



AUSTRALIAN RAIL TRACK CORPORATION

Certificate No.: **S 02 12 121**

## NEW EQUIPMENT & SYSTEM APPROVAL CERTIFICATE

**Approval date:** 30/01/2013

**Approved by:** T. Moore

**Report no.:** TAS-02-1203-IR121

**Report date:** 1/04/2012

This certificate is issued to:

**Supplier:** **INVENSYS RAIL**

In respect of:

**Manufacturer:** **Invensys Rail Pty Ltd**  
Level 7  
380 Docklands Drive  
Docklands 3008  
Victoria

**Product description:** **PSO 4000 PHASE SHIFT OVERLAY TRACK CIRCUIT**

**Item identification:** See approved item list

**Application:** INVENSYS RAIL PSO 4000 to be used on the entire ARTC network

**Relevant Standards:** SPS 02 - 'Environmental Conditions';  
SPS 21 - 'Audio Frequency Jointless Track Circuits for main Line';  
SPS 25 - 'Signal Circuits Design Standards';  
SDS 17 - Track Circuits (design principles applicable).

**Conditions of Approval:**

1. For use in accordance with ARTC signals construction standards and standard typical circuits only.
2. Only components from the list may be utilised.
3. Any changes to the design or materials are not covered by this approval certificate and are to be submitted to ARTC to be re-approved.

*A general condition of approval is that the supplier remains accredited to ISO 9001 specifically for these products and ARTC is advised on a 2 yearly basis that accreditation is current. ARTC reserves the right to conduct its own audit of the manufacture and supply of these components to AS 19011.*

*Any subsequent change to the design, materials or manufacturing process is not covered by this approval. The manufacturer should notify ARTC of any modification or changes in order to obtain a valid certificate.*

**Note/Comments:** None

**Issue date:** 5/02/2013

**Expiry date:**

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**Issued by:**

John Furness  
ARTC Manager Standards

**Specific Conditions of Approval:**

- i. All design for track circuit operation shall assume a train shunt of  $0.2 \Omega$  and a ballast resistance of  $1.5\Omega.km$ .
- ii. A special design analysis shall be undertaken and the results shall be submitted for Standards Section approval in each instance before PSO 4000 track circuits are applied to dual gauge track (one track circuit equipment detecting trains on either gauge).
- iii. Use of any PSO 4000 track frequency (with the same address) or ISL track circuit more than once on a single track shall require each usage to be separated by at least one insulated rail joint, without bypass coupler, in each rail and a distance  $> 3.0km$  OR by two insulated rail joints, without bypass coupler, in each rail and a distance  $> 1.0km$  or by  $> 20km$  and no IRJs. Use of any PSO 4000 track frequency (with different addresses) on a single track shall require alternate address usages to be separated by at least one insulated rail joint, without bypass coupler, in each rail.
- iv. Preferred PSO 4000 address codes for use are 'A' & 'C' to provide compatibility and interchange ability with existing PSO III track circuits. Additional D, E & F address codes may be used as design requires with Standards Section approval.
- v. Where a PSO 4000 equipment signal is transmitted over a line circuit (overlaid on another circuit or stand alone) no other circuit using the same frequency, irrespective of address code, shall be used in the same cable or any equipment case in which the circuit is terminated.
- vi. INVENSYS RAIL PSO 4000 Phase Shift Overlay system may be used to overlay 50V DC vital signalling line circuits, immune and non-immune DC feed track circuits, DC relay pulse coded track circuits, electronic coded track circuits and 50Hz AC feed track circuits (not including remote rectifier DC relay track circuits) and Invensys Rail GCP and GE HXP approaches provided that a frequency separation of greater than 15% is maintained.
- vii. For use in accordance with ARTC specification SDS 25 and standard typical circuits which shall be developed and approved specifically for PSO 4000 equipment based system only including surge protection provided in accordance with ARTC specification SCP 04 'Lightning and Surge Protection Requirements' for Electronic equipment subject to Category C exposure.
- viii. Vital track clear information for a signal interlocking shall be derived independently from PSO 4000 island track (ISL) output.
- ix. Output relay for vital circuits shall be WRSA type QS2 with minimum pick of 2.5V. The output relay and PSO 4000 receiver shall be housed in the same equipment enclosure.
- x. Design documentation shall record software configuration parameters, CCN and software version number for each track circuit or crossing module installed.
- xi. Design documentation shall record track related dimensions in both metric (meters) and imperial (feet) with the imperial dimensions always shown in parenthesis following the metric.
- xii. Only components from the list **TAS-02-1203-121a** may be utilised.
- xiii. Operations, Maintenance and Safeworking procedures, including amendments to routine maintenance and testing standards e.g. SMP 25, shall be published before the equipment is commissioned. Maintenance schedule shall include a requirement to check the frequency and software version of each IPI module.

A general condition of approval is that the supplier remains accredited to ISO 9001 specifically for these products and ARTC is advised on a 12 monthly basis that accreditation is current. ARTC reserves the right to conduct its own audit of the manufacture and supply of these components to AS 19011:2003.

Any subsequent change to the design, materials or manufacturing process is not covered by this approval.

## NEW EQUIPMENT & SYSTEM APPROVAL - APPROVED ITEM LIST

**Reference no.:** TAS-02-1203-121a  
**Date:**  
**Product description:** INVENSYS RAIL PHASE SHIFT OVERLAY (PSO 4000)  
**Certificate no.:** S 02 12 121

The following lists the individual types (by catalogue number) of Phase Shift Overlay (Track Circuit) Equipment manufactured by INVENSYS RAIL which are type approved for use in signalling circuits on ARTC infrastructure under Type Approval Certificate **TAS-02-1203-121** subject only to any conditions shown on that Certificate and the Conditions of Use shown against individual types.

Catalogue No.	Code	Item Type	Conditions of Use	
Equipment Assemblies				
7000-7A471		Transmitter	Frequencies (f) are Software configured and are to be selected from list ¶ .& Adjacent frequencies on the same track shall be differentiated by at least one increment in list ¶ of approved frequencies.	ISL track circuit requires a separation along track alignment of ≥ 1km from a PSO III or PSO 4000 track circuit using frequencies (f):- 2140, 2630, 3240 or 4000Hz.
7000-7A473		Receiver		
7000-7A475		Transceiver		
7000-7A474		Crossing Assembly		
Auxiliary Equipment				
7000-8A065A	-	Battery Choke	Must be used to isolate any D.C. feed to the circuit on which PSO III or PSO 4000 signal is overlaid. Suitable for GCP3000, GCP4000 & motion sensors.	
7000-7A418	-	Power Line Filter	Must be used to isolate the power supply busbar from individual PSO III or PSO 4000 equipment of similar frequency.	
7000-7A403	-	Line Overlay Coupler	Used together	
7000-7A345		Line Terminator		
7000-7A388	-	Line to Receiver Coupler		
7000-7A355A-f	-	Tuned Receiver	Frequency (f) may be from list ¶ of approved frequencies only.	Use where one transmitter feeds multiple receivers.
7000-7A366-f	-	Coupler		
7000-7A377-1-f	-	Rx end Line / Rail Coupler		
7000-7A399-f	-	Tx end Line / Rail Coupler		
7000-7A422-f	-	IRJ bypass coupler	Frequencies (f):- above 0790Hz only may be used.	Use only in areas where no rails conduct electric traction current.

<List ¶> For track circuits use frequencies (f):- 0790, 0970, 1180, 1450 and 1770Hz are approved for general use, frequencies (f):- 2140, 2630, 3240 and 4000Hz may be used where separation exists along track alignment of ≥ 1km from any ISL track circuit, frequencies (f):- 0156, 0211, 0285, 0348, 0430, 0525 and 0645Hz may be used where no IRJ requires to be bypassed. For D.C. line circuit overlay all above frequencies may be used. </List ¶>

-f :- insert required PSO 4000 frequency.