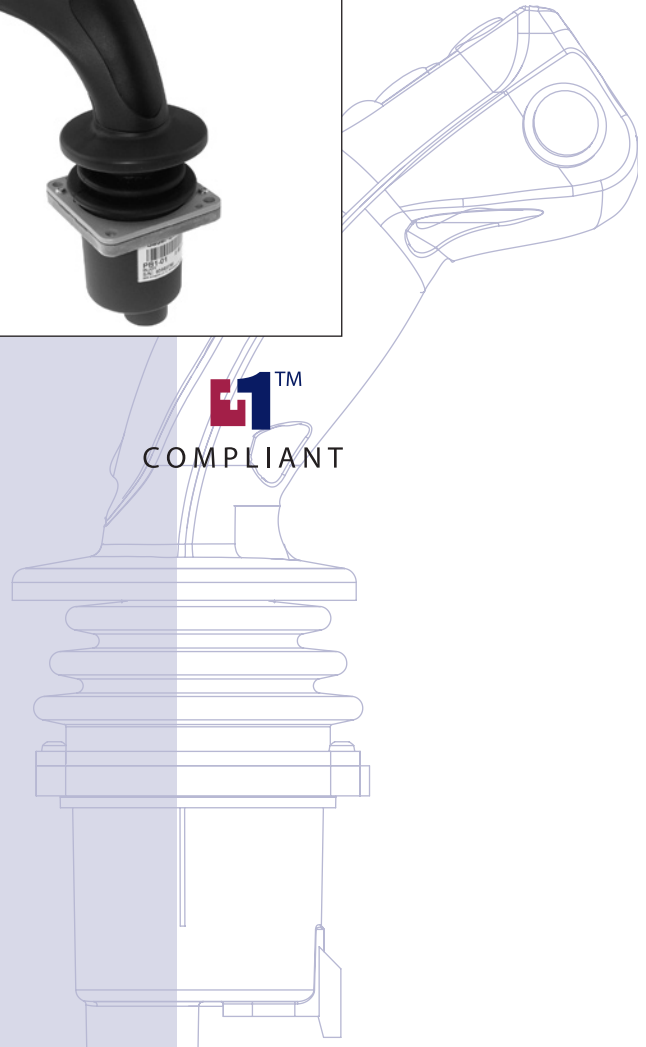
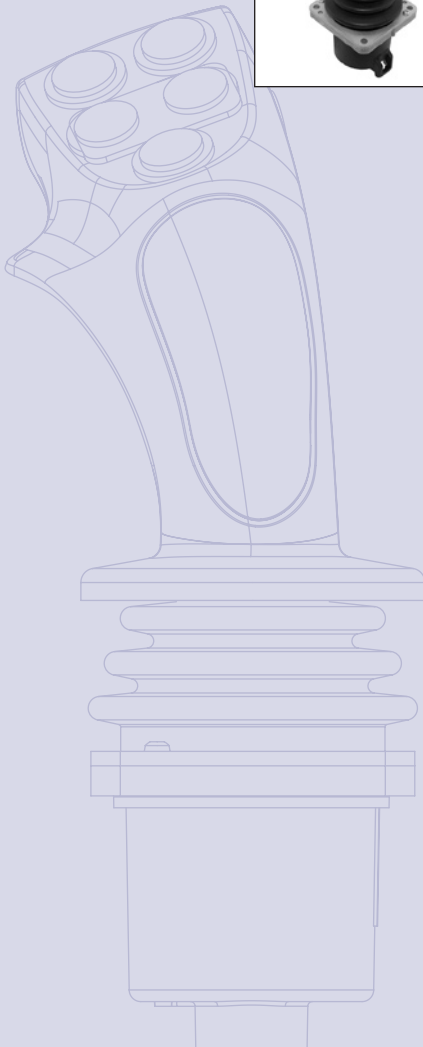




# JS1000 Joystick Base

## Technical Information



COMPLIANT

**Revision History**

*Table of Revisions*

Date	Page	Changed	Rev
18 Nov, 2010	8, 23	PRO grip is only available in a top mount configuration. Supply voltage is 9 to 32 Vdc.	GA
29 Mar, 2010	5, 8, 11, 23, various	Grip options, SAE J1939 CAN Message Specification, Electrical and Environmental Characteristics, formatting	FA
05 Mar, 2010	5—7, 17—20, 22	Features, model code, dimension drawings	EA
14 Sep, 2007	Various	Standard CAN option information added; revised CAN Message Protocol section; and various specifications revised	DA
12 Dec, 2005	9, 23	Pro grip side switch color table and Repair section	C
28 Nov, 2005	Various	Feature updates	B
27 Jul, 2005	Various	Content revised	A
17 Dec, 2004		First edition	

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### Product Overview

Together with its family of associated grips, the JS1000 joystick base is a high-reliability operator input device for controlling mobile machine work functions. The joystick is available in single axis spring-centered and dual axis spring-centered configurations. Both versions are available with the standard ergonomic PRO grip, ball grip, grip with integral Hall effect sensor rocker switch, and grip with integrated hall effect banana switch. The JS1000 is ideally suited for low clearance and armrest mounting and it withstands the most punishing mobile machine applications.

High reliability is the product design goal for the JS1000. It is resistant to the extremes of temperature, shock, vibration and EMI/RFI typically found in mobile machine operating environments. The non-contact Hall effect technology and low part count eliminates many of the failure modes associated with traditional joystick technology. The JS1000 design has been tested to 10 million cycles per axis with no indication of bearing or boot wear and no degradation of electrical performance.

This technical manual describes the many features you can select to configure the right product for your application.

### *JS1000 Joystick*



F101419

### Features and Options

- Non-contacting Hall effect sensing
- Available redundant sensing per axis for CAN output configurations
- Single or dual axis
- X-Y axis guided
- Spring return-to-center
- Two centering spring options
- Operating life exceeding 10 million cycles per axis
- Three electrical output options:
  - CAN 2.0B, SAE J1939 message protocol
  - 0.5 to 4.5 Vdc (nominal)
  - CAN 2.0B, CANopen protocol
- IP-67 environmental rating above panel, grip dependent. IP-67 below panel with vent plug installed
- EMI/RFI protected to 100 V/m
- Stable null
- Factory calibrated output range
- Low power consumption
- Multiple grip options:
  - Plain ball grip
  - Grip with *rocker* switch
  - Grip with *banana* switch
  - PRO grip

### Theory of Operation

The JS1000 base uses non-contacting Hall effect sensor technology to detect and transmit handle position. A spherical permanent magnet is attached to the base of the JS1000 shaft. This magnetic ball produces a magnetic field aligned with the Z-axis. Two programmable, temperature-compensated Hall effect sensors are positioned 90° from one another along the X and Y axes of the magnetic ball. They are aimed perpendicular to each other and the Z-axis. Movement of the joystick grip and the attached magnetic ball alters the magnetic field sensed by the Hall effect sensors, causing their electrical output to change. The output changes are proportional to changes in magnetic field caused by shaft movement. This electronic design yields a linear relationship between joystick shaft position and signal output, with no hysteresis and a stable null over the entire range of shaft displacement.

The programmable Hall effect sensors allow factory calibration of device null, gain, temperature coefficient and output voltage range. The joystick analog outputs are clamped to a nominal range of 0.5 Vdc to 4.5 Vdc. Any voltage outside that range can be assumed to be an invalid signal.

The two grip-with-switch options that are available with the JS1000 base feature a return to center Hall effect sensor rocker switch. The output range is nominally 23% to 77% of supply voltage. The output of the rocker switch can be used for state sensing (on-off) or for use as a proportional output.

**Product Configuration  
 Model Code**

Use the JS1000 product configuration model code to specify particular features when ordering a JS1000 joystick. The model code begins with the product family name: JS1000. Fill in the remaining fields to configure the product with the desired features.

*Product Configuration Model Code Example*

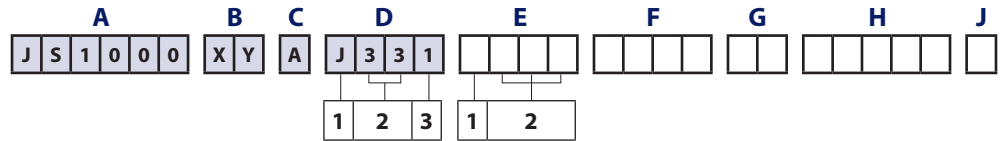
J	S	1	0	0	0	X	Y	A	J	3	3	1	T	P	R	O	R	3	R	L	R	Y	Y	N	R	N	G	N
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Where:

- XY** = Multi-axis movement
- A** = Standard spring
- J331** = CAN output with SAE J1939 message protocol, 33 (hex) source address, 1000 counts output range
- J33B** = CAN output with SAE J1939 message protocol, 33 (hex) source address, 1000 counts output range, redundant sensor
- TPRO** = Top Mount, PRO Grip
- R3RL** = Right hand grip, 3 buttons, 1 Roller on the Left
- RY** = Right hand grip with Yellow side switch
- YNRNG** = Button 1 = Yellow,  
 Button 2 = None,  
 Button 3 = Red,  
 Button 4 = None,  
 Button 5 = Grey
- N** = No operator presence switch

**Base Model Code**

JS1000 Product Configuration Model Code Example – **Base Part - A, B, C, and D**



**A Product Family**

Code	Description
JS1000	JS1000 joystick base with Deutsch® connector, spring return-to-center

**B Single or Dual Axis**

Code	Description
XY	Dual axis function, forward and reverse with left and right, with guided axis (force increases in the corners)
NY	Single axis function, forward and reverse

**C Center Return Spring**

Code	Description
A	Standard spring
B	Heavy spring

**D1 Electrical Interface Options**

Code	Description
J	CAN 2.0B, SAE J1939 message protocol
P	CAN 2.0B, CANopen protocol
S	Analog voltage output

**D2 CAN Source Address\***

Code	Description
NN	None—use with analog outputs when D1 = S
33	Source address = 0x 33
34	Source address = 0x 34
35	Source address = 0x 35
36	Source address = 0x 36

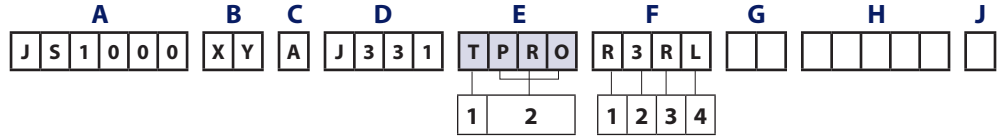
\* Factory set CAN source addresses and node IDs can be changed using the PLUS+1™ service tool.

**D3 Joystick Output Type**

Code	Description
N	None—use with analog output (when D1=S)
1	CAN full scale output = 1000 counts
B	CAN full scale output = 1000 counts, redundant sensor

**Grip Model Code**

*JS1000 Product Configuration Model Code Example – Base Part - E*



PRO grip is only available in a top mount configuration.

**E1 Grip Mounting Options**

Code	Description
B	Bottom mount (from below the panel, no boot retainer included, boot is captured between panel and housing) with IP-67 vent plug*
C	Bottom mount (from below the panel, no boot retainer included, boot is captured between panel and housing) without IP-67 vent plug*
T	Top mount (from above the panel, includes boot retainer for attaching boot to joystick housing) with IP-67 vent plug*
U	Top mount (from above the panel, includes boot retainer for attaching boot to joystick housing) without IP-67 vent plug*

\*IP-67 vent plug is a Gor-Tex® moisture barrier. If the plug is not present, IP below the base is unrated.

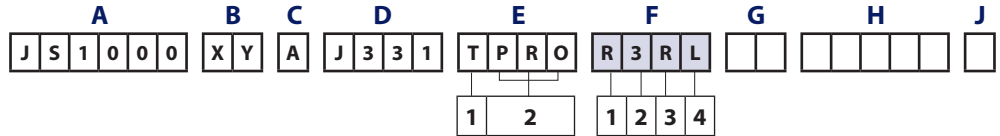
**E2 Grip Mounting and Handle Options**

Code	Description
PRO	PRO grip, CAN output. Complete section F, G, H, J
PR1	PRO grip, with no switch or proportional functions, CAN output
K01	Ball grip Do not complete F, G, H, J
LSW	Grip with rocker switch, 1.15 to 3.85 Vdc range (analog joystick) or On/Off switch (CAN joystick). Do not complete F, G, H, J
LSB	Grip with banana switch, 1.15 to 3.75 Vdc range (analog joystick) or On/Off switch (CAN joystick). Do not complete F, G, H, J
PSW	Grip with rocker switch CAN only. Proportional output representing voltage: 0 to 1000 CAN Counts = 0 to 5 Vdc. No fault checking available.
PSB	Grip with banana switch. CAN only. Proportional output representing voltage: 0 to 1000 CAN Counts = 0 to 5 Vdc. No fault checking available.



**Grip Model Code  
 (continued)**

*JS1000 Product Configuration Model Code Example – Base Part - F*



PRO grip available with CAN option only. Plain grip and grip-with-switch options are available with either analog or CAN output.

**F1 PRO Grip Function Layout**

Code	Description
R...	Right-handed grip
L...	Left-handed grip

**F2 PRO Grip Function Layout**

Code	Number of switches on the front plate
.0..	No switches
.1..	1 switch
.2..	2 switches
.3..	3 switches
.4..	4 switches
.5..	5 switches

**F3 PRO grip function layout**

Code	Type of proportional function
..R.	Roller or wheel, not sealed
..P.	Proportional grip function, sealed
..N.	None

**F4 PRO Grip Function Layout**

Code	Position of proportional function
...N	No proportional function
...R	Vertical proportional function on the Right-hand side
...L	Vertical proportional function on the Left-hand side
...B	Horizontal proportional function on the Bottom
...D	Dual vertical proportional functions (on both the left and the right-hand sides)
...S	Stacked horizontal proportional functions as dual set on the top and the bottom
...T	Horizontal proportional function on Top

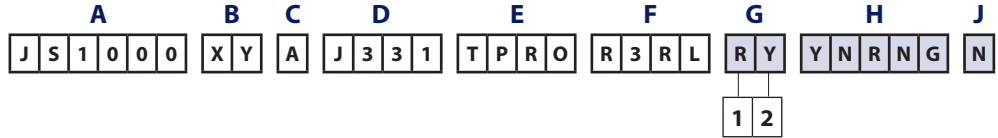
**F Grip Function Layout Examples**

Code	Description
R0NN	Right handed, 0 switches, No roller, No position
R1NN	Right handed, 1 switches, No roller, No position
R2NN	Right handed, 2 switches, No roller, No position
R3NN	Right handed, 3 switches, No roller, No position
R4NN	Right handed, 4 switches, No roller, No position
R5NN	Right handed, 5 switches, No roller, No position
R0RR	Right handed, 0 switches, Roller, Right positioned
R1RR	Right handed, 1 switches, Roller, Right positioned
R2RR	Right handed, 2 switches, Roller, Right positioned
R3RR	Right handed, 3 switches, Roller, Right positioned
R0RL	Right Handed, 0 switches, Roller, Left positioned
R1RL	Right Handed, 1 switches, Roller, Left positioned

Code	Description
R2RL	Right handed, 2 switches, Roller, Left positioned
R3RL	Right handed, 3 switches, Roller, Left positioned
R0RB	Right handed, 0 switches, Roller, Bottom positioned
R1RB	Right handed, 1 switches, Roller, Bottom positioned
R2RB	Right handed, 2 switches, Roller, Bottom positioned
R3RT	Right handed, 3 switches, Roller, Top positioned
R0RD	Right handed, 0 switches, 2 Roller, Dual positioned
R1RD	Right handed, 1 switches, 2 Roller, Dual positioned
R0RS	Right handed, 0 switches, 2 Roller, Stacked positioned
R1RS	Right handed, 1 switches, 2 Roller, Stacked positioned
R2NR	Right handed, 2 switches, No roller, Right positioned
R2NL	Right handed, 2 switches, No roller, Left positioned

**Grip Model Code  
 (continued)**

JS1000 Product Configuration Model Code Example – **Base Part - G, H, and J**



**G1 PRO Grip Side Switch Orientation**

Code	Description
R.	Right handed PRO Grip
L.	Left handed PRO Grip

**G2 PRO Grip Side Switch Color**

Code	Description
.R	Red side switch
.Y	Yellow side switch
.B	Black side switch
.G	Grey side switch
.N	No side switch

**H PRO Grip Front Plate Switch Color Selection Examples**

Code	Description
NNNNN	No switches (diagram 0NN*)
RYBGR	Position 1 switch Red, position 2 switch Yellow, position 3 switch Black, position 4 switch Grey, position 5 switch Red (diagram 5NN*)
YYYYY	5 Yellow switches (diagram 5NN*)
RNNRB	Position 1 switch Red, No position 2 switch, No position 3 switch, position 4 switch Red, position 5 switch Black (diagram 3NN*)
YRNNN	Position 1 switch Yellow, Position 2 switch Red, No position 3 switch, No position 4 switch, No position 5 switch (diagram 2RL*)

\* See *PRO Grip Button and Proportional Roller CAN Naming Conventions*, page 17. Number refers to button location on grip front panel. Select one color code for each switch.

**J Operator Presence Switch Option (not available)**

Code	Description
N	No: operator presence switch option not selected

**SAE J1939 CAN Option**

Joysticks with the SAE J1939 CAN output option, designated as model code CAN, broadcast two J1939 messages to communicate device information: Basic Joystick Message 1 (BJM1) and Extended Joystick Message 1 (EJM1).

**SAE J1939 CAN Message Specification**

**SAE J1939 Basic Joystick Message**


The JS1000 joystick uses the SAE J1939 basic joystick message to transfer information about the position on the X and Y axes of a joystick, the state of switches on the joystick grip, and the state of external digital inputs.

*Basic Joystick Message Structure*

Basic message number	Priority	Base Parameter Group Number (PGN)		Protocol Data Unit (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

\* Depends on position specified in master model code. JS1000 joysticks do not support SAE J1939 dynamic addressing, since the joystick source addresses are hard-coded (static). However, JS1000 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 JS1000, the JS1000 *may* cease communication on the bus, depending on the message priority of the other node).

Message transmission rate: 20 ms  
 CAN bus baud rate: 250kbps  
 CANopen bus baud rate selectable, default: 125kbps

The resulting SAE J1939 basic joystick message PGN on the CAN bus is: 0xCFDD6   
 \* = 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

\*Least Significant Bit \*\*Most Significant Bit

Button naming convention: Refer to the illustrated *PRO Grip Button and Roller CAN Naming Conventions*, page 17, for button and proportional input definitions.

*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*

This is 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 JS1000 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. Ensure application software recognizes 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. Ensure application software recognizes 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*

This is 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 is 1000 counts.

---

**⚠ Warning**

Potential uncommanded machine movement. Per the SAE J1939-71 standard, if the JS1000 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. Ensure application software recognizes 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. Ensure application software recognizes 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 JS1000 joystick uses the SAE J1939 extended joystick message to transfer information about the measured status of two additional proportional input functions on the joystick grip. 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

\* Depends on position specified in master model code. \* Depends on position specified in master model code. JS1000 joysticks do not support SAE J1939 dynamic addressing, since the joystick source addresses are hard-coded (static). However, JS1000 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 JS1000, the JS1000 *may* cease communication on the bus, depending on the message priority of the other node).

Message transmission rate: 100 ms or on change, not to exceed 20 ms  
 CAN bus baud rate: 250kbps

The resulting SAE J1939 basic joystick message PGN on the CAN bus is: 0xCFDD7   
 \* = joystick source address (hex)

*Extended Joystick Message Parameters and Data Field Locations*

Start position (Byte/Bit)	Length (Bits)	Parameter name
1/1	2	Grip X-axis neutral position status
1/3	2	Grip X-axis lever left negative position status
1/5	2	Grip X-axis lever right positive position status
1/7 through 2/1-8	10	Grip X-axis position
3/1	2	Grip Y-axis neutral position status
3/3	2	Grip Y-axis lever back negative position
3/5	2	Grip Y-axis lever forward positive position
3/7 through 4/1-8	10	Grip Y-axis position
7/5	2	Grip Y-axis detent position status-not available
7/7	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.

*PRO Grip Proportional Input Naming Convention*

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

Refer to the illustrated *PRO Grip Button and Roller CAN Naming Conventions*, page 16, for grip input naming conventions.

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

Grip-with-switch naming convention: The top switch is designated as the grip X-axis in the SAE J1939 extended joystick message. Moving the switch in either direction from null results in an immediate CAN output of 1000 counts.

**SAE J1939 Error (DM1) Messages**

SAE J1939 DM1 error messages are supported by JS1000 software.

See the tables below for Suspect Parameter Number (SPN) and Failure Mode Identifier (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*

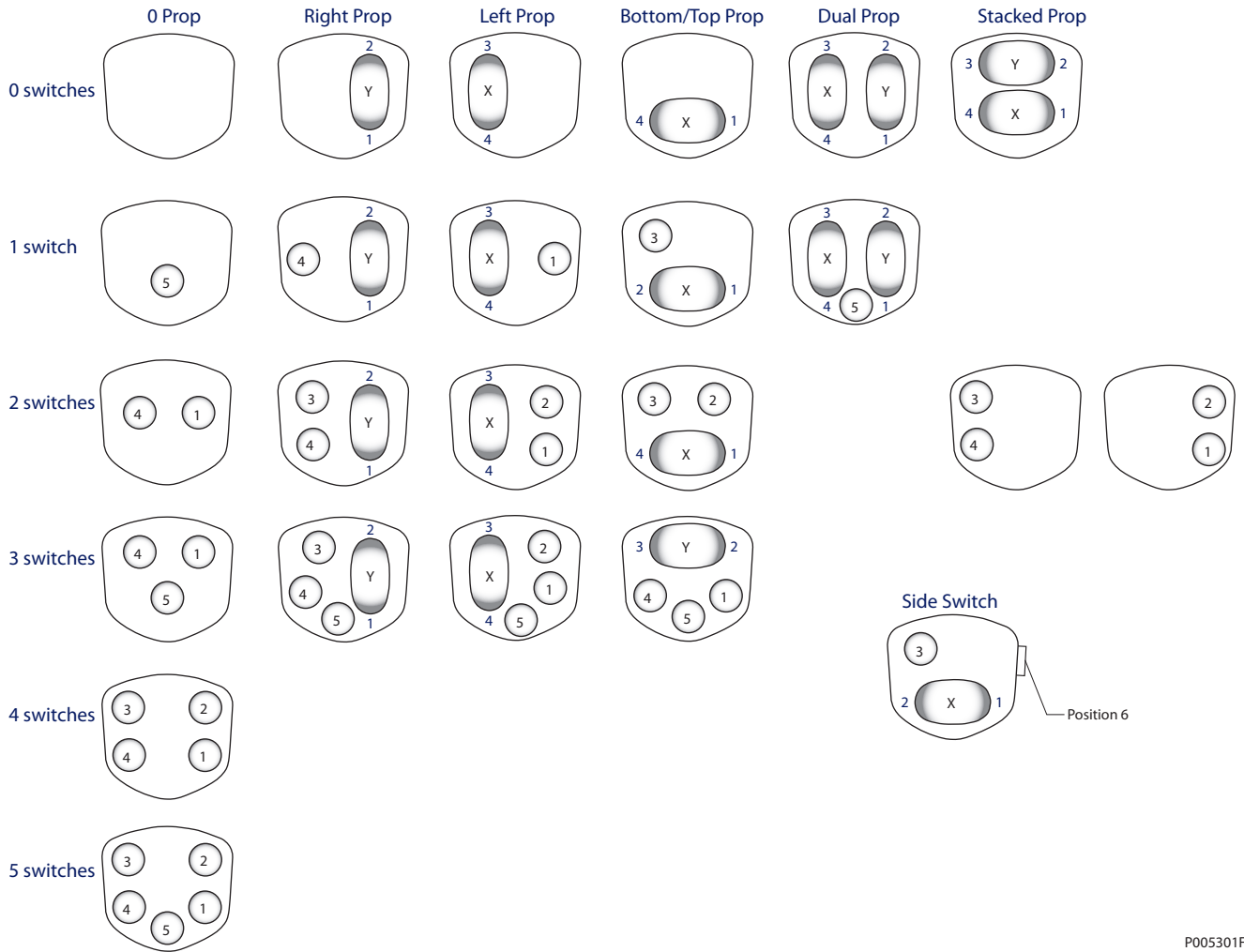
Message	Axis	SPN	FMI
BJM1	X	2660	14
BJM1	Y	2661	14
BJM1	Grip X	2662	14
BJM1	Grip Y	2663	14
BJM1	Grip Theta	2664	14

JS1000 joysticks do not support SAE J1939 dynamic addressing, since the joystick source addresses are hard-coded (static). However, JS1000 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 JS1000, the JS1000 *may* cease communication on the bus, depending on the message priority of the other node).



**PRO Grip Button and Proportional Roller CAN Naming Conventions**

*PRO Grip Button and Proportional Roller CAN Naming Conventions*



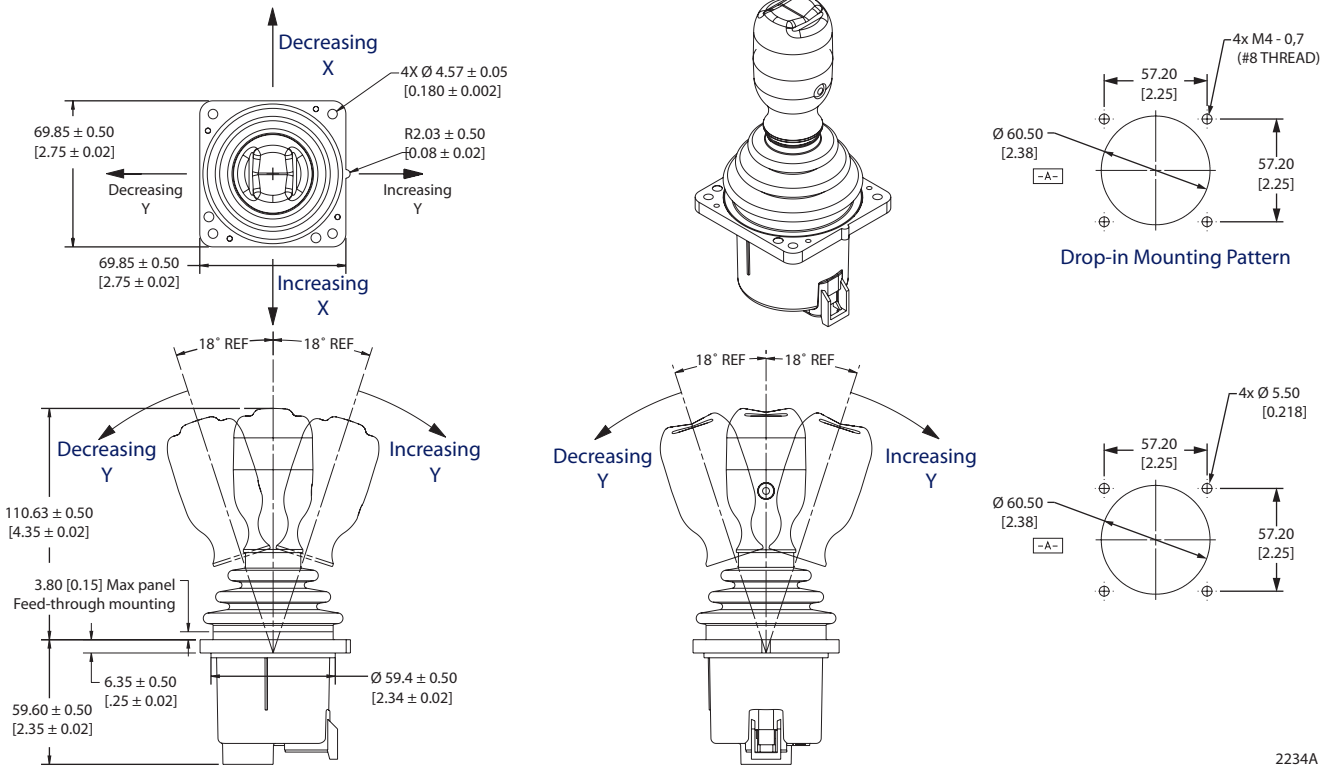
P005301F

**CANopen Object Dictionary**

CANopen Object Dictionary is on line at: [www.sauer-danfoss.com](http://www.sauer-danfoss.com)  
(Access dictionary in PDF format under Joysticks, CANopen EDS).

**Grip with Rocker  
 Switch Dimensions and  
 Mounting**

*Grip Mounting Dimensions in Millimeters [Inches]*

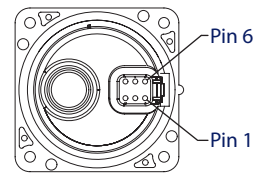


2234A

**Connector Pin Assignments**  
*Pinout and Wiring Information*

Pin	Analog option	CAN option
1	Ground -	Ground
2	5 Vdc Power +	Power
3	X output signal	CAN +
4	Y output signal	CAN -
5	Rocker switch	CAN Shield
6	No connection	No connection

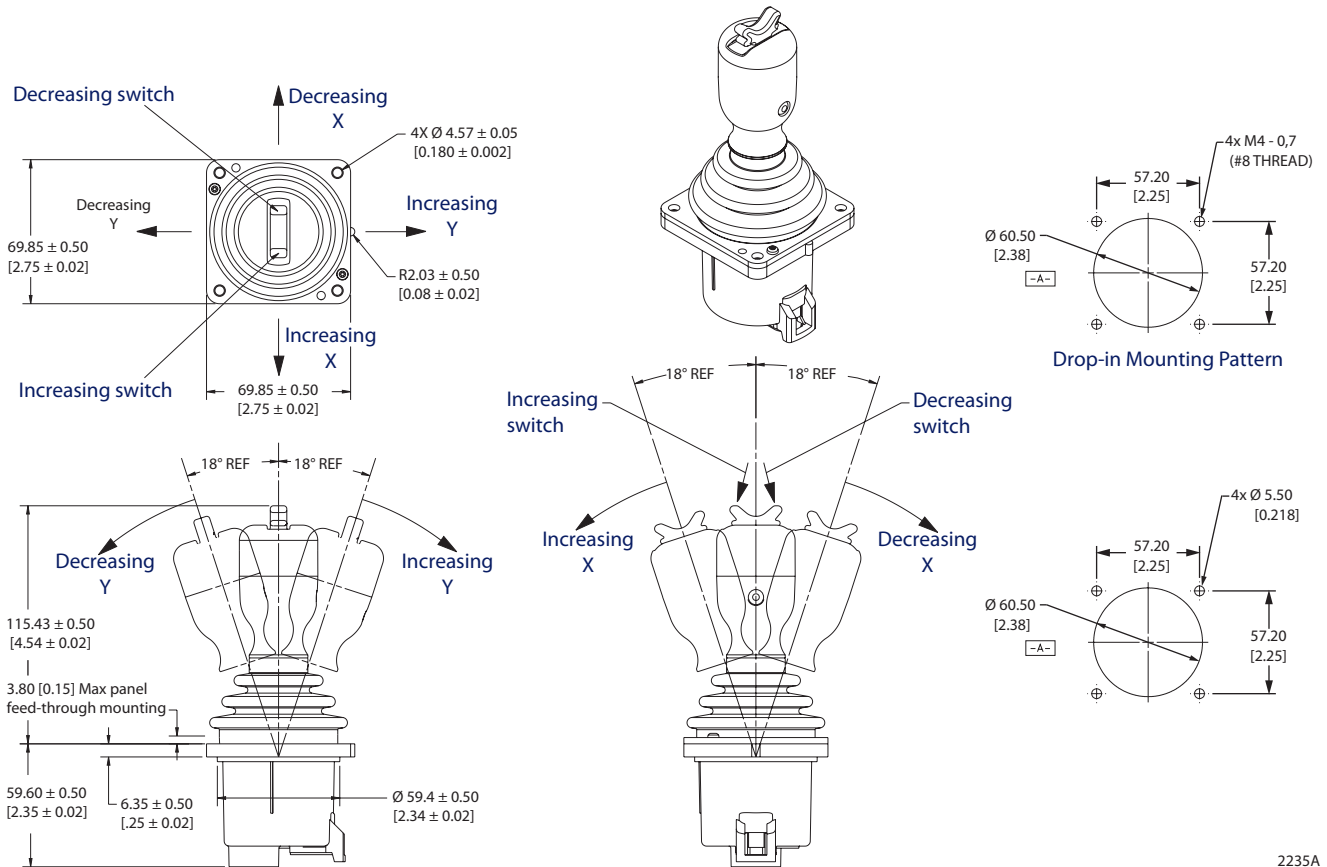
*Pin Location*



2242

**Grip with Banana  
 Switch Dimensions and  
 Mounting**

*Grip Mounting Dimensions in Millimeters [Inches]*

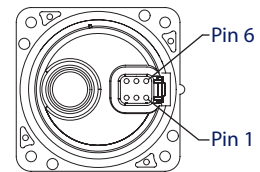


2235A

**Connector Pin Assignments**  
*Pinout and Wiring Information*

Pin	Analog option	CAN option
1	Ground -	Ground
2	5 Vdc Power +	Power
3	X output signal	CAN +
4	Y output signal	CAN -
5	Rocker switch	CAN Shield
6	No connection	No connection

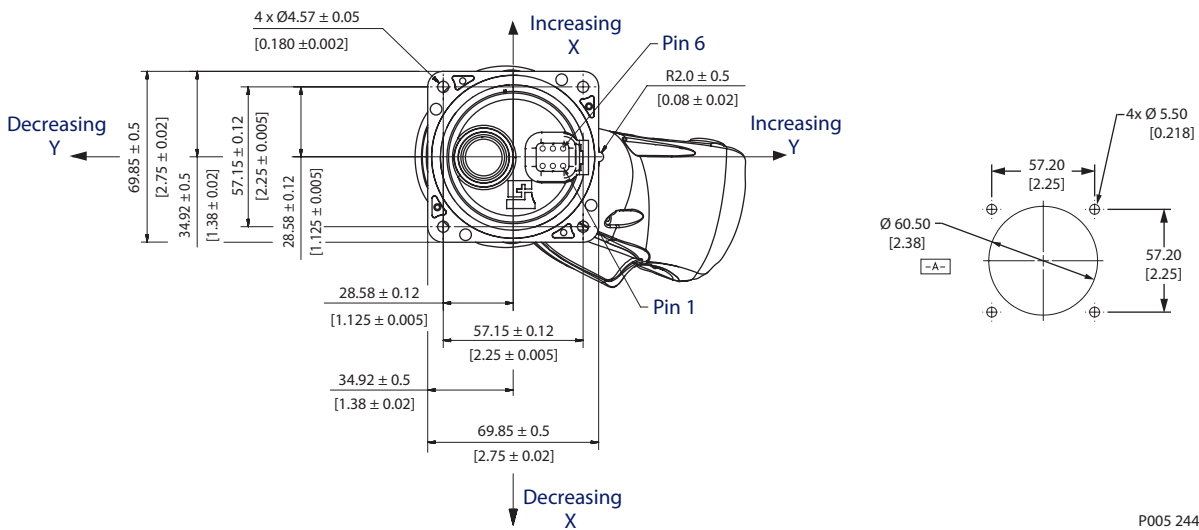
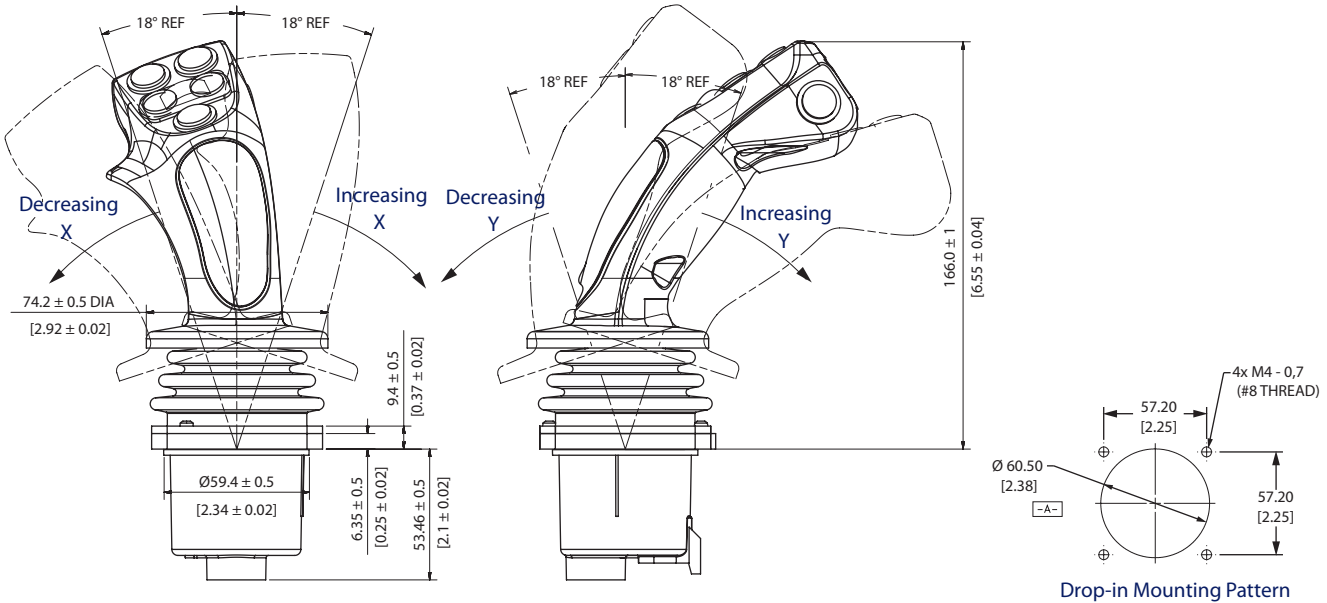
*Pin Location*



2242

**Pro Grip Dimensions and Mounting**

*Grip Mounting Dimensions in Millimeters [Inches]*

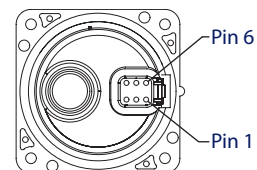


P005 244F

**Connector Pin Assignments**  
*Pinout and Wiring Information*

Pin	CAN option
1	Ground
2	Power
3	CAN high
4	CAN low
5	CAN shield
6	No connection

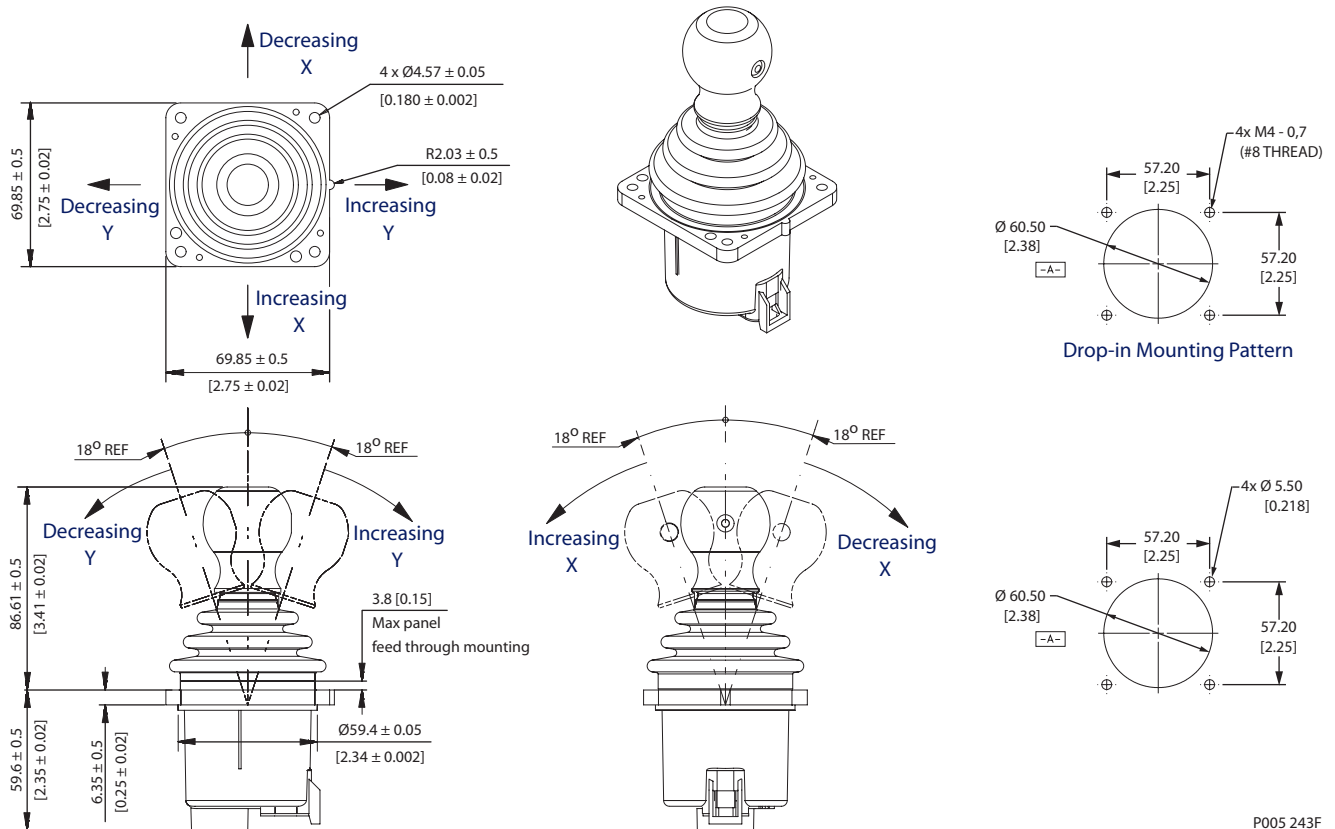
*Pin Location*



2242

**Ball Grip Dimensions and Mounting**

*Grip Mounting Dimensions in Millimeters [Inches]*

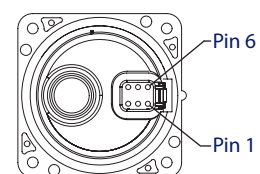


P005 243F

**Connector Pin Assignments**  
 Pinout and Wiring Information

Pin	Analog option	CAN option
1	Ground -	Ground
2	5 Vdc Power +	Power
3	X output signal	CAN +
4	Y output signal	CAN -
5	No connection	CAN Shield
6	No connection	No connection

**Pin Location**



2242

**Mating Connector Details**

**Mating Connector Deutsch® DTM06-6S**

Sauer-Danfoss provides mating connector kits (bag assemblies) for JS1000 joysticks. The bag assembly contains loose parts you must assemble. The connector with ribbon cable features a fully assembled connector with an unterminated wire harness.

**Mating Connector Assemblies**

Type	Sauer-Danfoss ordering number
Connector bag assembly	10101551
Connector with 400 mm [15.75 in] Wire Harness	10101557

**Recommended Wiring Practice**

- 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.

**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.

#### Mechanical Characteristics

##### Mechanical Characteristics

<b>Operating life</b>	10 million cycles per axis
<b>Handle travel</b>	On-axis: 18° Corners: 24.7°
<b>Spring centering forces</b>	Standard Spring: Breakout: 12 N [2.69 lbf] / On axis end of travel: 18 N [4.0 lbf] / At end of stroke at corners: 20 N [4.49 lbf] Heavy Spring: Breakout: 20 N [4.49 lbf] / On-axis end of travel: 29 N [6.51 lbf] / At end of stroke at corners 32 N [7.19 lbf]
<b>Shaft forces</b>	Force to bend shaft: 97.8 N·m [866 lbf·in] at 55 mm [2.165 in] Maximum shaft torque: 25.42 N·m [255 lbf·in] Maximum downward force: > 4.45 kN [1000 lbf]
<b>Weight (base without grip)</b>	0.38 kg [0.838 lbf]

#### Electrical Characteristics

##### Analog Option

<b>Supply voltage</b>	5.0 ± 0.5 Vdc
<b>Maximum current draw</b>	Base with no grip: 15 mA Base with rocker switch grip: 25 mA
<b>Output parameters, joystick base</b>	Null shift over rated temperature: 2% of supply voltage Span shift over rated temperature: 2% of supply voltage Linearity: 1% maximum deviation of voltage vs. shaft angle Output at maximum displacement: 92% ± 4% of supply voltage Output at Null: 50% ± 2% of supply voltage Output at minimum displacement: 8% ± 4% of supply voltage Maximum output current for each axis channel: 2 mA Maximum output current for each switch: 2 mA
<b>Output parameters, rocker switch</b>	Output at maximum displacement: 77% ± 7% of supply voltage Output at Null: 50% ± 8% of supply voltage Output at minimum displacement: 23% ± 7% of supply voltage

##### CAN Option

<b>Supports CAN 2.0B with SAE J1939 message protocol</b>	
Supply voltage	9 to 32 Vdc
Maximum current draw	150 mA—base with PRO grip

#### Environmental Characteristics

##### Environmental Characteristics

<b>Base operating temperature</b>	-40°C to +80°C [-40°F to +175°F]
<b>Base storage temperature</b>	-55°C to +85°C [-67°F to +180°F]
<b>Ingress protection rating</b>	
Above panel (Depends on grip and base options):	IP-67
Below panel (Depends on grip and base options):	IP-67
PRO grip:	IP-43
PRO grip with proportional roller function):	IP-40
<b>EMI/RFI rating</b>	100 V/m
<b>Vibration</b>	Meets IEC 60068-2-64
<b>Shock</b>	Meets IEC 60068-2-27 test Ea

#### Joysticks Requiring Repair

Return joystick along with information describing the product fault to:  
MPS CQAR Administrator, Sauer-Danfoss Company, 3500 Annapolis Lane North,  
Minneapolis, Minnesota 55447-5312, USA



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We offer expert worldwide support for our customers, ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide comprehensive global service for all of our components.

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