SAUER DANFOSS

JS1000
Joystick Base

Technical
Information
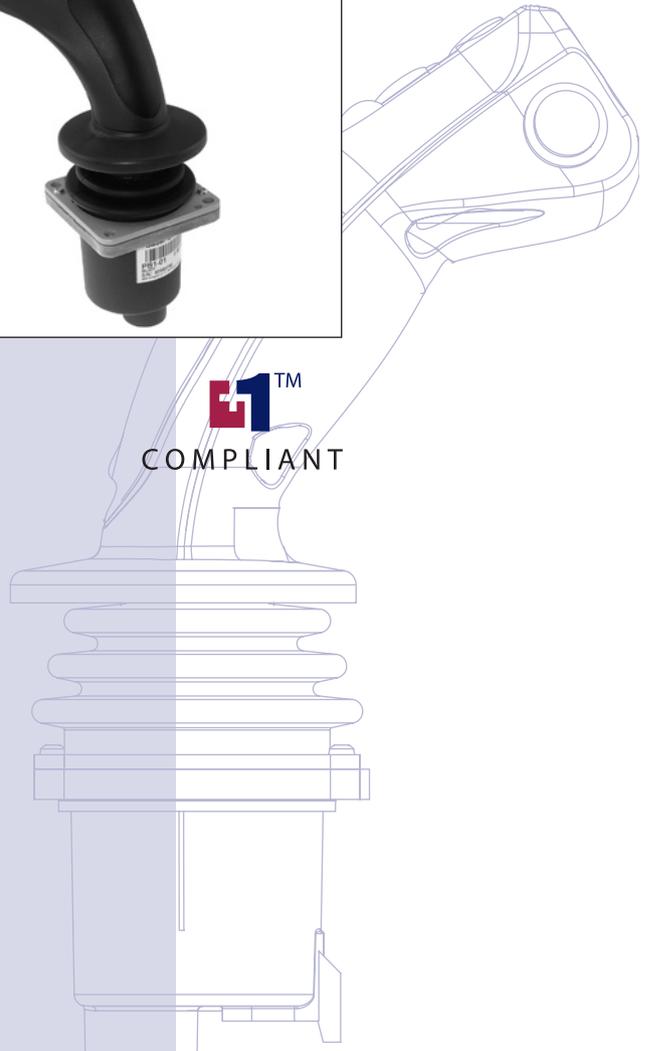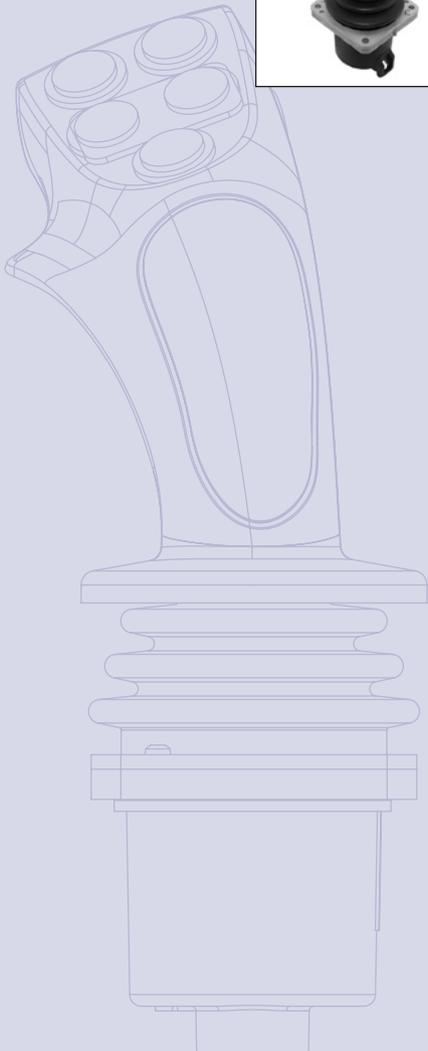
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Version

Revisions

Date	Page	Changed	Rev.
14 Sep, 2007	Various	Standard CAN option information added; revised CAN Message Protocol section; and varous specificatios revised	Rev-DA
12 Dec, 2005	9, 23	Pro grip side switch color table and Repair section	Rev-C
28 Nov, 2005	Various	Feature updates	Rev-B
27 Jul, 2005	Various	Content revised	Rev-A
17 Dec, 2004			Initial release

Front cover illustrations: F101527, F101419, F101528, F101431, P005300

Contents

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
- Single or dual axis
- X-Y axis guided or non-guided feel
- Spring return-to-center
- Two centering spring options
- Operating life exceeding 10 million cycles per axis
- Two electrical output options:
  - CAN 2.0B
  - 0.5 to 4.5 Vdc (nominal)
- 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 analog *rocker* switch
  - Grip with analog *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 90º 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) only. The switch is not suitable 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

TPRO = **T**op Mount, **PRO** Grip

R3RL = **R**ight hand grip, **3** buttons, 1 **R**oller on the **L**eft

RY = **R**ight hand grip with **Y**ellow side switch

YNRNG = Button 1 = **Y**ellow,
Button 2 = **N**one,
Button 3 = **R**ed,
Button 4 = **N**one,
Button 5 = **G**rey

N = **N**o operator presence switch

Base Model Code

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

A	B	C	D	E	F	G	H	J
J S 1 0 0 0	X Y	A	J 3 3 1					

          1 2 3 1 2
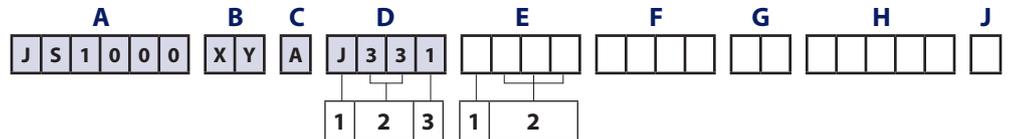
A   *Product Family*

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
NG	Dual axis function, without guided axis feel (free moving in all directions)

C   *Center Return Spring*

Code	Description
A	Standard spring
B	Heavy spring

D1   *Electrical Interface Options*

Code	Description
J	CAN with SAE J1939 message 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

Grip Model Code

*JS1000 Product Configuration Model Code – **Joystick Part - E, and F***

```
        A         B    C    D       E        F      G      H     J
   J S 1 0 0 0   X Y   A  J 3 3 1  T P R O  R 3 R L |  | |     | | |
                                   1   2    1 2 3 4
```
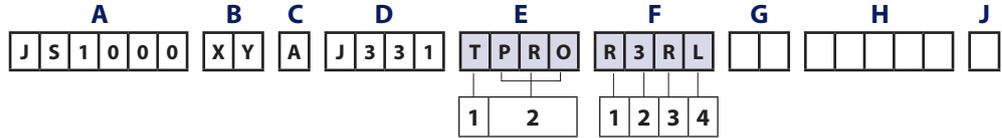
E1   *Grip Mounting Options*

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.

PRO grip option is top mount only.

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 analog rocker switch, 1.15 to 3.75 Vdc range. Do not complete F, G, H, J
LSB	Grip with banana switch, 1.15 to 3.75 Vdc range. Do not complete F, G, H, J

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

Grip Model Code (continued)

*JS1000 Product Configuration Model Code– **Joystick Part - F, G, H and J***

	A	B	C	D	E	F	G	H	J
	JS1000	XY	A	J331	TPRO	R3RL	RY	YNRNG	N

G: 1 2
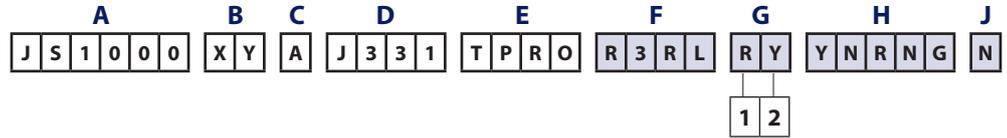
F Grip Function Layout Examples

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

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

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

SAE J1939 CAN Message Specification (continued)

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
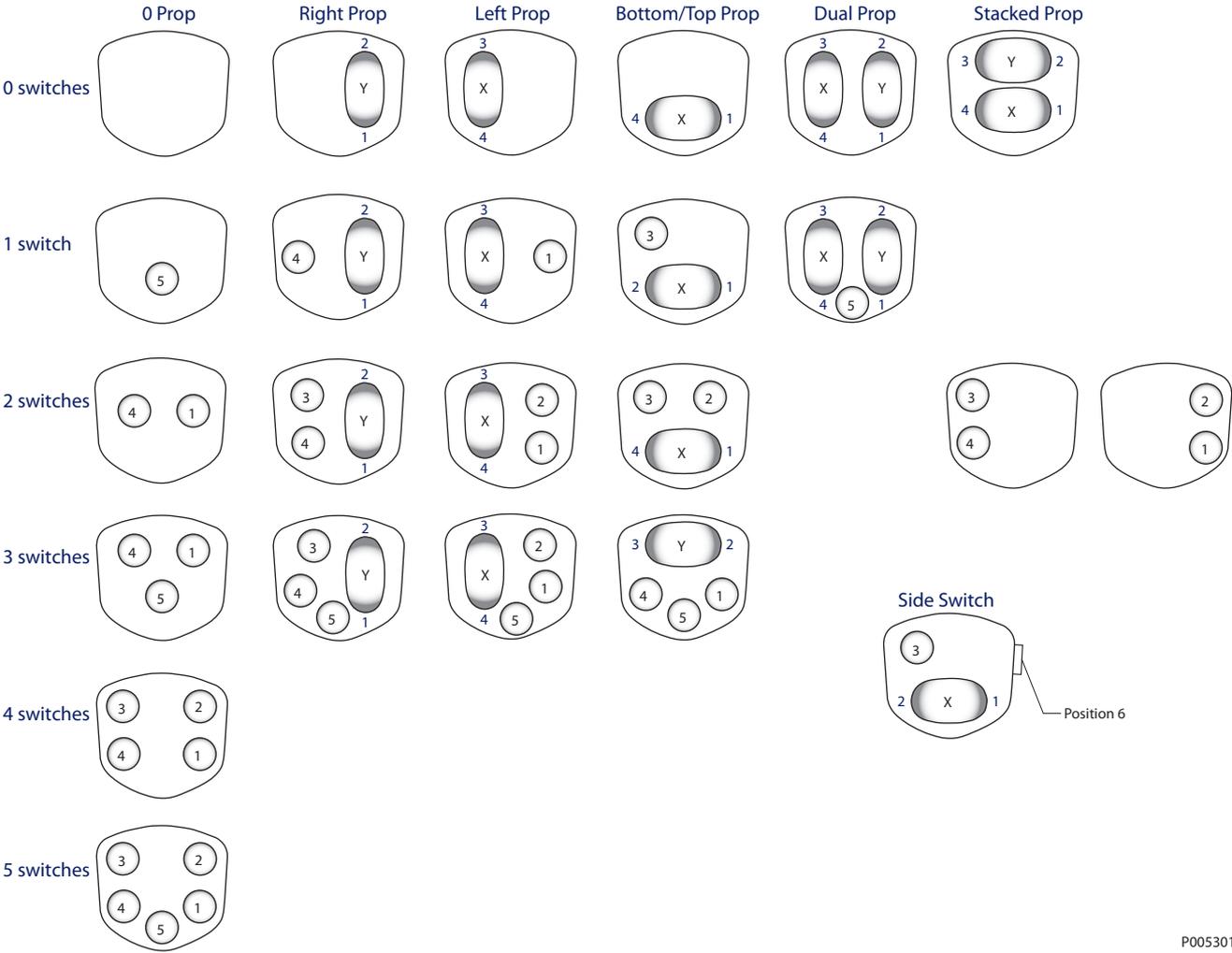
P005301F

**Grip with Rocker Switch Dimensions and Mounting**

Grip Mounting Dimensions in Millimeters [Inches]
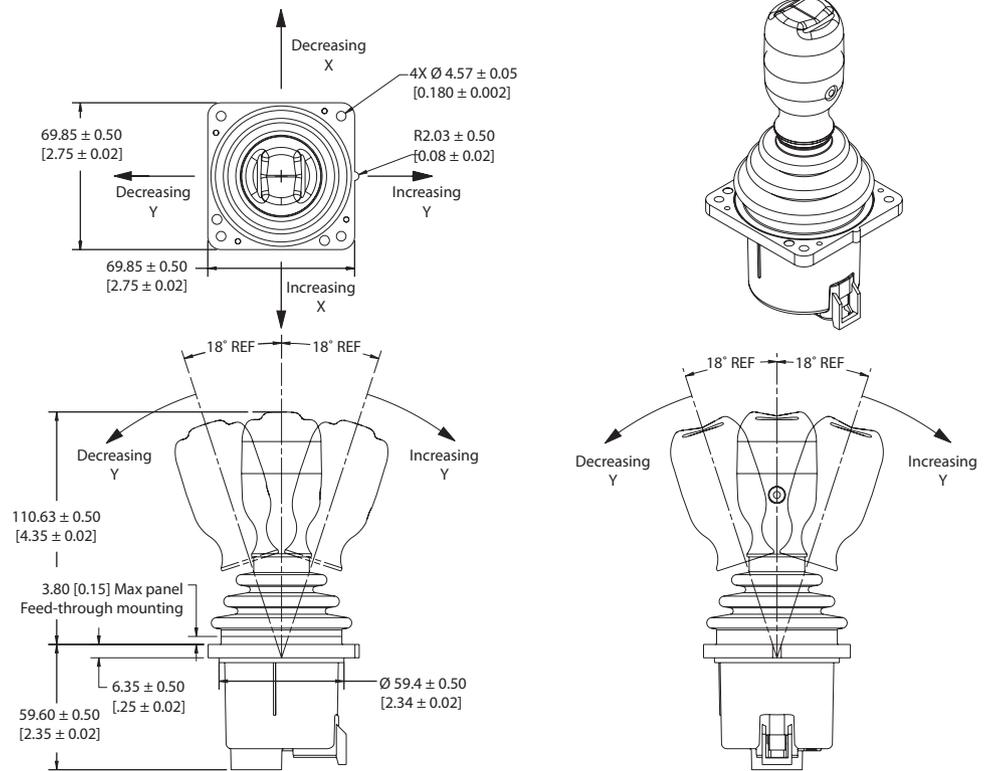
2234

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
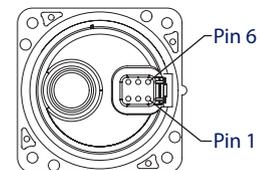
2242

Grip with Banana Switch Dimensions and Mounting

Grip Mounting Dimensions in Millimeters [Inches]
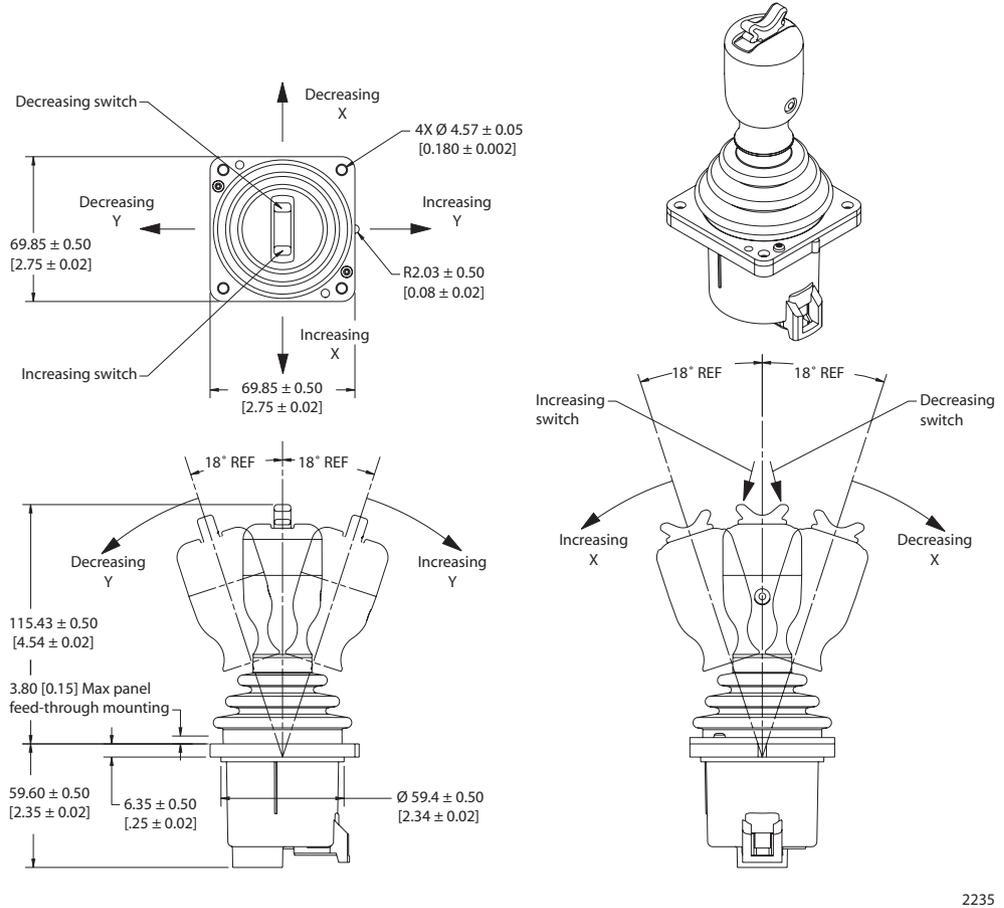
2235

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

Pin 6

Pin 1
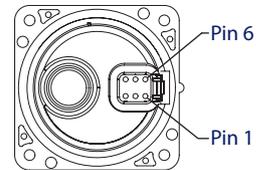
2242

Pro Grip Dimensions and Mounting

Grip Mounting Dimensions in Millimeters [Inches]

18° REF   18° REF   18° REF   18° REF

Decreasing X   Increasing X   Decreasing Y   Increasing Y

166.0 ± 1 [6.55 ± 0.04]

74.2 ± 0.5 DIA [2.92 ± 0.02]

9.4 ± 0.5 [0.37 ± 0.02]

Ø59.4 ± 0.5 [2.34 ± 0.02]

6.35 ± 0.5 [0.25 ± 0.02]

53.46 ± 0.5 [2.1 ± 0.02]

4 x Ø4.57 ± 0.05 [0.180 ±0.002]

Increasing X

Pin 6

R2.0 ± 0.5 [0.08 ± 0.02]

Increasing Y

Decreasing Y

69.85 ± 0.5 [2.75 ± 0.02]

34.92 ± 0.5 [1.38 ± 0.02]

57.15 ± 0.12 [2.25 ± 0.005]

28.58 ± 0.12 [1.125 ± 0.005]

Pin 1

28.58 ± 0.12 [1.125 ± 0.005]

57.15 ± 0.12 [2.25 ± 0.005]

34.92 ± 0.5 [1.38 ± 0.02]

69.85 ± 0.5 [2.75 ± 0.02]

Decreasing X
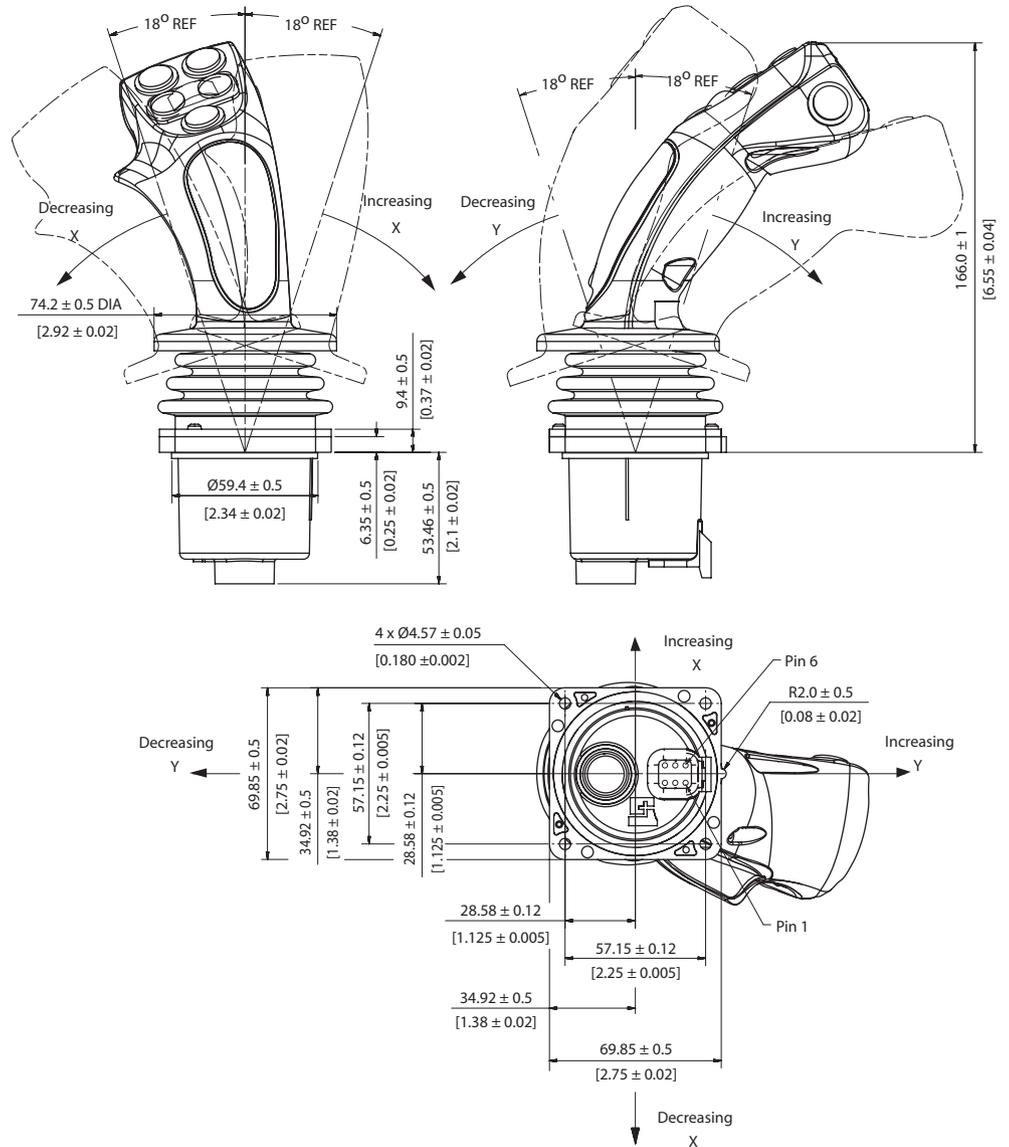
P005 244E

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

Pin 6

Pin 1
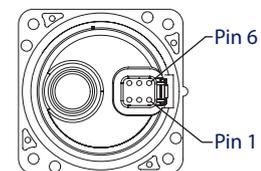
2242

Ball Grip Dimensions and Mounting

Grip Mounting Dimensions in Millimeters [Inches]
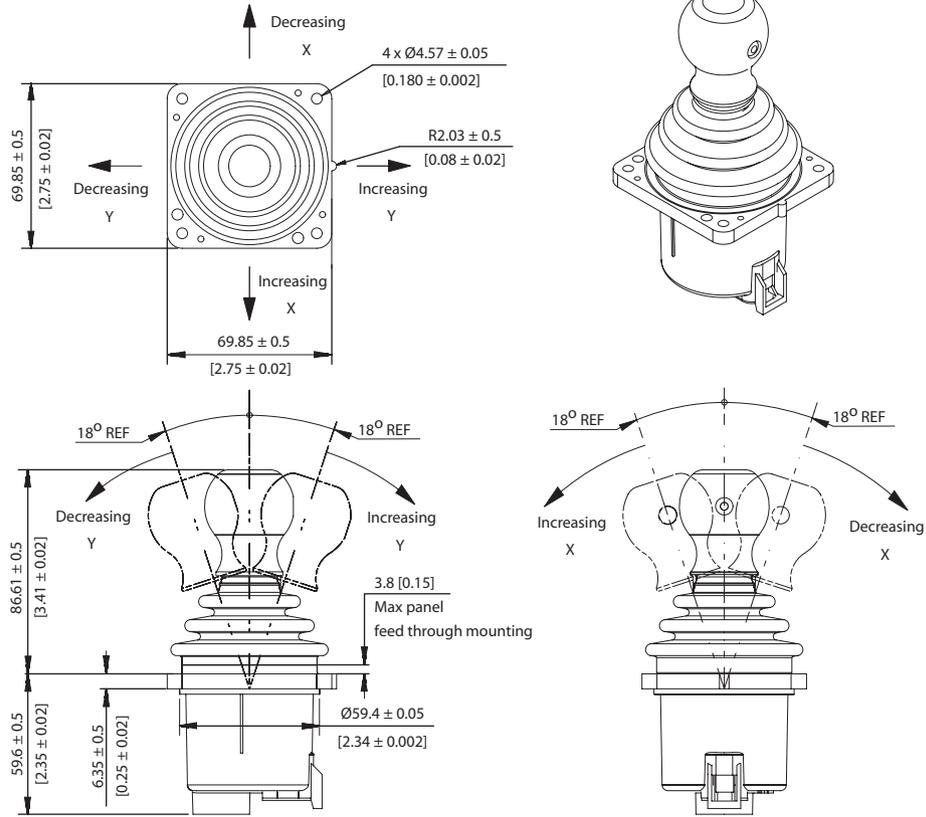
P005 243E

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
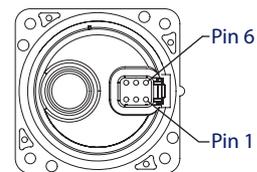
2242

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

Operating life	10 million cycles per axis
Handle travel	On-axis: 18°
	Corners: 24.7°
Spring centering forces	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]
Shaft forces	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]
Weight (base without grip)	0.38 kg [0.838 lbf]

Electrical Characteristics

Analog Option

Supply voltage	5.0 ± 0.5 Vdc
Maximum current draw	Base with no grip: 15 mA
	Base with rocker switch grip: 25 mA
Output parameters, joystick base	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
Output parameters, rocker switch	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

Supports CAN 2.0B with SAE J1939 message protocol	
Supply voltage	9 to 36 Vdc
Maximum current draw	150 mA—base with PRO grip

Environmental Characteristics

Environmental Characteristics

Base operating temperature	-40°C to +80°C [-40°F to +175°F]
Base storage temperature	-40°C to +85°C [-40°F to +180°F]
Ingress protection rating	Above panel: IP-67 } Depends on grip Below panel: IP-67 } and base options
EMI/RFI rating	100 V/m
Vibration	Meets IEC 60068-2-64
Shock	Meets IEC 60068-2-27 test Ea

Repair

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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