



## ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: Trent7000-68  
UNIQUE ID NUMBER: 02F23RR139  
COMBUSTOR: Phase5 Tiled  
ENGINE TYPE: TF

BYPASS RATIO (-): 9.2  
PRESSURE RATIO  $\pi_{co}$  (-): 43.0  
RATED OUTPUT  $F_{oo}$  (kN): 308.7

## 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 $nvPM_{mass}$	216.5	1.79E+15	3410
AS % OF CAEP/10 LIMIT	-	-	85.1
AS % OF CAEP/11 LIMIT (InP)	62.3	42.9	
AS % OF CAEP/11 LIMIT (NT)	101.2	64.4	

## 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	2.288	60.3	1.93E+14	
CLIMB OUT	85	2.2	1.876	101.3	3.56E+14	
APPROACH	30	4.0	0.628	67.8	8.29E+14	
IDLE	7	26.0	0.245	18.3	4.34E+14	
LTO TOTAL (kg, mg, number of particles)			877	48093	3.98E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE $LTO/F_{oo}$ VALUES (mg/kN, particles/kN)				155.8	1.29E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				151.3	9.57E+14	2649

\* 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	64.9	2.68E+14
CLIMB OUT	85	109.9	5.42E+14
APPROACH	30	78.6	1.87E+15
IDLE	7	22.1	8.75E+14

## AMBIENT CONDITIONS

			FUEL	
	From	To	HEAT OF COMBUSTION (MJ/kg)	43.34
BAROMETER (kPa)	100.8	101.6	HYDROGEN CONTENT (%mass)	13.97
TEMPERATURE (K)	287.0	292.6	AROMATICS CONTENT (%vol)	15.9
HUMIDITY (kg water/kg dry air)	0.0080	0.0090	NAPHTHALENE CONTENT (%vol)	0.11
			SULPHUR CONTENT (ppm by mass)	300

MANUFACTURER: Rolls-Royce plc  
TEST ORGANIZATION: Rolls-Royce plc  
TEST LOCATION: Derby  
TEST DATES: 04/10/2018

## REMARKS

1. Certification Report EDNS01000740804
2. Correction of minor error in reported nvPM data
3. The maximum  $EI_{mass}$  occurs between 30% and 85%  $F_{oo}$
4. The maximum  $EI_{num}$  occurs between 30% and 85%  $F_{oo}$