



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-7B22E BYPASS RATIO (-): 5.3  
UNIQUE ID NUMBER: 01P11CM112 PRESSURE RATIO  $\pi_{co}$  (-): 24.2  
COMBUSTOR: Tech Insertion  
ENGINE TYPE: TF RATED OUTPUT  $F_{oo}$  (kN): 101.0

### 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>	71.2	1.01E+15	1176
AS % OF CAEP/10 LIMIT	-	-	17.9
AS % OF CAEP/11 LIMIT (InP)	2.9	6.6	
AS % OF CAEP/11 LIMIT (NT)	12.9	15.0	

### 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	1.004	41.5	4.31E+14	
CLIMB OUT	85	2.2	0.832	29.3	4.07E+14	
APPROACH	30	4.0	0.291	1.1	4.79E+13	
IDLE	7	26.0	0.099	0.8	4.38E+13	
LTO TOTAL (kg, mg, number of particles)			377	5175	7.30E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ $F_{oo}$ VALUES (mg/kN, particles/kN)				51.2	7.23E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				41.5	4.31E+14	914

\* 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	50.6	1.32E+15
CLIMB OUT	85	36.9	1.38E+15
APPROACH	30	1.8	2.73E+14
IDLE	7	1.3	2.69E+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