



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-5B2/3 BYPASS RATIO (-): 5.5  
UNIQUE ID NUMBER: 01P08CM103 PRESSURE RATIO  $\pi_{co}$  (-): 31.3  
COMBUSTOR: Tech Insertion  
ENGINE TYPE: TF RATED OUTPUT  $F_{oo}$  (kN): 137.9

### 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 $nvPM_{mass}$	138.0	9.48E+14	2897
AS % OF CAEP/10 LIMIT	-	-	51.3
AS % OF CAEP/11 LIMIT (InP)	8.2	8.5	
AS % OF CAEP/11 LIMIT (NT)	46.4	24.9	

### 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	1.385	84.2	3.66E+14	
CLIMB OUT	85	2.2	1.107	58.0	4.22E+14	
APPROACH	30	4.0	0.358	2.1	8.49E+13	
IDLE	7	26.0	0.111	0.7	2.22E+13	
LTO TOTAL (kg, mg, number of particles)			463	13681	9.41E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ $F_{oo}$ VALUES (mg/kN, particles/kN)				99.2	6.82E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				84.2	4.34E+14	2251

\* 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	96.0	8.42E+14
CLIMB OUT	85	68.4	1.13E+15
APPROACH	30	3.2	4.72E+14
IDLE	7	1.0	1.07E+14

### AMBIENT CONDITIONS

	From	To	FUEL	
BAROMETER (kPa)	99.5	100.2	HEAT OF COMBUSTION (MJ/kg)	43.27
TEMPERATURE (K)	295.5	311.8	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0066	0.0122	AROMATICS CONTENT (%vol)	18.7
			NAPHTHALENE CONTENT (%vol)	0.67
			SULPHUR CONTENT (ppm by mass)	519

MANUFACTURER: CFM International  
TEST ORGANIZATION: Safran Aircraft Engines  
TEST LOCATION: Villaroche, France  
TEST DATES: 25/07/2019-30/07/2019

### REMARKS

- Engine 849-166/1
- Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B