



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: Trent 768  
UNIQUE ID NUMBER: 01P14RR101  
COMBUSTOR: Phase5  
ENGINE TYPE: MTF  
BYPASS RATIO (-): 5.2  
PRESSURE RATIO  $\pi_{co}$  (-): 34.5  
RATED OUTPUT  $F_{oo}$  (kN): 304.3

### 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 <sub>mass</sub>	207.4	2.14E+15	482
AS % OF CAEP/10 LIMIT	-	-	12.0
AS % OF CAEP/11 LIMIT (InP)	59.7	51.3	
AS % OF CAEP/11 LIMIT (NT)	96.9	76.9	

### MEASURED DATA

MODE	POWER SETTING (% $F_{oo}$ )	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM <sub>mass</sub> ( $\mu\text{g}/\text{m}^3$ )
				EI <sub>mass</sub> (mg/kg)	EI <sub>num</sub> (particles/kg)	
TAKE-OFF	100	0.7	2.907	84.7	2.97E+14	
CLIMB OUT	85	2.2	2.375	97.1	4.38E+14	
APPROACH	30	4.0	0.781	15.2	3.90E+14	
IDLE	7	26.0	0.259	4.3	5.48E+14	
LTO TOTAL (kg, mg, number of particles)			1027	45395	4.68E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ $F_{oo}$ VALUES (mg/kN, particles/kN)				149.2	1.54E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				96.8	5.48E+14	374

\* 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 <sub>mass_SL</sub> (mg/kg)	EI <sub>num_SL</sub> (particles/kg)
TAKE-OFF	100	90.8	4.18E+14
CLIMB OUT	85	105.2	6.55E+14
APPROACH	30	18.1	8.53E+14
IDLE	7	6.5	2.08E+15

### AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	101.0	101.3	HEAT OF COMBUSTION (MJ/kg)	43.10
TEMPERATURE (K)	289.3	293.2	HYDROGEN CONTENT (%mass)	13.60
HUMIDITY (kg water/kg dry air)	0.0074	0.0086	AROMATICS CONTENT (%vol)	19.4
			NAPHTHALENE CONTENT (%vol)	2.00
			SULPHUR CONTENT (ppm by mass)	400

MANUFACTURER: Rolls-Royce plc  
TEST ORGANIZATION: Rolls-Royce plc  
TEST LOCATION: Derby  
TEST DATES: 02/06/2014

### REMARKS

1. Certification Report EDNS01000788666
2. The maximum EI<sub>mass</sub> occurs between 30% and 85%  $F_{oo}$
3. The maximum EI<sub>num</sub> occurs between 30% and 85%  $F_{oo}$
4. Corrected peak EI number value (fuel correction) since EEDB v30