



Deutscher Ausschuss  
für das  
Grubenrettungswesen

**German Mine Rescue Committee**



**Adjusting of the Mine Rescue to the  
Requirements of Small Mining Enterprises in  
Germany**

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## German Mine Rescue Committee New German mine rescue guidelines 2014



**In 2014, the German Mine Rescue Committee (DA GRW) has edited the new mine rescue guidelines for non-coal mining.**



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In revision of former recommendations as of 1990 and 2005, the German Mine Rescue Committee (DA GRW) has adopted new guidelines for non-coal mine rescue teams in 2014. The guidelines take into account that throughout the last years particularly, the number of mine rescue teams in Germany has been declining and that there is an increasing number of small mining operations that do not have an own full mine rescue brigade, or can not call mine rescue assistance from close range. The new guidelines are also intended as a first step towards an amalgamation of the mine rescue rules of non-coal mining with the appropriate regulations of the coal industry, when in 2019, after termination of national coal production, all German rescue stations will be united under the umbrella of the Employers' Liability Insurance Association Raw Materials and Chemical Industry (BG RCI).



## German Mine Rescue Committee New German mine rescue guidelines 2014



### What were the reasons for the new guidelines?

**The main background was primarily the expiring coal mine industry in the Federal Republic of Germany.**

- Decreasing number of larger mining operations, as well as of mine rescue teams, both in non-coal and in underground coal mining.
- Fewer and fewer mine rescue teams from large mining enterprises are available.
- Associated with this are increasingly journeys of the remaining mine rescue teams, especially from local units of potash and rock salt mines.
- Growing inability of smaller non-coal mines to establish own full mine rescue brigade.
- Potential deteriorating for rapid mutual support.

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In the new 2014 guidelines of the German Mine Rescue Committee, especially the following issues have been revised or added, compared to the previous rules:

- Minimum strength requirements for mine rescue brigades in non-coal mining,
- Alternate safety measures in case of inability to meet the required number of personnel,
- Equipment of mine rescue brigades,
- Mine rescue operations under difficult ambient conditions.

Finally, I'd like to comment about some remaining specifics of colliery rescue in Germany.



## German Mine Rescue Committee New German mine rescue guidelines 2014



### Outline

Strength requirements for non-coal mine rescue brigades.

Alternative safety measures in case of inability to meet the required number of personnel.

Equipment of mine rescue brigades.

Mine rescue operations under difficult ambient conditions.



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Finally, I'd like to comment about some remaining specifics of colliery rescue in Germany.



## German Mine Rescue Committee New German mine rescue guidelines 2014



**1,446 active members at the end of 2014**

- **634 in hard coal mining, and**
- **812 in diverse non-coal mining branches**

In **coal mining**, we will have a decrease to some 300 estimated until 2018 – from 2019, after termination of production, only small brigades for remaining water pumping mines are required.

In **non-coal mining**, further decrease of manpower probable – inter alia through completion of larger mining remediation projects in the New German Federal States.



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The number of mine rescue team members in Germany has more than halved in the past two decades, and as of the end of 2013 was about 1,500, including 600 in collieries of RAG German Coal Co., and 900 in different branches of underground non-coal mining. In the German coal industry until the end of 2018, a further decline is predicted, down to the minimum of about 300 members required for a major event. From 2019, after termination of national coal production, a small rump brigade for remaining water pumping mines will only be required. In non-coal mining, a further progressive reduction of manpower is probable – among other things due to the completion of larger mining remediation projects in the New German Federal States.



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## German Mine Rescue Committee Statistics of DA GRW



Hauptstellen für das Grubenrettungswesen	Herne		Saar		Clausthal-Zellerfeld		Hohenpeißenberg		Leipzig		Gesamt	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
<b>1. Organisation</b>												
<b>1.1. Grubenrettungswesen</b>												
Grubenwehren:	7	6	2	2	9	9	9	8	7	7	34	32
Grubenwehrmitglieder:	580	570	58	64	282	278	229	217	320	317	1469	1446
Kreislauf-Atemschutzgeräte	301	261	55	56	179	208	193	188	212		940	713
<b>1.2. Gasschutzwesen/Atemschutz über Tage</b>												
Gasschutz-, Betriebsfeuerwehren, Atemschutzmannschaften:	7	6	4	4	27	26	3	3	4	4	45	43
Atemschutzgerätträger: (frei tragbare Atemschutzgeräte):	180	168	110	105	1606	1598	43	41	109	104	2048	2016
Behältergeräte:	208	208	105	87	661	660	40	44	137	131	1151	1130
Schlauchgeräte:	34	34	10	7	57	63	3	3	6	5	110	112
Kreislauf-Atemschutzgeräte:			10	10	121	120					131	130



## German Mine Rescue Committee New German mine rescue guidelines 2014



### Intention of the guidelines:

**Autonomous operation of a mine rescue brigade, especially in a remote regions and without timely assistance.**

- Minimum strength of three teams; available at any time, through appropriate surplus manpower to compensate absence rate
- Minimum strength allowable to be completed through rapid assistance from rescue brigade in **immediate** vicinity.



- Three teams because:  
10 hours of continuous operation under oxygen; 2 hours per team with 2 hours rest afterwards, fresh backup-team for every team.

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Since the reduction in the number of mine rescue teams in Germany represents a withdrawal from the area at the same time, special emphasis must be put on autonomous operational capability of remaining single mine rescue brigades, especially in remote regions. Therefore, the new guidelines define a minimum strength of three teams for a full-size mine rescue brigade, which allows a continuous operation to be maintained over approximately 10 hours: 2 hours per team with 2 hours rest afterwards, and a fresh backup-team for every team. If the required strength in individual cases or regularly (e. g. by leave, illness, training course, etc.) is not guaranteed, the minimum strength can be completed through rapid assistance from a rescue brigade in immediate neighborhood. However, this option must ensure quick operational readiness of the assistance after an alarm is triggered, the only way an uninterrupted operation is possible. To ensure a sufficient future membership potential, the former upper age limit of 50 years for brigadesmen and team leaders and 55 years for brigade leaders has now been abolished. Thus, the membership of a mine rescue brigade now is dependent only on the actual physical fitness.

### Minimum strength of three teams

- each consisting of a team leader
- and four rescue men,
- and a top leader with deputies
- and one serviceman



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## German Mine Rescue Committee New German mine rescue guidelines 2014

### Strength of Mine Rescue Teams

#### Minimum strength of three teams

- each consisting of a team leader
- and four rescue men,
- and a top leader with deputies
- and one serviceman



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## German Mine Rescue Committee New German mine rescue guidelines 2014

**What about small mining enterprises that can not establish a complete their own mine rescue brigade according to the requirements given in the mine rescue guidelines?**

**What about small mining enterprises, for which adequate assistance after accidents can not be guaranteed?**



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## German Mine Rescue Committee New German mine rescue guidelines 2014



**Minimum requirements for the rescue of persons in underground  
mining operations**



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## German Mine Rescue Committee New German mine rescue guidelines 2014

**Minimum requirements for “micro-brigades” in case of inability to establish complete mine rescue brigade and without timely assistance by a mine rescue brigade of another mining company**

**Small mines that are not capable to establish a complete mine rescue brigade with the strength of three teams may in individual cases in coordination with the competent Main Mine Rescue Station differ from the rules exclusively for the rescue of persons.**



## German Mine Rescue Committee New German mine rescue guidelines 2014



**Minimum requirements for “micro-brigades” in case of inability to establish complete mine rescue brigade and without timely assistance by a mine rescue brigade of another mining company**

**Minimum requirements for the rescue of persons:**

- a common understanding with the respective Main Mine Rescue Station assistance concept and self-rescue plan
- adequate assistance agreement with appropriate emergency services
- Trained emergency control manager,
- A rescue brigade consisting of one **top team leader**, one **serviceman** and **two small rescue teams**

**Absolute requirement:  
A precisely tuned self-rescue concept!**

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Due to personnel structure and occasional insularity of smaller mining operations in Germany, the strength requirement for a full-size mine rescue brigade is in many places increasingly not feasible. Therefore, in the revision of the guidelines, substitute measures had to be formulated, to guarantee equivalent safety of the workforce compared with a full-size mine rescue brigade. Essential, however, are at least some people trained as mine rescuers resp. respirator carriers in such a case. Depending on their viable number these can be organized either as local guides or in the form of a “micro-brigade”, with pure rescue tasks (squad leader and two mine rescuers). In both cases, a rescue operations manager trained at the local rescue center is needed, as well as a wide-ranging self rescue and fire prevention concept tailored to the specific situation.



## German Mine Rescue Committee New German mine rescue guidelines 2014



### Micro brigades – *with smaller teams of three*

#### Intermediate stage between local guides and full mine rescue brigade

For rapid availability of first aid and recovery capability under breathing protection

**Not for fire fighting!**

Team/ backup team strength  
three rescuemen

Brigade strength two teams,  
team leader, and  
serviceman

Further mine rescue and fire  
fighting assistance as with  
local guides



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As a new intermediate between local guides and a numerically full mine rescue brigade, micro brigades cover above all the need for the fastest possible availability of a respirator team for at least pure rescue purposes. By eliminating fire protection tasks, the team strength can be reduced here to three members (team leader and two rescue men), with a minimum brigade strength of two teams, plus brigade leader and maintenance chief. To support their operation, assistance arrangements are to meet with units trained in mine rescue and fire fighting, equivalent to the above local guide solution. The reason for the introduction of small teams is that especially for rescue purposes, immediately deployable services are more valuable than a foreign assistance, which often is only available with a delay.



## German Mine Rescue Committee New German mine rescue guidelines 2014



**Minimum requirements for “micro-brigades” in case of inability to establish complete mine rescue brigade and without timely assistance by a mine rescue brigade of another mining company**

### **What do we understand by a small rescue team?**

**A small rescue team consists of:**

- one team leader
- two rescue men

**A small rescue team may be used for rescue, if it can be expected with the arrival **within an hour** of the reserve team.**

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### Minimum requirements for “micro-brigades”

- At least a couple of own staff trained as mine rescue men
- Depending on available number, organized either as local guides or as a “micro-brigade” – **restricted to first aid measures only**
- Trained emergency control manager
- Self rescue concept, incl. far-reaching measures for fire prevention – *tailored to specific situation*



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Due to personnel structure and occasional insularity of smaller mining operations in Germany, the strength requirement for a full-size mine rescue brigade is in many places increasingly not feasible. Therefore, in the revision of the guidelines, substitute measures had to be formulated, to guarantee equivalent safety of the workforce compared with a full-size mine rescue brigade. Essential, however, are at least some people trained as mine rescuers resp. respirator carriers in such a case. Depending on their viable number these can be organized either as local guides or in the form of a “micro-brigade”, with pure rescue tasks (squad leader and two mine rescuers). In both cases, a rescue operations manager trained at the local rescue center is needed, as well as a wide-ranging self rescue and fire prevention concept tailored to the specific situation.



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### Self rescue and fire prevention concept

**Local guides or micro-brigades are not suitable for effective fire fighting.**

**Examples for compensatory measures to secure safe escape and self rescue:**

Incombustible supports, at least in places with potential ignition sources.

Conveyor belts in “self-extinguishing” quality in intake air galleries.

All underground diesel vehicles and garages equipped with automatically triggered fire extinguisher systems.



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In the case of the above exceptions, the absence or only late arrival of a regular mine rescue brigade must be balanced by enhanced measures for self-rescue of the workforce. This applies especially to fire protection, which by local guides or micro brigades can not be covered to the same extent as by a full mine rescue brigade. To ensure a safe escape of workforce even under this condition, without mine rescue support, a self-rescue and fire protection concept plan should be established, with adequate and suitable precautionary and preventive measures. The new guidelines here understand by way of example:

- Roof support generally non-combustible, or at least in areas with potential sources of ignition subsequently rendered incombustible,
- Belt conveyors with conveyor belts in self-extinguishing quality, at least in intake ventilation paths,
- Equipment of *all* diesel vehicles used underground with *automatic* fire extinguishing systems.

Worth considering in addition, are preventive constructive measures against overheating of components, and against fires of pressure-leaking hydraulic fluids on vehicles and other mechanical equipment underground, since these points usually are not covered by a fire extinguishing system. The discussed fire protection measures are already known from diverse safety regulations and tested in practice: through the escape route policy established in the German coal industry since 1989, in order to allow the safe use of filter self-rescuers underground. In the non-coal mining industry, however, such an approach can achieve reducing the availability and strength of conventional mine rescue teams if, for example, the mining industry is in decline or when mines are located in remote regions. These measures also provide, moreover, an option for visitors mines and caves. The full self-rescue and fire protection plan should be agreed for the individual case with an expert of the rescue center.

This is especially binding, if in the concept escape chambers are to be used.



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### Local guides

**Sufficient number required for round the clock guidance of assisting teams – 5 to 6 members**  
**Full basic training as mine rescue men, two full breathing protection drills per year**

However, the vicinity of a suitable mine rescue brigade to offer rapid assistance no longer exists.

New opening clause: Assistance is also allowable by a non-mining rescue- or fire brigade.

***But only after a specific supplementary training!***



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The use of local guides was so far common and permitted for small pits in Germany, but is specified in the new guidelines as to its boundary conditions, since in this context the originally presumed availability of an assisting mine rescue brigade in the immediate vicinity can almost not be assured any more. Therefore, to a local guide solution now also applies the constraint of a balancing self-rescue and fire protection concept, in coordination with the rescue center. As assistant brigades, in the framework of a deliberately chosen clause, alternate to pure mine rescue teams, other suitable, mine rescue trained units are allowed now. Local guides must participate in at least two mine rescue trainings per year, including an underground breathing protection drill, as well as the physically very demanding two hour “standard exercise” in the breathing protection gallery at 30° C, preceded by a fitness test.



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### Equipment of mine rescue brigades

#### **New recommendations – next to basic mine rescue equipment**

Defibrillator (AED)

Transportation aids for a recovery of injured persons on foot – *wheel sets or monorail suspensions for stretchers, track mounted cycles*

Hydraulic and pneumatic rescue tools – *exp. with vehicles underground*

Infrared thermographic camera



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Updating the equipment requirements for mine rescue teams, the new guidelines, in addition to the usual mine rescue basic equipment, provide a defibrillator (AED), suitable tools facilitating injured transport in case of failure of the customary means of transportation, for example unicycle stretchers, pit bikes, as well as hydraulic and pneumatic rescue tools. Furthermore, the ready-availability of a thermal imaging camera should be considered particularly at risk of heavy smoke in case of fire.

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### Difficult ambient conditions

#### German climate tables for salt, non-coal and coal mining were brought together

##### Climate tables for salt mines

Humidity < 50 %, alternatively light  
clothing or light flameproof clothing

##### Climate tables for collieries and non-salt mines

Calibrated to 35 l/min respiratory  
rate under oxygen, and a threshold  
body core temperature of 38,5° C  
Humidity 50 to 100 %, alternatively  
light clothing or full flameproof  
clothing, with or without cooling  
vest



Climate tables attached

Since the climate tables previously used for non-coal mining only cover the common climatic conditions especially in salt and other dry air mining branches, with a relative humidity below 50 %, they will be complemented in the new recommendations by two climate tables of the coal industry (relative humidity from 50 % to 100 %), for light clothing and full flame protective clothing.



## German Mine Rescue Committee New German mine rescue guidelines 2014



### Mine rescue in Germany and EU – *the next steps*

- Revision of Underground Emergency Directives
- Non Coal Self Rescue and Escape Directives
- Mid term: amalgamation of German non-coal and colliery mine rescue, incl. joint directives, under the roof of the Employers' Liability Insurance Association Raw Materials and Chemical Industry (BG RCI)
- European Mine Rescue Platform/ Database



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In addition to the discussed guidelines for underground mine rescue brigades, the DA GRW has published recommendations on various other topics of mine emergency prevention, including the organization of surface mine rescue brigades, the use and maintenance of oxygen self-rescuers as well as roping-("abseiling")-techniques. The aim of a next revision of the German mine rescue rules and regulations will be merging the current coal and non-coal mining regulations, not later than in 2019. At the European level, the Standing Working Party for the Extractive Industries (SWP EI) of the European Commission has started working this year on a European Mine Rescue Platform / Database.



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**Thank you – *questions?***



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# Attachments



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## German Mine Rescue Committee References – 1

- Leitlinien des Deutschen Ausschusses für das Grubenrettungswesen für Organisation, Ausstattung und Einsatz von Grubenwehren (*Non-coal Mine Rescue Directives*). Clausthal-Zellerfeld, Edition: Oct. 2014.
- Plan für das Grubenrettungswesen (*Colliery Mine Rescue Directives*). Edited by the RAG Mine Rescue Center, Herne, Edition: Sept. 2012.
- Jahresstatistik 2014 des Deutschen Ausschusses für das Grubenrettungswesen (*Mine Rescue Statistics 2014*). Clausthal-Zellerfeld, Edition: Dec. 2014 (unpublished).
- Richtlinien des Landesoberbergamtes Nordrhein-Westfalen für die Ermittlung zulässiger Fluchtweglängen im Steinkohlenbergbau unter Tage vom 18.12.1989 (*Colliery Self Rescue Directives*). Essen, Verlag Glückauf, 1989.
- Hermülheim, W./ Roehl, W.: Neue Grubenwehr-Leitlinien des Deutschen Ausschusses für das Grubenrettungswesen (*New Mine Rescue Guidelines of the German Mine Rescue Committee*). Mining Report Glückauf 150 (2014), P. 377/380.



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## German Mine Rescue Committee References – 2

- Kuhn, M.: Mindestanforderungen zur Personenrettung in untertägigen Gewinnungsbetrieben (*Minimum Underground Rescue Requirements*). Symposium "Zukünftige Organisation des Grubenrettungswesens im Mitteldeutschen Raum", TU Bergakademie Freiberg, 2013, P. 61/73.
- Bresser, G./ Kampmann, B.: Working-Time Standards for Mine Rescue Operations under Hot and Wet Ambient Conditions in German Coal Mines. Int. Conference on Mine Rescue Works, Bytom, 2000.
- Hermülheim, W.: Zen and the Art of Mine Rescue. 6<sup>th</sup> Int. Symposium on High Performance Mining, Aachen, RWTH, 2014, P. 385/398 (*also see reprint in Mining Report Glückauf 150 (2014), P. 265/276*).
- Hermülheim, W./ Bresser, G./ Schrader, N./ Winkelmann, T.: Fitness und Arbeitsfähigkeit bei wachsendem Altersdurchschnitt von Grubenwehren (*Mine Rescue Physical Strength Program*). Glückauf 143 (2007), P. 234/239.
- Hermülheim, W./ Betka, A.: Cutting down Production Loss after Mine Fires and Explosions. Glückauf Mining Reporter I/ Apr. 2010, P. 31/34.



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## German Mine Rescue Committee German mine rescue regulations – *online*

- <http://www.deutsche-grubenrettung.de>
  - Guidelines of the German Mine Rescue Committee – *Deutscher Ausschuss für das Grubenrettungswesen, DA GRW*
- <http://www.atenschutzzentrum.net>
  - Guidelines of the German Mine Rescue Committee and of the Employers Liability Insurance Association Raw Materials and Chemical Industry – *Berufsgenossenschaft Rohstoffe und Chemische Industrie, BG RCI*
- <http://esb.bezreg-arnsberg.nrw.de>
  - Regulations (“Elektronisches Sammelblatt”) of the Mines Inspectorate of North Rhine-Westphalia – *Bezirksregierung Arnsberg, BRA*



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# German Mine Rescue Committee

## Climate table: full flame protection suit – 50 to 100 % rel. humidity

Climate table for full flame protection work wear without and with (grey numbers) cooling vest – mission time in min

**Einsatztabelle für Flammenschutzkleidung ohne und mit Kühlweste Einsatzdauer in Minuten**

Dry bulb temp. (°C)	relative Feuchte (%)										Relative humidity (%)					Working time max. 90 min Einsatzdauer 90 Mn.								
	100	95	90	85	80	75	70	65	60	55	50	100	95	90	85		80	75	70	65	60	55	50	
22	80	90	85	90																			22	
23	75	90	80	90	80	90	85	90																23
24	70	90	70	90	75	90	80	90	85	90														24
25	65	90	65	90	70	90	70	90	75	90	80	90	85	90										25
26	60	90	60	90	65	90	65	90	70	90	75	90	80	90	85	90								26
27	55	90	55	90	60	90	60	90	65	90	70	90	70	90	75	90	80	90	85	90				27
28	50	90	50	85	55	90	55	90	60	90	65	90	65	90	70	90	75	90	80	90	85	90		28
29	45	75	50	75	50	80	55	85	55	90	60	90	60	90	65	90	70	90	75	90	80	90		29
30	45	65	45	70	45	75	50	80	50	85	55	90	55	90	60	90	65	90	70	90	75	90		30
31	40	60	40	65	45	70	45	70	50	75	50	80	55	85	55	90	60	90	65	90	70	90		31
32	35	55	40	60	40	60	40	65	45	70	45	75	50	80	50	90	55	90	60	90	65	90		32
33	35	50	35	55	40	55	40	60	40	65	45	70	45	75	50	80	55	85	55	90	60	90		33
34	35	45	35	50	35	50	35	55	40	60	40	65	45	65	45	70	50	75	50	85	55	90		34
35	30	45	30	45	35	50	35	55	40	60	40	60	45	65	45	70	50	75	50	85	55	90		35
36	30	40	30	40	30	45	35	45	35	50	35	55	40	55	40	60	40	65	45	70	50	75		36
37	25	35	30	40	30	40	30	45	30	45	35	50	35	55	40	55	40	60	40	65	45	70		37
38	25	35	25	35	30	40	30	40	30	45	30	45	35	50	35	50	35	55	40	60	40	65		38
39	25	30	25	35	25	35	25	40	30	40	30	40	30	45	35	50	35	50	35	55	40	60		39
40	25	30	25	30	25	35	25	35	25	35	30	40	30	40	30	45	35	50	35	50	40	55		40
41	20	30	25	30	25	30	25	35	25	35	25	35	30	40	30	40	30	45	35	50	35	50		41
42	20	25	20	30	20	30	20	30	25	35	25	35	25	35	30	40	30	40	30	45	35	50		42
43	20	25	20	25	20	25	20	30	25	30	25	30	25	35	25	35	30	40	30	40	30	45		43
44	20	25	20	25	20	25	20	25	20	30	25	30	25	30	25	35	25	35	30	40	30	45		44
45	20	20	20	25	20	25	20	25	20	25	20	30	25	30	25	30	25	35	25	35	30	40		45
46	15	20	15	20	20	20	25	20	25	20	25	20	30	25	30	25	30	25	35	25	35	40		46
47	15	20	15	20	15	20	20	20	25	20	25	20	25	20	25	20	25	30	25	30	25	35		47
48				15	20	15	20	20	20	20	25	20	25	20	25	20	25	30	25	30	25	35		48
49					15	20	15	20	20	20	20	25	20	25	20	25	20	25	30	25	30	35		49
50						15	20	15	20	20	20	20	25	20	25	20	25	30	25	30	30	40		50
51							15	20	15	20	15	20	20	20	25	20	25	20	25	20	25	30		51
52											15	20	15	20	20	20	20	25	20	25	20	25		52
53													15	20	15	20	15	20	20	25	20	25		53
54															15	20	15	20	15	20	20	25		54
55																	15	20	15	20	20	20		55

Messung mit dem elektronischen Psychrometer Measurement with electronic psychrometer



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# German Mine Rescue Committee

## Climate table: light work wear – 50 to 100 % rel. humidity

Climate table for light work wear without and with (grey numbers) cooling vest – mission time in min

**Einsatztabelle für leichte Bekleidung ohne und mit Kühlweste Einsatzdauer in Minuten**

		relative Feuchte (%)										Relative humidity (%)													
		100	95	90	85	80	75	70	65	60	55	50	100	95	90	85	80	75	70	65	60	55	50		
Trockentemperatur (°C)	Dry bulb temp. (°C)	30	95	*																				30	
		31	65	*	80	*	105	*																	31
		32	55	60	60	*	70	*	90	*															32
		33	50	60	50	60	55	80	60	*	80	*	110	*											33
		34	45	60	45	60	50	60	55	60	60	*	70	*	100	*									34
		35	40	55	40	60	45	60	50	60	50	60	55	60	65	*	90	*							35
		36	35	45	35	60	40	55	45	60	45	60	50	60	55	60	65	*	90	*					36
		37	30	40	35	45	35	50	40	55	40	60	45	60	50	60	55	60	60	*	90	*			37
		38	30	35	30	40	30	45	35	50	40	55	40	60	45	60	50	60	55	60	60	*	90	*	38
		39	25	30	25	35	30	40	30	40	35	45	35	60	40	60	45	60	50	60	55	60	65	*	39
		40	25	30	25	30	25	35	30	35	30	40	35	45	35	60	40	60	45	60	50	60	55	60	40
		41	20	25	20	25	25	30	25	30	30	35	30	40	35	45	35	60	40	60	45	60	50	60	41
		42	20	20	20	25	20	25	25	30	25	30	25	35	30	40	35	45	35	60	40	60	45	60	42
		43	15	20	20	20	20	25	20	25	25	30	25	30	25	35	30	40	35	45	35	60	40	60	43
		44	15	15	15	20	20	20	20	20	20	25	20	30	25	30	25	35	30	40	35	45	35	60	44
		45	15	15	15	15	15	20	15	20	20	20	20	25	20	25	25	30	25	35	30	40	35	45	45
		46	15	15	15	15	15	15	15	20	15	20	20	20	20	25	20	25	30	25	30	35	30	40	46
		47	10	10	10	15	15	15	15	15	15	15	20	20	20	20	25	20	30	25	30	30	35	47	
		48				10	15	15	15	15	15	15	15	20	20	20	20	25	25	30	25	35	48		
		49					10	10	15	15	15	15	15	15	15	20	20	20	20	25	25	30	49		
	50						10	10	15	15	15	15	15	15	15	15	20	20	25	20	25	50			
	51							10	10	15	15	15	15	15	15	20	15	20	20	25	51				
	52								10	10	15	15	15	15	15	15	20	20	20	20	52				
	53									10	10	15	15	15	15	15	15	15	15	15	20	53			
	54										10	15	15	15	15	15	15	15	15	15	15	54			
	55																					55			

Messung mit dem elektronischen Psychrometer Measurement with electronic psychrometer

## German Mine Rescue Committee

### Climate table: dry air/ salt mines – < 50 % rel. humidity

Climate table for light work wear (LK) or (grey numbers) flame protection work wear (FL)  
with only light underwear, without flame hood and gloves – mission time in min

		Feuchttemperatur (°C) Wet bulb temp. (°C)																																						
		18		19		20		21		22		23		24		25			26		27		28																	
		LK	FL	LK	FL	LK	FL	LK	FL	LK	FL	LK	FL	LK	FL	LK	FL	LK	FL	LK	FL	LK	FL																	
Dry bulb temp. (°C) <small>Lufttemperatur (°C)</small>	34																							34																
	35																120	115					105		35															
	36																120	115	105	100			entfällt		36															
	37																	115	110	100	95				37															
	38																	120	110	105	95	120	90		38															
	39																	120	110	105	100	95	115	85	39															
	40																	120	115	105	95	120	90	110	85	100	80	40												
	41																	120	115	110	100	95	90	115	85	105	80	95	80	41										
	42	120	120															120	115	110	105	95	90	120	85	110	85	100	80	90	75	80	70	42						
	43																		110	105	100	95	90	115	85	105	80	95	75	85	75	75	70	43						
	44																		105	100	95	90	120	85	110	80	100	80	90	75	80	70	75	65	44					
	45																		120	100	95	95	90	115	85	105	80	95	75	85	70	80	70	70	65	45				
	46																		95	90	85	120	85	110	80	100	80	90	75	85	70	75	65	70	60	46				
	47																		90	85	85	115	85	105	80	100	75	85	70	80	70	70	65	65	60	47				
	48	entfällt																	120	85	120	85	110	80	100	75	95	75	85	70	75	65	70	60	60	60	48			
	49																		115	85	105	80	95	75	90	70	80	70	75	65	65	60	60	55	49					
	50																		110	80	100	75	95	75	85	70	75	65	70	60	65	60	60	55	50	50	50	50		
	51																		105	80	100	75	90	70	85	70	75	65	70	60	60	60	55	55	51	51	51	51		
	52																			95	75	85	70	80	65	70	60	65	60	60	55	55	55	52	52	52	52	52		
	53																			90	70	85	70	75	65	70	60	65	60	60	55	50	50	50	53	53	53	53		
54																			85	70	80	65	75	60	65	60	60	55	55	55	50	50	54	54	54	54	54			
55																			85	70	80	65	70	60	65	60	60	55	55	50	50	50	55	55	50	50	55	55	55	55

LK: Leichte Kleidung (ohne Jacke; leichte kurze Unterkleidung)  
 FL: Flammenschutz-Anzug (ohne Haube + Handschuhe; leichte kurze Unterkleidung)

[With full flame protection suit in a dry air mine, always use climate table for 50 to 100 % humidity, and pick column "50 % rel. humidity"]



Deutscher Ausschuss  
für das  
Grubenrettungswesen

## German Mine Rescue Committee

### Walter Hermülheim – *biography*



- 56 years old, married, 3 (grown-up) children
- Graduate of RWTH Aachen University – 1984 to 1986 research assistant – doctorate in strata mechanics
- Since 1987 in German coal mining – DMT Research & Testing Ltd. and RAG German Coal Co. – underground production engineer, certified fire protection and mine rescue expert, part-time lecturer at Georg Agricola University of Applied Sciences, head of Herne Mine Rescue Center, head of RAG's mine safety and mine planning divisions
- Since 2009 head of occupational safety and health at RAG Holding Co. – retirement from RAG as longtime underground employee in 2012
- More than 40 publications on mining technology and mine safety issues, among them a mine rescue handbook, in 2007
- Lecturer for mine safety at Clausthal University of Technology
- Member of the German Mine Rescue Committee (DA GRW), and of the Standing Working Party for the Extractive Industries (SWP EI), of the EU-Advisory Committee on Safety and Health at the Workplace (ACSH W)
- E-mail: [walter.hermuelheim@tu-clausthal.de](mailto:walter.hermuelheim@tu-clausthal.de)



Deutscher Ausschuss  
für das  
Grubenrettungswesen



## German Mine Rescue Committee

### Matthias Kuhn – *biography*



- 54 years old, married, 1 (grown-up) child
- Graduate of RWTH Aachen University (mining engineer)
- additional training as graduate civil servant
- Head of department at the Upper Mining Authority, responsible for ventilation systems in underground mines, explosives, gas drainage, fire and explosion prevention and protection
- Convener of the German mirror group “explosion protection in mines”
- Member of CEN/TC 305/WG5 “Equipment and protective systems for mining”
- Member of technical committee CLC-TC 31-WG 11 “Electrical installations in mines”
- Chairman of the German Mine Rescue Committee (DA GRW)
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