



危险物品专家组 (DGP)

第二十九次会议

2023 年 11 月 13 日至 17 日，蒙特利尔

议程项目 4：管理航空载运锂电池带来的安全风险（编号：工作卡 DGP.003.04）

重新审议危险物品专家组第 28 次会议提出的 关于降低锂离子电池的荷电状态要求的修订

（由秘书提交）

摘要

本工作文件请专家组虑及危险物品专家组电子存储装置工作组进行的安全风险评估结果，重新审议危险物品专家组第 28 次会议提出的关于降低与设备包装在一起的或装在设备中的锂离子电池的荷电状态要求的修订。危险物品专家组第 28 次会议同意，一俟完成此项安全风险评估，将重新审议这些建议。

危险物品专家组的行动：请危险物品专家组：

- a) 决定是否接受危险物品专家组第 28 次会议根据危险物品专家组电子存储装置工作组进行的安全风险评估结果（载于 DGP/28-WP/41 号文件）而提出的修订建议，这些修订建议载于本工作文件附录 B 和 C 中；和
- b) 考虑是否有必要采取其他缓解措施。

1. INTRODUCTION

1.1 Considerable time was spent discussing proposed amendments related to reduced state of charge requirements for lithium ion batteries at the twenty-eighth meeting of the Dangerous Goods Panel (DGP/28, Montréal, 15 to 19 November 2021) (see Appendix A to this working paper for the report of the discussions). The proposed amendments:

- a) replaced an existing requirement for batteries packed without equipment to be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity with a requirement for them to be offered at the lowest state of charge practical but not exceeding 30 per cent of their rated capacity;
- b) extended the state of charge limit, with the proposed revision described in sub-paragraph a) above, to batteries packed with or contained in equipment (UN 3481) and to battery-powered vehicles and battery-powered equipment (UN 3177); and
- c) amended existing state of charge limits in Packing Instructions 910 and 974 of the Supplement to the Technical Instructions with the proposed revision described in sub-paragraph a) above.

Note.— Packing Instruction 910 applies to low production runs and prototype lithium batteries and cells not meeting the UN 38.3 test criteria shipped under an approval, and Packing Instruction 974 applies to lithium cells or batteries having a mass exceeding 35 kg shipped under an approval.

1.2 While there was support for the intent of the proposed amendments, the panel could not agree to them at that time. It could not agree to the revised state of charge requirement as written as it was considered ambiguous and difficult to implement and enforce. It could not reach a consensus on extending the reduced state of charge requirement beyond those packed on their own without first conducting a thorough safety risk assessment. However, this was not possible during DGP/28 due to time constraints. The panel agreed that this should be conducted by the DGP Working Group on Electronic Storage Devices (DGP-WG/Energy Storage Devices) and, given the complexity of the task, agreed that it should be conducted under the guidance of safety management experts through coordination with the Secretariat.

2. SAFETY RISK ASSESSMENT

2.1 A report of the safety risk assessment conducted by DGP-WG/Electronic Storage Devices is contained in DGP/29-WP/41, “Report of the Dangerous Goods Panel Working Group on Energy Storage Devices (DGP-WG/Energy Storage Devices)”. It focuses on lithium ion batteries packed with and contained in equipment. As noted in the report, “Lithium ion batteries packed with and contained in equipment were selected for this analysis because these configurations have similar characteristics and requirements, while lithium ion battery powered vehicles comprise a broad range of products and sizes that may warrant special consideration.”.

3. PROPOSED AMENDMENTS TO THE TECHNICAL INSTRUCTIONS AND ITS SUPPLEMENT PRESENTED TO DGP/28

3.1 The amendments to the Technical Instructions requiring a reduced state of charge for lithium ion batteries proposed at DGP/28 are reproduced in Appendix B and the amendments to the Supplement to the Technical Instructions are reproduced in Appendix C to this working paper. The amendments presented in

Appendices B and C are based on the 2023-2024 Edition of the Technical Instructions and the 2023-2024 Edition of the Supplement, respectively (the amendments presented at DGP/28 were based on the 2021-2022 Edition of these documents). The amendments were proposed to the following packing instructions at DGP/28:

- a) Packing Instruction 952 of the Technical Instructions, assigned to UN 3171 — **Battery-powered equipment and Battery-powered vehicle.**
- b) Packing Instructions 965 of the Technical Instructions, assigned to UN 3480 — **Lithium ion batteries;**
- c) Packing Instruction 966 of the Technical Instructions, assigned to UN 3481 — **Lithium ion batteries packed with equipment;**
- d) Packing Instruction 967 of the Technical Instructions, assigned to UN 3481 — **Lithium ion batteries contained in equipment;**
- e) Packing Instructions 910 of the Supplement; and
- f) Packing Instructions 974 of the Supplement.

3.2 The amendment to Packing Instruction 952 proposed at DGP/28 is outdated on account of lithium ion battery-powered vehicles being reassigned to new UN No. 3556 — **Vehicle, lithium ion battery powered** in the 23rd revised edition of the UN Model Regulations (see DGP/29-WP/13 for amendments to Table 3-1 and DGP/29-WP/14 for amendment to Packing Instruction 952 proposed to align with the UN provisions). A reference to vehicles in the text proposed for inclusion in Packing Instruction 952 is therefore struck out in the appendix to this working paper. A requirement for vehicles powered by lithium ion batteries to be discharged is proposed for inclusion in Packing Instruction 952 independently of this working paper (see DGP/29-WP/26).

4. ACTION BY THE DGP

4.1 The DGP is invited to:

- a) decide on whether to accept the amendments proposed at DGP/28 contained in Appendices B and C to this working paper based on the outcome of the safety risk assessment conducted by DGP-WG/Electronic Storage Devices presented in DGP/28-WP/41; and
- b) consider whether any other mitigation measures are necessary.

附录 A

危险物品专家组第 28 次会议报告摘录： 危险物品专家组第 28 次会议关于要求降低锂离子电池荷电状态的建议的讨论情况

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4.3 通过包装说明 965 将 UN 3480 的荷电状态降至不超过 30% (DGP/28-WP/6)，通过包装说明 966 和 967 将 UN 3481 的荷电状态降至不超过 30% (DGP/28-WP/7)，和将 UN 3171 的荷电状态降至不超过 30% (DGP/28-WP/10)

4.3.1 会议讨论了对几个锂离子电池包装说明的修订，提议要求电池芯和电池以最低可行、但不超过 30% 的荷电状态来运输。修订包括对现有的针对 UN 3480 — 锂离子电池的 30% 的限制要求进行修改，并将这一限制的适用范围扩大至所有锂离子电池的运输。提议人解释说，他的意图是在运输过程中最大程度地降低出现热失控、热失控从一个电池芯传导至另一个电池芯，以及产生爆炸性气体的风险。

4.3.2 提议进行修订的包装说明为：

- a) 适用于 UN 3480 — 锂离子电池的包装说明 965；
- b) 适用于 UN 3481 — 与设备包装在一起的锂离子电池的包装说明 966；
- c) 适用于 UN 3481 — 装在设备中的锂离子电池的包装说明 967；和
- d) 适用于 UN 3171 — 由电池驱动的设备 and 由电池驱动的车辆包装说明 952。

还提议对《技术细则补篇》的包装说明 910 和 974 进行修订。关于这些包装说明的讨论报告见第 4.4 段。

4.3.3 会议原则上讨论了这些提案，讨论侧重于：

- a) 要求最低可行、但不超过 30% 的荷电状态，没有审查针对每一具体包装说明的拟议修订；和
- b) 将包装说明 965 中所含荷电状态限制的适用范围扩大至其他锂离子电池包装说明，重点放在与设备包装在一起的和装在设备中的锂离子电池上。

4.3.4 最低可行但不超过 30% 的荷电状态

4.3.4.1 专家组支持对最低可行荷电状态（不超过 30%）作出要求的意图所在，但不能同意书面提案，因为它被认为模棱两可，难以实施和执行。有些人支持提出一项建议，但无法就措辞达成一致。专家组大多数成员认为对《技术细则》进行任何更改还为时过早，但支持由危险物品专家组储能装置工作组 (DGP-WG/Energy Storage Devices) 在下一个两年期仔细审议这一问题。在关于本议程项目的报告附录 B 中，详细列出了讨论期间所发表的意见。

4.3.5 将包装说明 965 中所含荷电状态限制的适用范围扩大至其他锂离子电池包装说明

4.3.5.1 虽然有些人支持将针对 UN 3480 的现有荷电状态限制的适用范围扩大至 UN 3481，特别是针对与设备包装在一起的锂电池，但在没有首先进行彻底的安全风险评估的情况下，专家组无法就强制实施这一要求达成共识。在 DGP/28 期间，由于时间限制，无法完成此项工作。建议危险物品专家组储能装置工作组在 DGP/28 之后尽快开展此项工作，最好是在 2022 年上半年。鉴于此项任务的复杂性，进一步建议通过与秘书处进行协调，在安全管理专家的指导下进行安全风险评估。如果安全风险评估发现了无法容忍的风险，专家组将建议采取风险缓解措施，其中可能包括强制降低荷电状态。电池行业的与会者强调，如果要求限制设备的荷电状态，将会产生巨大的经济影响。强调了有必要在考虑行业影响之前先评估安全风险。如果有必要采取风险缓解措施，则在考虑此类措施时，将会考虑电池行业所受影响。如果认为有必要，将建议编写一份 2023—2024 版《技术细则》的增编，纳入所商定的修订。在关于本议程项目的报告附录 B 中，详细列出了讨论期间所发表的意见。

4.4 通过《补篇》包装说明 910 将 UN3481 的荷电状态降至不超过 30% (DGP/28-WP/9) 和通过包装说明 974 将质量超过 35 千克的锂离子电池的荷电状态降至不超过 30% (DGP/28-WP/8)

4.4.1 针对《技术细则》中锂电池包装说明所提的修订提案（见第 4.3 段）也被提议用于《补篇》中的包装说明 910 和 974，该修订提案要求电池以最低可行、但不超过 30% 的荷电状态来进行运输。包装说明 910 适用于在获得批准的情况下予以运输的不符合联合国《试验和标准手册》第 38.3 节要求的低产量电池和锂电池和电池芯原型，包装说明 974 适用于在获得批准的情况下进行运输的质量超过 35 千克的锂电芯或电池。该修订未获得同意，原因与针对《技术细则》中包装说明的修订未获得同意的原因相同。在进行安全风险评估之后，会立即对此项修订作进一步审议。

4.4.2 包装说明 910 和 974 适用于 UN 3090、3091、3480 和 3481。每一个包装说明中均包含一项规定，要求锂离子电池芯和电池在荷电状态不超过其额定容量 30% 的情况下交运，但没有具体说明该规定同时适用于 UN 3480 和 3481。同意对包装说明 974 进行修订，以澄清其适用于这两项。在 DGP-WG/21 会议上，已同意对包装说明 910 进行一项类似修订（见 DGP-WG/21 会议报告第 3.2.3.3.2 段）。

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APPENDIX B TO THE REPORT ON AGENDA ITEM 4
(English only)

**DETAILED REPORT ON PROPOSALS TO INTRODUCE STATE OF CHARGE RESTRICTIONS
TO LITHIUM BATTERY PACKING INSTRUCTIONS IN THE TECHNICAL INSTRUCTIONS**

The following are comments provided during discussions on proposals to introduce state of charge restrictions to lithium battery packing instructions in the Technical Instructions

**1. REDUCED STATE OF CHARGE NOT EXCEEDING 30 PERCENT FOR UN 3480 THROUGH
PACKING INSTRUCTION 965 (DGP/28-WP/6)**

Support for requiring the lowest practical state of charge for lithium ion cells and batteries but not exceeding 30 per cent of their rated capacity

- a) All panel members supported the objective with agreement that shipping at the lowest, or safest, state of charge possible, without introducing a cell degradation hazard, was a good practice and might be something that could be recommended.
- b) There was data that indicated a problem, and proactive measures needed to be taken to prevent an accident.
- c) A 30 per cent state of charge limit for UN 3480 — **Lithium ion batteries** was introduced in the 2015-2016 Edition of the Technical Instructions based on FAA data that focused on 18650 cells, but this data was not extensive. It demonstrated that this limit significantly reduced the risk of thermal propagation for the majority of cell and battery types that were being transported at that time, but it was never accepted as providing a safe level for all. It was implemented to quickly and easily reduce the general risk the batteries posed to air transport. It was a prescriptive target. Some cells and batteries posed significant risk if they entered thermal runaway even at a 30 per cent state of charge. “Lowest practical” would reduce that risk.
- d) A reduced state of charge might not be possible for certain devices, including medical devices, and something could be done to address this, but it was unacceptable to put passengers at risk so that consumer devices could be ready for use when delivered.
- e) The wording of the amendment proposed was ambiguous, but could adapt it to clarify the intent. “Practicable” would be a more appropriate word choice than “practical”.

Justification for maintaining the status quo

- a) The language used was not appropriate for regulations.
- b) “Lowest practical state of charge” was not defined, which would make it very difficult to implement, particularly further down the supply chain. Manufacturers might be capable of determining the safest state of charge, but it would be challenging for others in the distribution chain.
- c) It would be difficult to enforce.
- d) What determined the lowest state of charge practical was not fixed for a given battery. The optimal level would change over the lifespan of a battery.
- e) A mandatory requirement was unjustified without data demonstrating that a 30 per cent limit was inadequate. Could be a best practice, but not a mandatory requirement.

2. EXTENDING 30 PERCENT STATE OF CHARGE LIMIT TO UN 3481 THROUGH PACKING INSTRUCTIONS 966, 967 AND UN 3171 THROUGH PACKING INSTRUCTION 952 (DGP/28-WP/7 AND DGP/28-WP/10)

Support for extending 30 per cent State of charge to Packing Instructions 966, 967 and 952

- a) There was some support to recommend state of charge limits for batteries packed with equipment through Packing Instruction 966 immediately, as these were not considered to be much different to batteries packed on their own. There was little data to demonstrate that equipment provided adequate protection from both thermal runaway propagation and explosive gas generation.
- b) Limiting the state of charge was accepted as a significant safety benefit for batteries packed on their own, and extending the requirement to UN 3481 would further reduce the risk of a lithium battery incident during transport.
- c) Not applying a state of charge limit to batteries packed with or contained in equipment may have been justified when the limit was applied to batteries packed on their own because of the protection the equipment provided, but there was an increased trend towards more powerful and energetic batteries, the numbers transported, and a diminishing ratio of equipment to batteries which meant less protection. The author of the proposal suggested that devices in the past usually consisted mostly of equipment that contained a battery, but that there was now a trend toward devices being composed mostly of batteries.

- d) Publicly-available FAA data and data from a reporting system established by UL (Thermal Runaway Incident Program (TRIP)) suggested that more air cargo incidents involving lithium battery powered equipment occurred than what was reported through mandatory reporting mechanisms. The number of airlines reporting to TRIP was a small subset of the aviation industry, but yet sixty-three cargo operation incidents involving lithium batteries had been reported between 2017-2021. This was just one system, and it was known that many incidents went unreported. While the number may have been small relative to the number of shipments, the severity of potential consequences from an incident needed to be taken into account to assess risk. There was also an overwhelming amount of data identifying a reduced state of charge as a valuable mitigation measure against both the likelihood and the severity of an event. There was a need to be proactive, not reactive.
- e) A lack of confidence with a member from the battery industry's conclusion that the data from the cited report on the heat release analysis justified status quo was expressed (see 2 b) below). The batteries in the study were tested at 50 per cent state of charge, but there was no requirement in the Technical Instructions for them to be shipped at that rate. They could be shipped at 100 per cent state of charge in compliance with the Technical Instructions. The tests were conducted more than ten years ago, and a 50 per cent state of charge then may not be comparable to 50 per cent now because of increased energy density. There were significant differences in gas volume at different states of charge, which was concerning given the fact that greater volumes of gas made fires more hazardous.
- f) A fire incident involving mobile phones being shipped as cargo that were on a skid waiting to be loaded on the aircraft had led some stakeholders to explore the feasibility of extending the state of charge limit to UN 3481, and it was known that one manufacturer implemented this limit following the incident (see DGP/28-IP/2).
- g) While sympathetic to the impact on industry (see 2 c) below), concerns that there would be an enormous impact were also expressed when other restrictions were introduced. The industry adapted, significant safety measures were implemented, and the industry's growth was maintained. Shippers had learned how to reduce the state of charge for batteries packed on their own. It would be no different for batteries packed with equipment. The impact did not justify ignoring safety risks if they existed. Nevertheless, the impact on the lithium battery industry and any other areas would be considered when developing mitigating measures, if the safety risk assessment identified the need for them.
- h) Test data from UL further demonstrated the safety benefits of a reduced state of charge (see DGP/28-IP/9). It also demonstrated no significant drop in voltage over a nine month period, suggesting the concern that a lower state of charge could result in cell degradation over time (see 2 f) below) was not a factor for air transport.

Support for not extending 30 per cent state of charge to Packing Instructions 966, 967 and 952

- a) Most panel members considered it premature to implement measures for lithium ion batteries contained in equipment because the safety risk had not been properly assessed and the impact would be much more severe than it would be for batteries packed with equipment, particularly with respect to medical devices. The risks associated with batteries contained in equipment were different to the risks with batteries packed with equipment. They wanted more time to consider with targeted discussions.
- b) Requiring a reduced state of charge for batteries packed on their own and not for batteries packed with or contained in equipment was a conscious decision the panel made. Batteries on their own were considered a much higher risk because of the increased energy density, the known ability for thermal runaway to propagate from cell to cell and package to package, and the potential for a fire involving high density batteries to overwhelm the aircraft's fire protection features.
- c) Members of the battery industry reported that implementation of a state of charge limit to equipment would be difficult to do and that the economic impact would be enormous. They were of the opinion that there was insufficient data to justify a state of charge limit, including a lack of testing. They were also of the opinion that there was sufficient data to support not introducing a state of charge limit, including an extremely low incident rate relative to the number of electronic devices transported and their belief that most incidents reported involved lithium batteries carried in the cabin and in checked baggage. A report on a heat release analysis and tests of lithium ion batteries packed with and contained in equipment was cited, one of the conclusions from it being that batteries, when at 50 per cent state of charge, did not significantly contribute to the total heat released during combustion.
- d) Establishing a 30 per cent state of charge was routine for battery manufacturers, but not so easy for others in the supply chain.
- e) Specific difficulties with regard to medical devices were raised, and it was suggested a limit was unjustified for them as they were manufactured to high standards and had an excellent safety record. Some, such as pacemakers, were extremely small. The requirement would increase the cost of medical devices and have an impact on life-saving measures if adequately charged batteries were not available to medical staff.
- f) A lower state of charge could result in cell degradation over time which increased the risk of thermal runaway.

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附录 B

在危险物品专家组第 28 次会议上提出的对《技术细则》的修订
(纳入每个文件的 2023—2024 年版)

第 4 部分

包装说明

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第 11 章

第 9 类 — 杂项危险物品

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包装说明 952

仅限于 UN 3171 的客机和货机运输

(参见包装说明 220 — 以易燃气体为燃料的发动机和机器，

包装说明 378 — 以易燃液体为燃料的发动机和机器，包装说明 950 — 以易燃液体为燃料的车辆，

包装说明 951 — 以易燃气体为燃料的车辆，或包装说明 972 — 仅包含对环境有害燃料的发动机或机器)

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补充包装说明

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电池驱动的车辆、机器或设备必须满足下列要求：

电池

所有电池都必须牢固地安装和固定在车辆、机器或设备的电池盒中，并采取保护措施防止损坏和短路。此外：

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- 3) 安装在设备中的锂离子电池必须以实际可行的最低荷电状态但不得超过其额定容量的 30% 交运；和
- 34) 如果安装的是钠电池，它们必须符合特殊规定 A94 的要求。

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包装说明 965

仅限货机运输 UN 3480

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IA 第 IA 节

每个电池芯或电池必须满足 2;9.3 的规定。

IA.1 一般要求

- 必须符合 4;1 的要求。
- 锂离子电池芯和电池必须在实际可行的最低荷电状态但不超过其额定容量 30% 的情况下交运。电池芯和/或电池在荷电状态大于其额定容量 30% 的情况下，仅可在始发国和运营人所属国的批准下根据这些当局规定的书面条件来运输。

注：关于确定额定容量的相关指南和方法，见《联合国试验和标准手册》的 38.3.2.3 小节。

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IB. 第 IB 节

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IB.1 一般要求

- 电池芯和电池必须装在符合 4;1.1.1，1.1.3.1 和 1.1.10（但 1.1.10.1 除外）规定的坚固外包装当中
- 锂离子电池芯和电池必须在实际可行的最低荷电状态但不超过其额定容量 30% 的情况下交运。电池芯和/或电池在荷电状态大于其额定容量 30% 的情况下，仅可在始发国和运营人所属国的批准下根据这些当局规定的书面条件来运输。

注：关于确定额定容量的相关指南和方法，见《联合国试验和标准手册》的 38.3.2.3 小节。

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包装说明 966

仅限于 UN 3481（与设备包装在一起）的客机和货机运输

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I. 第 I 节

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I.2 补充要求

- 锂离子电池芯和电池必须在实际可行的最低荷电状态但不超过其额定容量 30% 的情况下交运，除非始发国和运营人所属国具体批准某一更高荷电状态。
- 必须保护锂离子电池芯和电池防止短路。这包括防止在同一包装内与导电材料接触，导致发生短路。
- 锂离子电池芯和电池必须：
 - 放入能将电池芯或电池完全封装的内包装内，然后再放入下列类别所示、满足 II 类包装性能要求的包装，然后与设备一起放入坚固结实的外包装当中；或
 - 放入能将电池芯或电池完全封装的内包装内，然后与设备一起放入下列类别所示、满足 II 级包装的性能要求的包装内。
- 设备必须在外包装内得到固定以免移动。
- 每个包装件中的电池芯或电池的数量不得超过设备运行所需的数量，外加两组备用电池芯或电池。——“组”电池芯或电池为驱动每件设备所需的单个电池芯或电池的数量。
- 2011 年 12 月 31 日之后生产的电池必须在外壳上标明瓦时额定值。

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II. 第 II 节

II.2 补充要求

- 锂离子电池芯和电池必须在实际可行的最低荷电状态但不超过其额定容量 30% 的情况下交运，除非始发国和运营人所属国具体批准某一更高荷电状态。
- 锂离子电池芯和电池必须：
 - 放入能将电池芯或电池完全封装的内包装内，然后再放入符合 4.1.1.1、1.1.3.1 和 1.1.10（但 1.1.10.1 除外）规定的坚固、结实的外包装当中；或
 - 放入能将电池芯或电池完全封装的内包装内，然后与设备一起放入符合 4.1.1.1、1.1.3.1 和 1.1.10（但 1.1.10.1 除外）规定的坚固、结实的外包装当中。

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包装说明 967

仅限于 UN 3481（装在设备中）的客机和货机运输

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I. 第 I 节

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I.2 补充要求

- 锂离子电池芯和电池必须在实际可行的最低荷电状态但不超过其额定容量 30%的情况下交运，除非始发国和运营人所属国具体批准某一更高荷电状态。
- 设备必须在外包装内得到固定以免移动，必须配备防止发生意外启动的有效装置。
- 当多件设备装在同一个外包装中时，每件设备必须包装好防止与其他设备接触。
- 2011年12月31日之后生产的电池必须在外壳上标明瓦时额定值。

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II. 第 II 节

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II.2 补充要求

- 锂离子电池芯和电池必须在实际可行的最低荷电状态但不超过其额定容量 30%的情况下交运，除非始发国和运营人所属国具体批准某一更高荷电状态。
- 设备必须在外包装内得到固定以免移动，并配备防止发生意外启动的有效装置。

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附录 C

在危险物品专家组第 28 次会议上提出的对《技术细则补篇》的修订
(纳入 2023—2024 年版)

第 S-4 部分

包装说明

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第 11 章

第 9 类 — 杂项危险品

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包装说明 910

仅限货机运输

引言

本条说明适用于年生产量不超过 100 个电池芯或电池的联合国编号为 3090、3091、3480 和 3481 的电池芯或电池，并适用于出于试验目的予以运输的生产之前的电池芯或电池原型。

一般要求：

必须满足《技术细则》第 4 部分第 1 章中要求。

锂离子电池芯和电池（UN 3480），包括与设备一起包装或装在设备内的（UN 3481），必须在实际可行的最低荷电状态但不超过其额定容量 30% 的情况下交运，除非始发国和运营人所属国具体批准某一较高荷电状态。

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包装说明 974

仅限货机运输

引言

本包装说明在锂电池芯或电池质量超过 35 kg 时适用于联合国编号 3090、3091、3480 和 3481。

一般要求

必须满足《技术细则》第 4 部分第 1 章中要求。

锂离子电池芯和电池（UN 3480），包括与设备一起包装或装在设备内的（UN 3481），必须在实际可行的最低荷电状态但不超过其额定容量 30% 的情况下交运，除非始发国和运营人所属国具体批准某一较高荷电状态。

每个电池芯或电池必须满足《技术细则》第 2 部分第 9.3 段中的规定。

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