

型号认可证数据单
THE VALIDATION DATA SHEET

编号/No.: VTC0321E

版次/Revision: 1

型号/Type:

Trent 1000-A2	Trent 1000-C2	Trent 1000-D2
Trent 1000-E2	Trent 1000-G2	Trent 1000-H2
Trent 1000-J2	Trent 1000-K2	Trent 1000-L2
Trent 1000-AE3	Trent 1000-CE3	Trent 1000-D3
Trent 1000-G3	Trent 1000-H3	Trent 1000-J3
Trent 1000-K3	Trent 1000-L3	Trent 1000-M3
Trent 1000-N3	Trent 1000-P3	Trent 1000-Q3
Trent 1000-R3		

批准人/Approved by:



职务/Title: Director General of CAAC-AAD

日期/Date: 2022 年 10 月 8 日

本数据单是型号认可证（编号 VTC0321E）的组成部分，它规定了符合中国民用航空局的适航要求所颁发此型号认可证的产品状态和限制。

This data sheet, which is a part of Validation Type Certificate (No: VTC0321E), prescribes conditions and limitations under which the product for which the Type Certificate was issued meets the airworthiness requirements of the Chinese Civil Aviation Regulation.

型号认可证持有人/Validation of Type Certificate Holder:

Rolls-Royce Deutschland Ltd & Co KG
Eschenweg 11
Dahlewitz
15827 Blankenfelde-Mahlow
Germany

第1部分 概述

SECTION 1 GENERAL

1. CAAC 认可数据单和型号合格证数据单/CAAC Validation Data Sheet and Type Certificate Data Sheet:

	中国民用航空局认可数据单号、版次和颁发日期 CAAC Validation Data Sheet Number, Revision and issuance date	型号合格证数据单号、版次和颁发日期 Type Certificate Data Sheet Number, Revision and issuance date
当前 Current	No.VTC0321E, 版次1/Rev 1 2022年5月X日	EASA TCDS E.036, Issue: 16 05 Nov 2019
历史 History	No.VTC0321E, 版次0/Rev 0 2016年3月18日	EASA TCDS E.036, Issue: 06 06 May 2015

CAAC认可数据单修订记录/CAAC VTCDS Change Record

CAAC 认可数据单版次/ CAAC VTCDS Revision	相对上一版的修订记录 Change Record	备注 Remark
Rev 1	- 增加下列型别: Add the following models: Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, Trent 1000-R3 - 发动机型号定义从第二版更改到第三版并增加MB 72-K117的改装要求。 Change of DIS Issue 2 to Issue 3 and add the requirement of MB 72-K117 - 更改型号合格证持有人地址 Change of TC Holder's address - 更改型号合格证持有人, 由罗尔斯·罗伊斯公司更改为罗尔斯·罗伊斯德国公司 Transfer of TC from Rolls-Royce plc to Rolls-Royce Deutschland Ltd & Co KG - 增加 CAEP/10 非挥发性颗粒物要求的符合性 Introduction of CAEP/10 for nvPM compliance - 修订中华人民共和国国家标准“3号喷气燃料”(GB 6537) Revise National Standard of the People's Republic of China "No.3 Jet Fuel" (GB 6537)	

2. 类别/Category: 发动机/Engine

3. 认可当局/Validation Authority: 中国民用航空局/CAAC

审定当局/Certifying Authority:	欧盟航空安全局/EASA
4. 型号合格证持有人: Type Certificate Holder:	罗尔斯·罗伊斯德国公司 Rolls-Royce Deutschland Ltd & Co KG
5. ETOPS:	适用/Applicable
6. CAAC专用要求: CAAC Special Requirements:	中华人民共和国国家标准“3号喷气燃料” (GB 6537) National Standard of the People's Republic of China “No.3 Jet Fuel” (GB 6537)

第2部分 数据单

SECTION 2 DATA SHEET

I. 概述/General

1. 型别/Type/ Model

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2

Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3,

Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3,

Trent 1000-R3

此发动机型别批准按照以下额定值和运行限制在大型飞机上使用，发动机符合动力装置安装要求中规定的安装标准。

These engine models are approved for use on Large Aeroplanes at the ratings and within the operating limitations specified below, subject to compliance with the powerplant installation requirements appropriate to approved installations.

2. 型号合格证持有人/Type Certificate Holder

Rolls-Royce Deutschland Ltd & Co KG

Eschenweg 11

Dahlewitz

15827 Blankenfelde-Mahlow

Germany

DOA ref.: EASA.21J.065

到2019年2月20日/Formerly (until 20 February 2019)

Rolls-Royce plc

62 Buckingham Gate

London

SW1E 6AT

United Kingdom

之前的DOA/former DOA ref.: EASA.21J.035

3. 制造商/Manufacturer

Rolls-Royce plc

4. 申请日期/Date of Application

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2,

Trent 1000-H2, Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

申请日期/Application Date : 2012年5月16日/16 May 2012

发动机型别/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3,
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3,
Trent 1000-R3

申请日期/Application Date : 2013年11月22日/22 November 2013

5. 审定基准日期/Certification Reference Date

2004年9月30日/30 September 2004

6. EASA颁证日期/EASA Type Certification Date

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2,
Trent 1000-H2, Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

2013年9月10日/10 September 2013

发动机型别/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3,
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3,
Trent 1000-R3

2016年7月11日/11 July 2016

II. 审定基础/Certification Basis

1. EASA审定基础/EASA Certification Basis

1.1. 适航标准/Airworthiness Standards:

适用于全部型别/For all models

- CS-E: 初始版本, 2003年10月24日
CS-E: original issue, dated 24 October 2003
- 限时派遣: CS-E 1030第三修正案
Time Limited Dispatch : CS-E 1030 amendment 3
- 双发延程: CS-E 1040第三修正案
ETOPS: CS-E 1040 amendment 3

1.2. 专用条件/Special Conditions (SC)

无 none

1.3. 等效安全/Equivalent Safety Findings

适用于全部型别/For all models

- CS-E 740 150小时持久试验/150 Hour Endurance Test
- CS-E 740(f) 无最大连续转速限制声明或显示/Non declaration or display of Maximum Continuous Speed Limitation
- CS-E 790 吸雨吸雹/Ingestion of Rain and Hail

发动机型别/Engine models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2, Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3,
Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3,
Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, Trent 1000-R3

- CS-E 840和CS-E 850 高压轴基本可靠性/HP Shaft Prime Reliability

发动机型别/Engine models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3
Trent 1000-R3

- CS-E 740 (e) 和 (f)(4)(v) 滑油系统限制/Oil system limits
- CS-E 740(f)(1) 为更高N3转速限制的CS-E 740做的补充测试/Supplementary test to CS-E 740 for higher rotational N3 limitation

1.4 环境保护/Environmental Protection

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

排放物及燃油排放: ICAO附件16第II卷第II & III部分 (第三版, 2008年7月)

第7修正案2011年11月7日。

Emissions and Fuel Venting: ICAO Annex 16, Volume II, Parts II & III (3rd Edition, July 2008),
Amendment 7 dated 17 November 2011

发动机型别/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3

Trent 1000-R3

排放物及燃油排放: CS-34第3修正案按照欧盟立法决定 2019/014/R (2019年7月29日)实施; ICAO附件16第II卷第9修正案(2018年1月1日)于2018年9月11日实施; NO_x等级符合上述附件第III部分, 第二章, 2.3.2e 节 (CAEP/8); 非挥发性颗粒物最大质量浓度等级符合上述附件第III部分, 第四章, 4.2.2 节 (CAEP/10)。

Emissions and Fuel Venting: CS-34 Amendment 3 as implemented by ED Decision 2019/014/R (29th July 2019); ICAO Annex 16, Volume II, Amendment 9 (1st January 2018) as implemented into EU Legislation 11/09/2018; NO_x levels in compliance with Part III, Chapter 2, paragraph 2.3.2e) (CAEP/8) of the above mentioned Annex. Maximum nvPM mass concentration levels in compliance with Part III, Chapter 4, paragraph 4.2.2 (CAEP/10) of the above mentioned Annex.

2. CAAC认可审定基础/CAAC Validation Certification Basis

接受EASA的审定基础, 另外包括以下CAAC附加技术条件:

CAAC validation certification basis includes EASA certification basis and CAAC Additional Technical Conditions which are as follows:

2.1. CAAC型号认可证颁发之前EASA发布的所有适用的适航指令均须遵守。

All applicable airworthiness directives (ADs) issued by EASA prior to issuance of the CAAC VTC shall be complied with.

2.2. 中华人民共和国国家标准“3号喷气燃料”(GB 6537)。

National Standard of the People's Republic of China "No.3 Jet Fuel" (GB 6537) .

2.3. 基于CAAC和EASA适航标准和环境保护要求、条款解释、使用情况、政策和指导性资料之间的差异所确定的下列附加要求。

Based on the differences in the airworthiness standards, environmental requirement, applications, service experiences, policies, and guidance materials between CAAC and EASA, requirements below shall be complied with.

- 按照CCAR 33.4和A33.3(c)条款要求, 为申请获得安装在已批准ETOPS飞机上的发动机资格, 持续适航文件必须包括发动机状态监控程序。

Per CCAR 33.4 and A33.3(c), for seeking eligibility for the engine to be installed on an airplane

approved for ETOPS, the Instructions for Continued Airworthiness must include procedures for engine condition monitoring.

- 按照CCAR 33.69条款要求, 电点火系统必须至少有二个点火器和二条独立的次级电路。
Per CCAR 33.69, the electric ignition system must have at least two igniters and two separate secondary electric circuits.
- 按照CCAR 33.88(a)条款要求, 完成超温试验。
Per CCAR 33.88(a), the over-temperature test shall be completed.
- 按照CCAR 33.90条款要求, 须在符合型号设计的原始型发动机上进行初始维修检查相关的试验。
Per CCAR 33.90, an IMI test is required to be carried out on the original engine model of a type design.

III. 技术特性/Technical Characteristics

1. 型别设计定义/Type Design Definition

依照Trent1000型号合格证数据单进行运行的最低发动机型号设计标准列于下表中。

The minimum standard of Engine Type Design for operation in accordance with the Trent 1000 Type Certificate Data Sheet are defined in the following documents:

型别/Model	发动机型号定义/Engine Type Definition
Trent 1000-A2	DIS 2327 Issue 3
Trent 1000-C2	DIS 2328 Issue 3
Trent 1000-D2	DIS 2329 Issue 3
Trent 1000-E2	DIS 2330 Issue 3
Trent 1000-G2	DIS 2331 Issue 3
Trent 1000-H2	DIS 2332 Issue 3
Trent 1000-J2	DIS 2333 Issue 3
Trent 1000-K2	DIS 2334 Issue 3
Trent 1000-L2	DIS 2335 Issue 3
Trent 1000-AE3	DIS 2372 Issue 3 plus MB72-K117
Trent 1000-CE3	DIS 2373 Issue 3 plus MB72-K117
Trent 1000-D3	DIS 2357 Issue 3 plus MB72-K117
Trent 1000-G3	DIS 2360 Issue 3 plus MB72-K117
Trent 1000-H3	DIS 2361 Issue 3 plus MB72-K117
Trent 1000-J3	DIS 2362 Issue 3 plus MB72-K117
Trent 1000-K3	DIS 2363 Issue 3 plus MB72-K117
Trent 1000-L3	DIS 2364 Issue 3 plus MB72-K117
Trent 1000-M3	DIS 2365 Issue 3 plus MB72-K117
Trent 1000-N3	DIS 2367 Issue 3 plus MB72-K117
Trent 1000-P3	DIS 2368 Issue 3 plus MB72-K117
Trent 1000-Q3	DIS 2370 Issue 3 plus MB72-K117
Trent 1000-R3	DIS 2369 Issue 3 plus MB72-K117

经批准的服务通告引入了发动机型号设计更改, 详见注释9。

Changes to the Engine Type Design are introduced by approved Service Bulletins (SB). See note 9.

2. 描述/Description

Trent 1000发动机是一款三转子高涵道比轴流涡扇发动机。低压、中压和高压压气机分别由各自的涡轮驱动。低压压气机风扇由2.85m后掠叶片和出口导向叶片组成。燃烧系统由一个环形燃烧室及18个燃油喷嘴组成。

The Trent 1000 engine is a three shaft high bypass ratio, axial flow, turbofan with Low Pressure, Intermediate Pressure and High Pressure Compressors driven by separate turbines through coaxial shafts. The LP Compressor fan diameter is 2.85m with a swept fan blade and OGV's. The combustion system consists of a single annular combustor with 18-off fuel spray nozzles.

从发动机后部向前看，低压和中压组件分别逆时针方向旋转，高压组件顺时针方向旋转。压气机和涡轮特征如下：

The LP and IP assemblies rotate independently in an anti-clockwise direction, the HP assembly rotates clockwise, when viewed from the rear of the engine. The Compressor and Turbine have the following features:

压气机/Compressor	涡轮/Turbine
低压/LP – 单级/Single stage	低压/LP –6 级/6 stage
中压/IP – 8 级/8 stage	中压/IP –单级/Single stage
高压/HP – 6 级/6 stage	高压/HP –单级/Single stage

发动机控制系统利用EEC（发动机电子控制器）通过数字化数据总线与机身界面连接。发动机还有EMU（发动机监测单元）（给飞机提供监测的振动信号）。

The engine control system utilize an EEC (Electronic Engine Controller) which has an airframe interface for digital bus communications. An EMU (Engine Monitor Unit) is fitted (to provide vibration signals to the aircraft).

3. 设备/Equipment

型号设计定义包括的具体设备：参考安装手册。

For details of equipment included in the type design definition: refer to Installation Manual

飞机TC持有人提供的安装在发动机上或由发动机驱动的短舱设备和其他具体设备信息：参考安装手册。

For details of equipment and nacelle hardware supplied by the Airframe TC holder that may be mounted on or driven by the engine: refer to Installation Manual.

注释：发动机取证时使用了反推装置。注意反推装置不属于发动机型号设计的一部分，而是随飞机进行取证。

Note: The engine is certified for use with an operable Thrust Reverser Unit. Note that the Thrust Reverser Unit does not form part of the engine type design and is certified as part of the aircraft type design.

4. 尺寸/Dimensions

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2, Trent 1000-J2, Trent 1000-K2, Trent 1000-L2, Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, Trent 1000-R3

总长度/Overall mm (ins)	4771 (187.8)
最大半径/maximum Radius mm (ins)	1899 (74.8)

长度-从整流罩尖部开始，到尾部轴承箱内安装法兰盘后部。

Length - tip of spinner to rear of the tail bearing housing inner plug flange.

半径-从中线开始，不包括余油放泄管。

Radius - from centre line, not including drains mast.

5. 净重/Dry Weight

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,

Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

最大发动机净重/Maximum dry engine weight (kg)	5947
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包括作为发动机部分取证的短舱EBU组件，但不包括液体。

Including nacelle EBU items certified as part of the engine but not including fluids

发动机型别/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3

Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3

Trent 1000-R3

最大发动机净重/Maximum dry engine weight (kg)	6114
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包括作为发动机部分取证的短舱EBU组件，但不包括液体。

Including nacelle EBU items certified as part of the engine but not including fluids

6. 额定值/Ratings

ISA海平面静止条件推力额定值如下/The ISA sea-level static thrust ratings are:

额定值/Rating		Trent 1000-A2 Trent 1000-AE3	Trent 1000-C2 Trent 1000-CE3	Trent 1000-D2 Trent 1000-D3	Trent 1000-E2
推力 kN (lbf)	起飞(净) (5分钟) Take-Off (net) (5 minutes)	307.8 (69,194)	331.4 (74,511)	331.4 (74,511)	265.3 (59,631)
	等效无辅助设备发动机起飞值 Equivalent Bare Engine Take-Off	310.9 (69,885)	334.7 (75,239)	334.7 (75,239)	268.0 (60,253)
	最大连续值 (净) Maximum Continuous (net)	287.9 (64,722)	309.3 (69,523)	309.3 (69,523)	261.8 (58,866)
	等效无辅助设备发动机最大连续值 Equivalent Bare Engine Maximum Continuous	290.8 (65,382)	312.3 (70,217)	312.3 (70,217)	264.6 (59,481)

额定值/Rating	Trent 1000-G2	Trent 1000-H2	Trent 1000-J2	Trent 1000-K2
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		Trent 1000-G3	Trent 1000-H3	Trent 1000-J3	Trent 1000-K3
推力 kN (lbf)	起飞(净) (5分钟) Take-Off (net) (5 minutes)	320.6 (72,066)	284.2 (63,897)	347.5 (78,129)	347.5 (78,129)
	等效无辅助设备发动机起飞值 Equivalent Bare Engine Take-Off	323.7 (72,777)	287.1 (64,551)	350.9 (78,886)	350.9 (78,886)
	最大连续值 (净) Maximum Continuous (net)	287.9 (64,722)	261.8 (58,866)	319.5 (71,818)	319.5 (71,818)
	等效无辅助设备发动机最大连续值 Equivalent Bare Engine Maximum Continuous	290.8 (65,382)	264.6 (59,481)	322.6 (72,519)	322.6 (72,519)

额定值/Rating		Trent 1000-L2 Trent 1000-L3	Trent 1000-M3	Trent 1000-N3	Trent 1000-P3
推力 kN (lbf)	起飞(净) (5分钟) Take-Off (net) (5 minutes)	331.4 (74,511)	354.6 (79,728)	354.6 (79,728)	331.4 (74,511)
	等效无辅助设备发动机起飞值 Equivalent Bare Engine Take-Off	334.7 (75,239)	358.1 (80,494)	358.1 (80,494)	334.7 (75,239)
	最大连续值 (净) Maximum Continuous (net)	309.3 (69,523)	323.3 (72,691)	323.3 (72,691)	309.3 (69,523)
	等效无辅助设备发动机最大连续值 Equivalent Bare Engine Maximum Continuous	312.3 (70,217)	326.5 (73,409)	326.5 (73,409)	312.3 (70,217)

额定值/Rating		Trent 1000-Q3	Trent 1000-R3		
推力 kN (lbf)	起飞(净) Take-Off (net) (5分钟)	347.5 (78,129)	360.4 (81,028)		
	等效无辅助设备发动机起飞值 Equivalent Bare Engine Take-Off	350.9 (78,886)	363.9 (81,802)		
	最大连续值 (净) Maximum Continuous (net)	319.5 (71,818)	323.3 (72,691)		
	等效无辅助设备发动机最大连续值 Equivalent Bare	322.6 (72,519)	326.5 (73,409)		

	Engine Maximum Continuous				
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参考第VI章注释1,2,3.

Refer to Section VI Notes 1, 2 and 3.

7. 控制系统/Control System

发动机安装了全权限数字电子控制系统（FADEC）和发动机监测单元（EMU）。

The engine is equipped with a Full Authority Digital Engine Control (FADEC) system and an Engine Monitoring Unit (EMU).

其他信息参考安装及操作手册。参考VI章注释4和5。

Refer to the Installation Manual and Operating Instructions for further information. Refer to Section VI Notes 4 and 5.

8. 流体 (燃油, 滑油, 冷却剂, 添加剂) /Fluids (Fuel, Oil, Coolant, Additives)

8.1. 燃油和添加剂/Fuel and Additives

参考使用说明中批准的燃油及添加剂规范信息。

Refer to the Operating Instructions for information on approved fuel and additive specifications.

8.2. 滑油/Oil

参考使用说明中批准的滑油规范信息。

Refer to the Operating Instructions for information on approved oil specifications.

9. 航空器附件传动装置/Aircraft Accessory Drives

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3

Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3

Trent 1000-R3

发动机附件传动齿轮箱可搭配两个可变频率起动发电机（VFSG）和一个液压泵来为航空器提供电能和液压动力。这些单元是航空器机体的一部分，需按航空器适航标准认证。发动机安装说明给出安装运行的数据要求，包括扭矩和功率限制。

The engine's accessory gearbox may be fitted with two Variable Frequency Starter Generators (VFSG) and one Hydraulic Pump to provide electrical and hydraulic power to the aircraft. These units are part of the airframe, and certified under Aircraft Airworthiness Standards. The Engine Installation Manual details installation and operational requirements, including torque and power limitations.

10. 最大允许引气/Maximum Permissible Air Bleed Extraction

所有Trent 1000型发动机都为机身部件防冰（“短舱防冰引气”）提供压缩机空气。防冰引气通过调节活门控制气流量。

All of the Trent 1000 engine models supply compressor air for the purpose of anti-icing of airframe components (“Nacelle Anti-Ice Bleed”). The anti-icing bleed flow demand is modulated via a regulating valve.

10.1 正常和非正常情况下热防冰引气/Thermal Anti-Icing Bleed Off takes for Normal and Abnormal operation

发动机型别/Engine Models:

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

发动机功率设置 TET (K) Engine Power Setting TET(K)	最大整流罩热防冰气流量 %核心机流量 (W26) Maximum Cowl Thermal Anti Ice Flow % Core Mass Flow (W26)
空转至1430/Idle to 1430	2.67
1430至1785/1430 to 1785	2.67至1.25线性变化/2.67 to 1.25 varying linearly
1785至1820/1785 to 1820	1.25至0.54线性变化/1.25 to 0.54 varying linearly
1820及以上/1820 and above	0.54

“W26”表示流过发动机核心机的空气流量。

“W26” represents the air mass flow through the core of the engine.

发动机型别/Engine Models:

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3
Trent 1000-R3

发动机功率设置 TET (K) Engine Power Setting TET(K)	最大整流罩热防冰气流量 %核心机流量 (W26) Maximum Cowl Thermal Anti Ice Flow % Core Mass Flow (W26)
空转至1015/Idle to 1015	2.9
1015至1765/1015 to 1765	2.9至2.1线性变化/2.9 to 2.1 varying linearly
1765至1810/1765 to 1810	2.1至0.5线性变化/2.1 to 0.5 varying linearly
1810以上/ above 1810	0.5

IV. 使用限制/Operating Limitations

1. 温度限制/Temperature Limits

1.1 大气运行包线/Climatic Operating Envelope

发动机可在环境温度不大于ISA+40°C时使用。更多运行包线，包括发动机进口的进气畸变细节请参考安装手册。

The engine may be used in ambient temperatures up to ISA +40°C. Refer to the Installation Manual for details of the Operating Envelope, including the air inlet distortion at the engine inlet.

1.2 涡轮燃气温度-修正值/Turbine Gas Temperature – Trimmed (°C)

最大地面起动和停车/Maximum during ground starts and shutdown: 700

最大空中再点火/Maximum during in-flight relights: 900

最大起飞（5分钟限制）/Maximum for take-off (5 min. limit) : 900

最大连续（无限时间）/Maximum Continuous (unrestricted duration) : 850

最大超温（20秒限制）/Maximum over-temperature (20 second limit) : 920

参考第VI章 注释 6 and 7。

Refer to Section VI Notes 6 and 7.

1.3 燃油温度/Fuel temperature (°C)

发动机型号/Engine Models:

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

最小燃油温度: -45

Minimum fuel temperature

最大燃油温度: 65

Maximum fuel temperature

更多信息请参考安装手册。

Refer to the Installation Manual for additional information.

发动机型号/Engine Models:

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3
Trent 1000-R3

启动前最小燃油温度: -54

Minimum fuel temperature before start

发动机加速最小燃油温度: -45

Minimum fuel temperature for engine acceleration

最大燃油温度: 65

Maximum fuel temperature

更多信息请参考安装手册。

Refer to the Installation Manual for additional information.

1.4 滑油温度/Oil temperature (°C)

滑油回油温度/Combined oil scavenge temperature:

发动机型号/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

限制值/Limit		燃油进口温度 Fuel Inlet Temperature
发动机起动最小值 Minimum for engine starting	-40	
增加功率的最小值 Minimum for acceleration to power	40	燃油进口温度-23°C及以上 For fuel inlet temperature minus 23°C and higher.
	从40到77 线性变化	燃油进口温度在-23°C到-45°C之间. For fuel inlet temperature between minus 23°C and minus 45°C.
无限制使用的最大值	193	

Maximum for unrestricted use		
最大瞬态值（15分钟） Maximum transient (15 minutes)	201	

发动机型号/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3
Trent 1000-R3

限制值/Limit		燃油进口温度 Fuel Inlet Temperature
发动机起动最小值 Minimum for engine starting	-40	
增加功率的最小值 Minimum for acceleration to power	40	燃油进口温度-23°C及以上 For fuel inlet temperature minus 23°C and higher.
	从40到90 线性变化	燃油进口温度在-23°C到-45°C之间. For fuel inlet temperature between minus 23°C and minus 45°C.
无限制使用的最大值 Maximum for unrestricted use	196	
最大瞬态值（15分钟） Maximum transient (15 minutes)	201	

2. 压力限制/Pressure Limits

2.1 燃油压力/Fuel pressure (kPa)

发动机型号/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2
Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3
Trent 1000-R3

最小绝对进口压力（在发动机进气口处测量）：

Minimum absolute inlet pressure (measured at engine inlet):

	kPa	psi
发动机运行中的稳态条件 Steady state conditions with engine running:	34.5 + 蒸汽压力 34.5 + Vapour Pressure	5 + 蒸汽压力 5 + Vapour Pressure
发动机运行中的瞬态条件（2秒）： Transient conditions with engine	13.8 + 蒸汽压力 13.8 + Vapour Pressure	2 + 蒸汽压力 2 + Vapour Pressure

running (2 seconds):

当飞机增压泵不工作时，在运行高度不超过35000尺、运行时间不超过600分钟时发动机运行最小燃油压力限制下降至3.4 psi。

For engine operation with the aircraft boost pumps inoperative the engine minimum fuel pressure limit is reduced down to 3.4 psi at altitudes of up to 35000 feet for up to 600 minutes.

更多信息参考安装手册。

Refer to the Installation Manual for additional information.

进口最大压力（在吊架接口处测量）：

Maximum pressure at inlet (measured at the pylon interface):

	kPa	psi
发动机稳态运行 Steady state conditions with engine running:	483	70
发动机瞬态运行（2秒）： Transient conditions with engine running (2 seconds):	966	140
发动机停车后静态 Static after engine shut down:	1172	170

2.2 滑油压力/Oil pressure (kPa)

最小滑油压力/Minimum oil pressure:

发动机型号/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

	kPa	Psi
地面慢车到74%中压转速 Ground idle to 74% IP rpm	207	30
在74%至100%中压转速之间 Between 74% and 100% IP rpm	从207到621线性变化 Varies linearly from 207 to 621	从30到90线性变化 Varies linearly from 30 to 90
在100% 中压转速以上 Above 100% IP rpm	621	90

发动机型号/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3
Trent 1000-R3

	kPa	Psi
地面慢车到74%中压转速 Ground idle to 74% IP rpm	207	30
在74%至100%中压转速之间 Between 74% and 100% IP rpm	从207到621线性变化 Varies linearly from 207 to 621	从30到90线性变化 Varies linearly from 30 to 90

在100% 中压转速以上 Above 100% IP rpm	621	90
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见注释11。

See note 11.

3. 最大允许转子转速/Maximum Permissible Rotor Speeds:

当飞机静止，发动机在慢车推力以上维护运行时，控制系统自动适用于低压转速禁飞区的温度。详情参考维护手册。

When maintenance running is performed above idle thrust with the aircraft static, the control system automatically applies a temperature dependent LP speed Keep Out Zone. Refer to the Maintenance Manual for details.

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

转子/Rotor	高压/HP	中压/ IP	低压/LP
参考速度/Reference speeds, 100% rpm	13391	8937	2683
最大起飞（5分钟限制，参考第VI章，注释3） Maximum for Take-off (5 minute limit, refer to Section VI, note 3)	101.0%	103.5%	101.5%
最大连续（参考第VI章,注释8） Maximum Continuous (Refer to Section VI, note 8)	99.5%	100.8%	101.5%

（数据考虑了仪表精度）

(Data makes allowance for instrumentation accuracies)

发动机型别/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3
Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3
Trent 1000-R3

转子/Rotor	高压/HP	中压/ IP	低压/LP
参考速度/Reference speeds, 100% rpm	13391	8937	2683
最大起飞（5分钟限制，参考第VI章，注释3） Maximum for Take-off (5 minute limit, refer to Section VI, note 3)	101.5%	103.5%	101.5%
最大连续（参考第VI章,注释8） Maximum Continuous (Refer to Section VI, note 8)	99.5%	100.8%	101.5%

（数据考虑了仪表精度）

(Data makes allowance for instrumentation accuracies)

4. 安装假设/Installation Assumptions:

具体信息参阅安装手册。

Refer to Installation Manual for details.

5. 限时派遣/Time Limited Dispatch:

所有发动机型别/All Engine Models

发动机限时派遣依照CS-E 1030批准。每个可派遣状态的最大放行间隔在安装手册中规定。

The engine has been approved for Time Limited Dispatch in accordance with CS-E 1030. The maximum rectification period for each dispatchable state is specified in the Installation Manual.

6. 双发延程飞行能力/ETOPS Capability:

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2,
Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3

Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3

Trent 1000-R3

依照CS-E 1040批准发动机具有最长330分钟的最大连续推力及15分钟的持续功率双发延程飞行能力。双发延程飞行不需要任何特殊发动机限制，标注，标牌或配置。本批准不构成对可进行ETOPS运行的批准。

The engine is approved for ETOPS capability in accordance with CS-E 1040 for a Maximum Approved Diversion Time of 330 minutes at MCT thrust plus 15 minutes at hold power. ETOPS does not require any special engine limitation, marking, placard, or configuration. This approval does not constitute an approval to conduct ETOPS operations

V. 操作及服务说明/Operating and Service Instructions

发动机型别/Engine Models

Trent 1000-A2, Trent 1000-C2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2,

Trent 1000-H2, Trent 1000-J2, Trent 1000-K2, Trent 1000-L2

文档/Document	引用文件/Document Reference
安装手册包括发动机控制系统派遣单 Installation Manual including Engine Control System Dispatch Statement	DNS193530
使用说明/Operating Instructions	OI-Trent 1000-B787C1
发动机手册/Engine Manual	E-Trent-10RRC
维修手册/Maintenance Manual	B787-81205-Axxxx
时间限制手册/Time Limits Manual	T-Trent-10RRC
服务通告/Service Bulletins	Trent 1000 — 按需

注释：维修手册是由飞机主机厂针对飞机运营人特别编制的，“xxxx”表示航空公司用户代码。

Note: The Maintenance Manual is compiled by the Airframer and is specific to Aircraft Operators, “xxxx” denotes the Airlines customer code.

发动机型别/Engine Models

Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3

Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3

Trent 1000-R3

文档/Document	引用文件/Document Reference
安装手册 Installation Manual	EDNS01000566257
使用说明/Operating Instructions	OI-Trent 1000-TEN-B787
发动机手册/Engine Manual	E-Trent-10RRT
维修手册/Maintenance Manual	B787-81205-Axxxx
时间限制手册/Time Limits Manual	T-Trent-10RRT
服务通告/Service Bulletins	Trent 1000 — 按需

注释：维修手册是由飞机主机厂针对飞机运营人特别编制的，“xxxx”表示航空公司用户代码。

Note: The Maintenance Manual is compiled by the Airframer and is specific to Aircraft Operators, “xxxx” denotes the Airlines customer code.

VI. 注释/Notes

1. 第III章第6节中提到的等效无辅助设备发动机的起飞和最大连续推力来自于经批准的净起飞和最大连续推力，不包括由于进气道、冷喷管、热喷管、外涵道气流泄漏和机体后的损失。

The Equivalent Bare Engine Take-off and Maximum Continuous thrusts quoted in Section III sub level 6 are derived from the approved Net Take-off and Net Maximum Continuous thrust by excluding the losses attributable to the inlet, cold nozzle, hot nozzle, by-pass duct flow leakage and the after body.

2. 额定值基于无飞机附件功率提取，也没有引气。

The Ratings are based on having no power offtakes to aircraft accessories nor air bleeds.

3. 起飞额定值和相关运行限制可在一发失效时使用最多不超过10分钟。

The take-off rating and the associated operating limitations may be used for up to 10 minutes in the event of an engine failure.

4. 控制和监测系统软件符合EUROCAE ED-12B/RTCA DO178B标准中的下列级别：

The control and monitoring system software meets the following levels according to EUROCAE ED-12B/RTCA DO178B:

- EEC等级为A级
EEC is designated Level “A”.
- EMU等级为E级，除驾驶舱振动值显示为C级
EMU is designated Level “E”, except that the flight deck vibration display is Level “C”.

5. 电磁干扰(EMI)，高强度辐射场(HIRF)和闪电防护能力信息参考安装手册。

Refer to Installation Manual for details of Electro-Magnetic Interference (EMI), High Intensity Radiated Fields (HIRF) and Lightning capability.

6. 发动机批准在无意情况下超过最大燃气温度限制工作一段时间，而不需要进行专门的维护。导致超温的原因需要调查并改正。

The maximum exhaust gas over temperature limit is approved for inadvertent use for the periods specified without requiring maintenance action. The cause of the over temperature must be investigated

and corrected.

7. 涡轮燃气温度由位于低压涡轮第1级导叶的热电偶测量所得。

Turbine Gas Temperature is measured by thermocouples positioned at the 1st stage Nozzle Guide Vane of the LP Turbine.

8. 数据单中的最大连续转速限制不在驾驶舱飞行面板上显示，并已在审定计划中达成一致。

The Maximum Continuous Speed limitations defined in this Data Sheet are not displayed as limitations on the Aircraft flight deck. Non-display of these limitations was agreed during the certification programme.

9. Trent 1000-E发动机的型号定义总是包含 SB 72-G319。

Trent 1000-E model Engine type definition always embodies SB 72-G319.

10. 时间限制手册中包含了持续适航文件中适航限制章节的内容。

The EASA approved Airworthiness Limitations Section of the Instructions for Continued Airworthiness is published in the applicable “Time Limits Manual”.

11. 为Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, Trent 1000-R3定义的最小滑油压力显示修正/指示 kPa(psi)以确保驾驶舱的显示与其他机型一致。

The minimum oil pressure limits defined for Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, Trent 1000-R3 shows trimmed/indicated kPa (psi) to ensure cockpit display is consistent with the other engine models.

-结束-

-END-