



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: V2531-E5 BYPASS RATIO (-): 4.5  
UNIQUE ID NUMBER: 01P14IA026 PRESSURE RATIO  $\pi_{co}$  (-): 32.3  
COMBUSTOR: Floatwall  
ENGINE TYPE: MTF RATED OUTPUT  $F_{oo}$  (kN): 134.8

### REGULATORY DATA

CHARACTERISTIC VALUES:	$LTO_{mass}/F_{oo}$ (mg/kN)	$LTO_{num}/F_{oo}$ (particles/kN)	NVPM MASS CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )
$LTO/F_{oo}$ AND MAX $nvPM_{mass}$	817.3	7.52E+15	1766
AS % OF CAEP/10 LIMIT	-	-	30.9
AS % OF CAEP/11 LIMIT (InP)	46.7	65.3	
AS % OF CAEP/11 LIMIT (NT)	255.5	187.4	

### MEASURED DATA

MODE	POWER SETTING (% $F_{oo}$ )	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK $nvPM_{mass}$ ( $\mu\text{g}/\text{m}^3$ )
				$EI_{mass}$ (mg/kg)	$EI_{num}$ (particles/kg)	
TAKE-OFF	100	0.7	1.329	108.3	3.30E+14	
CLIMB OUT	85	2.2	1.079	206.5	9.43E+14	
APPROACH	30	4.0	0.391	326.2	2.75E+15	
IDLE	7	26.0	0.144	58.5	1.41E+15	
LTO TOTAL (kg, mg, number of particles)			517	79238	7.29E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE $LTO/F_{oo}$ VALUES (mg/kN, particles/kN)				587.9	5.41E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				450.4	2.87E+15	1372

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% $F_{oo}$ )	CORRECTED EMISSIONS INDICES	
		$EI_{mass\_SL}$ (mg/kg)	$EI_{num\_SL}$ (particles/kg)
TAKE-OFF	100	120.6	7.10E+14
CLIMB OUT	85	234.4	2.26E+15
APPROACH	30	387.0	7.99E+15
IDLE	7	79.3	6.34E+15

### AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	100.9	101.6	HEAT OF COMBUSTION (MJ/kg)	43.22
TEMPERATURE (K)	275.8	278.2	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0018	0.0025	AROMATICS CONTENT (%vol)	16.6
			NAPHTHALENE CONTENT (%vol)	2.38
			SULPHUR CONTENT (ppm by mass)	540

MANUFACTURER: International Aero Engines  
TEST ORGANIZATION: Pratt & Whitney  
TEST LOCATION: East Hartford, CT  
TEST DATES: 12/12/2016-14/12/2016

### REMARKS

1. Data from certification report IAE-0324
2. Engine performance reflects SelectOneTM and SelectTwoTM package upgrades
3. nvPM levels in accordance with Annex 16 Vol. II, Chapter 4, Appendix 7 and Appendix 8.