{cc}	-		For deflection in positive or negative X direction -> $V_{aux} = V_{cc}$
Current, auxiliary output	-	-	2,5	A	
Delay, auxiliary output	0	0	9	sec	
Toggle switch and rocker switch outputs					
Switching current			5	A	If the rocker switch and the the toggle switches on the keypad are used to directly control solenoids or relays, make sure that the solenoids or relays are equipped with suppression diodes.
max. switching operations, mech.			10 m		
max. switching operations, elec.			2.5 m		@ 0.5 A DC
General characteristics					
Plug connection	Sub-D 15-pin				
Protection class	IP 65				
Operating temperature	-40	-	+80	°C	

6.1.2 Dimensions



Mounting dimensions



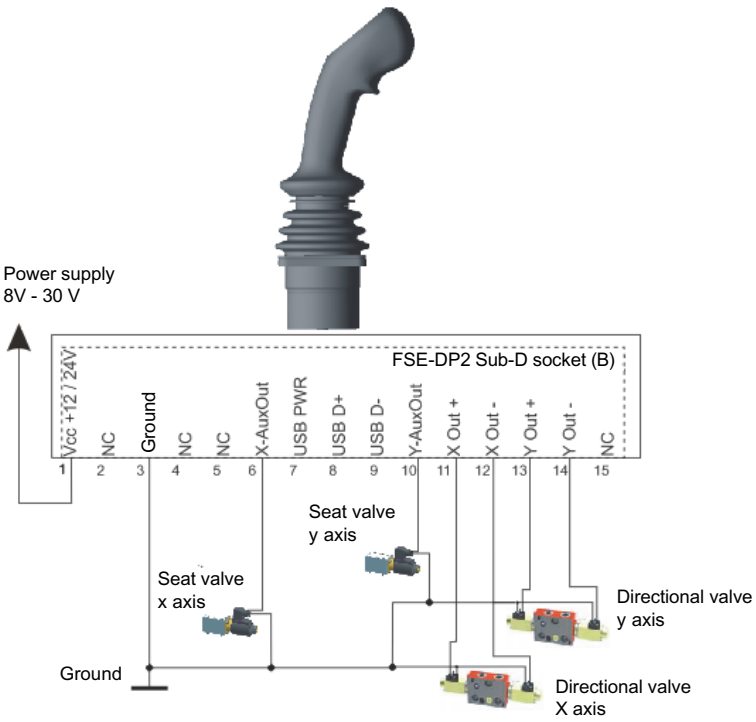
6.2 Ordering code

Description	Type	Ordering code
Style with multi-function grip, 4 front buttons, 1 rear button	FSE-DP2-02/JG0-M4-02	100034394

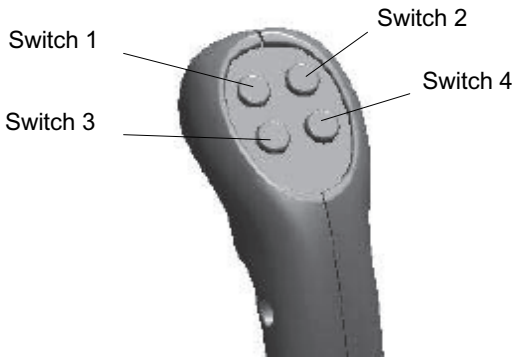
6.2.1 Accessories

Description	Type	Ordering code
Installation kit consisting of configuration cable and software CD	FSE-DP2 INSTALLATIONSKIT	100034672
Serial connection cable (on request)		

6.3 Connection diagram



6.4 Pin assignment



6.4.1 Plug A (male) - switch functions

Pin	Function	Wire colour	Description
1	Common switch connection	red	Common connection for all switches. The total current must not exceed 5 A.
2	Trigger switch	orange	Trigger switch, front (max. 5 A)
3	Switch 1	green	Switch 1 (max. 5 A) (switch, top left)
4	NC	violet	-
5	NC	black	-
6	Switch 3	brown	Switch 3 (max. 5 A) (switch, bottom left)
7	NC	yellow	-
8	Switch 2	blue	Switch 2 (max. 5 A) (switch, top right)
9	NC	grey	-
10	Switch 4	white	Switch 4 (max. 5 A) (switch, bottom right)
11	NC	green/white	-
12	NC	pink	-
13	NC	brown/white	-
14	NC	black/white	-
15	NC	red/white	-

Note. If the rocker switch and the toggle switches on the keypad are used to directly control solenoids or relays, make sure that the solenoids or relays are equipped with suppression diodes.

6.4.2 Socket B (female) - joystick functions

Pin	Function	Wire colour	Description
1	+12/24 V (Sensor 1)	red	Power supply 12 V or 24 V
2	+12/24 V (sensor 2 unused)	green	Unused
3	Ground (sensor 1)	green/white	Ground
4	Ground (sensor 2 unused)	black	Unused
5	NC	white	Unused
6	X Axis Aux Out	violet	Auxiliary output, X axis
7	USB-PWR	brown	USB power supply (only needed for parameterisation)
8	USB-D+	brown/white	USB data line, positive (only needed for parameterisation)
9	USB-D-	pink	USB data line, negative (only needed for parameterisation)
10	Y-Axis Aux Out	blue	Auxiliary output, Y axis
11	X-Axis Out+	orange	Solenoid 1 for the X axis (max. 2.5 A)
12	X-Axis Out-	yellow	Solenoid 2 for the X axis (max. 2.5 A)
13	Y-Axis Out+	black/white	Solenoid 1 for the Y axis (max. 2.5 A)
14	Y-Axis Out-	grey	Solenoid 2 for the Y axis (max. 2.5 A)
15	NC	red/white	Unused

6.5 Parameterisation

The joystick is parameterised via the USB port using the JDBUtility application. A configuration cable is available - Part No. 100034672 (FSE-DP2 installation kit). The JDBUtility application and a guide for configuring the joystick are included on the software CD in the installation kit, or can be obtained directly from Bucher Hydraulics.

7 Joysticks for CAN Bus systems, FCE... /ID Series

7.1 Description

The FCE/ID joystick is a CAN Bus-ready signal source for 2 axes. It is small, compact and robust. The handgrip is spring-centred. Within its temperature range, the joystick is temperature-compensated. Several optional handgrip variants are available.

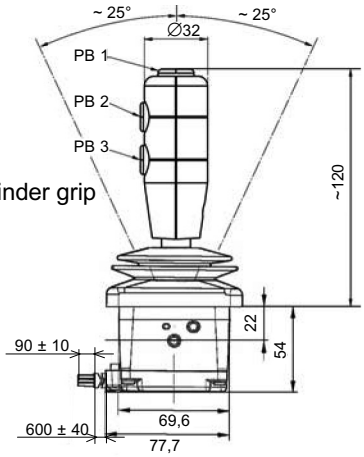
- CAN joystick is driven as a slave on the CAN bus.
- Once the WAKE_UP message is received, the joystick sends its data on a cyclic basis with a fixed cycle time.
- It is small, compact and robust.

7.2 Technical data

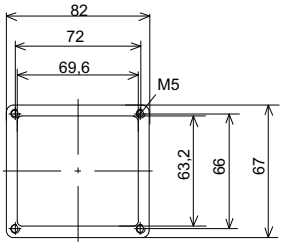
Description	Unit	Value
Supply voltage	V DC	9 ... 30
Temperature range	°C	-40 ... +85
Enclosure protection	IP	IP65 to DIN 40050 above the mounting surface
Weight	kg	0.35 without handgrip
Actuation angle	°	± 20°
Mid-position	°	± 1°
CAN protocol		Basic CAN 2.0 A, 11 bit identifier
Baud rate	kBaud	125
Terminating resistor	Ω	120, fitted as standard
Identifier for joystick WAKE_UP		64h, as standard
Identifier for joystick data (JOYSTICK_DATA)		100h, as standard
Cycle time	ms	50
Electrical connections	600 mm cable; 4 Pin M12 Connector	

7.3 Dimensions

Cylinder grip



Mounting dimensions

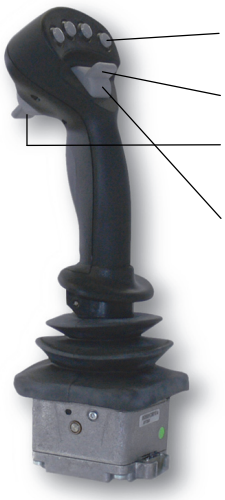


7.3.1 Ordering code

Description	Type	Ordering code
CAN Bus Joystick with cylindric handle, for 2 axes, no gate and 3 buttons. WAKE_UP 064h ≙ Identifier JOYSTICK_DATA 100h = ID64H	FCE*43-G**-JS3 / ID64H CAN2.0A	100028481

7.4 Style with multi function handle

7.4.1 Switch variants



Available rocker switch variants:

1 

With mid-position actuation +/- 30°

3 

7.4.2 Dimensions (see 5.1.2)

7.4.3 Ordering code

Description	Type	Ordering code
CAN Bus Joystick for 2 axes, no gate, 4 buttons and 1 analogue rocker switch as a third axis (version 3, installed horizontaly) in front, 1 rocker switch (version 1, installed verticaly) on the rear side. WAKE_UP 064h ≙ Identifier JOYSTICK_DATA 100h	FCEG-*A3HT1VG**/ID64H	100027803
CAN Bus Joystick for 2 axes, no gate, 4 buttons and 1 analogue rocker switch as a third axes (version 1, installed horizontal) in front, 1 analogue rocker switch (version 1, installed verticaly) on the rear side. WAKE_UP 065h ≙ Identifier JOYSTICK_DATA 100h	FCEG-*A3HT1VG**/ID65H	100027804
CAN Bus Joystick for 2 axes, with gate (+), 4 buttons and 1 analogue rocker switch as a third axis (version 3, installed verticaly) in front, 1 analogue rocker switch (version 1, installed verticaly) on the rear side. WAKE_UP 064h ≙ Identifier JOYSTICK_DATA 100h	FCEG-2A1VA1VG**/ID64H	100027809
CAN Bus Joystick for 2 axes, no gate, 4 buttons and 1 analogue rocker switch as a third axis (version 3, installed vertikaly) in front, 1 analogue rocker switch (version 1, installed verticaly) on the rear side. WAKE_UP 064h ≙ Identifier JOYSTICK_DATA 100h	FCEG-*A3VT1VG**/ID64H	100030178

8 Joysticks for CAN-Bus systems, FCE*-*1A2T*** /J6 CAN OPEN series

8.1 Description

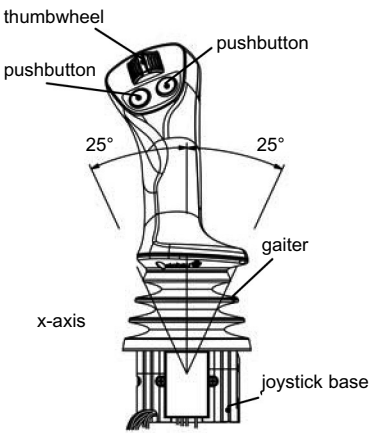
The FCE*-*1A2T*** /J6 joystick is a CAN Bus-ready signal source for 2 axes. The opperating principle is non-contacting with Hall technique.

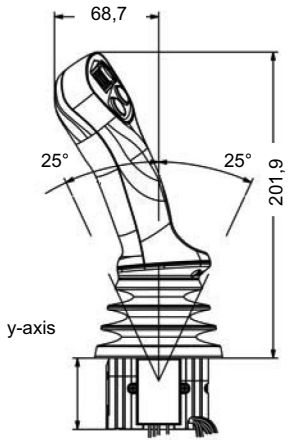
- CAN Bus-ready signal source
- Compact and robust design
- Hall technique
- Reverse voltage protected

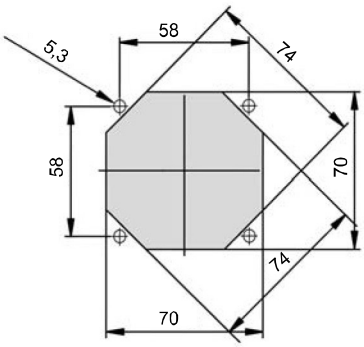
8.2 Technical data

Description	Unit	Value
Supply voltage	V DC	9 ... 36 (for V_N = 9 V)
Temperature range	°C	-25 ... +85
Enclosure protection	IP	IP 67
Weight	kg	1.2
Actuation angle	°	± 25°
Mid-position	°	± 2°
CAN protocol		CAN OPEN, 11 Bit Identifier
Electrical connections	300 mm (± 15 mm) cable; 4 Pin M12 Connector	

8.3 Dimensions







8.4 Ordering code

Description	Type	Ordering code
CAN Bus Joystick for 2 axes, no gate, 2 buttons and 1 analogue rocker switch as a third axis, right handed	FCER-*1A2T*** /J6 CAN OPEN	100031877
CAN Bus Joystick for 2 axes, no gate, 2 buttons and 1 analogue rocker switch as a third axis, left handed	FCEL-*1A2T*** /J6 CAN OPEN	100035992

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9 Joysticks for CAN Bus systems, FCE*-2A5T***/J5 CAN OPEN

9.1 Description

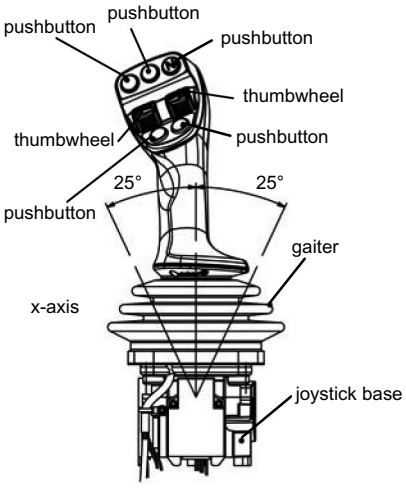
The FCE*-2A5T***/J5 joystick is a CAN Bus-ready signal source for 4 axes. It is compact and robust. The handgrip is spring-centred. Within its temperature range, the joystick is temperature-compensated.

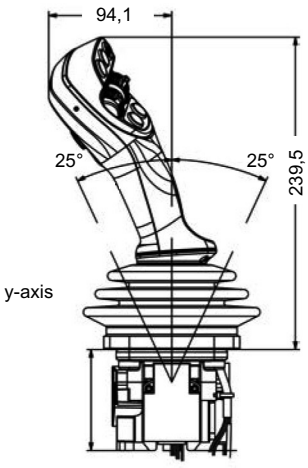
- Hall technique
- Compact and robust design
- Reverse voltage protected

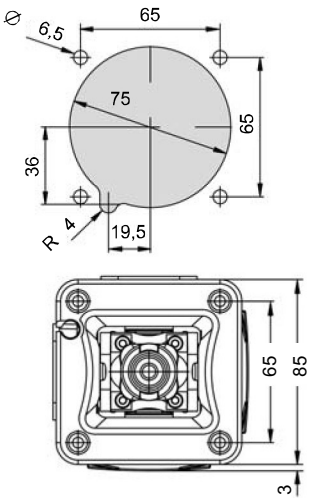
9.2 Technical data

Description	Unit	Value
Supply voltage	V DC	9 ... 36 (for V_N = 9 V)
Temperature range	°C	-25 ... +85
Enclosure protection	IP	IP 67
Weight	kg	2
Actuation angle	°	± 20°
Mid-position	°	± 2°
CAN protocol		CAN OPEN, 11 Bit Identifier
Electrical connections	300 mm (± 15 mm) cable; 4-Pin M12 Connector	

9.3 Dimensions







9.4 Ordering code

Description	Type	Ordering code
CAN Bus Joystick for 4 axes, no gate, 2 analogue rocker switches as a third and a fourth axis.	FCE*-2A5T*** /J5 CAN OPEN	100031878

10 Joysticks for CAN Bus systems, FCE*-T5A1G** /JS3 CAN OPEN

10.1 Description

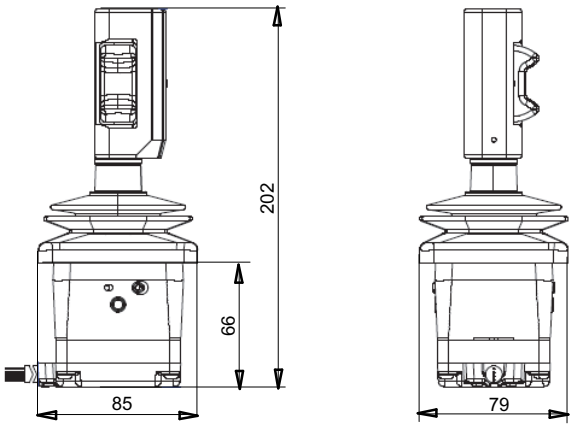
The FCE*-T5A1G**/JS3 joystick is a CAN Bus-ready signal source for 3 axes. It is compact and robust. The handgrip is spring-centred.

- Hall technique
- Compact and robust design
- Reverse voltage protected

10.2 Technical data

Description	Unit	Value
Supply voltage	V DC	8 ... 30 (for V_N = 9 V)
Temperature range	°C	-40 ... +85
Enclosure protection	IP	IP 65
Weight	kg	2
Actuation angle	°	± 20°
Mid-position	°	± 2° / +0,5°
CAN protocol		CAN OPEN, 11 Bit Identifier
Electrical connections	620 mm cable without connector (24 AWG, 0,25mm^2)	

10.3 Dimensions



10.4 Ordering code

Description	Type	Ordering code
CAN Bus Joystick for 3 axes, no gate, right handed	FCER-T5A1G**-JS3	100030293
CAN Bus Joystick for 3 axes, no gate, left handed	FCEL-T5A1G**-JS3	100030294

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11 CAN-Bus System Solution

11.1 The main components of a CAN Bus control system

The CAN-Bus system enables flexible processing of control- ans sensor information; from this information it generates the electrical signals required to control the valves. The entire wiring rerequirement is reduced to a bus cable and a power supply line.

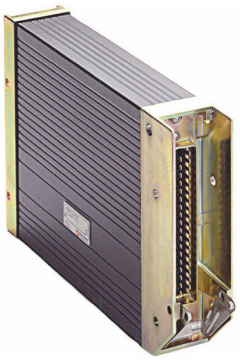
11.2 Advantages

- Increased system satety
- Lower wiring costs resulting from simple cable arrangements
- Greater ease of control
- Range and scopes of functions can be increased at a later date
- Diagnostic programmes
- Modular buid simplifies component replacement

11.3 Applications

The CAN-Bus system solution is used to control electrical acutated valves in mobile hydraulic systems.
Target applications areas include local authority vehicles, harvesting-, forestry- and construction machinery as well as systems for lifting/lowering and boom/mast positioning. In these applications, the positions and speeds (linear, rotary) of hydraulic acutators are controlled in open-and/or closed-loop mode.
With the advantages discribed, the CAN Bus system represents an optimum solution for application-specific drive requirements.

11.4 MasterModule ELMR 223



The ELMR223 master module is used as a controller in Bucher CAN bus systems. The module can have up to 24 power outputs and 16 inputs, some of which are configurable.

- programming to IEC 61131-3
- RS232 serial interface
- CAN-Bus (master) with CANopen protocol
- automatic, and program-controlled, data storage in flash EPROM

Description	Ordering code	Data sheet
Type ELMR223-00*** (without software)	100026514	100-P-700055

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Classification: 470.710.