Bundesanstalt für Arbeitsschutz und Arbeitsmedizin

Fire & explosion risk – a future EMKG module

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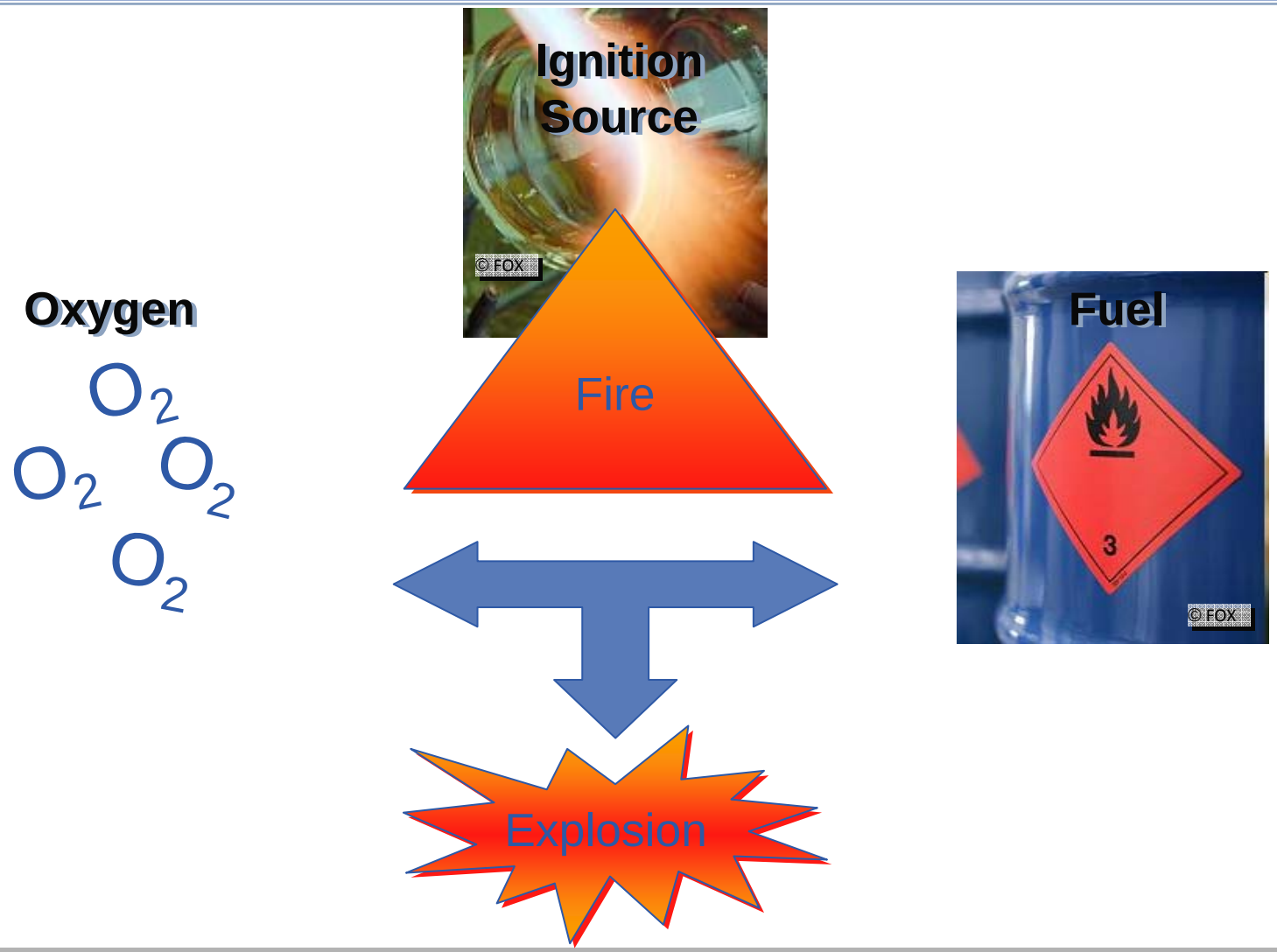
“EMKG” Easy-to-use workplace control scheme for hazardous substances

- The EMKG is established in a lot of SME
- The ‘EMKG kompakt’ offers additional help
- OSH professionals ask for more assistance for the assessment of fire & explosion risks
- There is no control banding based toolkit for fire & explosion risks in Germany (and world-wide?)
- A new EMKG module for fire and explosion risk is under current development and evaluation

Legal Requirements for Fire & Explosion Protection

A lot of regulations have to be implemented in SME

Physico-chemical Preconditions of Fire / Explosion



EMKG - Module ‚Fire & Explosion Risk‘

chemical-related hazard bands

R-phrase(s)
flash point
dustiness

Chemical-related Hazard		Ambient Conditions		
Hazard Group Fire & Explosion	Hazard bands for the occurrence of a hazardous atmosphere	Probability of Ignition Source		
		never	infrequent	always
pc-A	I - III	1		
pc-B	I	1	1	2
	II	1	1	2
	III	2	2	3
pc-C	I	1	1	2
	II	2	2	3
	III	2	3	3
pc-D	I - III	Special Expert advise		

DRAFT VERSION!

Control approaches

ambient condition bands

air ventilation system

quantity of use

duration of use

probability of ignition

Control approaches refer to Control Guidance Sheets

Example – Decanting of petrol

- Hazardous Substance: Petrol
- R-Phrase: R 12 Extremely flammable
  flash point: about - 40 °C
- General ventilation in the garage
- Quantity of use: l – band (jerrycan)
- duration of use < 15 Min.
- Probability of Ignition Source: infrequent

Step 1: Hazard Group Fire & Explosion

HAZARD

Hazard Group	R-Phrases	flash point
	In future by CLP/GHS-Regulation	
pc-A	**no R-phrases** Flammable Substance	> 55°C
pc-B	**R10**	21°C - 55°C
pc-C	**R5, R6, R7, R8, R9, R11, R12, R14, R15, R16, R18, R30, R44**	< 21°C
pc-D	**R1, R2, R3, R4, R17, R19**	

Dustiness
solids with small particles **activities with pellets, wax or granulate**
released dust settles down after a short time **activities with coarse powder (e.g. washing powder, sugar)**
clouds of dust are released and remain in the air for a few minutes **activities with fine powder (e. g. flour, toners)** Activities with aerosols

Step 2: Hazard bands for the Occurrence of a hazardous combustible or explosible Atmosphere

air ventilation system:
local exhaust ventilation
general ventilation
-> natural / space ventilation of the working place
hardly ventilation
-> activities in tanks or silos

quantity of use:
low ml– / g–band
medium l– / kg–band
high m³– / t–band

duration of use:
short < ¼ hour sporadically
medium < ¼ hour in series
long > ¼ hour

Hazard bands for the occurrence of a hazardous atmosphere

air ventilation system	quantity of use	duration of use		
		short	medium	long
local exhaust ventilation	low	I	I	I
	medium	I	II	II
	high	II	II	III
general ventilation	low	I	I	II
	medium	II	II	III
	high	II	III	III
hardly ventilation	low	II	II	III
	medium	II	III	III
	high	III	III	III

Step 3: Probability of Ignition Source

Probability of Ignition Source	Sources of ignition which can occur -
never	- in very rare situations - solely as a result of rare malfunctions
infrequent	- in rare situations - solely as a result of malfunctions
always	- frequently or continuously - during normal operations

A list with examples of typical ignition sources for the 13 types of ignition sources (Standard EN 1127-1) is given, to simplify the determination of ignition sources at the workplace.

Step 4: Determination of Control Approach

Chemical-related Hazard	Ambient Conditions			
Hazard Group Fire & Explosion	Hazard bands for the occurrence of a hazardous atmosphere	Probability of Ignition Source		
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pc-C	I	1	1	2
	II	2	Control Approach 2	3
	III	2	3	3
pc-D	I - III	Special Expert advise		

DRAFT VERSION!

The **control approach** can be taken from the schedule, which combines the **chemical-related hazard bands** with the **bands for ambient conditions**.

Determination of the Control Guidance Sheet (CGS)

Control Approach 1 = Control Guidance Sheet 1xx

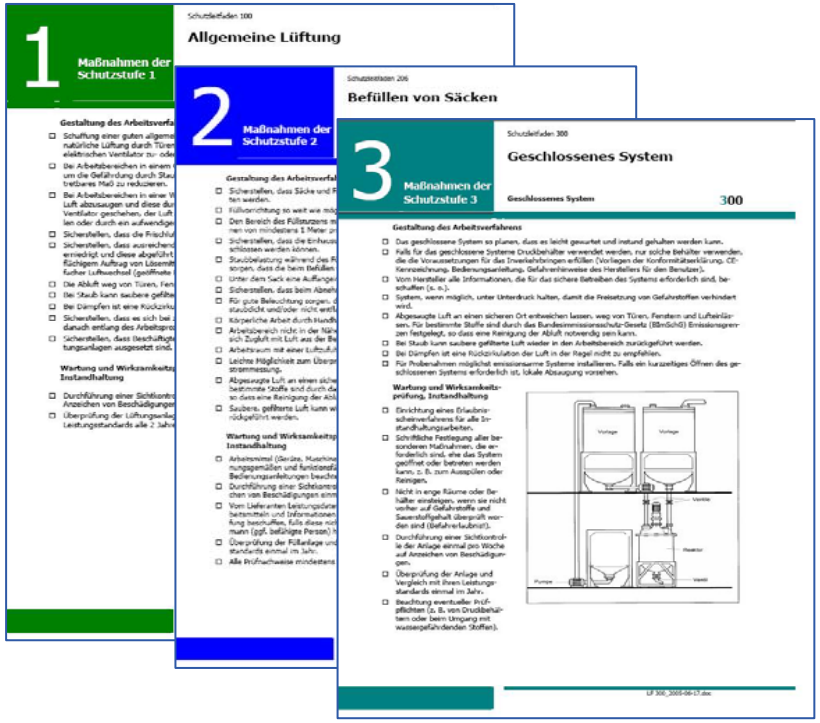
Control Approach 2 = Control Guidance Sheet 2xx

Control Approach 3 = Control Guidance Sheet 3xx

You have to choose the adequate Control Guidance Sheet according to your assessed activity!

e.g. drum filling

CGS 212



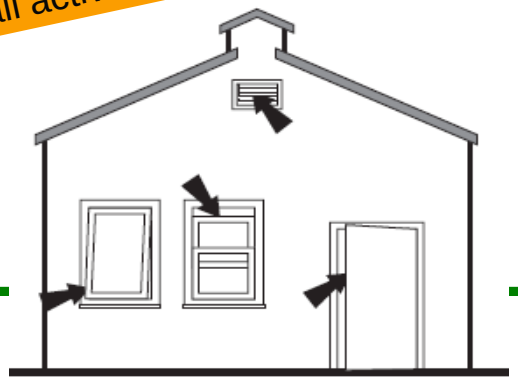
Topics of the control guidance sheets

Control approaches based on each other

Control Approach 1

- ✓General ventilation
- ✓General storage
- ✓Good work practice
- ✓General fire protection

Applies to all activities!

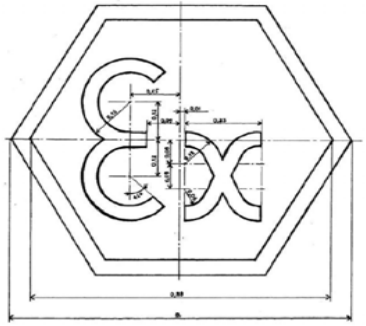


Natural ventilation

Control guidance sheet 100

Control Approach 2

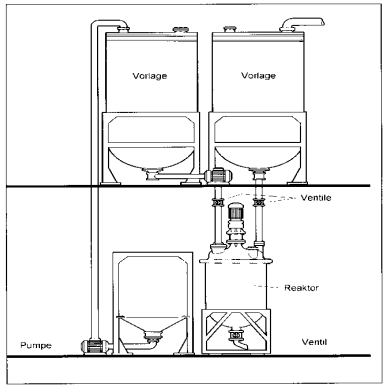
- ✓Local exhaust ventilation
- ✓Additional fire prevention
- ✓Organizational prevention measures against explosion
- ✓Avoidance of ignition sources



Guideline to directive 94/9/EC

Control Approach 3

- ✓Containment
- ✓Special fire prevention measures
- ✓Mitigation measures to extenuate the effects of a explosion



Control Guidance sheet 300

Extract of CGS draft

CGS 1x-80 General Fire Protection

Documentation aid

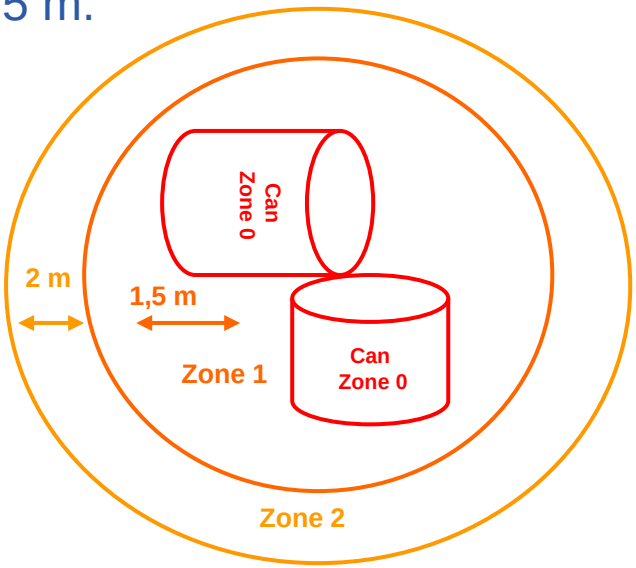
- ☑ The working areas are equipped with two independent emergency escape routes.
- ☑ The emergency escape routes have a maximum length of 35 m.
- ☑ The escape routes are marked and sufficiently lighted.
- ☑ Doors in escape exits opened in the way of the escape route.
- ☑ In all working areas it is an adequate number of fire extinguisher for the fire-protection class accessible.
- ☑ Activities with fire like welding, are managed by a approval procedure.
- ☑ Electrical apparatus are checked periodically for fault current.
- ☑ Fire protection trainings are taken place periodically.
- ☑ Only the amount of hazardous substance which are used for the work activities are provided at the workplace.
- ☑ Smoking and the use of any open flame are prohibited in every working area with activities with hazard substances.

Extract of CGS draft

CGS 2x-71 decanting flammable liquids

Documentation aid

- ☑ The emergency escape routes is reduced to a length of 25 m.
- ☑ Only earthed electrically conductive or antistatic cans, pipelines, hoppers and pumps are used.
- ☑ A constantly fire detection is guaranteed. (technical or organizational)
- ☑ In the case of an emergency outdoor meeting points are declared.
- ☑ The working area is marked with the sign W001.
- ☑ Workers wearing electro statically discharging protective shoes.
- ☑ The used pumps fulfill every requirements for decanting flammable liquids. (resistant to the substance, dip tube of stainless-steel, electrically conductive, opportunity connecting to earth, proofed for the uses in Zone 0 and Zone 1)
- ☑ Electrical apparatus are proofed fore the uses in the working area and the defined Zone.

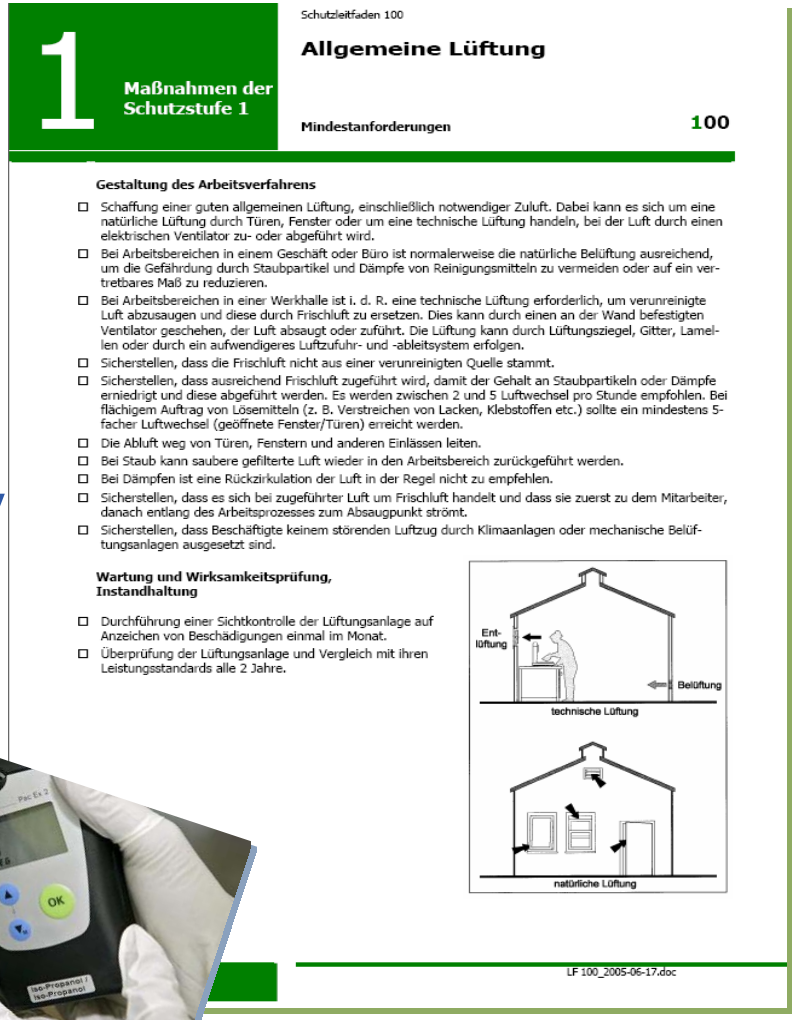


W001 s. ASR A1-3

workplace rules

Step 5: Check of the effectiveness of protective measures

- ✓ Control guidance sheet can be used as checklists
- ✓ Management and results of inspections have to be documented
- ✓ The functional capability of safety equipments has to be checked periodically
- ✓ If there is no way to avoid effective ignition sources, explosible atmospheres have to be avoided. Check their concentration by direct-reading instrument.



Schutzleitfaden 100

1 Maßnahmen der Schutzstufe 1

Allgemeine Lüftung

Mindestanforderungen 100

Gestaltung des Arbeitsverfahrens

- ☐ Schaffung einer guten allgemeinen Lüftung, einschließlich notwendiger Zuluft. Dabei kann es sich um eine natürliche Lüftung durch Türen, Fenster oder um eine technische Lüftung handeln, bei der Luft durch einen elektrischen Ventilator zu- oder abgeführt wird.
- ☐ Bei Arbeitsbereichen in einem Geschäft oder Büro ist normalerweise die natürliche Belüftung ausreichend, um die Gefährdung durch Staubpartikel und Dämpfe von Reinigungsmitteln zu vermeiden oder auf ein vertretbares Maß zu reduzieren.
- ☐ Bei Arbeitsbereichen in einer Werkhalle ist i. d. R. eine technische Lüftung erforderlich, um verunreinigte Luft abzusaugen und diese durch Frischluft zu ersetzen. Dies kann durch einen an der Wand befestigten Ventilator geschehen, der Luft absaugt oder zuführt. Die Lüftung kann durch Lüftungsziegel, Gitter, Lamellen oder durch ein aufwendigeres Luftzufuhr- und -ableitsystem erfolgen.
- ☐ Sicherstellen, dass die Frischluft nicht aus einer verunreinigten Quelle stammt.
- ☐ Sicherstellen, dass ausreichend Frischluft zugeführt wird, damit der Gehalt an Staubpartikeln oder Dämpfe erniedrigt und diese abgeführt werden. Es werden zwischen 2 und 5 Luftwechsel pro Stunde empfohlen. Bei flächigem Auftrag von Lösemitteln (z. B. Verstreichen von Lacken, Klebstoffen etc.) sollte ein mindestens 5-facher Luftwechsel (geöffnete Fenster/Türen) erreicht werden.
- ☐ Die Abluft weg von Türen, Fenstern und anderen Einlässen leiten.
- ☐ Bei Staub kann saubere gefilterte Luft wieder in den Arbeitsbereich zurückgeführt werden.
- ☐ Bei Dämpfen ist eine Rückzirkulation der Luft in der Regel nicht zu empfehlen.
- ☐ Sicherstellen, dass es sich bei zugeführter Luft um Frischluft handelt und dass sie zuerst zu dem Mitarbeiter, danach entlang des Arbeitsprozesses zum Absaugpunkt strömt.
- ☐ Sicherstellen, dass Beschäftigte keinem störenden Luftzug durch Klimaanlagen oder mechanische Belüftungsanlagen ausgesetzt sind.

Wartung und Wirksamkeitsprüfung, Instandhaltung

- ☐ Durchführung einer Sichtkontrolle der Lüftungsanlage auf Anzeichen von Beschädigungen einmal im Monat.
- ☐ Überprüfung der Lüftungsanlage und Vergleich mit ihren Leistungsstandards alle 2 Jahre.

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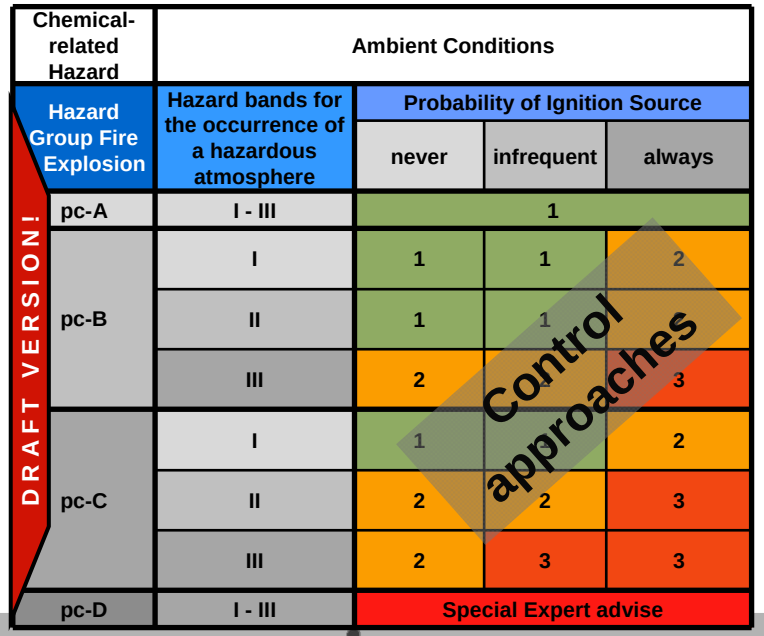
Field study

- Assessing the performance of the tool and the suitability of recommended protection measures
- Activities like filling, mixing, spraying, emptying of liquids and powder are evaluated
- The participation of the supervising expert group is very committed.
- Five draft versions of control guidance sheets for fire and explosion prevention measures are under discussion.
- Alternative parameters will be evaluated, too.

Summary - Fire & explosion risk - a future EMKG module

- Evaluation of the tool & the suitability of recommended protection measures
- Risk assessment by using parameters which are easy to determine
- Protection measures are categorized in control approaches and CGS
- New control guidance sheets and revised versions of the existing ones will be supplemented
- The final selection of the parameters can be appraised in 2012
- The module for fire & explosion prevention will be integrated into EMKG 3.0



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Thank you for your attention!

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