



ST-1083-2013

AIR TO BREATHE –
EVEN WHEN THINGS GET TOUGH.
SAFETY AND RESCUE IN MINING AND TUNNEL CONSTRUCTION.

DETECTION
PERSONAL PROTECTION
DIVING TECHNOLOGY
SYSTEM TECHNOLOGY
SERVICES

Drägersafety

Don't let danger pose a hazard.

ANYONE WHO IS RESPONSIBLE FOR PERSONNEL AND EQUIPMENT KNOWS JUST HOW MANY DIFFERENT ASPECTS THERE ARE TO SAFETY. WE ARE COMMITTED TO DEVELOPING A SOLUTION FOR EVERY ONE OF THEM. WE CAN DECLARE WITH PRIDE THAT DRÄGER SAFETY IS THE WORLD'S LEADING SUPPLIER OF SAFETY TECHNOLOGY.

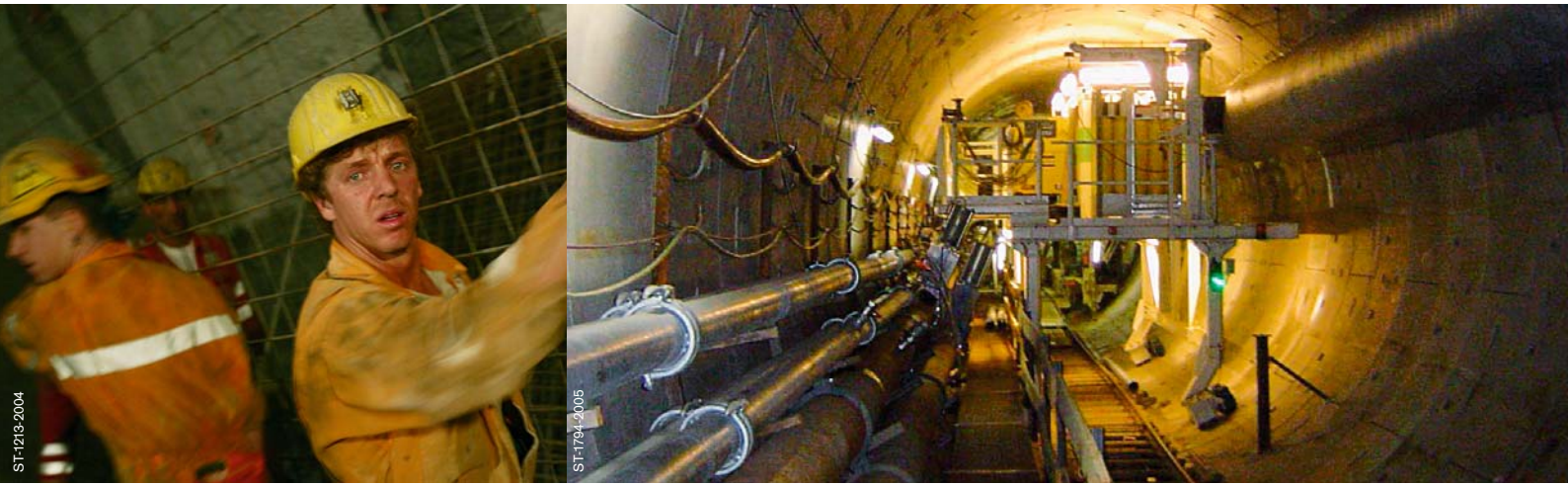
Even today, mining and tunnel construction are still filled with dangers for those working underground. Complying with legal guidelines, regulations and standards alone is no guarantee of safety. Risks can only be detected early on, systematically reduced and eliminated if the building contractor operates an all-encompassing system of risk management.

With decades of experience in the development of protection and rescue systems, and being a specialist in safe breathing, Dräger Safety is your professional partner for modern risk management. Thanks to our holistic approach, companies and operators can

be sure that they have the very best equipment at their disposal. We are not interested in offering standard solutions on a "one size fits all" basis – we work together with you to create safety concepts tailored to your specific needs.

Everything from a single source: Dräger Safety has made it our job to provide the maximum possible protection in every situation – with its gas detection technology, personal protective equipment and practical training seminars. The core element of our product range for safety underground are escape and rescue chambers.





You can only tackle risks if you know they are there.

TO MAKE WORKING CONDITIONS SAFER, POTENTIAL RISKS HAVE TO BE IDENTIFIED BEFORE ANY INCIDENT. THE FIRST STEP TOWARDS COMPLETE RISK MANAGEMENT IS TO CONDUCT AN EXTENSIVE RISK ANALYSIS OF THE PLANNED CONSTRUCTION PROJECT. THIS IS THE ONLY WAY TO ASSESS THE RISKS AND ALLOW YOU TO TAKE APPROPRIATE ACTION.

Analysing hazards: knowing where the risks are is half the battle.

Even before construction work starts, a risk analysis based on on-site inspections, checklists and guidelines is performed to identify and prevent potential hazards and their possible negative effects. Next, a risk assessment is carried out to determine how likely these chains of events are and on which scale they can be expected to occur.

On the basis of this knowledge, appropriate safety measures can be mapped out for the construction project:

Organizational precautions

- Inform the local fire department/brigade and emergency rescue services

Material precautions

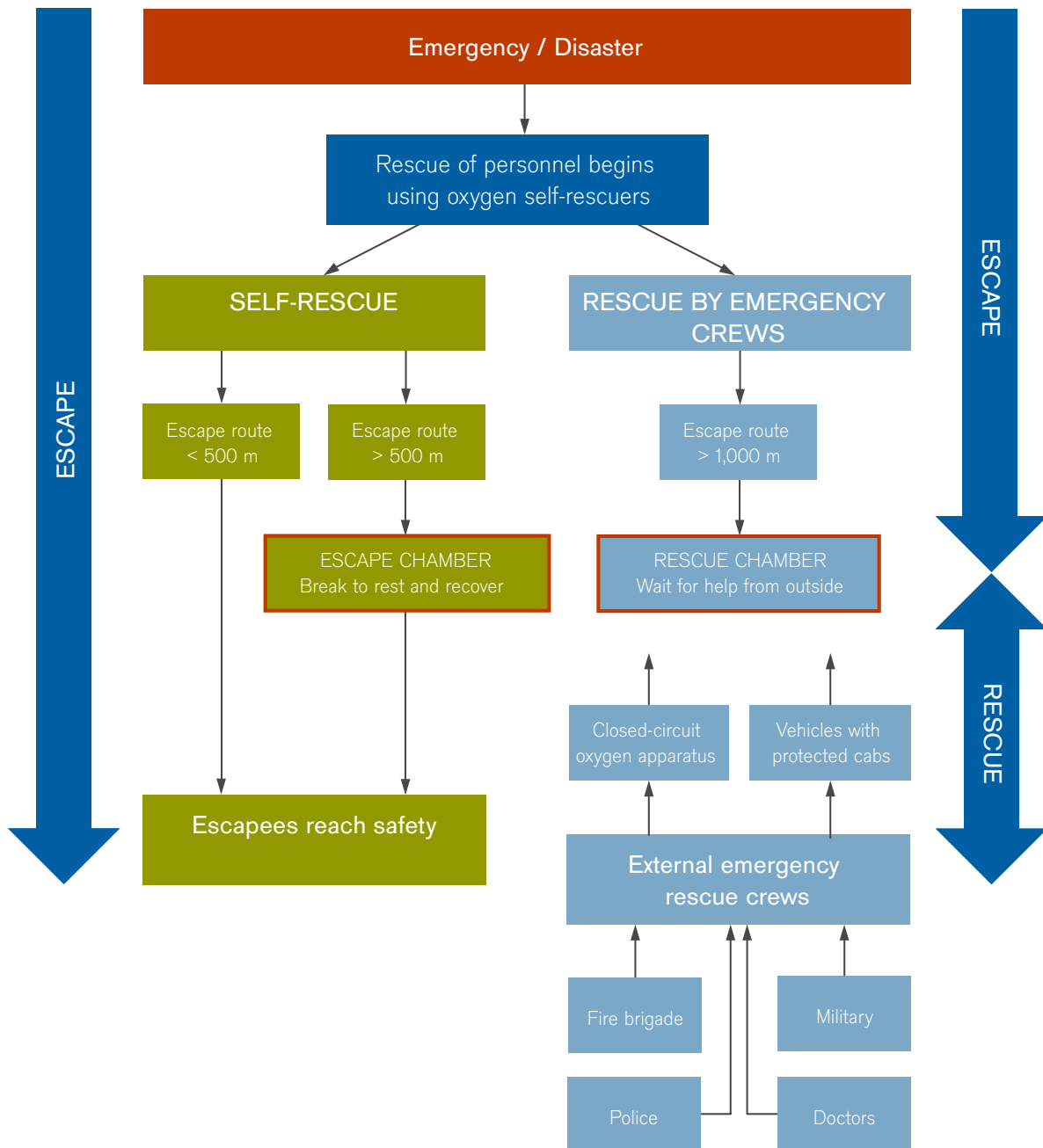
- Provide personal protective and full safety equipment
- Provide gas detection systems
- Install refuge chambers
- Equip emergency assistance organizations

Personnel precautions

- Instruct personnel in use of equipment
- Train personnel in use of personal protective equipment
- Appoint safety officers

In an emergency, what counts is experience and reliability – Dräger Safety solutions offer both.

AN APPROPRIATE EMERGENCY RESPONSE IS ONLY POSSIBLE IF EVERYONE IS FULLY PREPARED. AN ESCAPE AND RESCUE PLAN MUST BE DRAWN UP TO ENSURE THE SAFETY AND RESCUE OF WORKERS IN ALL WORK AND HAZARD SITUATIONS, INCLUDING EXPLOSIONS AND FIRE.





Refuge chambers from Dräger Safety: fully equipped for every possible scenario.

REFUGE CHAMBERS FROM DRÄGER SAFETY PROTECT WORKERS BY PROVIDING THEM WITH A BREATHABLE ATMOSPHERE WITHIN A SEALED ROOM. THE CHAMBERS SERVE AS A SAFE HAVEN IN WHICH PERSONNEL CAN TAKE A BREAK AND REST WHILE ATTEMPTING TO ESCAPE TO SAFETY (ESCAPE CHAMBER) OR IN WHICH THEY CAN WAIT UNTIL HELP ARRIVES (RESCUE CHAMBER).

Escape and rescue chambers function according to the same principle: when the air supply is turned on, the inside of the chamber is supplied with breathable air and positive pressure is generated to prevent any contaminated outside air from entering the chamber. The controls inside the chamber are easy to use to ensure that no mistakes are made in an emergency or stressful situations.

Escape chamber: taking a break enroute to safety.

When escaping from a hazard situation, taking a break can help workers recover from their exertions and regain their strength. In an emergency, the escape chamber is activated as part of an alarm plan, providing a safe haven enroute in which escapees can spend up to eight hours. Besides having access to communication facilities, the escapees can also take advantage of protective equipment (if the chamber has been equipped for this purpose) to help them on their path to safety.

Rescue chamber: reliable protection until help arrives.

After the cramped conditions and darkness of the tunnel shaft, light, breathable air, food and drink make the wait for help much more bearable. If in an emergency scenario the escape route is too long or could be cut off, a rescue chamber provides workers with a safe place in which to wait until external aid arrives in the form of rescue personnel – even if this takes up to 48 hours.



Our stringent safety requirements set the standards – even underground.

Alarm plan:

Easy activation of protective facilities following instructions contained in the alarm plan.

Chamber:

The welded version features fork-lift recesses and, on request, runners for transport.



Dimensions:

Variable size to meet individual requirements.

Gas-tight door:

For positive pressure.

Positive pressure inside chamber:

To prevent contaminated outside air from entering the chamber.

At Dräger, individual solutions come as standard.



BECAUSE NO TWO CONSTRUCTION SITES ARE ALIKE, INDIVIDUAL SOLUTIONS ENSURE THAT YOUR PARTICULAR SITE REQUIREMENTS ARE MET. WE ALSO TAKE THE CONCEPT OF "TAILOR-MADE" LITERALLY WHEN IT COMES TO THE SIZE OF OUR REFUGE CHAMBERS. WE CAN MANUFACTURE CHAMBERS WITH SPECIAL DIMENSIONS TO REFLECT THE SPACE AVAILALBE AT THE PLANNED SITE OF INSTALLATION. THE NUMBER OF PEOPLE YOU NEED TO ACCOMMODATE AND THE LENGTH OF TIME THEY WILL SPEND INSIDE THE CHAMBER DETERMINE WHICH FACILITIES ARE AVAILABLE INSIDE THE CHAMBERS.

In recent years, the following basic components have proved popular with our customers:

Air regeneration equipment:

- CO₂ absorber
- Oxygen supply
- Air conditioning

Positive pressure and air supply equipment:

- External supply of breathable air
- Breathing air tank
- Positive pressure valves
- Gas-tight door

Chamber equipment:

- Seating
- Lighting/emergency lighting
- Power supply (external/independent)
- Gas detector
- Chemical toilet
- Air curtain
- Emergency provisions: drinking water, blankets, food, first aid equipment

Refuge areas for underground emergencies.

You can also take advantage of our expertise and wide range of equipment options to kit out existing underground niche and refuge areas. If they are sealed against the ambient air and equipped with the necessary components, such refuge areas can also provide a breathable atmosphere in an emergency in which your workers can wait for rescue.



So help arrives quickly: mobile solutions.

WHEN POOR VISIBILITY, HIGH TEMPERATURES, SMOKE-FILLED ESCAPE ROUTES AND NON-BREATHABLE AIR MAKE IT IMPOSSIBLE FOR WORKERS TO ESCAPE ON THEIR OWN FROM THE HAZARD AREA, MOBILE SOLUTIONS ARE ESSENTIAL.

We get help on track quickly with our shuttle trains. Trains which are commonly used during construction projects to transport personnel to their workplaces are converted and equipped by Dräger Safety to make them independent of the ambient air so that they are suitable for use in an emergency.

As with our stationary refuge chambers, we take your customer-specific requirements very seriously. From overall design to detailed equipment modifications, like remote control of the train, bridging of

the emergency cut-out or adaptation of the heat exchanger, you can rely on our experience.

Rescue on wheels: cab protection systems

To ensure that help will arrive at the Sankt-Gotthard tunnel in Switzerland quickly and reliably in the event of an emergency, the local fire department/brigade uses technology from Dräger Safety. In close cooperation with the customer, a vehicle was equipped especially for use in the

tunnel. The cab is protected from the ambient air by maintaining positive pressure inside it, while breathing air is supplied from storage cylinders. A smoke extraction system reliably removes smoke, and incoming smoke contamination is reduced by means of circulating air. If necessary, passengers can access a central supply of breathing air inside the cab, and a smoke sensor is provided to additionally monitor the air.



There is no emergency exit in a hazardous fire situation.

FIRES IN TUNNELS AND SUBWAYS ARE EXTREME SITUATIONS WHICH PLACE THE VERY HIGHEST DEMANDS ON PERSONNEL AND MATERIALS. DRÄGER SAFETY RUNS PRACTICAL TRAINING SEMINARS FOR FIRE FIGHTERS, MINING PERSONNEL, DISASTER RELIEF CREWS AND INDUSTRIAL WORKERS, GIVING THEM THE CHANCE TO PRACTICE THEIR EMERGENCY RESPONSE AND GAIN A LEVEL OF CONFIDENCE WHICH MAY WELL PROVE VITAL IN A REAL-LIFE SITUATION.



ST-1835-2004

In the Hagerbach test mine in Sargens, Switzerland, personnel receive training in rescue and fire-fighting procedures under safe and realistic conditions. In the many branches of the tunnel systems, all kinds of different emergency situations can be simulated in a controlled manner. Hundreds have already completed the training seminar here, acquiring experience which

will be invaluable in their work. Take advantage of this opportunity to get the very best preparation.

The Hagerbach test mine, as well as any additional infrastructure which may be required, can be rented by the day.



ST-4191-2006

ESCAPE AND RESCUE CHAMBERS



ST-1783-2005

Escape and rescue chamber
 Refuge chambers with their own independent air supply, tailor-made for each construction project.



ST-1611-2007

Mobile solutions
 Available in the form of trains or vehicles, ensuring that help is provided wherever it is needed.



ST-1619-2007

Cab protection systems
 Positive pressure is maintained to protect the driver's cab from the ambient air, while breathing air is supplied from storage cylinders.

SOFTWARE



ST-70-2006

Drägerware.act
 Increasing transparency in an emergency and ensuring smooth and efficient operations and workflow.

GAS DETECTION TECHNOLOGY



ST-3811-2003

Dräger Polytron 3000
 Intrinsically safe gas detector for the continuous monitoring of toxic gases and oxygen in the ambient air.



ST-3837-2003

Dräger Polytron IR
 Flameproof encapsulated infrared gas detector for the continuous monitoring of combustible gases and vapours.



ST-7054-2005

Dräger X-am 7000
 Multigas detector for the simultaneous and continuous measurement of up to five gases. A combination of over 25 sensors makes the detector flexible so it can be adapted to individual measurement tasks.

PERSONAL PROTECTION TECHNOLOGY



ST-3475-2003

Dräger Oxy K-50
 Designed for situations in which there is a shortage of oxygen and/or when toxic gases may suddenly appear, this escape apparatus functions on the basis of chemically bound oxygen.



ST-585-2003

Dräger PSS BG 4
 Closed-circuit breathing apparatus for long-term operations of up to four hours in duration.



ST-1452-2004

Dräger Panorama Nova RP
 Comfortable full face mask for use with the Dräger PSS BG 4.

SUBSIDIARIES

AUSTRALIA

Draeger Safety Pacific Pty. Ltd.
Axxess Corporate Park
Unit 99, 45 Gilby Road
Mt. Waverley, Vic 3149
Tel +61 3 92 65 50 00
Fax +61 3 92 65 50 95

FRANCE

Dräger Safety France S.A.S.
3c, Route de la Fédération
67025 Strasbourg Cedex
Tel +33 388 40 76 76
Fax +33 388 40 76 67

SINGAPORE

Draeger Safety Asia Pte. Ltd.
67 Ayer Rajah Crescent # 06 03
139950 Singapore
Tel +65 68 72 92 88
Fax +65 67 73 20 33

UNITED KINGDOM

Draeger Safety UK Ltd.
Blyth Riverside Business Park
Blyth, Northumberland NE24 4RG
Tel +44 1670 352 891
Fax +44 1670 544 475

CANADA

Draeger Canada Ltd.
7555 Danbro Crescent
Mississauga, Ontario L5N 6P9
Tel +1 905 821 8988
Fax +1 905 821 2565

MEXICO

Draeger Safety S.A. de C.V.
Av. Peñuelas No. 5
Bodega No. 37
Fraccionamiento Industrial
San Pedrito
Querétaro, Qro México
Tel +52 442 246 1113
Fax +52 442 246 1114

REP. OF SOUTH AFRICA

Dräger South Africa (Pty) Ltd.
P.O.Box 68601
Bryanston 2021
Tel +27 11 465 99 59
Fax +27 11 465 69 53

USA

Draeger Safety, Inc.
101 Technology Drive
Pittsburgh, PA 15275
Tel +1 412 787 8383
Fax +1 412 787 2207

P. R. CHINA

Beijing Fortune Draeger
Safety Equipment Co., Ltd.
Yu An Lu A 22, B Area
Beijing Tianzhu Airport
Industrial Zone
Houshayu Shunyi District
Beijing 101300
Tel +86 10 80 49 80 00
Fax +86 10 80 49 80 05

NETHERLANDS

Dräger Safety Nederland B.V.
Edisonstraat 53
2700 AH Zoetermeer
Tel +31 79 344 46 66
Fax +31 79 344 47 90

SPAIN

Draeger Safety Hispania S.A.
Calle Xaudaró 5
28034 Madrid
Tel +34 91 728 34 00
Fax +34 91 729 48 99

Dräger Safety AG & Co. KGaA

Revalstrasse 1
23560 Luebeck, Germany
Tel +49 451 882 0
Fax +49 451 882 2080
www.draeger.com