SHIPPER / PACKER

Dry Ice (UN 1845)

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If liquids, goods or objects are transported that pose an immediate danger to people, animals or the environment, they are referred to as dangerous goods.

The UN number is a four-digit number defined by an expert committee of the United Nations for all hazardous substances and goods (dangerous goods).

Legal basis

Depending on the mode of transport, there are different international regulations (air freight: IATA-DGR, road freight: ADR, sea freight: IMDG Code) that govern the shipment of dangerous goods. The respective national laws (in AT, for example, the Hazardous Goods Transportation Act (GGBG), Hazardous Goods Transportation Ordinance (GGBV)) make it legally binding to comply with these regulations.

While the ADR and IMDG Code are updated every two years, the requirements for air freight are adjusted on an annual basis.

Note: *The regulations are organized into numbered sections. The first number in the references always indicates the section in which you can read the rules.*

Excerpts from the regulations:

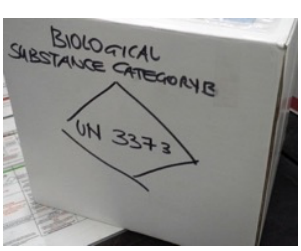
ADR 1.4.2.1.1
*"The **consignor of** dangerous goods is obliged to hand over a consignment for transportation that complies with the provisions of the ADR."*

IATA-DGR 1.3.1.1
*"A **consignor** must comply fully with these requirements when offering a consignment of dangerous goods to air carriers..."*

IATA DGR 1.2.8
"Except as otherwise provided in the Regulations, no person shall offer or accept dangerous goods for carriage by air unless such goods are properly classified, documented, certified, described, packaged, marked and labeled and in a condition ready for shipment as required by these Regulations.

IATA-DGR 1.2.3.2
"In the regulations, the word "must" is used to indicate a mandatory condition. The words "should" and "may" indicate a preferred condition that is not mandatory."

The carrier is obliged to check whether the consignments comply with the legal requirements and must report non-compliant air freight consignments to the competent authority (Austro Control GmbH).

Markings must not be covered or crossed out. They must have the correct shape, color and size and must be applied more completely on one side of the package.

Before shipment / General part

All persons involved, i.e. **every person** who packs dangerous goods, affixes labels or markings and/or fulfills the documentary requirements, must be trained in their responsibilities (IATA-DGR 1.5). Training may only be provided by officially recognized training providers.

Refresher training must be provided within a period of 24 months. According to the Hazardous Goods Transportation Ordinance, refresher training may be attended up to six months before the certificate expires (note that the month of expiry must be counted).

a) After you have successfully completed your final repetition, how long is your training valid?

b) From what date can you attend your refresher training?

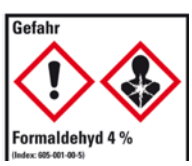
Successful completion of dangerous goods training authorizes you to ship the trained dangerous goods. As a passenger or crew member, you are subject to other regulations. Table 2.3.A regulates what passengers and crew members may carry in their checked or hand baggage. Extract:

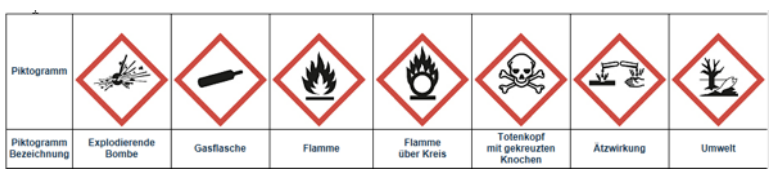
	The pilot-in-command must be informed of the location	Permitted in or as carry-on baggage	Permitted in or as checked baggage	The approval of the operator is required
Alcoholic beverages, when in retail packagings, containing more than 24% but not more than 70% alcohol by volume, in receptacles not exceeding 5 L, with a total net quantity per person of 5 L. ***Note:*** *Alcoholic beverages containing 24% or less alcohol by volume are not subject to any restrictions.*	NO	YES	YES	NO
Dry ice (carbon dioxide, solid), in quantities not exceeding 2.5 kg per person when used to pack perishables not subject to these Regulations in checked or carry-on baggage, provided the baggage (package) permits the release of carbon dioxide gas. Checked baggage must be marked "dry ice" or "carbon dioxide, solid" and with the net weight of dry ice or an indication that there is 2.5 kg or less dry ice.	YES	YES	YES	NO

c) After this dangerous goods training, are you allowed to carry infectious substances with 3 kg of dry ice for cooling in your hand luggage as a passenger?

Ensure that the goods to be shipped are handed over to the carrier in accordance with the law. Air carriers must pay attention to various indicators of hidden dangerous goods when accepting shipments (IATA DGR 2.2):

- ➪ GHS pictograms





While some pictograms denote substances that only pose a hazard during provision and use, other GHS pictograms contain symbols that essentially correspond to the symbols in the hazard labels for transportation and which are therefore to be classified as dangerous goods.

- ➪ General descriptions
- ➪ other clues (e.g.: Markings, labels, undeclared liquids, rattling noises from spray cans)

If the package does not contain items or substances classified as dangerous goods, the shipper should indicate "not restricted", "non-hazardous" or "non-dangerous" in the air waybill or on other transportation documents to avoid transit delays (IATA DGR 8.2.6).

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Safety data sheets (SDS), also known as **material safety data sheets (MSDS),** are used to communicate safety-related information on chemical substances and mixtures (not all products therefore have to have an MSDS). The structure is regulated in the REACH Regulation. Make sure that the MSDS is as up-to-date as possible (not older than 2 years). The note "(EU) 2020/878" shows that the current REACH version is complied with. The creation or update date is always relevant, never the print date!

Information on transportation can be found under point 14. Not all modes of transport must be listed there, but this does not mean that the product cannot be restricted on the modes of transport not listed. Please note that if something is classified as dangerous goods in road transport (a UN number is given), then the product is restricted on all modes of transport.

SICHERHEITSDATENBLATT
gemäß Verordnung (EG) Nr. 1907/2006

Version 8.2
Überarbeitet am 01.03.2021
Druckdatum 22.03.2021

ABSCHNITT 1: Bezeichnung des Stoffs beziehungsweise des Gemischs und des Unternehmens

1.1 Produktidentifikatoren
Produktname : 1-Hexadecanthiol

ABSCHNITT 14: Angaben zum Transport

14.1 UN-Nummer
ADR/RID: - IMDG: - IATA: 3334

14.2 Ordnungsgemäße UN-Versandbezeichnung
ADR/RID: Kein Gefahrgut
IMDG: Not dangerous goods
IATA: Aviation regulated liquid, n.o.s.

14.3 Transportgefahrenklassen
ADR/RID: - IMDG: - IATA: 9

14.4 Verpackungsgruppe
ADR/RID: - IMDG: - IATA: III

14.5 Umweltgefahren
ADR/RID: nein IMDG Meeresschadstoff: nein IATA: nein

14.6 Besondere Vorsichtsmaßnahmen für den Verwender
Keine Daten verfügbar

d) Are you allowed to send a bottle of this product by air after this dangerous goods training?

e) Is this MSDS valid?

Please note that each transport company and each airline may have additional requirements (IATA-DGR 2.8). Please clarify before shipping whether additional requirements are imposed by the carrier (e.g. additional contract).

Classification

Dangerous goods are divided into 9 classes with various subclasses. The order is for convenience and does not indicate a relative degree of danger (Class 1 is not more dangerous than Class 9) (IATA-DGR 3.0.2). An object or substance may have more than one hazardous property.

For packaging purposes, some substances are assigned to a packing group according to their degree of danger (IATA-DGR 3.0.3.1).

Class 1

Class 1 goods are assigned to one of six subclasses and one of thirteen compatibility groups.

1.1, 1.2, 1.3

1.4

1.5

1.6

Class 2

Gases are substances that have a vapor pressure of 3 bar at 50°C or are completely gaseous at 20°C and a standard pressure of 1.01 bar.

2.1
Flammable gases

2.2
Non-flammable, non-toxic gases

2.3
Toxic gases

Class 3

The liquid gives off vapors that can be ignited at max. 60° Celsius.

Note: The number of the class is shown in the bottom corner of each label.

Class 4

Flammable or combustible solids are divided into three subclasses depending on their main properties.

4.1
Flammable solids; self-reactive substances, polymerizing substances, and desensitized explosive solids

4.2
Spontaneously flammable substances

4.3
Substances that form flammable gases in contact with water

Class 5

Substances that support the formation of fire or combustion by releasing oxygen.

5.1
Inflammatory (oxidizing) substances

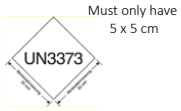
5.2
Organic peroxides

Note: For some labels (2.1, 2.2, 3, 4.3 and 5.2) the symbols may be displayed in black or white.

Class 6

Substances with directly harmful properties are assigned to one of two subclasses based on their effect/property.

6.1
Toxic substances



6.2
Infectious substances
Category A or Category B

Class 7

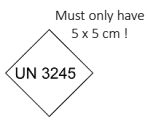
Substances containing radionuclides whose activity concentration and total activity are above the specified limits

Excepted packages

Category I
White

Category II Yellow

Category III Yellow

Class 8	A chemical reaction causes serious damage on contact with living tissue.	 Corrosive substances
Class 9	This class is a "catch-all" for dangerous goods that cannot otherwise be assigned.	
	 Various hazardous substances and objects (e.g. dry ice, asbestos)	 Only for fully declarable lithium batteries
	 GMOs	

Subsection 4.2, the "blue pages", contains around 3000 articles and substances that are assigned a UN number and "Proper Shipping Name" according to their hazard classification and composition. Such a list cannot be exhaustive.

If there is any doubt as to whether, or under what conditions, an unlisted article or substance is accepted for carriage by air, the consignor and/or the air carrier must seek advice from an appropriate specialized authority (IATA DGR 4.0.2.4).

Packing

When packing dangerous goods, the shipper must comply with all specifications of the applicable packing instructions (e.g. type of packaging, maximum quantities) (IATA-DGR 5.0.1.2).

Packages must be of such dimensions that there is sufficient space to affix all necessary markings and labels (IATA-DGR 5.0.2.13.4, 7.0.1 and 7.2.6.1).

There are different types of packaging:

- ⇨ Individual packaging (e.g. canisters)
- ⇨ Combination packaging (inner container and outer packaging inseparable)
- ⇨ Composite packaging (inner and outer packaging)

The type of packaging permitted for shipping is specified in the respective packaging instructions.

If packages ready for shipment are grouped together (e.g. wrapped on a pallet or placed in a larger outer carton), this is referred to as overpack. Each package within an overpack must be correctly packed, marked, labeled and without signs of damage or leakage.

The overpack does not have to be tested and the packages inside the overpack must be secured. The substances inside the overpack must not be able to react dangerously with each other (IATA Table 9.3.A). If not all representative labels and markings are visible through the overpack, they must be affixed again on the outside. Only in this case must the word "OVERPACK" (at least 12 mm high) also be affixed (IATA-DGR 7.1.7.1, 5.0.1.5).

As the "UN3373" must be at least 6 mm high, it is questionable whether the wording "OVERPACK" has the required 12 mm.

The package in the outer packaging must be labeled/marked; it is not sufficient if only the outer packaging bears the prescribed labels/markings. In the case of transparent outer packaging, only a label/marking on the outside would be necessary if you cannot see everything on the package.

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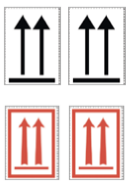


In the case of liquid hazardous goods in composite packaging, the orientation must be maintained throughout transportation. The shipper must therefore affix package orientation marks **on 2 opposite sides.** These may be red or black and have a minimum dimension of 74 × 105 mm.

The package orientation markings are **not prescribed** solid substances like Dry Ice.

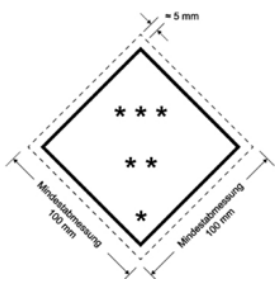
Dangerous goods must always be packed in undamaged packages of good quality. The packaging must not be attacked or weakened by direct contact with the dangerous goods, must not react dangerously and must not pose a risk during transportation. Depending on the dangerous goods being shipped, the packaging must have undergone certain tests.

Marking and labeling

The shipper is responsible for all necessary markings and labels on each package and overpack containing dangerous goods. **Each package must be large enough to provide sufficient space to affix all required markings and labels** (IATA DGR 7.0.1).

The label must have the shape of a square turned at a 45° angle (a diamond). Inside the border forming the diamond, a line must run parallel, approximately 5 mm from the outside of the line to the edge of the label. And the line inside the border in the lower half of the label must be of the same color as the class or subclass number in the lower corner. All features for which no dimensions are specified must be approximately in the same proportion as those shown.

7.2.6.1(b): Each label must be applied or printed on a contrasting color background or bordered with a **dotted or solid** outline.



Marking	Labeling
Indicate contents, shipper, consignee, etc. e.g. **UN 1845 Dry Ice**	Required for most dangerous goods. Identification of the 9 dangerous goods classes see "Classification"
Size UN number (incl. "UN"):	Minimum dimensions 10 x 10 cm
Packaging with over 30 L capacity or over 30 kg net weight⇨ 12 mm	They must be attached at an angle of 45° (diamond-shaped) if the dimensions of the package permit this.
max. 30 L capacity or max. 30 kg net weight⇨ 6 mm	They must not come loose under normal transportation conditions and must be able to withstand the effects of the weather.
with a maximum capacity of 5L or a maximum net weight of 5 kg⇨ an appropriate size	They must not be pasted over/covered and must not be attached over the corner.
The size of the shipping designation (e.g. Dry Ice) is not prescribed.	They should be affixed next to the corresponding UN/ID number.

UN 1845	12 or 6 mm high	Dry Ice Dry Ice *Dry Ice*	no size requirement fort he proper shipping name

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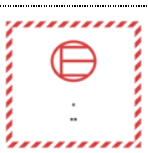
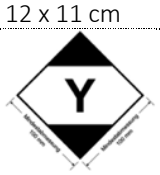
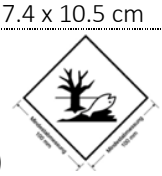
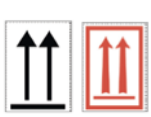
Handling markings and other **markings**:

a) magnetized materials and objects (magnetized material),
b) only with cargo aircraft (Cargo Aircraft Only (CAO)),
c) frozen liquid substances (cryogenic liquid),
d) Protect from heat (Keep away from heat),
e) Radioactive material- Excepted Package *(with indication of UN No.),*
f) Excepted quantities (*with specification of the class / subclass),*
g) Limited quantities,
h) Battery mark*(with indication of UN no.),*
i) Environmentally hazardous substances,
j) Package orientation marks.

a)  11 x 9 cm	b)  12 x 11 cm	c)  7.4 x 10.5 cm	d)  7.4 x 10.5 cm	e)  10.5 x 7.4 cm
f)  10 x 10 cm	g)  10 x 10 cm / 5 x 5 cm	h)  10 x 10 cm / 10 x 7 cm	i)  10 x 10 cm	j)  7.4 x 10.5 cm

These labels are always attached to packages but are not legally binding. They do not originate from the dangerous goods regulations.

This mark is prescribed in the ADR for vehicles in which dry ice is transported, and a certain concentration of dry ice is exceeded. This mark is not intended for packages!

You are welcome to print out labels/markings yourself. It must be ensured that all specifications regarding size, shape, color and quality are adhered to. **It is not permitted to draw them on packages yourself.**

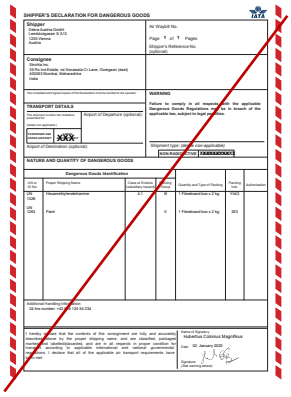
f) Do the following labels comply with the legal requirements?

a)	b)	c)	d)
			

Documentation

A "Shipper's Declaration for Dangerous Goods" or "DGD" is required for many dangerous goods shipments. This may only be completed and signed by appropriately trained persons. A **DGD is not required,** for example**,** for

- ⇨ UN 3373 Biological substances, category B
- ⇨ UN 1845 Dry ice (if shipped alone or with non dangerous goods)
- ⇨ UN 3245 Genetically modified (micro)organisms

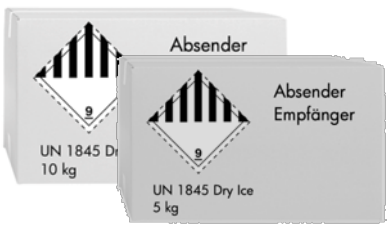
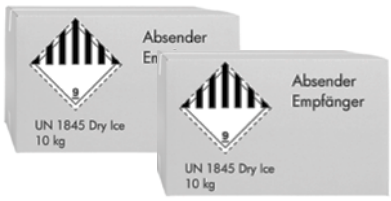

SHIPPER'S DECLARATION FOR DANGEROUS GOODS

If no DGD is prescribed, the following information **must be provided** in the "Nature and Quantity of Goods" field of the air waybill (AWB, shipping bill, freight label):

- ⇨ UN or ID number (not required for magnetized substances and objects);
- ⇨ Correct shipping name (in English);
- ⇨ Number of packages (unless they are the only packages within that consignment (not applicable to UN 1845)); and
- ⇨ Net quantity per package. (Only required for UN 1845).

Attention: The packing instructions or the subsection in the IATA-DGR may impose further requirements on the content declaration (e.g. lithium batteries)!

Examples

Contents	Package	Text in the Contents field of the dispatch bill (AWB) (air transport)
Non-infectious samples (exempt) that need to be cooled are sent. Therefore, 10 kg of dry ice is also included in the package.		*"Samples, not restricted, UN1845 Dry Ice 1x 10 kg"* or *"Samples, non-dangerous, UN 1845 Dry Ice 10 kg 1 parcel"*
Two packages are sent with foodstuffs that need to be cooled. One package contains 5 kg of dry ice and the other 10 kg of dry ice.		*"UN1845 Dry Ice 1x 10 kg, 1 x 5 kg"* or *"UN 1845 Dry Ice 10 kg 1 parcel , 5 kg 1 parcel"* NOT: "UN 1845 Dry Ice 2 x 15 kg"
Two packages are sent with non-hazardous goods that need to be cooled. Each package contains 10 kg of dry ice.		*"UN 1845 Dry Ice 2 x 10 kg"* or *"UN 1845 Dry Ice 10 kg 2 parcel"*

Of course, all size and color specifications must be adhered to for the markings and labels on the illustrated packages.

Specific part

Class 9

UN1845 Dry ice

Dry ice is classified as dangerous goods due to 3 properties: Risk of suffocation, pressure build-up/risk of bursting (if incorrectly packaged) and risk of injury (cold burn).

It can be used for the refrigeration of hazardous and non-hazardous goods. A DGD is only required if it is shipped with other dangerous goods that require a DGD.

Packaging regulations according to ADR (road freight)

If dry ice is shipped by road, then only "dry ice" or "carbon dioxide, solid" must appear on the package (ADR 2025). If dry ice is used to cool other goods, the package must state "Trockeneis, als Kühlmittel" or " Kohlendioxid, fest, als Kühlmittel ".

The carrier must be informed in advance that there is dry ice in the package. You should make a corresponding note "Dry ice, as coolant" on a transport document.

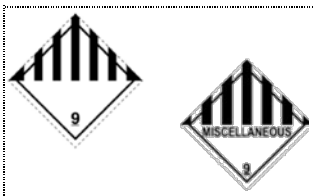
Regulations according to IATA-DGR (air freight)

Quantity	max. 200kg per package
Packaging	The packaging must be designed so that the carbon dioxide gas can escape ➪ Must not be airtight (risk of bursting)
Labeling Marking	➪ Class 9 marking (min. 100 mm x 100 mm) ➪ UN-Number and correct shipping name* in English (observe size specifications for the UN-Number!**) ➪ Net weight of dry ice contained in each package (including unit of measurement (e.g. kg)) ➪ Full name and address of sender and recipient
Documentation	If no DGD is required: Content field of the air waybill or, if none is used, on a transport document: "*UN1845 Dry Ice* "*+ number of packages + net weight of dry ice in each package

* Dry ice ***or*** carbon dioxide, solid

**Packages with

over 30L capacity or over 30kg net weight	➪ 12mm
Packages with a maximum capacity of 30L or a maximum net weight of 30 kg	➪ 6 mm
Packages with a maximum capacity of 5 L or a net weight of 5 kg	➪ an appropriate size



Class 9 specifications (only required for air freight) :

- ➪ 7 vertical stripes in the upper half in black
- ➪ Background white
- ➪ The lower half may contain a text in English describing the hazard, the UN number or descriptive words for the hazard class (e.g. "Miscellaneous" for class 9) and there must be an underlined 9 in the lower corner.

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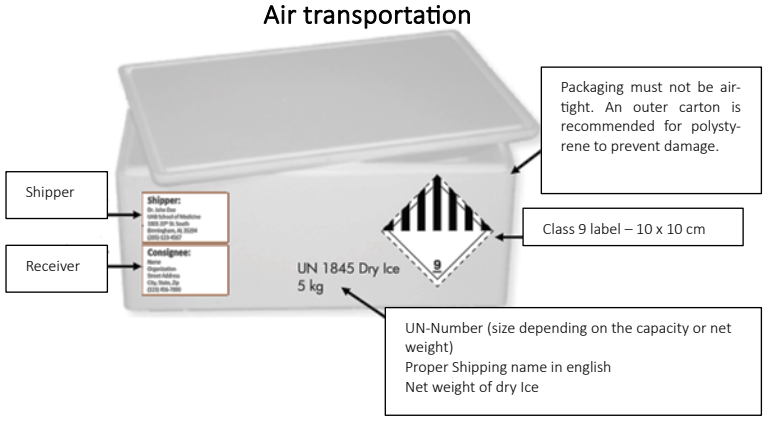
Air transportation



Packaging must not be air-tight. An outer carton is recommended for polystyrene to prevent damage.

Class 9 label – 10 x 10 cm

UN-Number (size depending on the capacity or net weight)
Proper Shipping name in english
Net weight of dry Ice

Road transportation

Road shipments sent from Austria must be marked in German

Packing instruction 954 (air freight):

This instruction applies to UN 1845, Carbon dioxide, solid (dry ice) on passenger and cargo aircraft and Cargo Aircraft Only.

The General Packing Requirements of 5.0.2 must be met.

Additional Packing Requirements

In packages:

(a) must be in packaging designed and constructed to permit the release of carbon dioxide gas and to prevent a build-up of pressure that could rupture the packaging;

(b) the shipper must make arrangements with the operator(s) for each shipment, to ensure ventilation safety procedures are followed;

(c) the Shipper's Declaration requirements of Subsections 8.1 and 10.8.1 only apply when Carbon dioxide, solid (dry ice) is used as a refrigerant for dangerous goods that require a Shipper's Declaration or when Carbon dioxide, solid (dry ice) used as a refrigerant for substances or articles not subject to these Regulations is described on a Shipper's Declaration;

(d) when a Shipper's Declaration is not required or used, the following information, as required by 8.2.3 for the Carbon dioxide, solid (dry ice), must be contained in the "Nature and Quantity of Goods" box on the air waybill when used, or in the appropriate location on alternate transport documentation. Where an agreement exists with the operator, the shipper may provide the information by EDP or EDI techniques. The information should be shown in the following order:

- UN 1845;
- proper shipping name (**Dry ice** or **Carbon dioxide, solid**);
- the number of packages; and
- the net weight of dry ice in each package.

(e) the net weight of the Carbon dioxide, solid (dry ice) must be marked on the outside of each package.

(f) when packages are placed in an overpack, the overpack must be marked on the outside with the total net quantity of dry ice in the overpack.

Dry ice in a unit load device:

(a) may be shipped in a unit load device prepared by a single shipper provided that the shipper has made prior arrangements with the operator:

(b) the unit load device must not contain dangerous goods other than UN 3373, **Biological substance, Category B** or ID 8000, **Consumer commodity**. Where the unit load device contains UN 3373 or ID 8000, the provisions of these Regulations that apply to those substances must be met in addition to the provisions set out in this packing instruction;

(c) the unit load device must allow the venting of the carbon dioxide gas to prevent a dangerous build-up of pressure (the marking and labelling requirements of Section 7 do not apply to the unit load device);

(d) the shipper must provide the following information in the "Nature and Quantity of Goods" box on the air waybill when used, or in the appropriate location on alternate transport documentation. Where an agreement exists with the operator, the shipper may provide the information by EDP or EDI techniques. The information should be shown in the following order:

- UN 1845;
- proper shipping name (**Dry ice** or **Carbon dioxide, solid**);
- the number of packages and the net weight of dry ice in each package if the ULD includes the packages that contain dry ice; or
- the identification number of the ULD and the net quantity of dry ice in each ULD if the dry ice is placed in the dry ice bunker of the ULD or loose in the ULD.

Notes:

1. *Refer to the relevant airline's loading procedures for Carbon dioxide, solid (dry ice) limitations.*
2. *For Air Waybill requirements see 8.2.3. For loading instructions see 9.3.10.*
3. *For cooling purposes, an overpack may contain Carbon dioxide, solid (dry ice), provided that the overpack meets the requirements of this packing instruction.*

CHECKLIST- UN1845 Dry ice

Packaging must not be airtight. ☐

Maximum 200kg dry ice per package. ☐

The following labeling is affixed to the outer packaging:

Size: **10 x 10 cm**. May be reduced to 5 x 5 cm on packages with infectious substances. ☐

Symbol (seven vertical stripes in the upper half): Black;
Background: White
A dotted or solid outer line must be present on white packages.

In addition to the marking: "*UN1845 Dry Ice*" or *"UN1845 Carbon dioxide, solid"* ☐

Size of the UN number: Capacity = (length cm * width cm * height cm) / 1000

Over 30L capacity or over 30kg net weight ➪ 12 mm
max. 30L capacity or max. 30 kg net weight ➪ 6 mm
maximum 5 L capacity or 5 kg net weight ➪ an appropriate size ☐

Next to the label: Net weight of dry ice in the package (incl. unit of measurement) ☐

Labeling must not be covered (fully visible) ☐

Name and address of the consignor and consignee on each package ☐

The contents of the air waybill (AWB) must be indicated:
"**UN1845 Dry Ice**" or "**UN1845 Carbon dioxide, solid"**, net weight of dry ice in each package and the number of packages. ☐
Attention: Abbreviations are not allowed.

The package must not be damaged. ☐

Even with pre-declared packages or air waybills, the physical sender is responsible for the package and must check the pre-declared information.