

# Data Sheet for Joysticks

Finger Joystick

Series TRY120



- Rugged finger joystick ideal for mobile vehicle applications
- Easy to service due to plug connection
- With Hall sensors, optionally redundant
- Also with digital interfaces (CAN J1939, CANopen, USB)
- Low installation depth < 26 mm

The TRY120 joystick is designed for use in mobile machinery, small vehicles and small boats. It has the dimensions of a standard finger joystick, but has a reinforced mechanism that allows maximum loads of 350N in the X and Y directions and a maximum torque of 9Nm in the Z rotation. All versions are available with IP67 protection (above panel).

## Technical Data

Sensor technology	Hall Effect
Supply Voltage	Analogue versions: 5.0 ± 0.5 VDC, transient free Versions with voltage regulator: 8 to 35 VDC (unipolar) / 11 to 35 VDC (bipolar) USB versions: 5 VDC (via bus) CAN versions: 7 to 35 VDC
Voltage in Center Position*	2.5 V
Return to Center Accuracy	±200 mV (valid for output voltage span of 0 to 5 V without load)
Output Linearity	±200 mV
Output Impedance*	2 Ohm
Supply Current	typ. 40 mA / max. 50 mA (3 axes)
Load Resistance*	Min. 1 kOhm, recommended > 100 kOhm
Expected Mechanical Life**	5 million cycles**
Output Voltages*	0 to 5 V / 0.5 to 4.5 V / 0.25 to 4.75 V / for others see description on page 2
Angle of Movement X-, Y-Axis / Z-Axis	36° (±18° from center) / 60° (±30° from center)
Operating Force X-Y-Axis	1.3 N (break out force) / 2.8 N (operating force) / max. applied: 350 N
Operating Torque Z-Axis	0.09 Nm (break out torque) / 0.12 Nm (operating torque) / max. applied: 9.0 Nm
Operating / Storage Temperature	-40 °C to +85 °C / -40 °C to +85 °C
Above Panel Sealing	IP67 (depending on final configuration)
Panel Thickness	1.17 to 3.17 mm
EMC Immunity Level (V/M)	EN61000-4-3, level 4 (30 V/m, 80 MHz ~ 2 GHz swept freq., 80% AM @1 kHz)
EMC Emissions Level	EN6100-6-3:2001
ESD	EN61000-4-2, level 3 (±6 kV contact, ±8 kV aerial discharge)

\*Only valid for the versions with analogue output. The output voltage is ratiometric to the input voltage. We therefore recommend using low-noise, stabilized voltage sources.

\*\*Valid only for versions without z-axis and without pushbuttons

## Material Information

Shaft Material	Stainless steel
Rubber Boot Material:	Silicone
Handle Materials	Glass filled nylon (depends on handle variant)
Housing Material	Glass filled nylon

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Please contact us for information regarding stock articles, delivery times and minimum order quantities.

## Order Description / Options

Description	Selection: <b>standard=black/bold</b> , possible <i>options=grey/italics</i>									
<b>Series</b>	<b>TRY120</b>									
<b>Axes:</b> 1 Axis (handle cannot be rotated) 2 Axes 3 Axes (handle can be rotated)		1 2 3								
<b>Sealing:</b> Rubber boot			5							
<b>Return Mechanism:</b> Spring return (standard type)				1						
<b>Handles:</b> Handle B, without pushbutton, IP67 Handle C, 1 pushbutton, IP67 Handle D, 2 pushbuttons, IP67 Handle E, cobra-shaped, 2 pushbuttons, IP67 Handle F, cobra-shaped, no pushbutton, IP67						B C D E F				
<b>Limiters:</b> Square Round Plus "+" X/Y 1-axis X 1-axis Y Square "guided feel" Round "guided feel"							1 3 9 7 8 4 5			
<b>Output Signal:</b> 0 to 5 V (redundant signals parallel / inverse <sup>(1)</sup> ) 0.5 to 4.5 V (redundant signals parallel / inverse <sup>(2)</sup> ) 0.25..4.75 V (redundant signals parallel / inverse <sup>(3)</sup> ) USB HID compliant game controller USB HID compliant mouse-emulation <sup>(4)</sup> CAN-bus J1939-71 CANopen with Baud rate 250 kbit/s CANopen LSS (Layer setting service) Bipolar ±10 V (with option VB, see below)								1 (1P / 1X) 2 (2P / 2X) 3 (3P / 3X) 5 6 7 8B 9 0		
<b>Mounting:</b> Drop-in									1	
<b>Voltage Regulator:</b> Unipolar, supply 8-35 V, outputs according to order code above Bipolar, supply 11..35 V (only for output option „0“, bipolar ±10 V)										VU VB
<sup>(1)</sup> Output signals parallel: 0 to 5 V / 0 to 5 V; output signals inverse: 0 to 5 V / 5 to 0 V <sup>(2)</sup> Output signals parallel: 0.5 to 4.5 V / 0.5 to 4.5 V; output signals inverse: 0.5 to 4.5 V / 4.5 to 0.5 V <sup>(3)</sup> Output signals parallel: 0.25 to 4.75 V / 0.25 to 4.75 V; output signals inverse: 0.25 to 4.75 V / 4.75 to 0.25 V <sup>(4)</sup> Linux operating system not supported										

## Note on the order code when selecting the axis options

All knob types are suitable for operating modes for 1 to 3 axes. When selecting the 1-axis variant, the handle (i.e. the Z-axis) is not rotatable, while in the case of the 3-axis variant it can be rotated and has a sensor and a return spring integrated in the handle. 2 axes can also be realized by rotating knob and 1-axis limiter (X- or Y).

## Information on the order code for the unipolar voltage regulator (special option VU)

If you select the special option VU, you can choose from all analogue output signals.  
For example, the variant TRY120 3 5 1 D 1 2 1 VU provides an output signal of 0.5-4.5 V with an input of 8-35 V.

## For higher quantities or on-going demand, additional options are available

- Customer-specific cables
- Increased operation force/torque
- Additional limiters
- Customer-specific programming of the output signals (USB, CANBus, see the following pages)

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## Limiters



Square - Option "1"



1-axis "X" - Option „7“



Round - Option "3"



1-axis "Y" - Option „8“



Square "guided feel" <sup>(1)</sup> - Option "4"



X/Y Plus "+" - Option „9“



Round "guided feel" <sup>(1)</sup> - Option "5"



X/Y Cross "x" - Option „D“

<sup>(1)</sup> "guided feel" still allows the joystick handle to be deflected omni-directionally, but as the operation force needed for the main axes is slightly below the force needed for diagonal deflection the resulting impression is that of a „guided movement“.

## Connection description for analogue outputs (output options 1-3)

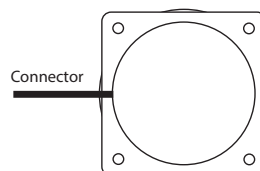
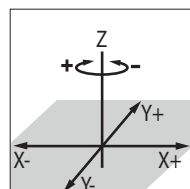
The analogue outputs are supplied with your Hirose connector type DF11-12DP-2DS9 (24) (pin connector, see the first illustration on the right). We optionally offer the appropriate connection cable (length approx. 25 cm) with Hirose DF11-12DS-2C connector (item no. 129802).

We are happy to supply other lengths and configurations on request. For the connection configuration of joysticks with digital outputs (CAN-bus, USB interface) see the respective sections below.



## Pin assignment for analogue outputs (output options 1-3)

Pin	Function	Colour	Pin	Function	Colour
1	Ground	black	7	Z axis dual output	grey (old: green / black)
2	Vcc	red	8	Z axis	green
3	X axis dual output	pink (old: blue/white)	9	Pushbutton 1	orange
4	X axis	blue	10	Pushbutton 1/2 Common	white
5	Y axis dual output	brown (old: yellow/black)	11	Pushbutton 2	violet
6	Y axis	yellow	12	Not used	Not used



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## USB specifications (output options 5-6)

Supply voltage	5 V
Max. current consumption:	70 mA
USB version:	2.0
Operating systems:	Windows 7, Windows 8.1, Windows 10
Cable outlet	USB mini B connector (at housing)
Cable (included)	USB cable (length approx. 198 cm, min. bending radius 34 mm) with USB A plug to USB mini B plug.

The USB controller is integrated in the joystick housing. The joystick is powered via the interface cable. Most Windows and Linux versions recognize the device without additional drivers.

There are two different configurations of the joystick available according to the data sheet:

### USB HID compliant game controller (option 5)

The device identifies itself on the USB bus as a USB 2.0 HID-compliant game controller, i.e. as a joystick.

### USB HID-compliant mouse emulation (USB joystick as a mouse replacement, option 6)

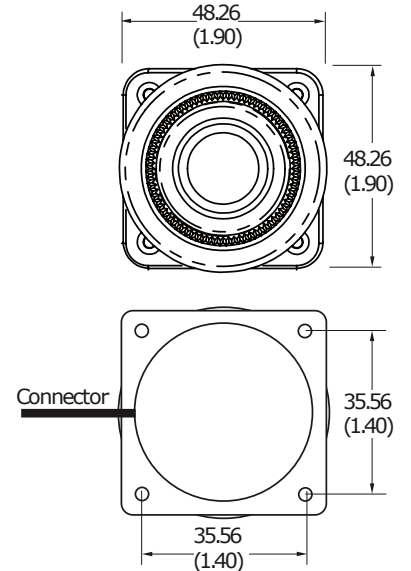
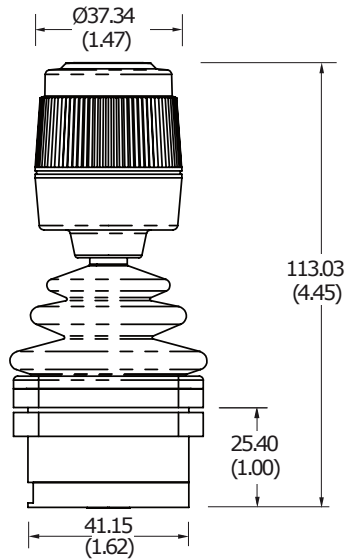
Optionally, the joystick can also be operated as a mouse replacement. In this case, the device identifies itself on the USB bus as a USB 2.0 HID-compliant mouse. The X and Y axes are converted in the movement of the mouse pointer on the screen. The third axis acts as an additional input element similar to a mouse wheel and can be assigned various functions by the user. Button 1 is a left mouse button, button 2 is a right mouse button. Linux operating systems are not supported.

## For higher quantities or on-going demand, additional options are available

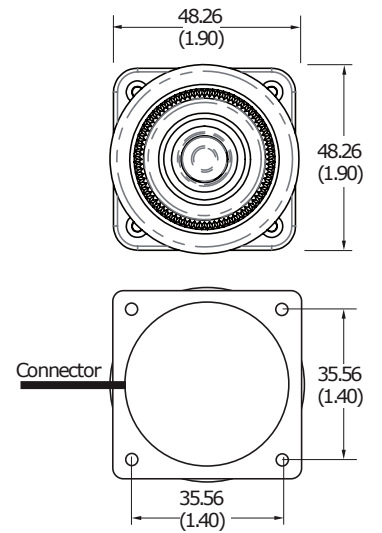
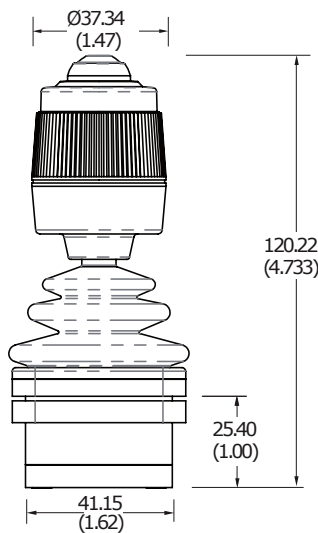
- Button assignment / sequence
- Custom USB product identification

Handle versions

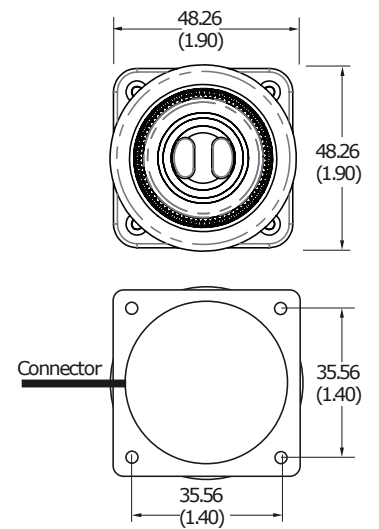
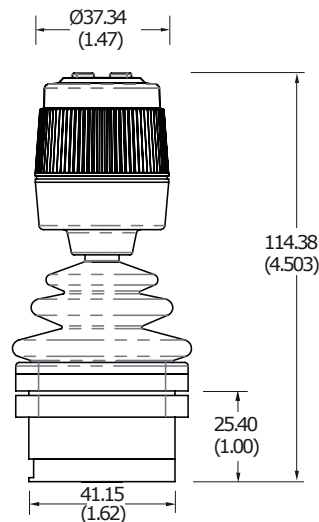
**Handle B**



**Handle C**



**Handle D**



All dimensions in mm (inches)

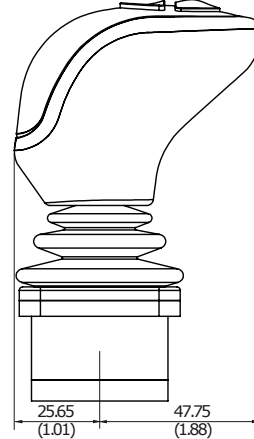
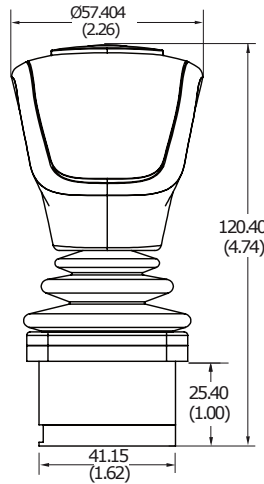
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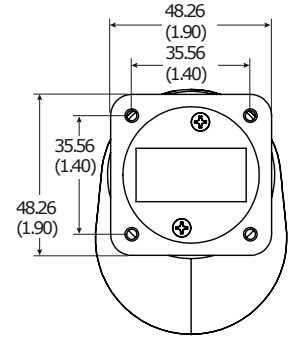
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## Handle versions

### Handle E and F



No pushbutton for handle "F"



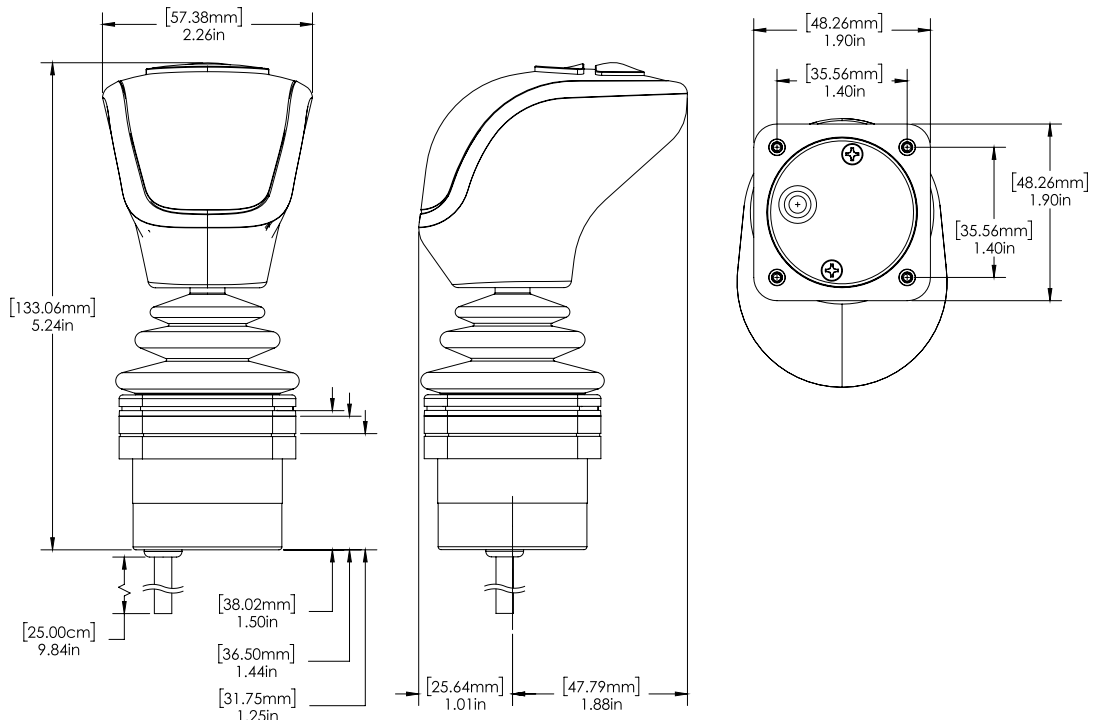
All dimensions in mm (inches)

## Technical data voltage regulator (options VU, VB)

As a special option, the joystick TRY120 can be equipped with a voltage regulator, which enables the joystick to be operated with various input voltage signals. There are two variants to choose from: With the unipolar variant (VU option), the standard output signals can be selected in the order code. The bipolar variant (option VB) generates a bipolar signal of  $\pm 10$  V at the axis outputs (middle position at approx. 0 V, output option "0" only).

Maximum power consumption:	90 mA
Cable assembly:	Strands AWG 28 16.5 $\pm$ 1.25 cm PTFE
Supply voltage unipolar variant (VU):	8-35 V
Supply voltage bipolar variant (VB):	11-35 V

## Housing dimensions of the voltage regulator versions (options VU, VB)



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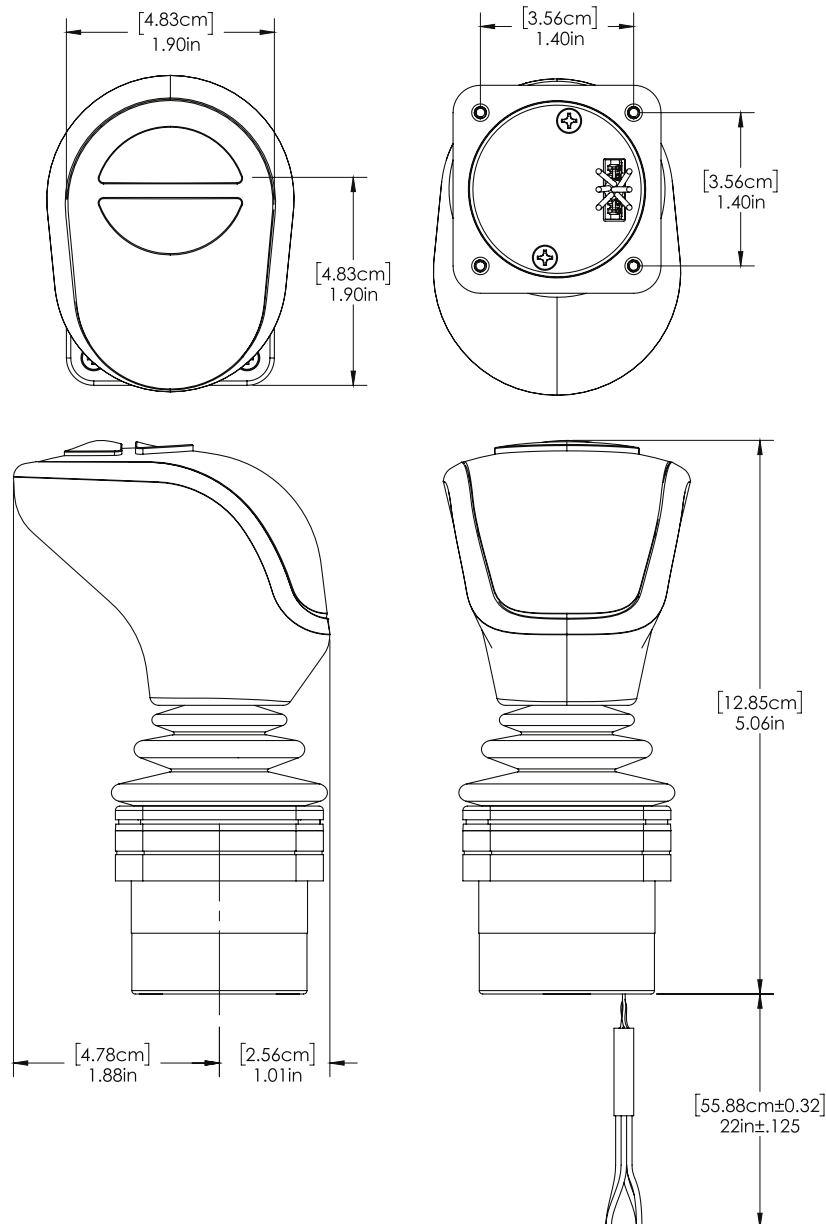
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## Cable configuration CAN-bus versions (output options 7-9)

TRY120 series joysticks with CAN-bus output (output options 7-9) are delivered with a JST B06B-PASK-1(LF)(SN) connector in combination with a 45 cm cable harness (AWG22, PTFE, JST PAP-06V-S , stripped ends, tinned). The table on the left shows the assignment / functions of the individual pins on the housing or the different strands.

Pin	Colour	Function
6	red	Supply voltage 7-35 V
5	black	Ground GND
1	green	CAN high
2	White	CAN low
3	blue	ID / Node ID select LSB
4	orange	ID / Node ID Select MSB

## Housing dimensions of the CAN-bus versions (output options 7-9)



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## Technical data CAN J1939 version (output option 7)

The TRY120 series can be configured with a maximum of 3 proportional axes and with a maximum of 2 buttons. The axis information and button data are transmitted via a CAN 2.0B-compatible physical interface. Two additional wires allow the address of the controller to be configured. The controller transmits its information in accordance with the SAE J1939-71 protocol. For the exact structure of the data packages, see the tables on the next page.

Transmission repetition rate	50 ms
Terminal resistor	None
Baud rate	250 kbit/s
CAN ID format	29 bit (CAN 2.0B)
BJMI/EJMI interval time	20 ms

## For higher quantities or on-going demand, additional options are available

- Redundant joystick versions with CAN-bus
- Other Baud rates 125 kbit/s, 500 kbit/s, 1 Mbit/s
- Customer-specific CAN addresses and output configuration

## Data CAN J1939-71 protocol (output option 7)

- Primary axis and Pushbutton data on Basic Joystick Message 1 (BJM1):
  - Priority: 3
  - PGN: 0xFDD6
  - Source address: 0x16<sup>(1)</sup>
  - Length of data field: 8 bytes

- Redundant axis and Pushbutton data on Extended Joystick Message 1 (EJM1):
  - Priority: 3
  - PGN: 0xFDD7
  - Source address: 0x16<sup>(1)</sup>
  - Length of data field: 8 bytes

<sup>(1)</sup> Alternative source addresses can be configured by grounding the blue and / or orange wires:

- Source address = 0x16: ORANGE = floating, BLUE = floating (standard)
- Source address = 0x26: ORANGE = floating, BLUE = grounded
- Source address = 0x36: ORANGE = grounded, BLUE = floating
- Source address = 0x46: ORANGE = grounded, BLUE = grounded

## BJM1 data field configuration (output option 7)

Start position (BYTE/BIT)	Length (BITS)	Function
1/1	2	Primary data X-axis, status neutral position
1/3	2	Primary data X-axis, status left position (minimum value)
1/5	2	Primary data X-axis, status right position (maximum value)
1/7 to 2/8	10	Primary data X-axis, axis position
3/1	2	Primary data Y-axis, status neutral position
3/3	2	Primary data Y-axis, status backward position (minimum value)
3/5	2	Primary data Y-axis, status forward position (maximum value)
3/7 to 4/8	10	Primary data Y-axis, axis position
6/5	2	Button 2 status
6/7	2	Button 1 status



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## EJM1 data field configuration (output option 7)

Start position (BYTE/BIT)	Length (BITS)	Function
1/1*	2	Redundant data X axis, status neutral position *
1/3*	2	Redundant data X axis, status left position (minimum value) *
1/5*	2	Redundant data X axis, status right position (maximum value) *
1/7 bis 2/8*	10	Redundant data X axis, axis position *
3/1*	2	Redundant data Y axis, status neutral position *
3/3*	2	Redundant data Y axis, status reverse position (minimum value) *
3/5*	2	Redundant data Y axis, status forward position (minimum value) *
3/7 bis 4/8*	10	Redundant data Y axis, axis position *
5/1	2	Primary data Z axis neutral position status
5/3	2	Primary data Z axis status deflection counterclockwise
5/5	2	Primary data Z-axis status deflection clockwise
5/7 to 4/8	10	Primary data Z axis, axis position

\*Redundant outputs are available as a special version

## Technical data CANopen version (output option 8B)

The TRY120 series can be configured with a maximum of 3 proportional axes and 2 buttons. Two additional lines allow the address of the controller to be configured. The following configuration applies to the CANopen® protocol. To use LSS (Layer Setting Service), please select the exit option „9“ according to the order key.

Node ID:	20h
Baud rate:	250 kbit/s
Push button data:	Button status is transmitted in a 1 byte data frame with the identifier 1A0 (180h + node ID)
Axis data:	Axis data are transmitted in a 3 byte data frame with the identifier 2A0 (280h + node ID)
Heartbeat (500 ms):	720h (700h + node ID)
Axis resolution:	8 bit
Network management:	Autostart activated

Alternative node IDs can be configured by grounding the blue and/or orange wires:

- Node ID = 20H: ORANGE= floating, BLUE= floating (standard)
- Node ID = 21H: ORANGE= floating, BLUE= grounded
- Node ID = 22H: ORANGE= grounded, BLUE= floating
- Node ID = 23H: ORANGE= grounded, BLUE= grounded

## Button data (output option 8B)

Identifier	1A0
Byte 0	Buttons 2:0

## Axis data (output option 8B)

Identifier	2A0
Byte 0	A_IN0 [7:0]
Byte 1	A_IN1 [7:0]
Byte 2	A_IN2 [7:0]

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## Technical data CANopen LSS (output option 9)

The TRY120 series can be configured with a maximum of 3 proportional axes and 2 buttons. Two additional wires allow the address of the controller to be configured. The CANopen LSS interface option follows the CiA305 and CiA401 standards from CiA (CAN in Automation). Node ID, baud rate and additional configurations can be set and saved in the EEPROM Service Data Object. The default settings are as follows:

Node ID:	20h
Baud rate:	250 kbit/s
Push button data:	Button status is transmitted in a 1 byte data frame with the identifier 1A0 (180h + node ID)
Axis data:	10-bit axis data are transmitted in a 6-byte data field with the identifier 2A0 (280h + node ID)
Heartbeat (500 ms):	720h (700h + node ID)
Axis resolution:	10 bit
Network management:	Autostart activated

Alternative node IDs can be configured by grounding the blue and/or orange wires:

- Node ID = 20H: ORANGE= floating, BLUE= floating (standard)
- Node ID = 21H: ORANGE= floating, BLUE= earthed
- Node ID = 22H: ORANGE= grounded, BLUE= floating
- Node ID = 23H: ORANGE= grounded, BLUE= grounded

## Button data (output option 9)

Identifier	1A0
Byte 0	Taster 2:0

## Axis data (output option 9)

Identifier	2A0
Byte 0	A_IN0 [7:0]
Byte 1	A_IN1 [9:8]
Byte 2	A_IN2 [7:0]
Byte 3	A_IN1 [9:8]
Byte 4	A_IN2 [7:0]
Byte 5	A_IN2 [9:8]

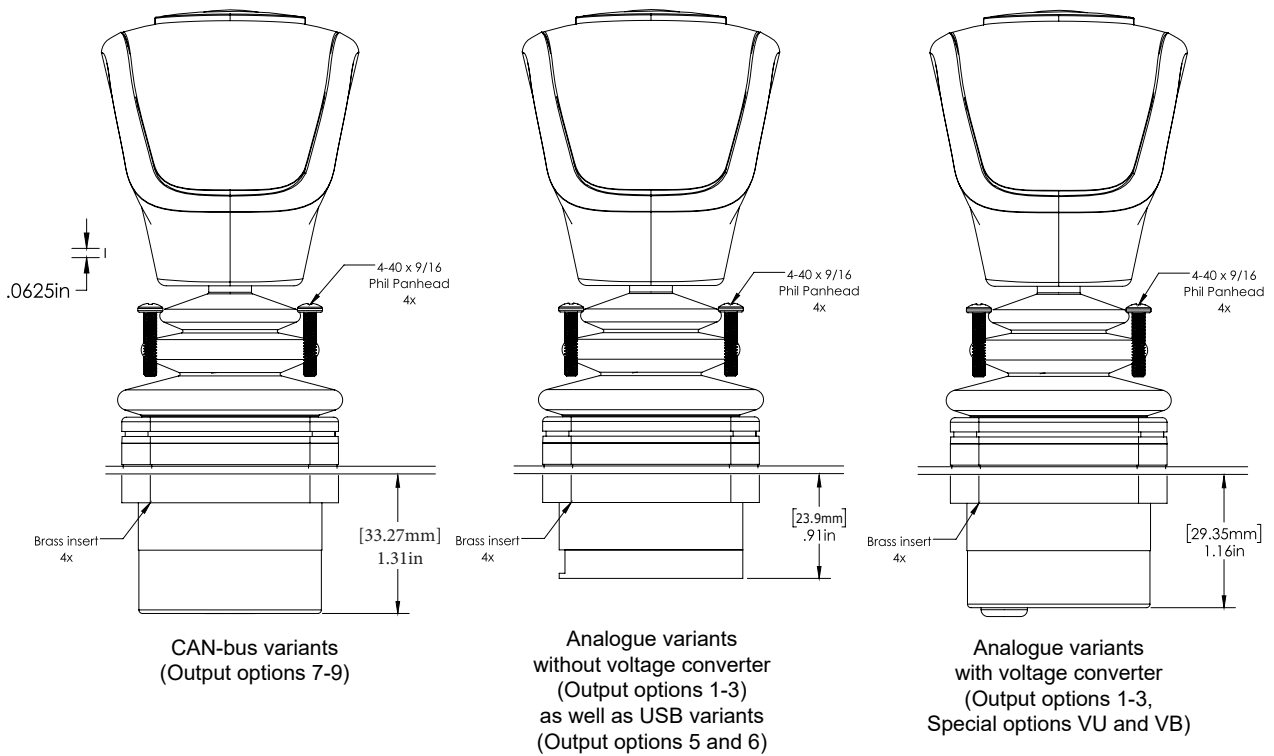
## For higher quantities or on-going demand, additional options are available

- Redundant joystick versions with CAN-bus
- Other Baud rates 125 kbit/s, 500 kbit/s, 1 Mbit/s
- Customer-specific CAN addresses and output configuration

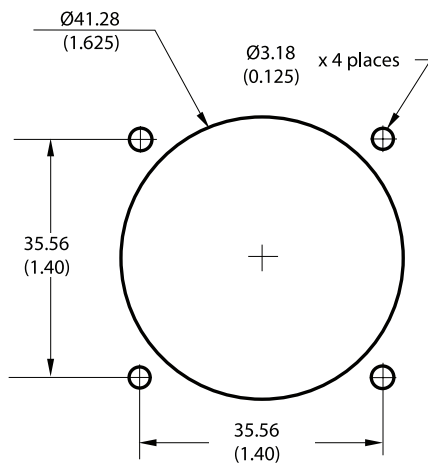
### Mounting Options

Each joystick is supplied with 1 seal, 1 clamping ring and 4 pieces of mounting screws type 4-40 x 9/16.

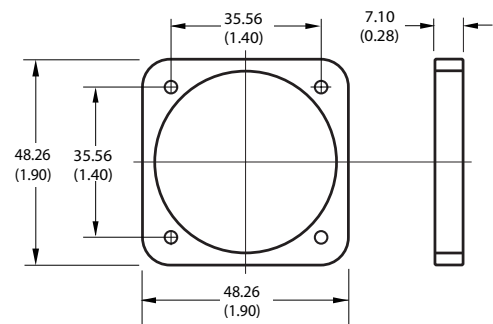
#### Drawings for panel thickness 1.6 mm (max. 3.17 mm)



### Panel cut-out



### Clamping ring



All dimensions in mm (inches)