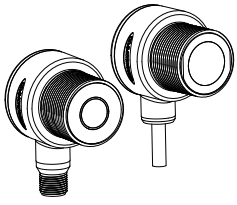
U-GAGE® T30U Series Sensors - Pump-In and Pump-Out

Features

Ultrasonic Sensors with Pump-In/Pump-Out Switching Logic



- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Program both outputs together or independently. The two outputs may be identical, independent, overlapping, or complementary
- Remote TEACH for security and convenience
- Choose models with 150 mm to 1 m range (5.9 in to 39.4 in) or 300 mm to 2 m range (11.8 in to 78.7 in)
- Wide operating range of –20 °C to +70 °C (–4 °F to +158 °F)
- Choose models with either NPN or PNP dual discrete outputs
- LED indicators for Power ON/OFF, Signal Strength, and Discrete Outputs Conducting
- Choose models with integral unterminated 2 m (6.5 ft) or 9 m (30 ft) cable, or with M12 quick-disconnect connection
- Compact, self-contained, right-angle sensor package with fully encapsulated electronics
- Rugged design for use in demanding sensing environments; rated IP67, NEMA 6P

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models

Models	Range and Frequency	Connection	Discrete Output	Response Time
T30UHNA	150 mm to 1 m (5.9 in to 39 in) 228 kHz	2 m (6.5 ft) cable	NPN (sinking)	48 ms
T30UHNAQ		5-pin M12 quick disconnect (QD)		
T30UHPA		2 m (6.5 ft) cable	PNP (sourcing)	
T30UHPAQ		5-pin M12 QD		
T30UHPB	300 mm to 2 m (11.8 in to 79 in) 128 kHz	2 m (6.5 ft) cable	PNP (sourcing)	96 ms
T30UHPB W/30		9 m cable		
T30UHPBQ		5-pin M12 QD		

A model with a QD connector requires an optional mating cable; see "Cordsets" on page 7. The following models are no longer available for order but are still covered by the information in this document: T30UHNA W/30; T30UHPA W/30; and T30UHNB, T30UHNB W/30, T30UHNBQ (300 mm to 2 m range, NPN output).

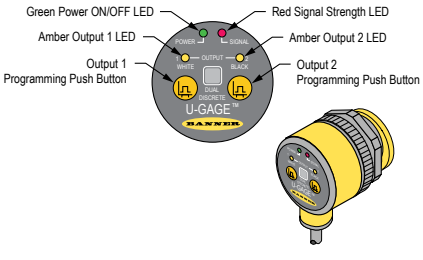
Overview

Output 1 = Pump-Out
Output 2 = Pump-In

U-GAGE® is an easy-to-use ultrasonic sensor, ideal for demanding environments. Simple push-button programming provides flexibility for a variety of applications. Excellent for gauging applications such as sensing liquid levels in a tank or for sensing most clear materials.

Each sensor includes two discrete outputs, which may be programmed independently with different window limits or together with identical limits.

Sensor features



Pump-In/Pump-Out Switching Function

Pump-in/pump-out operation provides the switching logic required for fill-level control, web tensioning control, and similar applications. In this mode, Output 2 energizes when the target reaches the farthest sensing window limit and stays energized until the target moves to the nearest limit. Output 1 de-energizes at the farthest limit and does not re-energize until the target moves to the nearest limit. Figure 2 shows how pumping action might be controlled directly by the sensor in a fill-level-control application.

Original Instructions
22-Jul-26

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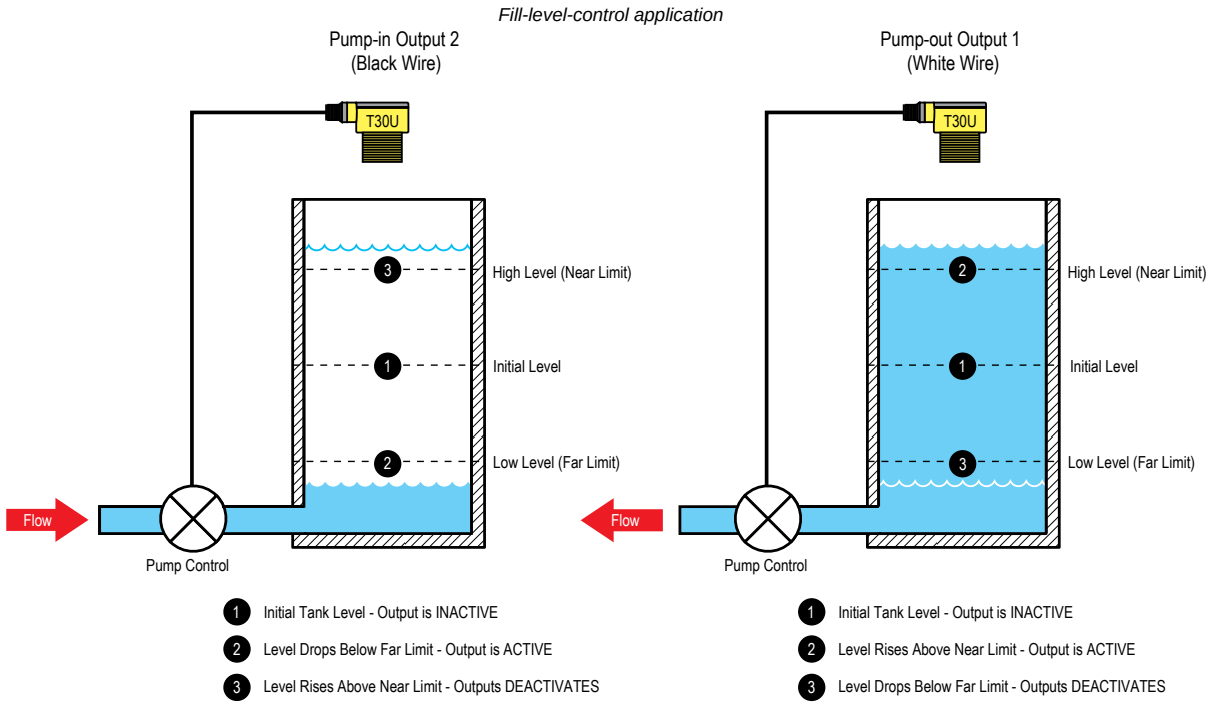
63974
p/n: 63974 Rev E

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com



If no echo is received by the sensor, the target is assumed to be beyond the far window limit.

Configuration Instructions

Sensor Programming

Window limits may be taught to the sensor using the push buttons on the back of the sensor or using remote programming.

> **NOTE:** When the sensor changes state between Program and Run modes, all of the LED indicators turn OFF momentarily, before the appropriate LEDs turn ON. The sensing window limits expand temporarily to full scale (max range) during Program mode.

Program the outputs independently to define separate sensing windows (both their size and placement) or program the outputs simultaneously for complementary operation. Sensing windows may be as large as 0.85 m for 1 m range models, and 1.7 m for 2 m range models. **Note: Output 1** = White wire (Pump-Out), **Output 2** = Black wire (Pump-In).

General Notes on Programming:

1. The sensor returns to Run mode if the first TEACH condition is not registered within 120 seconds.
2. After the first limit is taught, the sensor remains in Program mode until the TEACH sequence is finished.
3. Press and hold the programming push button > 2 seconds (before teaching the second limit) to exit Program mode without saving any changes. The sensor reverts to the last saved program.

Remote Programming

Use the Remote Programming function to program the sensor remotely or to disable the keypad, Disabling the keypad prevents anyone from adjusting any of the programming settings directly from the sensor. Connect the gray wire of the sensor to +12 to 24 V DC, with a remote programming switch connected between them.

> **NOTE:** The impedance of the remote teach input is 55 kΩ.

Follow the sequence of input pulses to program the sensor. The duration of each pulse (corresponding to a push button “click”), and the period between multiple pulses, is defined as: 0.04 seconds < T < 0.8 seconds.

> **NOTE:** Hold the Remote line high > 2 seconds (before teaching the second limit) to exit Program mode without saving any changes. The sensor will revert to the last saved program.

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TEACH Separate Window Limits for Each Output

Each output conducts in its respective manner (either pump-in or pump-out) independently, in response to the target distance. The two outputs may overlap or may be completely independent.

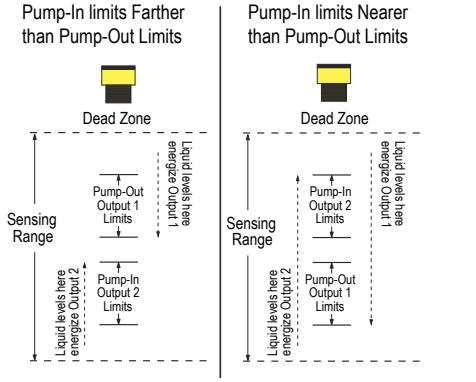
For fill-level applications, set the window limits for Output 2 (pump-in) farther from the sensor than for Output 1 (pump-out); see figure on the right.

The distance between the taught near and far limits for each output must be at least 10 mm.

To readjust window limits for either output, follow the teach procedure for that output only.

Remote wire: 0.04 s < T < 0.8 s.

Programming separate sensing window limits for each output



1. Enter the programming mode.

Method	Action	Result
TEACH Button	Push and hold push button for selected output[1] **>2 sec.**	The green Power LED turns off. The corresponding Output LED turns on amber. The sensor waits for first limit.
Remote Input	No action is necessary.	N/A

2. TEACH the first limit.

Method	Action	Result
TEACH Button	Position the target for the first limit Click the same push button	After a short delay, the amber LED flashes. The sensor learns the first limit and waits for the second limit.
Remote Input	Position the target for the first limit For Output 1 (Pump-Out), double-pulse the remote line. For Output 2 (Pump-In), single-pulse the remote line.	The green Power LED turns off. The corresponding Output LED turns on amber. After a short delay, the amber LED flashes.

3. TEACH the second limit.

Method	Action	Result
TEACH Button	Position the target for the second limit Click the same push button	After a short delay, the green Power LED turns on. The sensor learns the second limit and returns automatically to Run mode.
Remote Input	Position the target for the second limit Single-pulse the remote line	

4. Repeat as needed for the second output.

[1] Sensor will return to RUN mode if first TEACH condition is not registered within 120 seconds.

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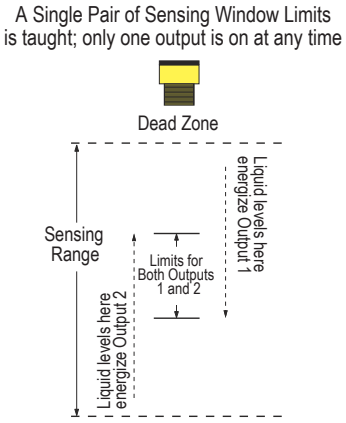
TEACH Identical (Complementary) Window Limits for Both Outputs

Only one output conducts at any time in response to the target distance. Under no conditions will both outputs conduct at the same time; see "T30U PIPO Overview" on page 1 and the figure on the left.

The distance between the taught near and far limits must be at least 10 mm in this complementary mode for proper sensor operation.

Remote wire: 0.04 s < T < 0.8 s.

Programming one pair of sensing window limits, complementary outputs



1. Enter Programming mode.

Method	Action	Result
TEACH Button	Press and hold both push buttons (or press and hold one and then the other)[2] >2 sec. 	The green Power LED turns off. Both Output LEDs turn on amber. The sensor waits for first limit.
Remote Input	No action is necessary.	N/A

2. TEACH the first limit.

Method	Action	Result
TEACH Button	Position the target for the first limit. Click either push button. 	After a short delay, the amber LEDs flash. The sensor learns the first limit and waits for the second limit.
Remote Input	Position the target for the first limit. Triple-pulse the remote line. 	The green Power LED turns off. Both Output LEDs turn on amber. After a short delay, the amber LEDs flash.

3. TEACH the second limit.

Method	Action	Result
TEACH Button	Position the target for the second limit. Click either push button. 	After a short delay, the green Power LED turns on. The sensor learns second limit and returns automatically to Run mode.
Remote Input	Position the target for the second limit. Single-pulse the remote line. 	After a short delay, the green Power LED turns on. The sensor learns second limit and returns automatically to Run mode

[2] Sensor will return to RUN mode if first TEACH condition is not registered within 120 seconds.

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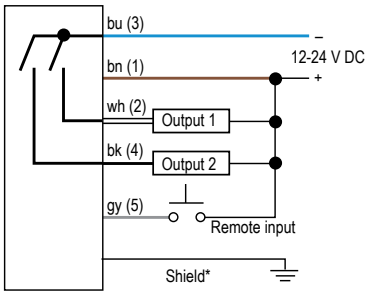
Push Button Lockout

Remote wire: 0.04 s < T < 0.8 s.

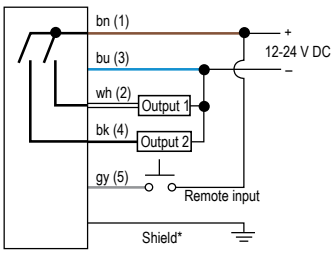
Method	Action	Result
TEACH Button	Not available via push button	Not applicable
Remote Input	Four-pulse the remote line	Push buttons are either enabled or disabled, depending on the previous condition

Wiring Diagrams

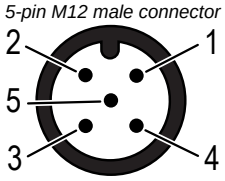
Cabled NPN



Cabled PNP



5-pin M12 male connector



1 = Brown
2 = White
3 = Blue
4 = Black
5 = Gray

It is recommended that the shield wire is connected to earth ground or DC common.

Run Mode

NOTE: All LED indicators momentarily turn OFF when sensor changes state between Program and Run modes.

Signal LED. The red Signal LED indicates the strength and condition of the sensor's incoming signal.

Signal LED Status	Indicates
Off	No signal is received, or the target is beyond the range limitations of the sensor (with some tolerance beyond the recommended minimum and maximum sensing distance)
Flashing	Relative received signal strength; the faster the LED flashes, the stronger the signal

Output LEDs. Each amber Output LED lights when the corresponding output (pump-in or pump-out) is energized.

Power ON/OFF LED. The green Power on/off LED indicates the operating status of the sensor.

Power LED	Indicates
Off	Power is off (or the sensor is in Program mode if the other LEDs are on)
On	Sensor is operating normally (power is on, Run mode)
Flashing	Discrete output is overloaded (Run mode)

Self-Diagnostic Error Mode

In the unlikely event of a microprocessor memory error, all of the LEDs will flash in sequence. If this occurs, the setup parameters have been lost and the sensor may be corrupt. Contact Banner Engineering for further information.

Specifications

Proximity Mode Range

"A" suffix models: 150 mm (5.9 in) min. near limit; 1 m (39 in) max. far limit

"B" suffix models: 300 mm (11.8 in) min. near limit; 2 m (79 in) max. far limit

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Supply Voltage
12 to 24 V DC (10% max. ripple) at 90 mA, exclusive of load

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Ratings
Dual Discrete Outputs: 100 mA maximum, total – both outputs
OFF-state leakage current: less than 10 microamps
ON-state saturation voltage: less than 1 V at 10 mA and less than 1.5 V at 100 mA

Output Configurations
SPST solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models

Output Protection
Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up

Output Response Time
"A" suffix models: 48 milliseconds
"B" suffix models: 96 milliseconds

Sensing Performance
Sensing repeatability: ±0.25% of distance
Minimum window size: 10 mm (0.4 in)
Hysteresis of discrete output: 2.5 mm (0.10 in)

Adjustments
Sensing window limits: TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely via TEACH input. Window limits may be programmed separately, or together

Construction
Molded reinforced thermoplastic polyester housing

Environmental Rating
Leakproof design is rated IEC IP67, NEMA 6P

Connections
2 m (6.5 ft) or 9 m (30 ft) 5-conductor PVC-covered attached cable, or 5-pin M12 quick-disconnect fitting

Operating Conditions
Temperature: –20 °C to +70 °C (–4 °F to +158 °F)
Humidity: 100% maximum relative humidity

Vibration and Mechanical Shock
All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60 Hz max., double amplitude 0.06 in, maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave

Certifications
CE

Application Notes
Objects passing inside the specified near limit will produce a false response

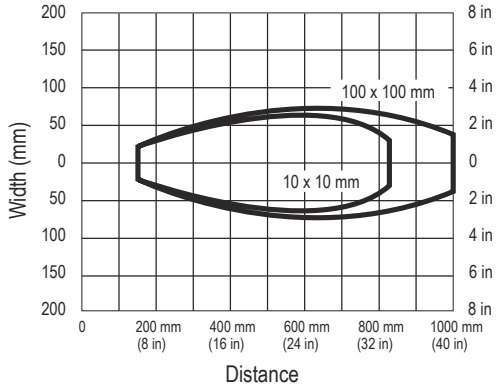
Indicators

Status LEDs	Run Mode	Program mode
Green	ON: Power ON, Run mode	OFF: Program Mode
	Flashing: Output is overloaded	
Red	Flashing: Relative received signal strength	Flashing: Relative received signal strength
Amber (2)	ON: Output energized (conducting)	ON: Ready for first window limit
		Flashing: Ready for second limit
		OFF: Not teaching this output

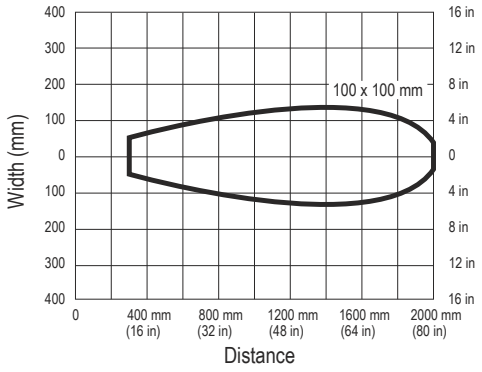
Performance Curves

Effective Beam with Plate Target (Typical)

A Models



B Models



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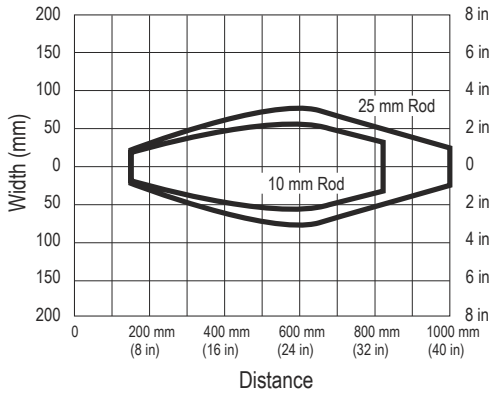
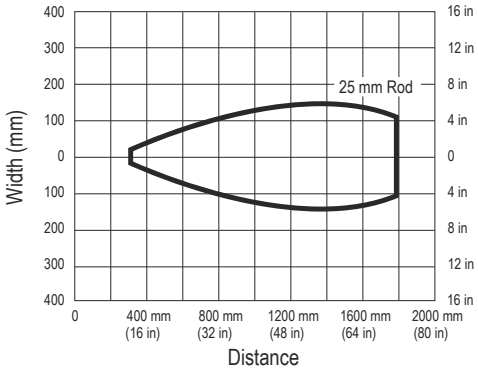
Effective Beam with Rod Target (Typical)

A Models



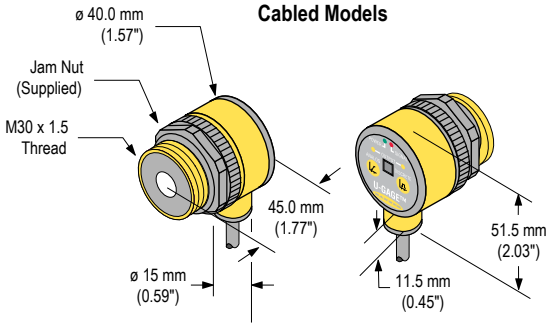
B Models



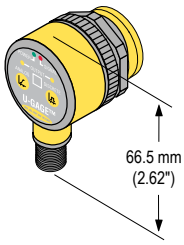
Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise. The measurements provided are subject to change.

Cabled Models

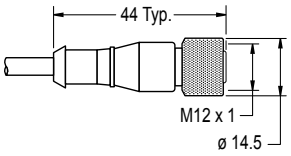
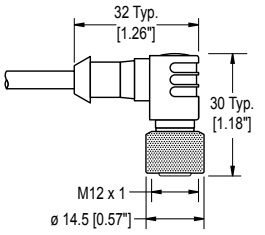


Quick-Disconnect Models



Accessories

Cordsets

5-Pin Single-Ended M12 Female Shielded Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDEC2-506	2 m (6.56 ft)	Straight		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray c UL us
MQDEC2-515	5 m (16.4 ft)			
MQDEC2-530	9 m (29.5 ft)			
MQDEC2-550	15 m (49.2 ft)			
MQDEC2-575	23 m (75.44 ft)			
MQDEC2-5100	30.5 m (100 ft)			
MQDEC2-506RA	2 m (6.56 ft)	Right-Angle		
MQDEC2-515RA	5 m (16.4 ft)			
MQDEC2-530RA	9 m (29.5 ft)			
MQDEC2-550RA	15 m (49.2 ft)			
MQDEC2-575RA	23 m (75.44 ft)			
MQDEC2-5100RA	31 m (101.68 ft)			

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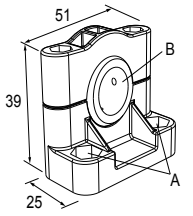
Brackets

All measurements are in mm.

SMB1815SF

- Swivel with set screws for mounting sensors by the cable hub
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware and hex wrench included
- CAD Files: DXF, PDF, IGS, STP

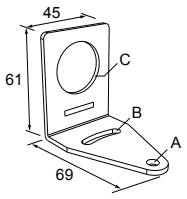
Hole center spacing: A = 36.0
Hole size: A = ø 5.0, B = ø 15.0



SMB30A

- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-gauge stainless steel
- CAD Files: DXF, PDF, IGS, STP

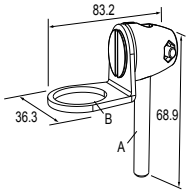
Hole center spacing: A to B=40
Hole size: A=ø 6.3, B= 27.1 × 6.3, C=ø 30.5



SMB30FA

- Swivel bracket with tilt and pan movement for precise adjustment
- Mounting hole for 30 mm sensor
- 12-gauge 304 stainless steel
- Easy sensor mounting to extrude rail T-slot
- Metric- and inch-size bolt available
- CAD Files: DXF, PDF, IGS, STP

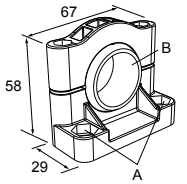
Bolt thread: SMB30FA, A=3/8 - 16 × 2 in; SMB30FAL, A=3/8 - 16 × 4 in; SMB30FAM10, A=M10 - 1.5 × 50
Hole size: B=ø 30.1



SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A=ø 50.8
Hole size: A=ø 7.0, B=ø 30.0



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