

1867; VACEK, 1907); Kramenzelkalk (HERITSCH, 1917b), Manticoceraskalk (HERITSCH, 1927c), Kalkschiefer der Rannachwiese (CLAR, 1933), Oberdevonische Flaserkalke (KUNTSCHNIG, 1937), Bunte Flaserkalke (SCHÄFER, 1937), oberer Clymenienkalk (WAAGEN, 1937).

Lithology: Monotonous, well-bedded flaser limestones of variable colors.

Fossils: Conodonts and rare macrofossils (goniatites and clymeniids; solitary rugose corals).

Origin, facies: Depositions of a deeper shelf margin.

Chronostratigraphic age: Frasnian–Famennian (also may contain uppermost Givetian).

Biostratigraphy: *asymmetricus* to *praesulcata* conodont zones.

Thickness: Approximately 70 m.

Lithostratigraphically higher rank unit: Rannach Group.

Lithostratigraphic subdivision: FLÜGEL (2000) affiliates the “Flaserkalke des Höllerer-Kogel” of EBNER et al. (1979, 1980a) as a member to the Steinberg Formation. The Höllerkogel member comprises 20 to 30 m thick thin-bedded, yellow micritic flaser limestones that are developed at the base of the formation.

Underlying unit(s): Kollerkogel Formation, Hochlantsch Formation (conformable contact).

Overlying unit(s): Sanzenkogel Formation.

Lateral unit(s): Hochlantsch Formation.

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheets 134 Passail, 163 Voitsberg, and 164 Graz.

Remarks: -

Complementary references: EBNER (1978a), SURENIAN (1978), EBNER & HUBMANN (2012).

Sanzenkogel-Formation / Sanzenkogel Formation

BERNHARD HUBMANN

Validity: Valid; first description by NÖSSING (1975: Sanzenkogel-Schichten); formalized by FLÜGEL (2000: p. 29; Sanzenkogel-Formation).

Type area: ÖK50-UTM, map sheet 4228 Voitsberg (ÖK50-BMN, map sheet 163 Voitsberg).

Type section: At Sanzenkogel west of village Steinberg, 15 km west of Graz (ÖK50-BMN, map sheet 163 Voitsberg) (N 47°04'07" / E 15°19'18"); the type section is now within the abandoned quarry “Trolp” (NÖSSING, 1975).

Reference section(s): Eichkogel at Rein (NÖSSING et al., 1977) (N 47°07'17" / E 15°16'22") and section “Hartbauer” (N 47°07'22" / E 15°21'58") southeast of Gratkorn (EBNER et al., 1980b).

Derivation of name: After the hill Sanzenkogel 15 km west of Graz.

Synonyms: Partly: Clymenienkalk (PETERS, 1867; VACEK, 1907); Kramenzelkalk (HERITSCH, 1917b); Manticoceraskalk (HERITSCH, 1927c); Kalkschiefer der Rannachwiese (CLAR, 1933); Oberdevonische Flaserkalke (KUNTSCHNIG, 1937); Bunte Flaserkalke (SCHÄFER, 1937); oberer Clymenienkalk (WAAGEN, 1937); *Gnathodus*-Kalk (FLÜGEL & ZIEGLER, 1957); Steinberg-Kalk (H. FLÜGEL, 1975).

Lithology: Monotonous, well-bedded flaser limestones of variable colors, mostly greyish; lydites.

Fossils: Conodonts.

Origin, facies: Depositions of a deeper shelf margin.

Chronostratigraphic age: Tournaisian–Serpukhovian.

Biostratigraphy: *sulcata* to *bilineatus bollandensis* conodont zones.

Thickness: Up to 35 m.

Lithostratigraphically higher rank unit: Forstkogel Group.

Lithostratigraphic subdivision: Within the Sanzenkogel Formation FLÜGEL (2000) distinguished two beds, Hart Bed and Trolp Bed.

Hart Bed: Well-bedded grey-yellowish lydites; variable in thickness (half a meter to 2 meters).

Trolp Bed: Dark grey marly limestones with phosphoritic nodules (diameters up to 5 cm); about 20 cm in thickness.

Underlying unit(s): Steinberg Formation.

Overlying unit(s): Höchkogel Formation.

Lateral unit(s): -

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheets 163 Voitsberg, 164 Graz.

Remarks: Distinguishing lithological features between rocks of the Sanzenkogel Formation and the underlying Steinberg Formation are rather meagre. Furthermore, the subdivision of a “lower Sanzenkogel Formation” with its type section at Sanzenkogel (abandoned quarry “Trolp”; see NÖSSING, 1975) and the “upper Sanzenkogel Formation” (FLÜGEL, 2000) with its type section at the roadcut “Hartbauer” (see EBNER, 1978a) is only a biostratigraphic not a lithostratigraphic one.

Complementary references: BOŠIČ (1998), EBNER & HUBMANN (2012).

Dornerkogel-Formation / Dornerkogel Formation

BERNHARD HUBMANN

Validity: Valid; first description by SY (1957: “Sandsteine des Dorner-Kogels”); formalization by FLÜGEL (2000: p. 13; Dornerkogel-Formation).

Type area: ÖK50-UTM, map sheet 4223 Weiz (ÖK50-BMN, map sheet 134 Passail).

Type section: No type section defined, but FLÜGEL (2000) proposed a type region at Dornerkogel, a mountain near St. Erhard (Breitenau), ÖK50-BMN, map sheet 134 Passail (N 47°21'11" / E 15°22'58").

Reference section(s): -

Derivation of name: After the mountain Dornerkogel (1,336 m) north St. Erhard (Breitenau), approx. 60 km north of Graz.

Synonyms: Sandsteine des Dorner-Kogels (SY, 1957); Dornerkogel-Folge (H. FLÜGEL, 1975); Dornerkogelfolge (FLÜGEL & NEUBAUER, 1984); partly: Karbon der Breitenau (FLÜGEL, 1953a).

Lithology: Greenish-grey arkoses, greywackes and sandstones.

Fossils: Undeterminable fragmental plant remains.

Origin, facies: Shallow marine environment.

Chronostratigraphic age: Carboniferous (?)

Remarks: The age of the formation is unknown but due to the presence of undeterminable fragmental plant remains a Carboniferous age is proposed (HASENHÜTTL, 1994).

Biostratigraphy: -

Thickness: Probably several hundreds of meters.

Lithostratigraphically higher rank unit: Laufnitzdorf Group (FLÜGEL, 2000).

Lithostratigraphic subdivision: -

Underlying unit(s): Tectonic boundary to the Schattleitner Member (St. Jakob Formation).

Overlying unit(s): ?

Lateral unit(s): -

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheet 134 Passail.

Remarks: -

Complementary references: -

Bärenschtz-Formation / Bärenschtz Formation

BERNHARD HUBMANN

Validity: Valid; first description by ZIER (1981: "Karbonkalke", "Mixnitzer Karbon"); formalized by FLÜGEL (2000: p. 37; Bärenschtz-Formation).

Type area: ÖK50-UTM, map sheet 4223 Weiz (ÖK50-BMN, map sheet 134 Passail).

Type section: No type section selected, although ZIER (1981) described four sections in the area of the Rote Wand (Hochlantsch region) ÖK50-BMN, map sheet 134 Passail (N 47°21'54" / E 15°25'47").

Reference section(s): See above.

Derivation of name: After "Bärenschtzklamm", a gorge west of Mixnitz, approx. 45 km north of Graz.

Synonyms: Partly Hochlantschkalk [sic!] (CLAR, 1874), Hochlantsch-Kalk (H. FLÜGEL, 1975).

Lithology: Reddish to yellow and grey cephalopod limestones with cherts.

Fossils: Conodonts, cephalopods.

Origin, facies: Open marine environment with pelagic organisms.

Chronostratigraphic age: Tournaisian–Serpukhovian ("Namurian B"); not Moskovian as indicated in the ASC 2004.

Biostratigraphy: *declinognathodus noduliferus* conodont zone.

Thickness: About 100 m.

Lithostratigraphically higher rank unit: Mixnitz Group (FLÜGEL, 2000).

Lithostratigraphic subdivision: At the base of the Bärenschtz Formation red-brown brecciated limestones and dolostones are developed following an erosional relief. This breccia horizon is integrated into the Nadelspitz Bed (FLÜGEL, 2000).

Underlying unit(s): Hochlantsch Formation.

Overlying unit(s): -

Lateral unit(s): -

Geographic distribution: Styria, highland in the surroundings of Graz; ÖK50-BMN, map sheet 134 Passail.

Remarks: -

Complementary references: -

Höchkogel-Formation / Höchkogel Formation

BERNHARD HUBMANN

Validity: Valid; first nomination and description by CLAR (1933: "Kalkschiefer vom Höchkogel"); formalized and re-described by FLÜGEL (2000: p. 30–31; Höchkogel-Formation).

Type area: ÖK50-UTM, map sheet 4229 Graz (ÖK50-BMN, map sheet 164 Graz).

Type section: No type section defined, but FLÜGEL (2000) proposed a type region at Höchkogel near Gratkorn (elevation spot 643 m on ÖK50-BMN, map sheet 164 Graz) (N 47°09'22" / E 15°22'36") 16 km northwest of Graz.

Reference section(s): -

Remarks: CLAR's (1933) conception of the "Kalkschiefer vom Höchkogel" integrated different stratigraphic units (see FLÜGEL, 2000) and therefore the term was re-interpreted by FLÜGEL (2000). EBNER (1978a) summarized those units following the Steinberg and Sanzenkogel Formations to the "Folge der Dult" which he subdivided into two lithologically different parts. Limestones of the lower part which are developed upon an erosional surface (i.e., "Kalke der Dult" sensu EBNER, 1978a = Höchkogel Formation) are overlain by shales (i.e., "Schiefer der Dult" sensu EBNER, 1978a = Hahngraben Formation).

Derivation of name: After the hill Höchkogel 16 km northwest of Graz.

Synonyms: Kalke der Dult (EBNER, 1978a); partly: Kalke mit *Cladochonus* (HERITSCH, 1930b); Kalkschiefer vom Höchkogel (CLAR, 1933).

Lithology: Dark grey-brownish to black micritic limestones.

Fossils: Conodonts

Origin, facies: Shallow marine deposits.

Chronostratigraphic age: Bashkirian.

Biostratigraphy: Conodonts of the *Declinognathodus-Idiognathoides* group indicate an early Bashkirian age (EBNER, 1977, 1980a).

Thickness: Up to 20 m in thickness.

Lithostratigraphically higher rank unit: Dult Group.

Lithostratigraphic subdivision: FLÜGEL (2000) distinguished two members:

Hartbauer Member (= Typ II-Kalk, EBNER, 1975a = Basis-kalk, EBNER 1978a): Black massive limestones with crusts of hematite; locally dolostones, breccias and shales; maximum thickness of 20 m.

Schrausbauer Member (= Typ III-Kalk, EBNER, 1975a): Black argillaceous shales and oolitic limestones with birdseye-structures; some few meters in thickness.

Underlying unit(s): Sanzenkogel Formation (erosional contact).

Overlying unit(s): Hahngraben Formation.

Lateral unit(s): -

Austrian Stratigraphic Chart 2004 - Paleozoic

(sedimentary successions)

Austrian Stratigraphic Commission



ERA	SYSTEM / PERIOD / SERIES / EPOCH	STAGE / AGE	DURATION Ma	Global Classification					
				ERATHM / ERA	SYSTEM / PERIOD / SERIES / EPOCH				
PALEOZOIC	PERMIAN	CHANGHSINGIAN / Dorashamian	251	PERMIAN	MID PERMIAN / GUADALUPIAN				
		WUCHIAPINGIAN / Dzhulfian	255						
		CAPITANIAN	260						
		WORDIAN	265						
		ROADIAN	270						
		PERMIAN	LOWER PERMIAN / CISURALIAN			KUNGURIAN	275		
						ARTINSKIAN	280		
						SAKMARIAN	285		
						ASSELIAN	290		
		PERMIAN	TRIAS			GZHELIAN	295	TRIAS	U. CARBONIFEROUS / PENNSYLVANIAN
KASIMOVIAN	300								
MOSKOVIAN	305								
BASHKIRIAN	310								
TRIAS	LOWER CARBONIFEROUS / MISSISSIPPIAN			SERPUKHOVIAN	315				
				VISEAN	320				
				TOURNAISIAN	325				
PERMIAN	DEVONIAN			FAMENNIAN	330	DEVONIAN	UPPER DEVONIAN		
				FRASNIAN	335				
				GIVETIAN	340				
		EIFELIAN	345						
		DEVONIAN	LOWER DEVONIAN	EMSIAN	350				
				PRAGIAN	355				
				LOCHKOVIAN	359.2				
		PERMIAN	DEVONIAN	LUDFORDIAN / GORSTIAN	365			DEVONIAN	MIDDLE DEVONIAN
				HOMERIAN / SHEINWOOD	370				
				TELYCHIAN	375				
AERONIAN	380								
RHUDDANIAN	385								
PERMIAN	SILURIAN			HIRNANTIAN	390				
				LLANDOVERY	395				
				WEN-LUD-LOCK	400				
PERMIAN	ORDOVICIAN			DARRIWILIAN	405	ORDOVICIAN	UPPER ORDOVICIAN		
				TREMA-DOCIAN	410				
		PAIBIAN	415						
		PERMIAN	MIDDLE CAMBRIAN	MIDDLE CAMBRIAN	420				
				MIDDLE CAMBRIAN	425				
				MIDDLE CAMBRIAN	430				
		PERMIAN	CAMBRIAN	LOWER CAMBRIAN	435			CAMBRIAN	MIDDLE CAMBRIAN
				LOWER CAMBRIAN	440				
				LOWER CAMBRIAN	443.7				
				LOWER CAMBRIAN	445				
LOWER CAMBRIAN	450								
LOWER CAMBRIAN	455								
LOWER CAMBRIAN	460								
LOWER CAMBRIAN	465								
LOWER CAMBRIAN	470								
LOWER CAMBRIAN	475								
PERMIAN	CAMBRIAN	LOWER CAMBRIAN	480	CAMBRIAN	LOWER CAMBRIAN				
		LOWER CAMBRIAN	485						
		LOWER CAMBRIAN	490						
		LOWER CAMBRIAN	495						
		LOWER CAMBRIAN	500						
		LOWER CAMBRIAN	505						
		LOWER CAMBRIAN	510						
		LOWER CAMBRIAN	515						
		LOWER CAMBRIAN	520						
		LOWER CAMBRIAN	525						
PERMIAN	CAMBRIAN	LOWER CAMBRIAN	530	CAMBRIAN	LOWER CAMBRIAN				
		LOWER CAMBRIAN	535						
		LOWER CAMBRIAN	540						
		LOWER CAMBRIAN	542						



- Legend**
- pelagic, offshore, siliciclastic
 - pelagic, nearshore, calcareous
 - shallow marin, neritic
 - terrestrial-continental, coarse clastic
 - terrestrial-continental, fine clastic
 - evaporite (chloride, sulphate)
 - rhyolite, dacite
 - (basaltic) andesite, trachyandesite
 - basalt
 - phyllite
 - mixed-facies (in corresponding colors)
 - coal (may include several seams)
 - ? position/age doubtful/controversial
 - | equal units
 - \ older unit left \ younger unit right
 - hiatus
 - unconformity
 - GSSP
 - Fm. Formation
 - Ls. Limestone

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