WORK SAFER, WHEREVER WORK TAKES YOU

HAZARDOUS LOCATION CERTIFICATION TRANSITION

When you're operating in environments where flammable or explosive gases, vapors or dust may be present, you should consider communications equipment certified for use in a Hazardous Location – often called "HazLoc".

EXPIRING STANDARD

The established Factory Mutual standard FM3610_88 expired in 2012. Radios certified to FM3610_88 will be phased out of production in December 2015. Motorola will be adapting to a new TIA-4950 standard for Hazardous Location certification of two-way radios, which is similar to the FM3610_88 standard. Compliance testing will be done by UL (Underwriters Laboratories).

FM approved radios that are deployed in the field will maintain their FM Intrinsically Safe approval status, provided that any service and repairs are done at an FM audited repair facility.

NEW MARKINGS

ASTRO 25™ and MOTOTRBO™ Radios and batteries certified to TIA-4950 have been available since Q1 2015. They are labelled clearly with the new UL markings.

ACTION REQUIRED

Ensure that your facility documentation defines Hazardous Location requirements in terms of Division, Class and Group rather than simply "FM Approved" or "Intrinsically Safe". Knowing the specific Hazardous Locations classification is important in selecting equipment that is approved for use in those environments.

*TIA: Telcommunications Industry Association

HAZLOC CLASSIFICATION

Hazardous locations can be found in many industries, including refineries, fuel storage facilities, chemical plants, grain elevators and plastics processing plants. The National Electrical Code (NEC) NFPA 70 defines hazardous locations as areas "where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings."

Equipment manufacturers do not determine the need for "hazloc" products, or evaluate the environment in which the radios will be used. The Hazardous Location classification is determined by the Authorities Having Jurisdiction (AHJs) over the particular facility, for example the fire marshal, insurance provider or facility safety expert.

NATIONAL ELECTRICAL CODE (NEC) NFPA 70

Classes

- Class I: Flammable Gases, Vapors, or Liquids
- Class II: Combustible Dust
- Class III: Ignitable Fibers and Flyings

Division (Area Classification)

- Division 1: Locations where ignitable gas/vapor/liquid/dust are present continously or some of the time under normal operating conditions
- Division 2: Locations where ignitable gas/vapor/liquid/dust are not likely to exist under normal operating conditions

Groups (Organized by Classes)

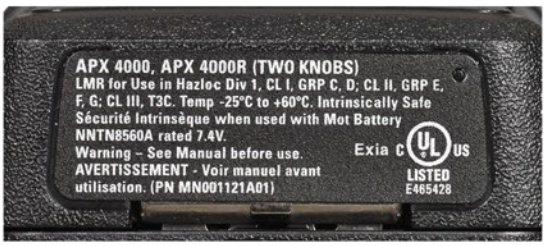
Class I Gas Groups

- Group A - Acetylene and equivalent gas groups
- Group B - Hydrogen and equivalent gas groups
- Group C - Ethylene and equivalent gas groups
- Group D - Methane and equivalent gas groups

Class II Dust Groups

- Group E - Conductive dust (mechanical – factories, recyclers)
- Group F - Combustible carbon dust (charcoal & coke dust) - above ground only
- Group G - Grain dust

Class III Fibers has no sub-groups

	TODAY	FUTURE
Certification Lab	FM Approvals (FM)	Underwriters Laboratories (UL)
Standard Applied	FM 3610_88	TIA-4950
Classification Rating	Division 1 Class I, Groups C, D, Class II, Groups E, F, G, Class III, T3C	Division 1 Class I, Groups C, D, Class II, Groups E, F, G, Class III, T3C
For use in Hazardous Locations	Yes	Yes
ASTRO 25 Radio Label example		
MOTOTRBO Radio Label example		

For more information, please contact your local Motorola representative.

Motorola Solutions, Inc. 1301 East Algonquin Road Schaumburg, Illinois 60196, U.S.A. 800-367-2346 **motorolasolutions.com**

MOTOROLA

PRODUCT DATA SHEET
MOTOTRBO™ DP4000e SERIES
DIGITAL TWO-WAY RADIOS

MOTOTRBO™ DP4000e SERIES

YOU'RE COMPLETELY CONNECTED

With this dynamic evolution of MOTOTRBO digital two-way radios, you're better connected, safer and more productive. The DP4000e Series is designed for the skilled professional who refuses to compromise. With high performance integrated voice and data, and advanced features for efficient operation, these next-generation radios deliver complete connectivity to your organisation.

CONNECTED

The MOTOTRBO DP4000e Series is a family of ETSI DMR Standards compliant digital radios that delivers operation-critical voice and data communications. Bluetooth® audio lets you talk without wires, integrated Wi-Fi® enables remote software updates, and indoor and outdoor location-tracking capabilities give you total visibility of your resources. With support for trunking as well as legacy analogue technology, you can keep your organisation connected as it grows.

SAFE

Safeguard your staff with responsive push-to-talk technology. The prominent orange emergency button on DP4000e Series radios summons help with one touch, using Transmit Interrupt to clear a channel when necessary. An integrated accelerometer senses if you've fallen, and can initiate a call for assistance. The radio is tested tough to military standards and is waterproof to IP68. It won't let you down.

PRODUCTIVE

Text messaging and Work Order Ticketing simplify complex communications, and data capabilities support advanced applications. Featuring a powerful audio amplifier, these radios deliver loud, clear speech, with industrial noise cancellation for better intelligibility. The latest energy technology delivers up to 28 hours of battery life for 3-shift working, and an improved receiver boosts range by up to 8% compared to previous models.

WHAT'S NEW IN THESE NEXT GENERATION RADIOS

- Integrated accelerometer for optional Man Down
- Bluetooth[1] 4.0
- Indoor location tracking
- Multi-constellation GNSS for increased location accuracy[1]
- Integrated Wi-Fi[1]
- Over-the-air software updates
- Enhanced audio quality
- Improved expandability
- Better battery life (up to 28 hrs)
- Better range (up to 8%)
- Better waterproofing (IP68)

PRODUCT DATA SHEET
MOTOTRBO™ DP4000e SERIES
DIGITAL TWO-WAY RADIOS



	Full Keypad (FKP) Model			Limited Keypad (LKP) Model			No Keypad (NKP) Model		
Model Number	DP4801e, DP4800e[1]			DP4601e, DP4600e[1]			DP4401e, DP4400e[1]		
Band	VHF	300MHz	UHF	VHF	300MHz	UHF	VHF	300MHz	UHF
GENERAL SPECIFICATIONS									
Frequency	136-174 MHz	300-360 MHz 350-400 MHz	403-527 MHz	136-174 MHz	300-360 MHz 350-400 MHz	403-527 MHz	136-174 MHz	300-360 MHz 350-400 MHz	403-527 MHz
High Power Output	5 W	4 W	4 W	5 W	4 W	4 W	5 W	4 W	4 W
Low Power Output	1 W	1 W	1 W	1 W	1 W	1 W	1 W	1 W	1 W
Channel Spacing	12.5, 20[2], 25 kHz								
Channel Capacity	1000			1000			32		
NiMH 1400mAh IP67 Battery									
Dimensions with Radio (H x W x D)	130 x 55 x 39 mm			130 x 55 x 39 mm			130 x 55 x 37 mm		
Weight with Radio	405 g			405 g			380 g		
Digital / Analogue Battery Life[3]	13.0 / 10.0 hrs	12.0 / 9.5 hrs		13.0 / 10.0 hrs	12.0 / 9.5 hrs		13.0 / 10.0 hrs	12.0 / 9.5 hrs	
Li-ion 1400mAh Low Temp IP57 Battery									
Dimensions with Radio (H x W x D)	130 x 55 x 41 mm			130 x 55 x 41 mm			130 x 55 x 40 mm		
Weight with Radio	345 g			345 g			320 g		
Digital / Analogue Battery Life[3]	13.0 / 10.0 hrs	12.0 / 9.5 hrs		13.0 / 10.0 hrs	12.0 / 9.5 hrs		13.0 / 10.0 hrs	12.0 / 9.5 hrs	
Slim IMPRES Li-ion 1650mAh IP67 Battery									
Dimensions with Radio (H x W x D)	130 x 55 x 36 mm			130 x 55 x 36 mm			130 x 55 x 34 mm		
Weight with Radio	330 g			330 g			295 g		
Digital / Analogue Battery Life[3]	16.0 / 12.0 hrs	15.5 / 11.5 hrs		16.0 / 12.0 hrs	15.5 / 11.5 hrs		16.0 / 12.0 hrs	15.5 / 11.5 hrs	
IMPRES Li-ion 2100mAh IP68 Battery									
Dimensions with Radio (H x W x D)	130 x 55 x 36 mm			130 x 55 x 36 mm			130 x 55 x 34 mm		
Weight with Radio	330 g			330 g			295 g		
Digital / Analogue Battery Life[3]	20.0 / 15.0 hrs	19.0 / 14.5 hrs		20.0 / 15.0 hrs	19.0 / 14.5 hrs		20.0 / 15.0 hrs	19.0 / 14.5 hrs	
IMPRES Li-ion 2250mAh IP67 Battery									
Dimensions with Radio (H x W x D)	130 x 55 x 41 mm			130 x 55 x 41 mm			130 x 55 x 40 mm		
Weight with Radio	345 g			345 g			320 g		
Digital / Analogue Battery Life[3]	21.5 / 16.5 hrs	21.0 / 16.0 hrs		21.5 / 16.5 hrs	21.0 / 16.0 hrs		21.5 / 16.5 hrs	21.0 / 16.0 hrs	
IMPRES TIA4950 Li-ion 2900mAh IP68 Battery									
Dimensions with Radio (H x W x D)	130 x 55 x 41 mm			130 x 55 x 41 mm			130 x 55 x 40 mm		
Weight with Radio	405 g			405 g			380 g		
Digital / Analogue Battery Life[3]	28.0 / 21.0 hrs	27.0 / 20.5 hrs		28.0 / 21.0 hrs	27.0 / 20.5 hrs		28.0 / 21.0 hrs	27.0 / 20.5 hrs	
IMPRES Li-ion 3000mAh LV IP68 Battery									
Dimensions with Radio (H x W x D)	130 x 55 x 41 mm			130 x 55 x 41 mm			130 x 55 x 40 mm		
Weight with Radio	350 g			350 g			325 g		
Digital / Analogue Battery Life[3]	29.0 / 21.5 hrs	28.0 / 21.5 hrs		29.0 / 21.5 hrs	28.0 / 21.5 hrs		29.0 / 21.5 hrs	28.0 / 21.5 hrs	
IMPRES Li-ion 3000mAh LV IP68 Battery w/Vibrator									
Dimensions with Radio (H x W x D)	130 x 55 x 41 mm			130 x 55 x 41 mm			130 x 55 x 40 mm		
Weight with Radio	350 g			350 g			325 g		
Digital / Analogue Battery Life[3]	29.0 / 21.5 hrs	28.0 / 21.5 hrs		29.0 / 21.5 hrs	28.0 / 21.5 hrs		29.0 / 21.5 hrs	28.0 / 21.5 hrs	

PRODUCT DATA SHEET
MOTOTRBO™ DP4000e SERIES
DIGITAL TWO-WAY RADIOS

ALL MODELS

TRANSMITTER SPECIFICATIONS	
Channel Spacing	12.5, 20[1], 25 kHz
4FSK Digital Modulation	12.5 kHz Data: 7K60F1D and 7K60FXD, 12.5 kHz Voice: 7K60F1E and 7K60FXE, Combination of 12.5 kHz Voice and Data: 7K60F1W
Digital Protocol	ETSI TS 102 361-1, -2, -3
Conducted/Radiated Emissions (TIA603D)	-36 dBm < 1GHz, -30 dBm > 1GHz
Adjacent Channel Power	60dB (12.5 kHz) 70dB (20[2] / 25 kHz)
Frequency Stability	± 0.5 ppm
RECEIVER SPECIFICATIONS	
Analogue Sensitivity (12dB SINAD)	0.16 uV
Digital Sensitivity (5% BER)	0.14 uV
Intermodulation (TIA603D)	70 dB
Adjacent Channel Selectivity, (TIA603A)-1T	60 dB (12.5 kHz) 70 dB (20[2] / 25 kHz channel)
Adjacent Channel Selectivity, (TIA603D)-2T & (TIA603C)-2T	45 dB (12.5 kHz) 70 dB (20[2] / 25 kHz)
Spurious Rejection (TIA603D)	70 dB
AUDIO SPECIFICATIONS	
Digital Vocoder Type	AMBE+2™
Audio Response	TIA603D
Rated Audio	0.5 W
Audio Distortion at Rated Audio	3%
Hum and Noise	-40 dB (12.5 kHz) -45 dB (20[2] / 25 kHz)
Conducted Spurious Emissions (TIA603D)	-57 dBm

BLUETOOTH SPECIFICATIONS	
Version	4.0
Range	Class 2, 10 m
Supported Profiles	Bluetooth Headset Profile (HSP), Serial Port Profile (SPP), Motorola fast push-to-talk.
Simultaneous Connections	1 x audio accessory and 1 x data device
Permanent Discoverable Mode	Optional
GNSS SPECIFICATIONS	
Constellation Support	GPS, GLONASS
Time To First Fix, Cold Start	< 60 s
Time To First Fix, Hot Start	< 10 s
Horizontal Accuracy	< 5 m
Wi-Fi SPECIFICATIONS	
Standards Supported	IEEE 802.11b, 802.11g, 802.11n
Security Protocol Supported	WPA, WPA-2, WEP
Maximum Number of SSIDs	128 (64 for LKP and NKP models)
ENVIRONMENTAL SPECIFICATIONS	
Operating Temperature[4]	-30 °C to +60 °C
Storage Temperature	-40 °C to +85 °C
Electrostatic Discharge	IEC 61000-4-2 Level 4
Dust and Water Intrusion	IEC 60529 - IP68, 2 m for 2 hrs
Packaging Test	MIL-STD 810D and E

HAZLOC CERTIFICATION

When properly equipped with Motorola UL-Approved battery, UL-Approved to TIA-4950 for use in Hazardous Locations, Division 1, Class I, II, III, Groups C, D, E, F, G; Division 2, Class 1, Groups A, B, C, D, T3C. Tamb = -25°C to +60°C .

NOTES
1: Bluetooth, GNSS and Wi-Fi only included on DP4401e, DP4601e and DP4801e.
2: 20 kHz channel not available for 300MHz models.
3: Typical battery life, 5/5/90 profile at maximum transmitter power with GNSS, Bluetooth, Wi-Fi and Option Board applications disabled. Actual observed runtimes may vary.
4: Radio only. Specialised low-temperature battery required for operation below -10 °C.

MILITARY STANDARDS

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	METHOD	PROCEDURE	METHOD	PROCEDURE	METHOD	PROCEDURE	METHOD	PROCEDURE	METHOD	PROCEDURE
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temp	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Hot	501.5	I/A1, II/A1
Low Temp	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temp Shock	503.1	I	503.2	A1/C3	503.3	A1/C3	503.4	I	503.5	I-C
Solar Radiation	505.1	II	505.2	I/Hot-Dry	505.3	I/Hot-Dry	505.4	I/Hot-Dry	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II/Hot-Humid	507.3	II/Hot-Humid	507.4	-	507.5	II/Hot-Humid
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	-	509.5	-
Dust	510.1	I, II	510.2	I, II	510.3	I, II	510.4	I, II	510.5	I, II
Vibration	514.2	VIII/F, W, XI	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24, II/5	514.6	I/24, II/5
Shock	516.2	II	516.3	I, IV	516.4	I, IV	516.5	I, IV	516.6	I, IV

CONNECTION
- ● VHF Band, 5 W
- ● UHF Band, 4 W
- ● 300 MHz Band, 4 W
- ● FKP Models: Colour screen, full keypad, 1000 channels
- ● LKP Models: Colour screen, limited keypad, 1000 channels
- ● NKP models: No screen or keypad, 32 channels
- ● Analogue and Digital
- ● Voice and Data
- ○ Integrated Wi-Fi
- ● Canned Text Messaging
- ● Freeform Text Messaging (FKP models)
- ● Work Order Ticketing
- ● Multi-constellation GNSS
- ● High Efficiency GNSS
- ● Event-Driven Location Update
- ● Bluetooth Audio
- ● Bluetooth Data
- ○ Bluetooth Permanent Discoverable Mode
- ○ Bluetooth Indoor Location Tracking
- ● Voice Announcement
- ○ Text to Speech
- ○ Option Board
- ○ Vibrate Alert
- ● Home Channel Reminder

AUDIO
- ● Intelligent Audio
- ● IMPRES Audio
- ○ SINC+ Noise Cancellation
- ● Acoustic Feedback Suppressor
- ● Microphone Distortion Control
- ● User-Selectable Audio Profiles
- ● Switch Speaker
- ● Trill Enhancement

PERSONALISATION
- ● Wide Range of Accessories
- ○ Multi-Button PTT
- ● 5 Programmable Buttons (3 for DP4400e/DP4401e)
- ● Emergency Button

MANAGEMENT
- ● Radio Management
- ● Over-the-Air Programming
- ○ Over-the-Air Software Update
- ○ IMPRES Energy
- ○ IMPRES Battery Management
- ○ Over-the-Air Battery Management

SAFETY
- ● Integrated Accelerometer
- ○ Man Down
- ● Lone Worker
- ● Basic Privacy
- ● Enhanced Privacy
- ○ AES256 Encryption
- ● Transmit Interrupt (decode)
- ● Transmit Interrupt (encode)
- ● Emergency
- ● Emergency Search Tone
- ● Remote Monitor
- ● Radio Disable / Enable
- ○ TIA4950 HazLoc Certification
- ● Waterproof to IP68
- ● Rugged to MIL-STD 810

SYSTEMS
- ● Direct Mode (including Dual Capacity Direct Mode)
- ● IP Site Connect (Single and Multi-Site)
- ● Capacity Plus (Single and Multi-Site)
- ○ Capacity Max
- ○ Connect Plus

- ● Standard feature
- ○ Optional feature

BLUETOOTH

Connect to your radio without wires, for extra comfort and safety. A full portfolio of Bluetooth headsets and earpieces is available.

REMOTE SPEAKER MICROPHONE

Improve usability with a Remote Speaker Microphone (RSM). Choose from standard, heavy duty and noise-cancelling models, with or without secondary earpiece connector.

SMART ENERGY

Motorola's patented IMPRES™ Energy technology gives you smart batteries to keep your radio powered for longer. Choose from a range of batteries, chargers, and management tools.

EARPIECES

For all-day comfort, choose from our range of earpieces. Lightweight or heavy duty, discreet or rugged, with or without built-in hearing protection.

CARRY SOLUTIONS

However you choose to wear or carry your radio, we have a solution for you. From leather cases to belts and belt clips to bags, straps and pouches.

HEADSETS

In a noisy workplace, you need to protect your workers' hearing. Whether it's heavy duty noise reduction or innovative temple transducer technology, our headsets can help.

VIBRATING BELTCLIP

When it's unacceptable to miss calls in a noisy environment, equip your radios with a powerful vibrating belt clip for an extra physical alert.

To get connected with MOTOTRBO, visit www.motorolasolutions.com/mototrbo or find your closest Motorola representative or authorised Partner at www.motorolasolutions.com/contactus

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EAv1 (05/16)

MOTOROLA SOLUTIONS

Intrinsically Safe Radios

“Intrinsic Safety” (IS) is a protection level for safe operation of electronic equipment in various explosive atmospheres. Petrochemical markets and other industries whose work environments may be exposed to explosive vapors as well as ignitable dust, fibers or filings benefit from use of Intrinsic Safety standards.

Each region of the world has its own standards and certification process.

Europe	Europe	USA	USA	Canada	Brazil
IECEx	EU (ATEX)	FM Approval	UL	CSA	INMETRO

Russia	Australia	China	Korea	Japan
GOST-R	ANZEx	NEPSI	KCs	TIIS

Intrinsic Safety Around the WorldIn the U.S., the National Electric Code Article 500, ANSI/NFPA-70, defines the hazardous area by Class, Division, and Groups which indicate the nature of the environment.

Hazardous Area		Class I				Class II & Class III		
		Group A	Group B	Group C	Group D	Group E	Group F	Group G
		Acetylene	Hydrogen	Ethylene	Propane	Combustible metal dust	Combustible carbonaceous dust	Flammable dust
Class I	Division 1	Explosive Gas is present (such as inside of storage tank)						
	Division 2	Explosive Gas may be present (such as outside of shielded storage tank)						
Class II	Division 1					The area with combustible dust present		
	Division 2					The area where combustible dust may be present		
Class III	Division 1					The area with flammable dust present		
	Division 2					The area where flammable dust may be present		

Intrinsic Safety in Hazardous AreasThe longstanding standard for IS in the U.S. has been the Factory Mutual FM 3610-1988. Although no safety issues have been found with the standard, an effort of “harmonize” the U.S. standard with the international IEC standards began a few years back. For most products manufactured for IS environments, this makes a lot of sense. Manufacturers can design and test to a single standard worldwide. However, for certain niche products such as land mobile radio (LMR), a worldwide standard is not feasible. There just too many local frequency coordination regulations to address. Effective since 2012, Factory Mutual announced a “design freeze” for the FM 3610-1988. By January 2016, manufacturers are required to have their LMR products re-evaluated under FM 3610-2010, or to comply with a LMR specific FM 3640 standard. Unfortunately, these standards limit the transmit power and thus the range of the radio.

An effort was initiated to replace the FM 361-1988 with a new (but similar) standard. The successful result is ANSI/TIA-4950. Radio manufacturers now have the choice of designing and producing to international standards or domestic standards that are very similar to those in use today from either Factory Mutual (FM) or Underwriters Laboratory (UL).

It is important to note that many customers have specified “FM Approved radios” in their procurement documents and RFPs. It is advisable to specify the level of Intrinsic Safety desired by referring to the Class, Division and Groups usage rather than “FM approved.”

ATEX GUIDE

A SHORT GUIDE TO ATEX TERMINOLOGY

EQUIPMENT FOR USE IN FLAMMABLE ATMOSPHERES - DIRECTIVE 2014/34/EU

DANISH TECHNOLOGICAL INSTITUTE

WHAT IS EX-EQUIPMENT / AREAS?

Electrical or non-electrical equipment used in an area where there is a risk of presence of a flammable atmosphere (gas or dust) - are popularly called "Ex-equipment" or equipment for use in Hazardous Areas.

Ex-equipment are typically used in places like:

- The chemical industry
- Oil refineries
- Off shore installations (platforms)
- Filling stations
- Tunnels/ sewers/ drains
- Milling industry/ printing-house / painting industry
- Farmer's installations
- Mining industry

SCOPE OF THE ATEX DIRECTIVE 2014/34/EU

The Directive covers Electrical and Non-electrical equipment!

- **Equipment:** Machines, apparatus, instruments, fixed or mobile devices, control components and so on.
- **Protective systems:** e.g. equipment that can stop or delay an explosion
- **Components:** Essential parts for the safety but with no autonomous function.
- Safety control and regulation equipment intended to be used outside the Ex-area - but with a function, that secures the safety in the Ex-area.

EXCLUSIONS FROM THE ATEX SCOPE

- Medical devices intended for use in medical environment.
- Equipment and protective systems intended to for use in relation with unstable chemical substances.
- Equipment intended to for use in domestic and non-commercial environments where flammable atmosphere is only a result of accidents.
- Personal protective equipment covered by Directive 89/686/EEC.
- Seagoing vessels and mobile offshore units together with equipment on board such units.
- Means of transport i.e. vehicles, trailers, planes used for transportation. (Vehicles used in potential explosive atmosphere are not excluded).

ESSENTIAL HEALTH AND SAFETY REQUIREMENTS

Annex II of Directive 2014/34/EU

- Principle of integrated safety
- Specific conditions of inspection and maintenance
- Environmental conditions
- Marking
- Instructions for use
- Choice of materials
- Design and manufacture
- Risk caused by software
- Ex atmospheres caused by the presence of gas, vapours and mist.
- Explosive atmospheres caused by presence of air-dust mixtures.
- Potential ignition sources:
  - Sparks, flames, electric arcs
  - High surface temperatures
  - Acoustic energy, radiation: optical
  - Electromagnetic or other sources

FREQUENTLY USED STANDARDS

Electrical / Non-Electrical – Installation – Quality Requirements etc.

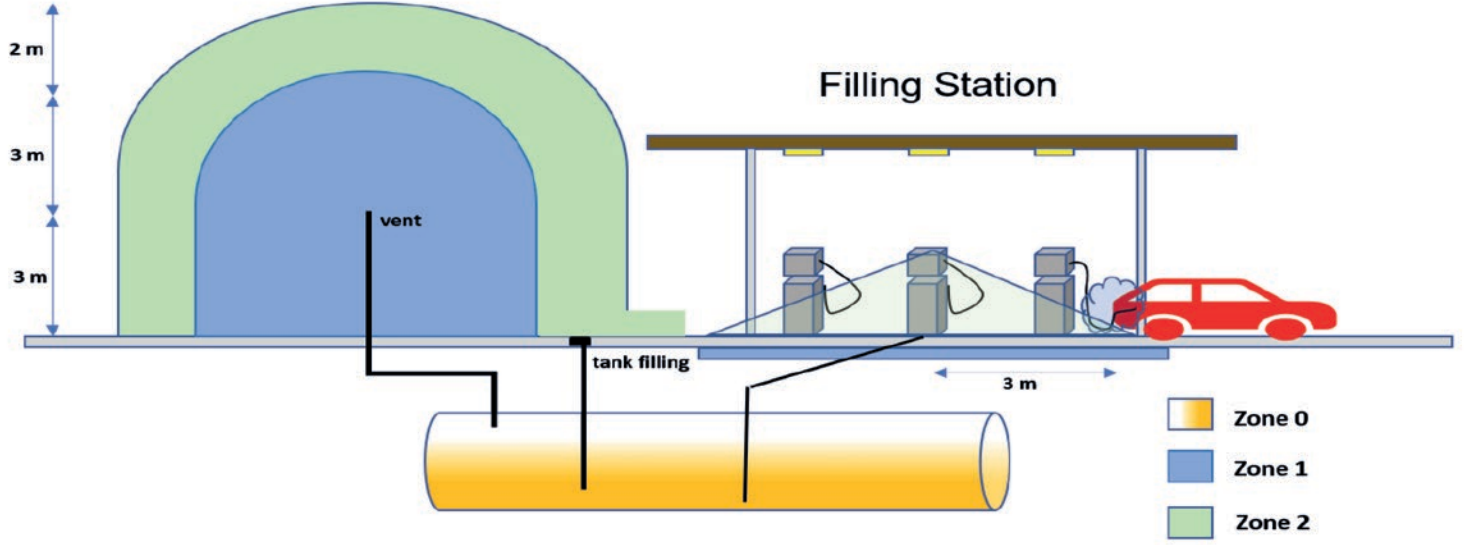
Protection Principles (Gas areas)	**Standards**
General Requirements	EN 60079-0
Oil Immersion – **"o"**	EN 60079-6
Pressurized Apparatus – **"p"**	EN 60079-2
Powder Filling – **"q"**	EN 60079-5
Flameproof Enclosure – **"d"**	EN 60079-1
Increased Safety – **"e"**	EN 60079-7
Intrinsic Safety – **"i"**	EN 60079-11
Encapsulation – **"m"**	EN 60079-18
Field Bus Concept (FISCO)	EN 60079-27
Laser Optics/radiation	EN 60079-28
Intrinsically Safe Systems	EN 60079-25
Zone 0 Standard Equipment with equipment protection level (EPL) Ga	EN 60079-26
Zone 2 Standards: Type "n" Protection	EN 60079-15
Dust Standards	
Dust – General requirements	EN 60079-0
Protection by intrinsic Safety **"i"**	EN 60079-11
Encapsulation in dust **"m"**	EN 60079-18
Protection by enclosure **"t"**	EN 60079-31
Classification of dust areas	EN 60079-10-2

Protection Principles (Gas areas)	Standards
Non-Electrical	
Basic concepts and methodology	EN 1127-1
Basic Requirements	EN 80079-36
Non-electrical protection principles	EN 80079-37
Group II engines	EN 1834-1
Petrol filling stations	EN 13012
ATEX Quality Requirements	EN 80079-34
Installations	EN 60079-14
Installations/Inspection/maintenance	EN 60079-17
Equipment repair, overhaul, and reclamation	EN 60079-19
Classification of hazardous areas	EN 60079-10-1
Protective Systems	
Explosion resistant equipment	EN 14460
Dust explosion venting protective systems	EN 14491
Explosion isolating systems	EN 15089

Places to find Ex-information / current Harmonized Standards:

http://www.teknologisk.dk/ydelser/atex/38372
http://www.atexdirektivet.dk
http://www.dancert.dk/certificeringer/atex-certificering/
http://ec.europa.eu/growth/sectors/mechanical-engineering/atex/

EXAMPLE OF ZONE CLASSIFICATION (FILLING STATION)



In **Zone 0** – Ex-equipment must be marked for **Category 1**
In **Zone 1** – Ex equipment must be marked for **Category 2**
In **Zone 2** – Ex equipment must be marked for **Category 3**

IP CLASSIFICATION'S – INGRESS PROTECTION TO EN 60529

FIRST NUMBER Protection against solid objects		SECOND NUMBER Protection against liquids	
IP	TEST REQUIREMENT	**IP**	TEST REQUIREMENT
0	No protection	**0**	No protection
1	Protected against solid objects over 50 mm e.g. accidental touch by hands	**1**	Vertically falling water drops
2	Protected against solid objects over 12 mm e.g. fingers	**2**	75° to 90° degrees vertically falling water
3	Protected against solid objects over 2,5 mm (tools +small wires)	**3**	Spraying water in angle of 60° from vertical
4	Protected against solid objects over 1 mm (tools + small wires)	**4**	Splashing water from any direction
5	Protected against dust – limited ingress permitted (no harmful deposit - test under vacuum)	**5**	Water jets from any direction
6	Totally protected against dust (test under vacuum)	**6**	Powerful jets from any direction
		7	Protection at immersion
		8	Protected at continuous immersion

CLASSIFICATION BY GROUP AND CATEGORY ACCORDING TO INTENDED USE

Surface industry (not mining)

Area	Category of Equipment to ATEX Definitions	Presence or Duration of Explosive Atmosphere	Level of Protection Faults to Allow for	Comparison with Present Practice
Equipment Group II **(surface industry)**	**1**	Continuous presence Long Periods Frequent	**Very high level of protection:** 2 types of protection, or 2 independent faults	Group II **Zone 0** (gas) Zone 20 (dust)
	2	Likely to occur	**High level of protection:** 1 type of protection Habitual frequent malfunction	Group II **Zone 1** (Gas Zone 21 (dust)
	3	Unlikely to occur Present for a short period	**Normal protection:** Required level of protection.	Group II **Zone 2** (gas) Zone 22 (dust)

Inflammable substances for all 3 Categories can be Gas, Vapours, Mist, or Dust

TEMPERATURE CLASSES AND PROTECTION PRINCIPLES

	T1	T2	T3	T4	T5	T6
Maximum Surface temperature of equipment – taking the maximum Ambient temperature into account	**450 °C**	**300 °C**	**200 °C**	**135 °C**	**100 °C**	**85 °C**

To ensure Ex-equipment can be safely used, the Gas Group must be known and the Temperature Class must be compared with the spontaneous temperature of the present flammable atmospheres.

EN / IEC STANDARD		Code		Protection Principle	ZONE	
Gas	Dust	Gas	Dust		Gas	Dust
60079-0				General Requirements		
60079-1		Ex da Ex db Ex dc		Flameproof	0 (gas sensors) 1 2	
	60079-31		Ex ta Ex tb Ex tc	Enclosure		20 21 22
60079-2		Ex pxb Ex pyb Ex pzc		Pressurized	1 1 2	21 22
60079-5		Ex q		Powder Filling	1	
60079-6		Ex o		Oil Filed	1	
60079-7		Ex e		Increased Safety	1	
60079-11		Ex ia Ex ib Ex ic		Intrinsic Safety	0 1 2	20 21 22
60079-15		Ex nA EX nR Ex nC		Non-sparking Restricted breathing Enclosed break	2	
60079-18		Ex ma Ex mb Ex mc		Encapsulation	0 1 2	20 21 22

GAS GROUPS AND TEMPERATURE CLASS - EXAMPLES OF MARKING PLATE

Examples of flammable gases and their belonging Gas Group and temperature class								
Group	Gas (example)	Ignition Temperature [°C]	Temperature Class					
			T1	T2	T3	T4	T5	T6
I	Methane	595	X					
IIA	Propane	450		X				
	Benzene	498	X					
	Ethyl nitrite	95						X
	Methanol	440		X				
	Acetone	539	X					
	Ethane	515	X					
	Hexane	225			X			
IIB	Ethylene	440		X				
	Diethyl-ether	175				X		
	Ethylene oxide	429		X				
	Ethanol	400		X				
	Methyl ether	240			X			
IIC	Acetylene	305		X				
	Hydrogen	560	X					
	Carbon disulfide	90						X
Source: EN/IEC 60079-20-1								

Marking Gas

EX-Safety Corp.
Bahnhofstrasse 2, CH-8712 Buchs

Load Cell Type: 1709Ex, series 116
CE 0396 Ex II 1G
DTI 18*ATEX 1234X*
Ex ia IIC T6 Ga

Ui: 28 V, Ii: 98 mA
Ci.: 10 nF, Li: 0 mH, Pi: 0,85 W

Marking Dust

EX-Safety Corp.
Bahnhofstrasse 2, CH-8712 Buchs

Spotlight Type: Light 20"
series no. 469
CE 0396 Ex II 1D
DTI 18*ATEX 5678X*
Ex ma IIIC T120 °C Da

-15 °C < T_{amb} < 90 °C