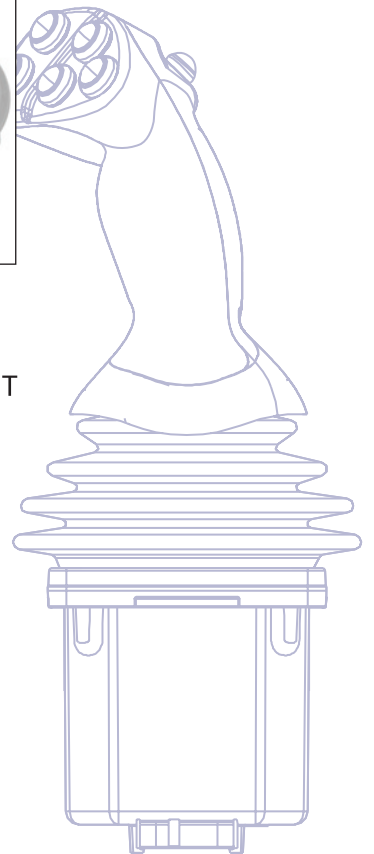
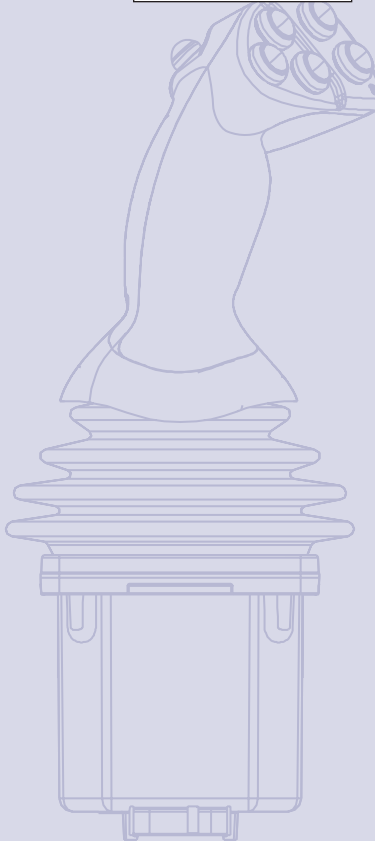
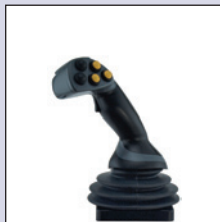




# JS7000 Joystick

## Technical Information



 <sup>TM</sup>  
COMPLIANT

**Revision History***Table of Revisions*

Date	Page	Changed	Rev
02 June 2011	5, 6, 7, 10, 20, 21	Various updates	CA
23 May 2011		Initial release	BA
20 Mar 2011		Not released	AC
19 Mar 2011		Not released	AB
16 Mar 2011		Not released	AA

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**Description**

The JS7000 Joystick features a heavy duty and intuitive design specially developed to meet the harsh operating requirements of today's mobile machines. Dual Hall effect sensing technology ensures reliable long life performance including the most safety critical applications.

The JS7000 ergonomic left-hand and right-hand grip design options enable comfortable and efficient operation for maximum productivity. The vertical grip is a multi-function, ergonomic grip designed for a comfortable human-machine interface with easy-to-use finger tip controls. The grip features a modular design that allows switch and proportional rocker location flexibility.

The JS7000 was designed after extensive research detailing operator needs from live interviews and also in-cab video recording. The JS7000 joystick establishes new industry standards for performance, durability, flexibility and user comfort. The PLUS+1™ Compliant JS7000 is well-suited for off-highway machines including backhoe loaders, skid steer loaders, telehandlers, wheel loaders and dozers.

Designed for serviceability, the JS7000 minimizes down time with easy access for replacing grip functions including the boot.

**Features and Options****Features**

- Hall effect sensing
- Two Hall effect sensors per axis for redundancy
- Dual axis, spring return to neutral
- One centering spring force

**Output Options**

- Analog
- CAN 2.0B, J1939 protocol, including separate analog outputs
- CANopen 2.0B, protocol, including separate analog outputs

**Ergonomic Vertical Grip Options**

- Left hand
- Right hand
- Seven momentary red, black and yellow push-button combinations, plus trigger switch
- Three proportional roller switches, 1 momentary push-button, plus trigger switch

**On Axis Shaft, Deflection Options**

- $\pm 20^\circ$  or  $\pm 25^\circ$

**Product Configuration Model Code**

Use the JS7000 product configuration model code to specify particular features when ordering a JS7000 joystick. The model code begins with the product family name: JS7000. Fill in the remaining fields that are not pre filled to configure the product with the desired features.

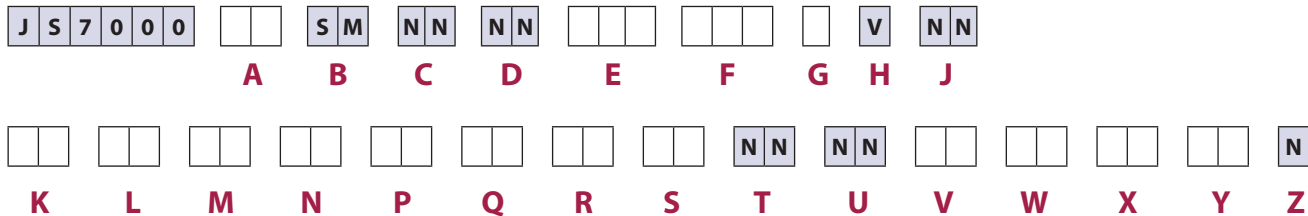
*Base*

Field	Feature
A	Operational Axis Options
B	Mechanical Options and Centering Force
C	X axis detents
D	Y axis detents
E	Electrical output
F	Electrical Interface and Source Address
G	Mounting
H	Boot
J	Special Hardware Features

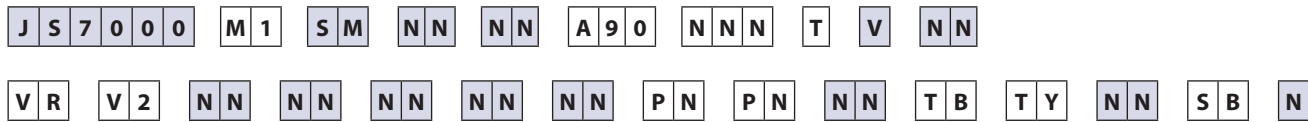
*Grip*

Field	Feature
K	Grip Type
L	Faceplate
M	Switch 1
N	Switch 2
P	Switch 3
Q	Switch 4
R	Switch 5
S	Roller/Rocker 1
T	Roller/Rocker 2
U	Mini-Joystick
V	Switch 6
W	Switch 7
X	Roller/Rocker 3
Y	Switch 8
Z	Operator Present

*JS7000 Joystick Product Configuration Model Code*



*JS7000 Joystick Product Configuration Model Code Example*



**Base Options**



**A** *Operational Axis*

Code	Description
M1	Multi axis: $\pm 20^\circ$
M2	Multi axis: $\pm 25^\circ$

**B** *Mechanical*

Code	Description
SM	Lever operator spring force, 1.5 Nm medium range

**C** *X Axis Force Profile includes spring return, future options*

Code	Description
NN	Standard force profile, result of options A and Option B selection

**D** *Axis Force Profile includes spring return, future options*

Code	Description
NN	Standard force profile, result of options A and Option B selection

**E** *Electrical Output*

Code	Description
A90	Analog 10-90% output (5 Vdc supply)
CAN	CAN 2.0B communication with Analog (redundant X-Y axis outputs)

**F** *Electrical Interface*

Code	Description
NNN	None (used only for non-CAN electrical output options, E0NNN OR E0A)
J90	J1939 protocol, source address 0x90 (144 decimal)
J93	J1939 protocol, source address 0x93 (147 decimal)
J96	J1939 protocol, source address 0x96 (150 decimal)
J9C	J1939 protocol, source address 0x9C (156 decimal)
P90	CANopen protocol, source address 0x90 (144 decimal)
P93	CANopen protocol, source address 0x93 (147 decimal)
P96	CANopen protocol, source address 0x96 (150 decimal)
P9C	CANopen protocol, source address 0x9C (156 decimal)

**Base Options  
 (continued)**

**G** *Mounting*

Code	Description
T	Top mount
U	Top mount with decorative decal

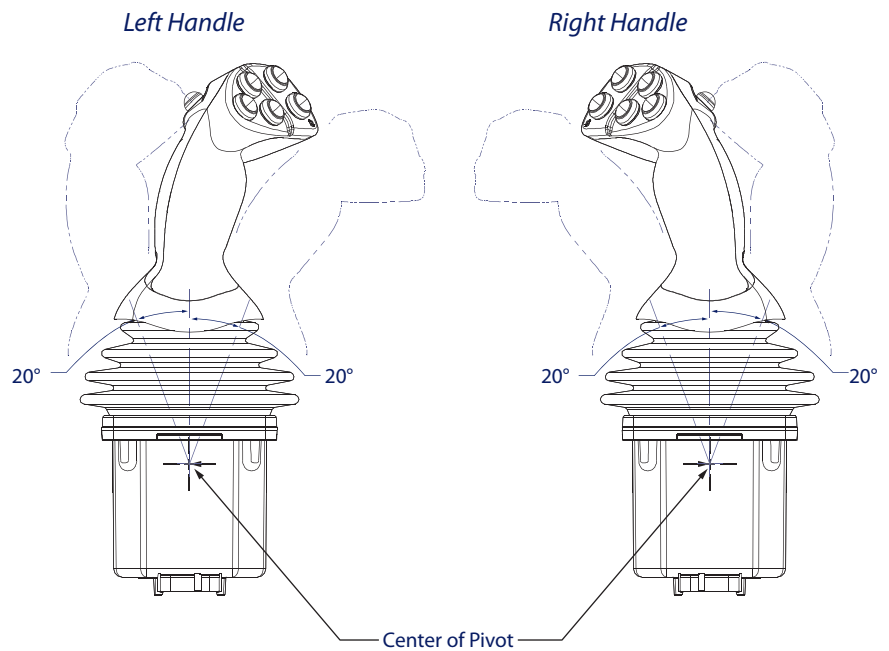
**H** *Boot*

Code	Description
V	Vertical grip boot

**J** *Special Hardware*

Code	Description
NN	Standard

**X and Y Operation or Movement (20° configuration shown)**





P200 069













**Grip Options**

**K** **L** **M** **N** **P** **Q** **R** **S** **T** **U** **V** **W** **X** **Y** **Z**

**K** *Grip Series*

Grip	Code	Description
	VR	Vertical Grip, right hand (grip functions shown are example only)
	VL	Vertical Grip, left hand (grip functions shown are example only)

**L** *Faceplate*

Faceplate	Code	Description
	B0	Blank faceplate
	B1	1 push button (N00**)
	B2	2 push button (N00**) (P00**)
	B3	3 push button (M00**) (N00**) (P00**)
	B4	4 push button (N00**) (P00**) (Q00**) (R00**)
	B5	5 push button (M00**) (N00**) (P00**) (Q00**) (R00**)
	V1	1 roller/rocker (T00**)
	V2	2 roller/rocker (S00**) (T00**)
	AV	1 push button (M00**), 1 roller/rocker (T00**)
	BV	2 push button (Q00**) (R00**), 1 roller/rocker (T00**)
	CV	3 push button (M00**) (Q00**) (R00**), 1 roller/rocker (T00**)
	AZ	1 push buttons (M00**), 2 roller/rocker (S00**) (T00**)



**Grip Options  
 (continued)**

**M** *Switch 1*

Code	Description
NN	None
TB	Black, momentary SPST-NO electro-mechanical pushbutton
TY	Yellow, momentary SPST-NO electro-mechanical pushbutton
TR	Red, momentary SPST-NO electro-mechanical pushbutton

- N** *Switch 2*
- P** *Switch 3*
- Q** *Switch 4*
- R** *Switch 5*

See **M** *Switch 1 Options, choices are the same. (NN, TB, TY, TR).*

**S** *Roller 1*

Code	Description
NN	None
PN	Potentiometer roller

**T** *Roller 2*

Code	Description
NN	None
PN	Potentiometer roller

**U** *Mini Joystick*


Code	Description
NN	None

- V** *Switch 6*
- W** *Switch 7*
- X** *Roller 3*



See **M** *Switch 1 Options, choices are the same. (NN, TB, TY, TR).*

**Y** *Switch 8*

Switch	Code	Description
	NN	None
	SB	Trigger—for use with vertical grip options (K00VR and K00VL)

**Z** *Operator Presence*

Code	Description
N	None

**Analog**

The analog output option gives a direct voltage output from the joystick's shaft sensors, position switches and grip functions. No signal conditioning is performed.

**CAN**

Joysticks CAN J1939 protocol option, designated as model code CAN, broadcasts two J1939 messages to communicate device information: Basic Joystick Message 1 (BJM1) and Extended Joystick Message 1 (EJM1).

The CAN joystick has one fully dedicated CAN channel. The two CAN options available are:

**CAN 2.0B, J1939 Protocol**

The CAN J1939 output option provides conditioned joystick output information in 2.0B, J1939 message protocol.

**CANopen 2.0B, J1939 Protocol**

The CANopen output option provides conditioned joystick output information in 2.0B, CANopen message protocol.

**Additional X and Y  
Analog Outputs**

There are two X axis outputs and two Y axis outputs on the CAN joystick, see [Pin Connections](#), page 19). The outputs are linear with respect to the shaft angle. The two outputs of the same axis are complimentary of each other, as the output voltage of one increases, the output voltage of the second decreases. The voltage output ranges from 0.5 to 4.5 Vdc.

**SAE J1939 CAN Message Specification**

**SAE J1939 Basic Joystick Message**

The JS7000 joystick uses the SAE J1939 basic joystick message to transfer information about the measured status of the X and Y axes of a joystick, the state of switches on the joystick grip, and the state of external-to-the-joystick digital inputs.

*Basic Joystick Message Structure*

Basic message number	Priority	Base PGN		PDU format		PDU specific		Source address		Data field
		Dec	hex	Dec	hex	Dec	hex	Dec	hex	
1	3	64982	FDD6	253	FD	214	D6	*	*	8 bytes
3	3		FDDA		FD		DA	*	*	8 bytes

\* Depends on position specified in master model code.

- Message transmission rate: 20 ms
- CAN bus baud rate: 250kbps

The resulting SAE J1939 basic joystick message PGN on the CAN bus is:

0xCFDD6          or 0xCFDDA           
                   \*                  \*  
 (Note: Brackets under the last two characters of each hex value point to asterisks below.)

\* = joystick source address (hex)

**Data Field**

The data field contains the joystick’s output information. SAE J1939 data fields contain 8 bytes of data.

*Information in the Data Field*

Byte#	0								1								2 and so on							
Bit#	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8

**Basic Joystick Message Data Field Descriptions**

*Basic Joystick Message Parameters and Data Field Locations*

Start position (byte/bit)	Length (bits)	Parameter name
0/1	2	Joystick X-axis neutral position status
0/3	2	Joystick X-axis lever left negative position status
0/5	2	Joystick X-axis lever right positive position status
0/7 through 1/1-8	10	Joystick X-axis position (Byte 0 Bit 7 is LSB. Byte 1 Bit 8 is MSB)
2/1	2	Joystick Y-axis neutral position status
2/3	2	Joystick Y-axis lever back negative position
2/5	2	Joystick Y-axis lever forward positive position
2/7 through 3/1-8	10	Joystick Y-axis position (Byte 2 Bit 7 is LSB. Byte 3 Bit 8 is MSB)
4/5	2	Joystick Y-axis detent position status
4/7	2	Joystick X-axis detent position status
5/1	2	Grip button 4 pressed status
5/3	2	Grip button 3 pressed status
5/5	2	Grip button 2 pressed status
5/7	2	Grip button 1 pressed status
6/1	2	Grip button 8 pressed status
6/3	2	Grip button 7 pressed status
6/5	2	Grip button 6 pressed status
6/7	2	Grip button 5 pressed status
7/1	2	Grip button 12 pressed status
7/3	2	Grip button 11 pressed status
7/5	2	Grip button 10 presses status
7/7	2	Grip button 9 pressed status

*Data Field Examples*

Byte	0							
Bit	8	7	6	5	4	3	2	1
	The 2 LSB* of X-axis position		X-axis lever right positive status		X-axis lever left negative position status		X-axis neutral position status	

\*Least Significant Bit

Byte	1							
Bit	8	7	6	5	4	3	2	1
	MSB* X-axis position							

\*Most Significant Bit

Byte	2							
Bit	8	7	6	5	4	3	2	1
	The 2 LSB* of Y-axis position status		X-axis lever forward positive status		Y-axis lever back negative position status		Y-axis neutral position status	

\*Least Significant Bit

SAE J1939 CAN Message  
 Specification  
 (continued)

Basic Joystick Message Data Field Descriptions (continued)

*Joystick X-axis Neutral Position Status*

Reports when the current joystick position is in the neutral position for the X-axis of travel.

*Information in the Data Field*

Bit status	Remarks
00	Not in neutral position
01	In neutral position
10	Error indicator
11	Not available

*Joystick X-axis Handle Left Negative Position Status*

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for the X-axis.

*Information in the Data Field*

Bit status	Remarks
00	Not on negative side of neutral
01	On negative side of neutral
10	Error indicator
11	Not available

*Joystick X-axis Handle Right Positive Position Status*

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for the X-axis.

*Information in the Data Field*

Bit status	Remarks
00	Not on positive side of neutral
01	On positive side of neutral
10	Error indicator
11	Not available

*Joystick X-axis Position Status*

The position of the joystick in the relative motion of travel from the neutral position. The position value of 0 is always neutral. The output range of the joystick handle at the end of travel is factory set according to the option specified in the *electrical interface options* section of the master model code.

---

The master model code specifies that the full-scale output at the end of each linear zone will be 1000 counts.

---

**Warning**

Potential uncommanded machine movement. Per the SAE J1939-71 standard, if the JS7000 joystick internal diagnostics detect a shaft position measurement error, the joystick output will be set to a value of 1022 counts regardless of shaft position. Application software should be written to recognize this error condition to avoid the possibility of unintended machine motion.

Per the SAE J1939-71 standard, if a specific joystick axis is not available, the basic joystick message for the unavailable axis will indicate an output value of 1023 counts. Application software should be written to recognize this condition to avoid the possibility of unintended machine motion.

---

SAE J1939 CAN Message  
 Specification  
 (continued)

Basic Joystick Message Data Field Descriptions (continued)

*Joystick Y-axis Neutral Position Status*

Reports when the current joystick position is in the neutral position for the Y-axis of travel.

*Information in the Data Field*

Bit status	Remarks
00	Not in neutral position
01	In neutral position
10	Error indicator
11	Not available

*Joystick Y-axis Handle Back Negative Position Status*

Reports when the current joystick position is on the negative travel side (back, left, counterclockwise, down) relative to the neutral position for the Y-axis.

*Information in the Data Field*

Bit status	Remarks
00	Not on negative side of neutral
01	On negative side of neutral
10	Error indicator
11	Not available

*Joystick Y-axis Handle Forward Positive Position Status*

Reports when the current joystick position is on the positive travel side (forward, right, clockwise, up) relative to the neutral position for the Y-axis.

*Information in the Data Field*

Bit status	Remarks
00	Not on positive side of neutral
01	On positive side of neutral
10	Error indicator
11	Not available

*Joystick Y-axis Position Status*

The position of the joystick in the relative motion of travel from the neutral position. The position value of 0 is always neutral. The output range of the joystick handle at the end of travel is factory set according to the option specified in the *electrical interface options* section of the master model code.

---

The master model code specifies that the full-scale output at the end of each linear zone will be 1000 counts.

---

**⚠ Warning**

Potential uncommanded machine movement. Per the SAE J1939-71 standard, if the JS7000 joystick internal diagnostics detect a shaft position measurement error, the joystick output will be set to a value of 1022 counts regardless of shaft position. Application software should be written to recognize this error condition to avoid the possibility of unintended machine motion.

Per the SAE J1939-71 standard, if a specific joystick axis is not available, the basic joystick message for the unavailable axis will indicate an output value of 1023 counts. Application software should be written to recognize this condition to avoid the possibility of unintended machine motion.

---

*Joystick Button 1-8 Pressed Status*

Bit status	Remarks
00	Button not pressed
01	Button pressed
10	Error indicator
11	Not available (no button installed)

**SAE J1939 CAN Message Specification (continued)**

**SAE J1939 Extended Joystick Message**

The JS7000 joystick uses the SAE J1939 extended joystick message to transfer information about the measured status of up to 3 additional proportional input functions on the joystick grip, and external-to-the-joystick analog inputs. The joystick base X and Y-axis information is available in the basic joystick message. The extended joystick message structure is as follows:

*Extended Joystick Message Structure*

Extended message number	Priority	Base PGN		PDU format		PDU specific		Source address		Data field
		Dec	hex	Dec	hex	Dec	hex	Dec	hex	
1	3	64983	FDD7	253	FD	215	D7	*	*	8 bytes
3			FDDB		FD		DB	*	*	8 bytes

\* Depends on position specified in master model code.

- Message transmission rate: 20 ms
- CAN bus baud rate: 250kbps

The resulting SAE J1939 basic joystick message PGN on the CAN bus is:

0xCFDD7          or 0xCFDDB           
                   \*  \*

\* = joystick source address (hex)

*Extended Joystick Message Parameters and Data Field Locations*

Start position (byte/bit)	Length (bits)	Parameter name
0/1	2	Grip X-axis neutral position status
0/3	2	Grip X-axis lever left negative position status
0/5	2	Grip X-axis lever right positive position status
0/7 through 1/1-8	10	Grip X-axis position
2/1	2	Grip Y-axis neutral position status
2/3	2	Grip Y-axis lever back negative position
2/5	2	Grip Y-axis lever forward positive position
2/7 through 3/1-8	10	Grip Y-axis position
6/5	2	Grip Y-axis detent position status-not available
6/7	2	Grip X-axis detent position status-not available

Data field descriptions and output ranges for extended joystick messages are similar to those for base X and Y-axis basic joystick messages.

*Grip Proportional Input Naming Convention*

Proportional input location	Extended joystick message designation
Horizontal orientation, top	Y-axis
Horizontal orientation, bottom	X-axis
Vertical orientation, left side	X-axis
Vertical orientation, right side	Y-axis

**SAE J1939 CAN Message Specification (continued)**

**SAE J1939 Error (DM1) Messages**

SAE J1939 DM1 error messages are supported by JS7000 software. See the tables below for SPN and FMI information.

*Failure: Voltage Too High*

Message	Axis	SPN	FMI
BJM1	X	2660	3
BJM1	Y	2661	3
BJM1	Grip X	2662	3
BJM1	Grip Y	2663	3
BJM1	Grip Theta	2664	3

*Failure: Voltage Too Low*

Message	Axis	SPN	FMI
BJM1	X	2660	4
BJM1	Y	2661	4
BJM1	Grip X	2662	4
BJM1	Grip Y	2663	4
BJM1	Grip Theta	2664	4

*Failure: Input Not Calibrated*

Message	Axis	SPN	FMI
BJM1	X	2660	13
BJM1	Y	2661	13
BJM1	Grip X	2662	13
BJM1	Grip Y	2663	13
BJM1	Grip Theta	2664	13

*Failure: Redundant Input Failure*

Message	Axis	SPN	FMI
BJM1	X	2660	14
BJM1	Y	2661	14
BJM1	Grip X	2662	14
BJM1	Grip Y	2663	14
BJM1	Grip Theta	2664	14

*Sensor Power Fault (CAN+ Only)*

Message	Power Fault	SPN	FMI
	Sensor power too high	3509	3
	Sensor power too low	3509	4

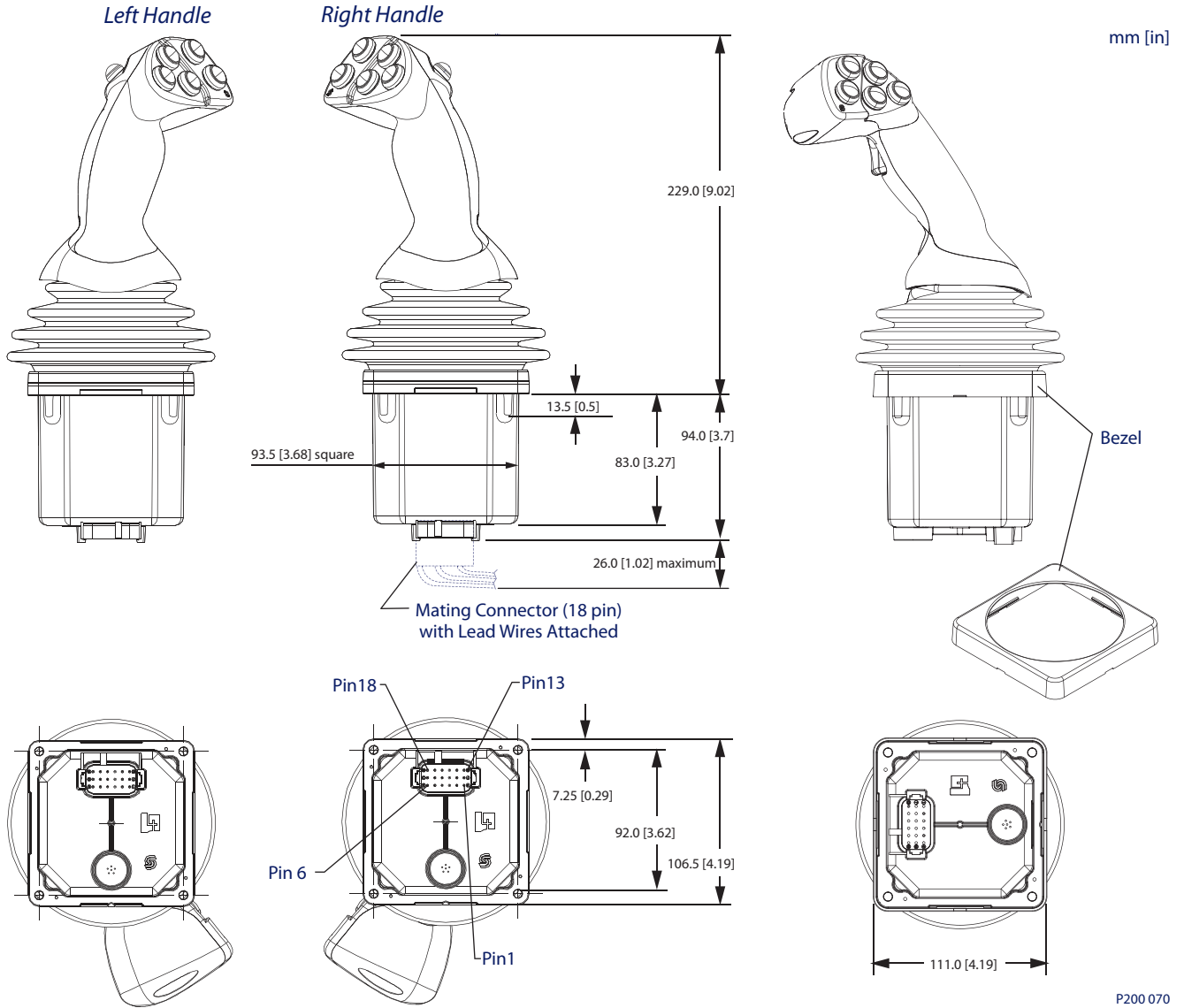
**SAE CANopen Protocol Information**

JS7000 joysticks do not support SAE J1939 dynamic addressing, since the joystick source addresses are hard-coded (static). However, JS7000 joysticks are compliant with SAE J1939 address claiming protocol (in the unlikely event another node on the SAE J1939 bus claims an identical source address to the JS7000, the JS7000 *may* cease communication on the bus, depending on the message priority of the other node).

When you want to use CANopen Joystick, go to <http://www.sauer-danfoss.com/Products/MobileElectronics/Joysticks/index.htm>, and click on CANopen EDS to open CANopen Object Dictionary

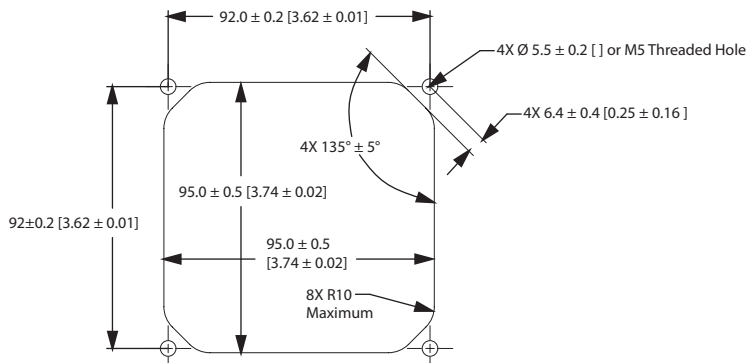


**Dimensions**



**Mounting Panel**

The JS7000 is designed to be installed from the mounting panel through a  $95.0 \pm 0.5$  ( $3.75 \pm 0.02$ ) diameter hole.



The mounting flange of the JS7000 should be connected to the vehicle chassis ground.

### Joystick Safety

---

For a system to operate safely it must be able to differentiate between commanded and uncommanded inputs. Take steps to detect and manage joystick and system failures that may cause an erroneous output.

For safety critical functions Sauer-Danfoss recommends you use an independent momentary action *system enable* switch. You can incorporate this switch into the joystick as an *operator presence* switch or can be a separate foot or hand operated momentary switch. Disable all joystick functions that the joystick controls when this switch is released.

Ensure the control system looks for the appropriate *system enable* switch input before the joystick is displaced from its neutral position. Enable functions only after receiving this input.

Applications using CAN joysticks should continuously monitor for the presence of the CAN messages on periodic basis. Messages are to be checked frequently enough for the system or operator to react if the CAN messages lose priority or are no longer received.

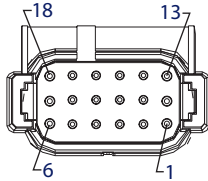
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### Wiring Recommendations

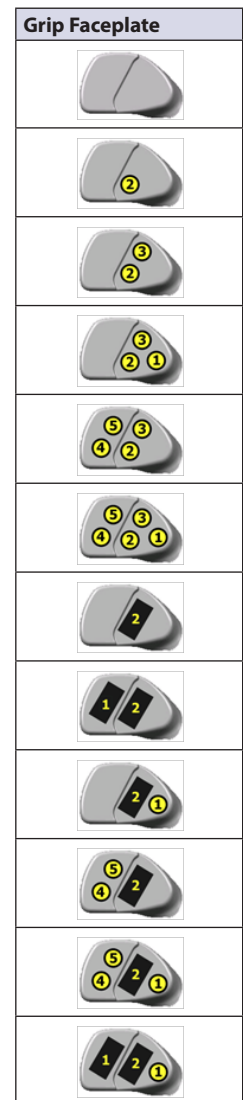
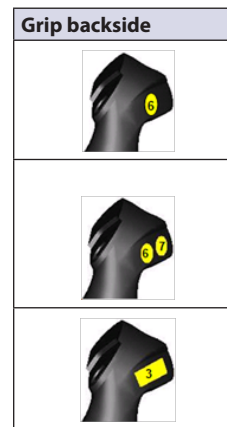
- Protect all wires from mechanical abuse.
- Use 85°C [185°F] wire with abrasion resistant insulation.
- Use a wire gauge that is appropriate for the joystick electrical mating connector.
- Separate high current wires such as feeds to solenoids, lights, alternators, or fuel pumps from control wires. Recommended minimum separation is 300 mm [11.8 in].
- Run wires along the inside of or close to metal machine frame surfaces where possible. This simulates a shield which minimizes the effects of EMI/RFI radiation.
- Do not run wires near sharp metal corners. Run wires through grommets when rounding a corner.
- Provide strain relief for all wires.
- Avoid running wires near moving or vibrating components.
- Avoid long, unsupported wire spans.
- All sensors have dedicated wired power sources and ground returns: use them.
- Twist sensor lines about one turn every 100 mm [3.94 in].
- Use wire harness anchors that will allow wires to float with respect to the machine frame rather than rigid anchors.
- The mounting flange of the joystick base should be electrically connected to the machine reference ground plane.

### Pinout

18 pin Deutsch® connector (DRC23-18SA)



P200 065



### Analog Pinout

Pin number	Signal name
1	Battery Ground
2	+5V
3	Proportional1
4	Proportional2
5	Proportional3
6	Proportional4 (future option)
7	Digital1
8	Digital2
9	Digital3
10	Digital4
11	Digital5
12	Digital6
13	Digital7
14	Digital8
15	Proportional Y Axis 1
16	Proportional X Axis 1
17	Proportional Y Axis 2
18	Proportional X Axis 2

### CAN Pinout

Pin number	Signal name
1	Battery Ground
2	Battery Power
3	CAN Hi
4	CAN Lo
5	CAN Shield
6	Not Connected
7	Reference Ground
8	Reference +5V
9	Not Connected
10	Not Connected
11	Not Connected
12	Not Connected
13	Not Connected
14	Not Connected
15	Proportional Y Axis 1
16	Proportional X Axis 1
17	Proportional Y Axis 2
18	Proportional X Axis 2

Digital = Buttons and Switch

Proportional = Roller

### Analog Grip Pinout Connections Example

<b>Pin 7</b>	Digital1	Faceplate push-button 1
<b>Pin 12</b>	Digital6	Back side push-button 6
<b>Pin 14</b>	Digital8	Trigger switch
<b>Pin 3</b>	Proportional1	Face plate proportional 1
<b>Pin 5</b>	Proportional3	Back side proportional 3

### CAN Minimum Pinout Connections Example

<b>Pin 1</b>	Battery Ground
<b>Pin 2</b>	Battery Power
<b>Pin 3</b>	CAN Hi
<b>Pin 4</b>	CAN Lo
<b>Pin 5</b>	CAN Shield

**Mating Connector**

The mating connector is the Deutsch® DT16-18SB-K004. Sauer-Danfoss provides mating connector kits (bag assemblies) for JS7000 joysticks. The bag assembly contains loose parts you must assemble. The connector with wire harness features a fully assembled connector with an unterminated wire harness.

*Mating Connector Parts List*

<b>18 Pin Deutsch® Connector</b>	<b>Quantity</b>	<b>Ordering Number</b>
Connector	1	Deutsch, DT16-18SB-K004
Terminal (16 to 18 AWG)	18	Deutsch, 0462-201-1631
Sauer-Danfoss mating connector kit	1	11012648
Sauer-Danfoss mating connector with 400 mm (15.75 in) wire harness	1	11012646

**Electrical  
 Characteristics**

<b>Sensor type</b>	Hall Effect with redundant sensors	
<b>Resolution</b>	Infinite	
<b>Supply voltage (Vs)</b>	Analog: 5 ± 0.5 Vdc CAN with redundant analog outputs: 9 to 60 Vdc	
<b>Output</b>	Analog: 0.5 to 4.5 Vdc Minimum output voltage: 10% ± 4% Vs Center voltage: 50% ± 2% Vs Maximum output voltage: 90% ± 4% Vs CAN: 2.0 B, J1939 and CANopen protocols	
<b>Maximum current consumption</b>	<b>Base</b>	Analog output: 45 mA
	<b>Base</b>	CAN output: 120 mA at 9 V
<b>Maximum survival supply voltage</b>	<b>Base</b>	30 Vdc
<b>Maximum current draw</b>	<b>Base</b>	45 mA

**Mechanical  
 Characteristics**

<b>Lever mechanical angle</b>	± 20°
	± 25°
<b>Lever operating torque</b>	Medium: 0.8 Nm
<b>Operating life (on each axis)</b>	> 15 million cycles
<b>Weight (base without grip)</b>	725 G (1.8 lb)
<b>Horizontal load maximum (125 mm from the pivot)</b>	1335 N (300 lbs)
<b>Vertical load maximum</b>	6000 N (1350 lbs)

**Environmental  
 Parameters**

<b>Operating temperature</b>	-40° C to 85° C (-40° F to 185° F)	
<b>Storage temperature</b>	-55° C to 85° C (-67° F to 185° F)	
<b>Ingress protection (IP) rating</b>	IP 67 above and below panel	
<b>Push-button and trigger configuration</b>		
<b>Proportional roller</b>		
<b>EMI/RFI rating</b>	150 V/m	
<b>Random vibration</b>	<b>Level 2</b>	7.67 Grms
<b>Shock</b>	<b>Level 1</b>	50 g 11 ms
<b>Bump</b>	<b>Level 2</b>	40 g 6 ms

**Grip  
 Characteristics**

*Push Button and Trigger Configuration*

<b>Switch action</b>	Momentary
<b>Switch type</b>	Single pole, NO
<b>Contact rating</b>	200 mA at 50 Vdc - person present switch 100 mA at 50 Vdc - top and front plate switches
<b>Contact resistance</b>	50 MΩ maximum
<b>Mechanical life</b>	1 million cycles
<b>Ingress protection (IP) rating</b>	IP 67 above and below panel

*Proportional Roller Specifications*

<b>Roller action</b>	Spring return to center
<b>Roller electrical output</b>	±1000 counts from null
<b>Roller mechanical life</b>	3 million cycles
<b>Ingress protection (IP) rating</b>	IP 43 in cab use only

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Proportional rollers are not to be used in no cabin or open cabin joystick applications.

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JS7000 Joystick  
Technical Information  
Notes



- Bent Axis Motors
- Closed Circuit Axial Piston Pumps and Motors
- Displays
- Electrohydraulic Power Steering
- Electrohydraulics
- Hydraulic Power Steering
- Integrated Systems
- Joysticks and Control Handles
- Microcontrollers and Software
- Open Circuit Axial Piston Pumps
- Orbital Motors
- PLUS+1™ GUIDE
- Proportional Valves
- Sensors
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