

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

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Item 3 of the provisional agenda

Listing, classification and packing

MAGNETIC RESONANCE IMAGING (MRI) SCANNERS

Submitted by the expert from the Netherlands

I. Introduction

1. Magnetic resonance imaging (MRI) scanners are used worldwide by healthcare professionals to diagnose a variety of conditions, from torn ligaments to tumors. They are also very useful for examining the brain and spinal cord. For healthcare reasons it is essential for MRI scanners to be transported safely and in a timely manner to and from all parts of the world.

2. A large manufacture of MRI scanners recently developed a new type of MRI. This includes the use of new, superconductive magnets. These magnets contain helium that need to be cooled to nearly the absolute zero to achieve (super)conductivity of the coils.

3. The old type of MRI scanner contains between 125 and 250 kg of refrigerated liquid helium and is transported as UN 1963 HELIUM, REFRIGERATED LIQUID. The new type of MRI scanner contains considerably less helium with a maximum of 1.5 kg of compressed helium. Both types of MRI scanners also contain small lithium metal cells or batteries. There has been a lot of debate between several authorities, ICAO and other dangerous goods specialists on how to classify the new type of MRI scanners, since UN 1963 may not be appropriate anymore.

4. Some experts noted that the device should be transported as UN 2857 REFRIGERATING MACHINES containing non-flammable, non-toxic, gases or ammonia solutions (UN 2672), since both MRI scanners and refrigerating machines contain components designed for cooling purposes. Others were of the opinion that it should be transported as UN 3538 ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.

5. The main issue regarding the determination of the most appropriate classification is the fact that the MRI scanner's primary goal is to make images and not to cool, as it is the case for refrigerating machines. However, the MRI scanner contains components designed for cooling that ensure the device achieves its purpose: taking images. Without cooling, this is impossible. The new type of MRI scanners are currently transported as UN 3538 ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S..

II. Discussion

6. UN 2857 and UN 3538 have different transport provisions which has led to transport problems for the new type of MRI scanners for air transport. The packing instructions for UN 2857 and UN 3538 also differ from each other in the *Model Regulations*, as follows (the instructions for portable tanks and bulk containers are omitted):

UN No.	Name and description	Class or division	Subsidiary hazard	UN packing group	Special provisions	Limited and excepted quantities		Packagings and IBCs	
								Packing instruction	Special packing provisions
2857	REFRIGERATING MACHINES containing non-flammable, non-toxic gases or ammonia solutions (UN 2672)	2.2			119	0	E0	P003	PP32
3538	ARTICLES CONTAINING NON-FLAMMABLE, NON-TOXIC GAS, N.O.S.	2.2	See 2.0.5.6		274 310 391 396	0	E0	P006 LP03	

7. One of the important differences between the two UN numbers is the assignment of special provision 119 to UN 2857 and not to UN 3538. Special provision 119 reads as follows:

“119 Refrigerating machines include machines or other appliances which have been designed for the specific purpose of keeping food or other items at a low temperature in an internal compartment, and air conditioning units. Refrigerating machines and refrigerating machine components are not subject to these Regulations if they contain less than 12 kg of gas in Division 2.2 or less than 12 litres ammonia solution (UN 2672).”

8. Special provision 119 refers to machines or appliances that have the same mechanism as the MRI scanners assigned to entry UN 3538, which is cooling items in an internal compartment of the machine. These refrigerating machines are exempted if they contain less than 12 kg of a Division 2.2 gas. Since the new type of MRI scanners only contains a maximum of 1.5 kg of compressed helium (which is a Division 2.2 gas) it seems that the same or a similar exemption for the cooling parts is applicable here.

9. To ensure safe and timely transport of the new MRI scanners it is proposed to exempt them from the *Model Regulations* when certain conditions are met, since the amount of dangerous goods within the apparatus is smaller than in other machines that are already exempted through special provision 119. Two options are provided; option 1 introduces a new UN entry for MRI scanners and a new special provision that exempts MRI scanners with not more than 1.5 kg of Division 2.2 gas. Option 2 assigns a new special provision to UN 3538 that exempts specifically MRI scanners with no more than 1.5 kg Division 2.2 gas from the Regulations. Whether the proposed limit of 1.5 kg gas is appropriate is to be discussed and therefore placed between square brackets.

10. Option 1 follows the rationale of the current discussions at the Sub-Committee where relatively new appliances or machinery are assigned to a new and specific UN entry as is currently discussed for other machines, such as heat pumps (document ST/SG/AC.10/C.3/2023/38) as well. Furthermore, option 1 applies specifically to MRI scanners instead of to a more general N.O.S. entry.

11. Option 2 applies to UN 3538 and thereby to an N.O.S. entry. Exempting certain articles or machines from an N.O.S. entry can have unintended consequences if the exemption is too broad thereby exempting other articles as well which do not fall under the scope of this document (i.e., healthcare appliances). For that reason, the special provision in option 2 applies only to MRI scanners with a maximum of 1.5 kg of gas in Division 2.2 without subsidiary hazards which is similar to UN 2857. It thereby follows the rationale of special provision 119, since it applies to articles with a similar mechanism (cooling), and it also contains non-flammable and non-toxic gases of Division 2.2.

III. Proposal

Option 1

12. Introduce of a new UN number with a proper shipping name as well as a corresponding special provision 4XX to address this issue in the *Model Regulations* (new text in bold and underlined):

UN No.	Name and description	Class or division	Subsidiary hazard	UN packing group	Special provisions	Limited and excepted quantities		Packagings and IBCs	
								Packing instruction	Special packing provisions
<u>XXXX</u>	<u>MAGNETIC RESONANCE IMAGING (MRI) SCANNERS containing non-flammable, non-toxic gas</u>	<u>2.2</u>			<u>4XX</u>	<u>0</u>	<u>E0</u>	<u>P006</u> <u>LP03</u>	

SP 4XX: Magnetic resonance imaging (MRI) scanners which contain a Division 2.2 gas in an internal compartment with the specific purpose of keeping the superconductive magnets at low temperature are not subject to these Regulations if they contain no more than [1.5] kg of gas in Division 2.2.

13. Additionally, add the following new entry to the alphabetical index:

<u>MAGNETIC RESONANCE IMAGING (MRI) SCANNERS containing non-flammable, non-toxic gas</u>	<u>2.2</u>	<u>XXXX</u>
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Option 2

14. Assign a new special provision 4XY specific for MRI scanners to UN 3538 ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S., as follows:

SP 4XY Non-flammable, non-toxic gas shall be contained within magnetic resonance imaging scanners components. The magnetic resonance imaging scanners shall be designed and constructed to contain the gas and preclude the risk of bursting or cracking of the gas retaining components during normal conditions of transport. Magnetic resonance imaging scanners are not subject to these Regulations if they contain no more than [1.5] kg of gas in Division 2.2.

UN No.	Name and description	Class or division	Subsidiary hazard	UN packing group	Special provisions	Limited and excepted quantities		Packagings and IBCs	
								Packing instruction	Special packing provisions
3538	ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.	2.2	See 2.0.5.6		274 310 391 396 <u>4XY</u>	0	E0	P006 LP03	

IV. Sustainable Development Goals

15. This proposal aims to ensure safe and timely transport of MRI scanners for healthcare professionals around the world. By doing so the Sub-Committee contributes to the implementation of Sustainable Development Goal 3 Ensure healthy lives and promote well-being for all at all ages and more specifically to target 3.8 achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.
