

# EXPLOSION PROTECTION FUNDAMENTALS

## Labelling of explosion-protected industrial trucks according to ATEX

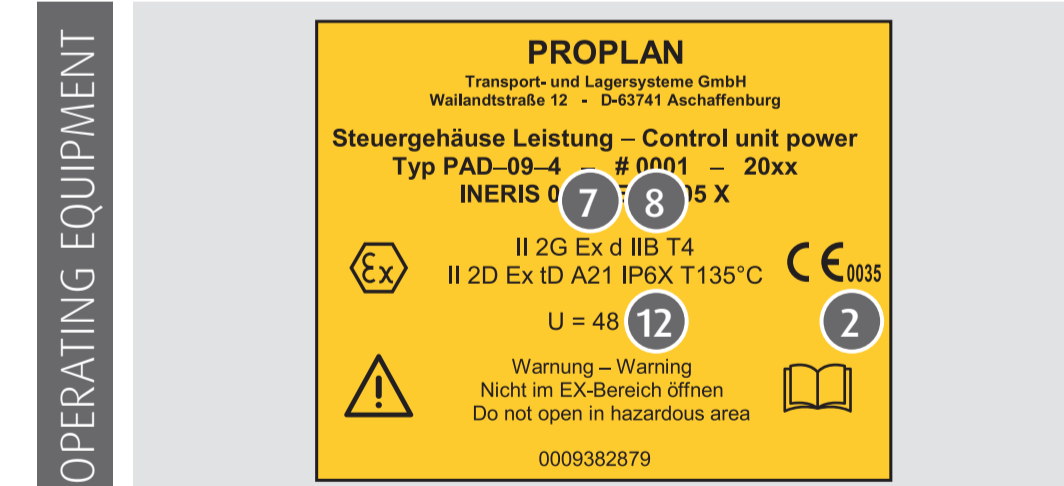
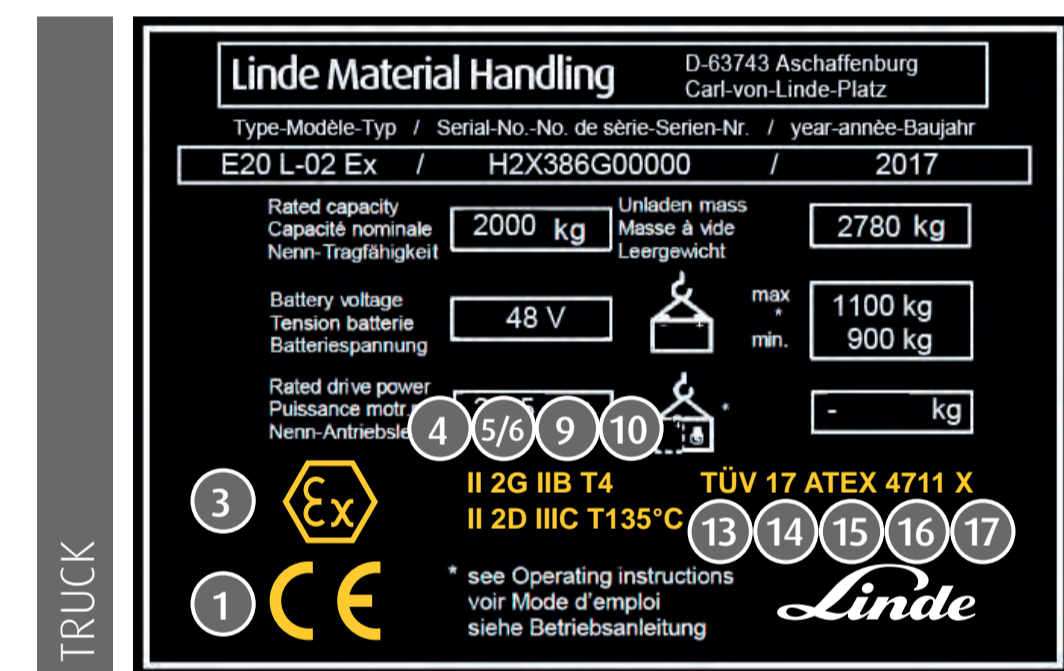


Linde Material Handling



ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5/6	ITEM 7	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17																											
	0035		II	2G 2D	EX	d td	II III	B C	T4 T 135°C	Gb Db	IP6X	TÜV	17	ATEX	4711	X																										
<b>MARK OF CONFORMITY</b>	<b>IDENTIFICATION NUMBER OF THE NOTIFIED BODY</b>	<b>EXPLOSION PROTECTION SYMBOL</b>	<b>EQUIPMENT GROUP</b>	<b>EQUIPMENT CATEGORY / ZONE</b>	<b>EXPLOSION PROTECTION ACCORDING TO STANDARD</b>	<b>IGNITION PROTECTION TYPES</b>	<b>EXPLOSION GROUP</b>	<b>EXPLOSION SUBGROUP</b>	<b>TEMPERATURE CLASS / T MAX</b>	<b>EQUIPMENT PROTECTION LEVEL (EPL)</b>	<b>IP PROTECTION RATING</b>	<b>NOTIFIED BODY (USED AT LINDE MATERIAL HANDLING)</b>	<b>TIME AND DATE OF CERTIFICATION</b>	<b>REFERENCE TO THE ATEX DIRECTIVE</b>	<b>SERIAL NUMBER OF THE NOTIFIED BODY</b>	<b>ADDITIONAL CONDITIONS</b>																										
Conveys the conformity of a product. By applying the CE marking, the manufacturer declares that the product meets the applicable CE requirements.	The registration authority that monitors the manufacturer's Ex-quality-management system.		I I II II II II II	M1 M2 1G 2G 3G 1D 2D 3D	'Ex' indicates that the electrical equipment corresponds to one or more of the ignition protection types.	Industrial trucks can incorporate a combination of many different electrical components with different ignition protection types. The specific type of ignition protection is shown on the nameplates attached to the equipment.	I I II II III III III	 A,B,C A,B,C (C --> IIB + H2) A,B,C (C --> IIB + H2) A,B,C A,B,C A,B,C	- - T1 - T4, T5 on request T1 - T4, T5 on request - e.g. 135°C	Ma Mb Ga Gb Gc Da Db Dc	Operating components are enclosed in a housing to protect them against external hazards and to prevent persons from touching hazardous operating equipment.	<table border="1"> <thead> <tr> <th>Name</th> <th>Country</th> <th>ID</th> </tr> </thead> <tbody> <tr> <td>TÜV</td> <td>D</td> <td>0035</td> </tr> <tr> <td>PTB</td> <td>D</td> <td>0102</td> </tr> <tr> <td>IBEXU</td> <td>D</td> <td>0637</td> </tr> <tr> <td>INERIS</td> <td>F</td> <td>0080</td> </tr> <tr> <td>BV</td> <td>D</td> <td>2004</td> </tr> </tbody> </table>	Name	Country	ID	TÜV	D	0035	PTB	D	0102	IBEXU	D	0637	INERIS	F	0080	BV	D	2004	The year in which the certification (test) was carried out is indicated on the Ex-protection marking.	The requirements of directive 2014/34/EU (previously 94/9/EC) were followed during certification.	For the certification, a number is created under which all documents and examination results are filed. This number is included in the Ex-label to enable the operator or the trade supervisory authority to view the required documentation.	<table border="1"> <thead> <tr> <th>Condition</th> <th>Note</th> </tr> </thead> <tbody> <tr> <td>The operating equipment can be used without restrictions.</td> <td>-</td> </tr> <tr> <td>Special conditions must be observed when using this operating equipment. These can be found in the operating documents.</td> <td>X</td> </tr> <tr> <td>The operating equipment was only partially certified. It can be used in combination with additional technical measures. The operating equipment must comply to the requirements of directive 2014/34/EU entirely.</td> <td>U</td> </tr> </tbody> </table>	Condition	Note	The operating equipment can be used without restrictions.	-	Special conditions must be observed when using this operating equipment. These can be found in the operating documents.	X	The operating equipment was only partially certified. It can be used in combination with additional technical measures. The operating equipment must comply to the requirements of directive 2014/34/EU entirely.	U
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### NAMEPLATES EX-PROTECTION



### FOR ITEM 5/6 EQUIPMENT CATEGORY / ZONE

CATEGORY	FLAMMABLE MATERIALS	EX-ATMOSPHERE	ZONE
M1	Methane, coal dust	Operation in ex-hazardous areas	-
M2	Methane, coal dust	Operation in ex-hazardous areas	-
1G	Gases, vapours, mists	Constant, long-term, frequent	0
2G	Gases, vapours, mists	Occasional	1
3G	Gases, vapours, mists	Rare, brief	2
1D	Dusts	Constant, long-term, frequent	20
2D	Dusts	Occasional	21
3D	Dusts	Rare, brief	22

**INFO**  
Industrial trucks designed for use in hazardous areas with a high likelihood of an explosive atmosphere can also be used in hazardous areas with a lower likelihood.

### FOR ITEM 11 EQUIPMENT PROTECTION LEVEL (EPL)

In addition to the equipment category (ITEM 5/6), the equipment protection level (EPL) can describe the internal ignition risks of equipment independently of the applicable ignition protection type.

### FOR ITEM 8 IGNITION PROTECTION TYPES

SYMBOL	TYPE OF IGNITION PROTECTION	STANDARD	SAFETY LEVEL
<b>IGNITION PROTECTION TYPES FOR ELECTRICAL OPERATING EQUIPMENT IN AREAS AT RISK OF GAS EXPLOSIONS</b>			
	Flameproof enclosure Ex 'd'	EN 60079-1	Equipment protection level (EPL): db / Gb / dc / Gc Equipment category: 2G / 3G
	Increased safety Ex 'e'	EN 60079-7	Equipment protection level (EPL): eb / Gb / ec / Gc Equipment category: 2G / 3G
	Intrinsic safety Ex 'i'	EN 60079-11	Equipment protection level (EPL): ia / Ga / ib / Gb / ic / Gc Equipment category: 1G / 2G / 3G
	Cast encapsulation Ex 'm'	EN 60079-18	Equipment protection level (EPL): ma / Ga / mb / Gb / mc / Gc Equipment category: 1G / 2G / 3G
	Ignition type 'na' non-sparking equipment	EN 60079-15	Equipment category: 3G
	Ignition type 'hc' surrounded, enclosed, hermetically sealed	EN 60079-15	Equipment category: 3G
	Ignition type 'nr' restricted breathing	EN 60079-15	Equipment category: 3G

SYMBOL	TYPE OF IGNITION PROTECTION	STANDARD	SAFETY LEVEL
<b>IGNITION PROTECTION TYPES FOR ELECTRICAL OPERATING EQUIPMENT IN AREAS WITH FLAMMABLE DUST</b>			
	Intrinsic safety Ex 'i'	EN 60079-11	Equipment protection level (EPL): ia / Da / ib / Db / ic / Dc Equipment category: 1D / 2D / 3D
	Encapsulation Ex 'm'	EN 60079-18	Equipment protection level (EPL): ma / Da / mb / Db / mc / Dc Equipment category: 1D / 2D / 3D
	Protection via housing Ex 't'	EN 60079-31	Equipment protection level (EPL): tb / Db / tc / Dc Equipment category: 2D / 3D
<b>IGNITION PROTECTION TYPES FOR NON-ELECTRICAL OPERATING EQUIPMENT IN POTENTIALLY EXPLOSIVE AREAS WITH GAS AND FLAMMABLE DUST</b>			
	Flameproof enclosure Ex 'd'	EN 13463-3	Equipment category: 2G / 3G
	Constructional safety Ex 'c' / Ex 'h'	EN 13463-5 ISO 80079-37 <sup>2</sup>	Equipment category: 2G/3G / 2D/3D

<sup>1</sup> Transition period ends 10/2019 <sup>2</sup> Transition period ends in 2019

### ADDITIONAL IGNITION PROTECTION MEASURES

SYMBOL	EP MEASURE	STANDARD	SAFETY LEVEL
<b>FOR OPERATING EQUIPMENT IN POTENTIALLY EXPLOSIVE AREAS WITH GAS AND FLAMMABLE DUST</b>			
	Protection against static electricity	TRGS 727 EN 1755 EN 13463-1	Equipment category: 2G / 2D
	Safety monitoring functions and shutdowns	EN 1755	Equipment category: 2G / 3G / 2D / 3D
	Temperature monitoring with safety shutdown before reaching the maximum permissible surface temperature		Equipment category: 2G / 3G / 2D / 3D
	Isolation monitoring with safety shutdown and visual alarm if the circuit resistance between the frame and the live parts falls below 500 Ω		Equipment category: 2G / 3G / 2D / 3D
	Gas sensing system with safety shutdown when a flammable gas atmosphere reaches 25% LEL		Equipment category: 3G

### FOR ITEM 9 & ITEM 10 POTENTIALLY EXPLOSIVE GAS ATMOSPHERES

INFO	TEMPERATURE CLASS	T1	T2	T3	T4	T5	T6
Classification according to flammability in explosion subgroups. The flammability rises from A to C. Equipment with a high flammability level can also be used in atmospheres with low flammability. LMH standard: IIB. Additional release for IIB + H2 possible after test (see light blue marking). Trucks for IIC are not covered by EN 1755.	Ignition temperature of the gas	> 450 °C	> 300 °C	> 200 °C	> 135 °C	> 100 °C	> 85 °C
	Maximum permitted surface temperature	450 °C	300 °C	200 °C	135 °C	100 °C	85 °C
	<b>EXPLOSION SUBGROUPS</b>	<b>FLAMMABILITY</b>	<b>EXAMPLE SUBSTANCES</b>				
	IIB	Low	Ammonia, methane	Ethyl alcohol	Gasoline, diesel	Acetaldehyde	
	IIB + H2	Medium	Town gas, acrylonitrile	Ethylene, ethylene oxide	Ethylene glycol	Ethyl ether	
	IIC	High	Hydrogen (IIC)	Acetylene			Carbon disulphide

### FOR ITEM 9 & ITEM 10 POTENTIALLY EXPLOSIVE DUST ATMOSPHERES

INFO	PERMISSIBLE SURFACE TEMPERATURE	295 °C	225 °C	225 °C	320 °C	305 °C	166 °C	205 °C	335 °C
Classification according to flammability in explosion subgroups. The flammability rises from A to C. Equipment with a high flammability level can also be used in atmospheres with low flammability.	Minimum ignition temperature (dust cloud)	500 °C	400 °C	540 °C	480 °C	530 °C	280 °C	530 °C	610 °C
	Minimum glow temperature (dust layer)	370 °C	300 °C	300 °C	450 °C	380 °C	280 °C	280 °C	410 °C
	<b>EXPLOSION SUBGROUPS</b>	<b>FLAMMABILITY</b>	<b>EXAMPLE SUBSTANCES</b>						
	IIB	Low	Cellulose	Wood	Paper	Wheat flour	PVC	Sulphur	
	IIB	Medium							Aluminium
	IIB	High							Magnesium
	State IIIA <sup>1</sup> : Flammable fibres and flyings / solid particles with a nominal size > 500 µm (textiles)								
	State IIIB <sup>1</sup> : Non-conductive flammable dust / nominal size ≤ 500 µm (wood dust, flour dusts)								
	State IIIC <sup>1</sup> : Conductive flammable dust / specific electrical resistance ≤ 10 <sup>3</sup> or 1000 Ω x m (metal & carbon dusts)								

<sup>1</sup> According to EN 60079-0