Sodium Diacetate

Diacetato de sodio; E262. Sodium hydrogen diacetate. $CH_3COONa, CH_3COOH(+xH_2O).$ CAS — 126-96-5 (anhydrous sodium diacetate).

Sodium diacetate is used as a preservative in foods, particularly as an inhibitor of moulds and rope-forming micro-organisms in bread

Sodium Formaldehyde Sulfoxylate

Formaldehído sulfoxilato sódico; Natrii Formaldehydosulfoxylas; Sodium Formaldehyde Sulphoxylate; Sodu formaldehydosulfoksylan. Sodium hydroxymethanesulphinate dihydrate.

 $CH_3NaO_3S,2H_2O = 154.1.$

CAS — 149-44-0 (anhydrous sodium formaldehyde sulfoxylate); 6035-47-8 (sodium formaldehyde sulfoxylate, dihy-

Pharmacopoeias. In *Pol.* Also in *USNF*.

USNF 26 (Sodium Formaldehyde Sulfoxylate). White crystals or hard white masses with the characteristic odour of garlic. Soluble 1 in 3.4 of water, 1 in 510 of alcohol, 1 in 175 of chloroform, and 1 in 180 of ether; slightly soluble in benzene. A 2% solution in water has a pH of 9.5 to 10.5. Store at 15° to 30°. Protect from

Sodium formaldehyde sulfoxylate is an antoxidant used as a preservative in pharmaceuticals. It has been used in the treatment of acute mercury poisoning (p.2342).

Sodium Hypochlorite

Hipoclorito sódico.

Гипохлорит Натрия

 $NaOCI,5H_2O = 164.5.$

CAS = 7681-52-9

ATC - D08AX07 ATC Vet - QD08AX07.

NOTE. The term 'liquid chlorine' has been used for solutions of sodium hypochlorite. These should not be confused with the pressurised form of chlorine gas (p.1638) which is also liquid

and has been referred to similarly Pharmacopoeias. Br., Fr., and US include sodium hypochlo-

rite solutions. BP 2008 (Dilute Sodium Hypochlorite Solution). It contains 1% of available chlorine. Store away from acids at a temperature not

exceeding 20°. Protect from light. BP 2008 (Strong Sodium Hypochlorite Solution). It contains not less than 8% of available chlorine. It should be diluted before use. Store away from acids at a temperature not exceeding 20°. Protect from light.

USP 31 (Sodium Hypochlorite Solution). It contains not less than 4% and not more than 6% w/w of anhydrous sodium hypochlorite. It is not suitable for application to wounds. Store in airtight containers. Protect from light.

USP 31 (Sodium Hypochlorite Topical Solution). It contains 0.025% sodium hypochlorite. Store in airtight containers. Protect

Incompatibility. The antimicrobial activity of hypochlorites is rapidly reduced in the presence of organic material; it is also pH dependent being greater in acid pH although hypochlorites are more stable at alkaline pH.

Sodium hypochlorite solutions should not be mixed with solutions of strong acids or ammonia; the subsequent reactions release chlorine gas and tosylchloramide sodium gas, respectively.

Stability. The stability of sodium hypochlorite solutions increases with pH, solutions of pH 10 or more being most stable.1 Stability studies have shown that solutions providing 0.04 to 0.12% 'available chlorine' stored in amber glass bottles at room temperature could carry a 23-month expiry date.2

- Bloomfield SF, Sizer TJ. Eusol BPC and other hypochlorite for-mulations used in hospitals. *Pharm J* 1985; 235: 153–5 and 157.
- Fabian TM, Walker SE. Stability of sodium hypochlorite solutions. Am J Hosp Pharm 1982; 39: 1016–17.

Adverse Effects

Hypochlorite solutions release hypochlorous acid upon contact with gastric juice and acids. Most patients ingesting hypochlorites will develop only mild gastrointestinal irritation. However, ingestion of small amounts of 3 to 5% hypochlorite solutions may result in irritation of the oropharynx, a burning sensation in the mouth and throat, and thirst. Nausea, vomiting, and haematemesis may occur. Ingestion of large amounts or more concentrated solutions causes irritation and corrosion of mucous membranes with chest and abdominal pain and tenderness, vomiting, haematemesis, watery diarrhoea and sometimes melaena. Ingestion of extremely large volumes may rarely cause hypernatraemia, hyperchloraemia, hypotension, and changes in mental status. In very severe cases ulceration or perforation of the oesophagus or stomach may occur leading to haemorrhage and shock.

Inhalation of the fumes is irritant to the eyes, nose, and respiratory tract. Sore throat, cough, bronchoconstriction, headache, ataxia, and confusion may develop. In severe cases dyspnoea and stridor due to laryngeal oedema may develop with breathlessness, wheeze, hypoxia, cyanosis, pneumonitis, and pulmonary oedema.

Hypochlorite solutions may be irritating to the skin and allergic contact dermatitis has been reported. Hypochlorite solutions may cause an alkali-type burn when splashed into the eye.

♦ General references.

 Racioppi F, et al. Household bleaches based on sodium hypochlorite: review of acute toxicology and Poison Control Center experience. Food Chem Toxicol 1994; 32: 845-61.

Effects on the blood. A child with G6PD deficiency had an acute haemolytic crisis after swimming for about 4 hours in an indoor pool containing very high concentrations of sodium hypochlorite.1

1. Ong SJ, Kearney B. Local swimming pool and G-6-PD deficiency. Med J Aust 1994; 161: 226-7.

Effects on wound healing. For comment on the adverse effects of hypochlorite solutions on wound healing, see Disinfection: Wounds under Uses and Administration below.

Toxicity from mixing cleaning agents. Mixing the household cleaning agents bleach (5.25% sodium hypochlorite solution) and 4% phosphoric acid (p.2367) causes chlorine gas and water to be released. The chlorine in turn reacts with the water to form hydrochloric and hypochlorous acids. There have been case reports of patients and hospital staff who have been accidentally exposed to chlorine gas as a result of mixing of these two cleaning agents. They had temporary illness and symptoms typical of chlorine toxicity; irritation of the eyes, nose and throat, headache, dizziness, nausea, cough, and chest pain or tightness. One patient had an acute exacerbation of asthma.

Tosylchloramide sodium gas is produced when common household cleaning agents containing sodium hypochlorite and ammonia (p.2256) are mixed together. On inhalation the water in the respiratory tract reacts with the tosylchloramide sodium gas to release ammonia, hydrochloric acid and oxygen free radicals. Numerous case reports have described the symptoms resulting from inhalation of these gases. A 12-month review2 of 216 patients who reported to a regional poison information centre after exposure to tosylchloramide sodium gas as a result of mixing cleaning products found that only 1 patient, with a pre-existing respiratory-tract infection, required hospital admission for ongoing respiratory distress. The most frequent symptoms were cough and shortness of breath and other symptoms experienced were those commonly associated with exposure to chlorine gas (p.1638). Most (200) of the patients' symptoms resolved within 6 hours and 145 patients were treated at home, while 71 were referred for further medical care. Oxygen was given to 62 patients, bronchodilators to 9 patients and 3 patients received corticosteroids. Similar symptoms and findings were reported³ when 2 groups of 36 soldiers were exposed to tosylchloramide sodium gas as a result of mixing sodium hypochlorite and ammonia containing cleaning agents. Only 2 soldiers required hospital admission for persistent respiratory symptoms, with one of them requiring a few days of treatment in intensive care. Another case report4 described a previously healthy 53-year-old woman who experienced shortness of breath progressing to pneumonitis and requiring emergency tracheostomy after a similar exposure to tosylchloramide sodium gas.

- CDC. Epidemiologic notes and reports: chlorine gas toxicity from mixture of bleach with other cleaning products—Califor-nia. MMWR 1991; 40: 619–21, 627–9. Corrections. ibid.; 646, 819.
- 2. Mrvos R, et al. Home exposures to chlorine/chloramine gas: review of 216 cases. South Med J 1993; 86: 654-7.

- Pascuzzi TA, Storrow AB. Mass casualties from acute inhalation of chloramine gas. Mil Med 1998; 163: 102–4.
- Tanen DA, et al. Severe lung injury after exposure to chloramine gas from household cleaners. N Engl J Med 1999; 341: 848–9.

Toxicity during root canal irrigation. A review of case reports1 where sodium hypochlorite had been inadvertently injected into the periapical tissues during root canal irrigation reported that most patients experienced immediate severe pain and swelling of the neighbouring soft tissue, which could possibly spread over the injured side of the face, upper lip and infra-orbital region. Other symptoms included bleeding from the root canal, interstitial bleeding with haemorrhage of the skin and mucosa, a chlorine taste, irritation of the throat, and reversible anaesthesia or paraesthesia.

Hülsmann M, Hahn W. Complications during root canal irriga-tion—literature review and case reports. *Int Endod J* 2000; 33:

Treatment of Adverse Effects

If sodium hypochlorite solution is ingested symptomatic care, including dilution with water, milk, or other demulcents should be given; opinion over the use of antacids is divided. Sodium thiosulfate 1 to 2.5% solution has been used but is of little or no value. If spilled on skin or eyes, washing with copious amounts of water is recommended.

Poisoning. A patient who accidentally received an intravenous infusion of 150 mL of a 1% solution of sodium hypochlorite experienced a slow heart rate, mild hypotension, and increased respiratory rate. The slow heart rate persisted for 3 days but other parameters returned to normal after symptomatic treatment.1

1. Marroni M, Menichetti F. Accidental intravenous infusion of so dium hypochlorite. DICP Ann Pharmacother 1991; 25: 1008-9.

Precautions

Topically applied hypochlorites may dissolve blood clots and cause bleeding.

Uses and Administration

Sodium hypochlorite is a disinfectant and antiseptic with the brief and rapid actions of chlorine (see p.1638). Sodium hypochlorite pentahydrate contains about 43% of 'available chlorine' (see p.1638); anhydrous sodium hypochlorite contains about 95%. Powders and solutions are commonly used for the rapid disinfection of hard surfaces (see Disinfection in Creutzfeldt-Jakob Disease, p.1622 and in Hepatitis and HIV Infection, p.1623), food and dairy equipment, babies' feeding bottles, excreta, and water (p.1623). Solutions for use as domestic bleaches contain up to 5.25% of hypochlorite. Only diluted solutions containing up to 0.5% of 'available chlorine' are suitable for use on the skin and in wounds (but see Wound Disinfection, p.1624). Sodium hypochlorite solutions ranging from 0.5 to 5.25% are used in dentistry for root canal irrigation.

Solutions of hypochlorites used as disinfectants have included Labarraque's Solution containing sodium hypochlorite with an alkali, and Eau de Javel, containing sodium or potassium hypochlorite.

Disinfection. INSTRUMENTS. Needles and syringes should not usually be sterilised chemically. However, cleaning of injection equipment with hypochlorite has been suggested as a last resort in the absence of sterile equipment, to reduce the risk of HIV transmission associated with the enforced re-use of injection equipment by injection drug users. 1 Use of fullstrength domestic bleach (about 5% sodium hypochlorite, about 2% of 'available chlorine') was reported to be effective for the cleaning of intravenous drug users' equipment; a 30-second contact time was required.^{1,2} A 1 in 10 dilution of bleach was not effective after exposure for 5 minutes.2 Despite rinsing with water, a low residual concentration of hypochlorite and microaggregates of blood are likely to remain on the cleaned instruments. Free chlorine is a potent oxidant and low concentrations of oxidants have been shown to enhance tissue inflammation in vivo as well as HIV-1 replication in vitro. This has led some researchers to suggest that there may be an increased possibility of an injection drug user contracting HIV-1 through the sharing of a bleach-cleaned bloodcontaminated syringe as a consequence of the concomitant transmission of residual bleach; however, there is no epidemiological evidence to confirm this.3

- Donoghoe MC, Power R. Household bleach as disinfectant for use by injecting drug users. *Lancet* 1993; 341: 1658.
- 2. Watters JK, et al. Household bleach as disinfectant for use by injecting drug users. Lancet 1993; 342: 742–3.

 3. Contoregi C, et al. Effects of varying concentrations of bleach on in vitro HIV-1 replication and the relevance to injection drug use. Intervirology 2000; 43: 1-5.

worms. Sodium hypochlorite in aqueous solution at a concentration of 3.75% (or greater) is an effective ovicide for Echinococcus and may be used on hard surfaces, glassware, and sinks

1. Craig PS, Macpherson CNL. Sodium hypochlorite as an ovicide for Echinococcus. Ann Trop Med Parasitol 1988; 82: 211–13.

WOUNDS. Hypochlorite solutions are now generally considered to be too irritant for use in the management of wounds (p.1585). Studies suggest that they may delay wound healing if repeatedly applied to open wounds. 1.2 It has been suggested that they may be of use in debriding burns (p.1578) or necrotic chronic wounds,³ but also that any benefit that might be seen from the desloughing of necrotic tissue might be produced by damage of the superficial cell layer leading to separation4 or from tissue hydration produced by wet dressing packs.5 However, some burns units have found that hypochlorite as Dakin's solution (see Chlorinated Lime, p.1638) produces better healing than other antibacterials.

See also p.1624.

- 1. Thomas S, Hay NP. Wound healing. Pharm J 1985; 235: 206.
- Lineweaver W, et al. Topical antimicrobial toxicity. Arch Surg 1985; 120: 267–70.
- 3. Leaper DJ. Eusol. BMJ 1992; 304: 930-1.
- A. Anonymous. Local applications to wounds—I: cleansers, anti-bacterials, debriders. *Drug Ther Bull* 1991; 29: 93–5.
 Thomas S. Milton and the treatment of burns. *Pharm J* 1986;
- 236: 128-9
- Murphy KD, et al. Current pharmacotherapy for the treatment of severe burns. Expert Opin Pharmacother 2003; 4: 369–84.

Preparations

BP 2008: Dilute Sodium Hypochlorite Solution; Strong Sodium Hypochlo-

USP 31: Sodium Hypochlorite Solution; Sodium Hypochlorite Topical So-

Proprietary Preparations (details are given in Part 3)
Arg.: Antibacter; Austral.: Milton; Belg.: Dakincooper; Braz.: Liquido de
Dakin; Canad.: Dakin's Solution; Hygeol; Fr.: Dakin; Ger.: Maranon H;
Israel: Chlorasol; Ital.: Arnukine Med; Milton; Singapore: Milton Anti-Bacterial; **UK:** Chlorasol†; Milton.

Multi-ingredient: Fr.: Amukine; Mex.: Amuchina†; Switz.: Amuchina

Sodium Nitrate

E25 I; Natrii Nitras; Natrium Nitricum; Nitrato sódico; Sodu azotan.

 $NaNO_3 = 84.99$. CAS - 7631-99-4.

NOTE. Crude sodium nitrate is known as Chile Saltpetre.

Profile

Sodium nitrate has similar actions to potassium nitrate (p.1658) and is used as a preservative in foods, particularly in meat products.

Crude sodium nitrate is used as a fertiliser.

Handling. Sodium nitrate has been used for the illicit preparation of explosives or fireworks; care is required with its supply.

Poisoning. Cyanosis and methaemoglobinaemia has been reported1 in 3 patients after eating sausages that had been preserved mistakenly with a mixture of sodium nitrate and sodium nitrite rather than with potassium nitrate (saltpetre). The name saltpetre is used as a generic term for a number of potassium- or sodium-based preservatives used in food manufacture.

Kennedy N, et al. Faulty sausage production causing methaemo-globinaemia. Arch Dis Child 1997; 76: 367–8.

Sodium Perborate Monohydrate (USAN)

 $NaBO_3.H_3O = 99.81.$ CAS — 7632-04-4 (anhydrous sodium perborate); 10332-33-9 (sodium perborate monohydrate) ATC - AOIABI9.

ATC Vet - QA01AB19.

(anhydrous)

Sodium Perborate

Natrii perboras; Natrio perboratas; Natriumperboraatti; Natriumperborat; Nátrium-perborát; Perborato sódico; Perboritan sodný; Sod. Perbor.; Sodium, perborate de; Sodium Perborate Tetrahydrate.

 $NaBO_3, 4H_2O = 153.9.$ CAS — 10042-94-1. ATC — A01AB19. ATC Vet - QA01AB19. Pharmacopoeias. In Eur. (see p.vii).

Ph. Eur. 6.2 (Sodium Perborate, Hydrated; Sodium Perborate BP 2008). Colourless prismatic crystals or a white or almost white powder, stable in crystalline form. Sparingly soluble in water, with slow decomposition. It dissolves in dilute mineral acids. Store in airtight containers.

Adverse Effects

Frequent use of toothpowders containing sodium perborate may cause blistering and oedema. Hypertrophy of the papillae of the tongue has also been reported. The effects of swallowed sodium perborate are similar to those of boric acid (p.2268).

Uses and Administration

Sodium perborate is a mild disinfectant and deodorant. It readily releases oxygen in contact with oxidisable matter and has been used in aqueous solutions for purposes similar to weak solutions of hydrogen peroxide.

Sodium perborate is used for tooth whitening and has also been used, with calcium carbonate, as a toothpowder. A freshly prepared solution is used as a mouthwash.

The monohydrate is used similarly.

Preparations

Proprietary Preparations (details are given in Part 3)

Arg.: Hifamonil; Canad.: Amosan; India: Steradent; Ital.: Kavosan†; Neth.: Bocasan; USA: Amosan.

Multi-ingredient: Arg.: Oral-B Enjuague Bucal Amosan†: Austral.: Amosan; Belg.: Amosan; Braz.: Anginotricin; Malvatricin Branqueador; Oticerim; Fr.: Bactident; Hydralin; Hong Kong: Hydralin; Spain: Lema C; Switz.: Saltrates Rodell†; USA: Trichotine; Venez.: Novafix.

Sodium Percarbonate

Percarbonato sódico; Sodium Carbonate Peroxide. Na_2CO_3 , $I / H_2O_2 = 157.0$. CAS — 15630-89-4.

Profile

Sodium percarbonate has similar uses to sodium perborate (above).

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: Arg.: Ascoxal†; Austral.: Ascoxal; Fin.: Ascoxal†; Mex.: Ascoxal; Norw.: Ascoxal†; Swed.: Ascoxal†; Switz.: Desaquick

Sorbates

Sorbatos

Sorbic Acid

Acide sorbique; Acidum sorbicum; E200; Kwas sorbowy; Kyselina sorbová; Sórbico, ácido; Sorbiinihappo; Sorbinsyra; Sorbo rūgštis; Szorbinsav. (E,E)-Hexa-2,4-dienoic acid.

 $C_6H_8O_2 = 112.1.$ CAS — 22500-92-1.

Pharmacopoeias. In Chin. and Eur. (see p.vii). Also in USNF. Ph. Eur. 6.2 (Sorbic Acid). A white or almost white, crystalline powder. Slightly soluble in water; freely soluble in alcohol. Protect from light.

USNF 26 (Sorbic Acid). A free-flowing white crystalline powder with a characteristic odour. Soluble 1 in 1000 of water, 1 in 10 of alcohol, 1 in 8 of dehydrated alcohol, 1 in 15 of chloroform, 1 in 30 of ether, 1 in 8 of methyl alcohol, and 1 in 19 of propylene glycol. Store in airtight containers at a temperature not exceeding 40°. Protect from light.

Incompatibility. The incompatibility of sorbates is discussed under Potassium Sorbate, below.

Potassium Sorbate

E202; Kalii sorbas; Kalio sorbatas; Kaliumsorbaatti; Kaliumsorbat; Kalium-sorbát; Kálium-szorbát; Potassium, sorbate de; Sorbato potásico. Potassium (E,E)-hexa-2,4-dienoate.

 $C_6H_7KO_2 = 150.2$. CAS — 590-00-1; 24634-61-5.

Pharmacopoeias. In Eur. (see p.vii). Also in USNF.

Ph. Eur. 6.2 (Potassium Sorbate). White or almost white granules or powder. Very soluble in water; slightly soluble in alcohol. Protect from light.

USNF 26 (Potassium Sorbate). White crystals or powder with a characteristic odour. Soluble 1 in 4.5 of water, 1 in 35 of alcohol, and 1 in more than 1000 of chloroform and of ether. Store in airtight containers at a temperature not exceeding 40°. Protect from light.

Incompatibility. Sorbic acid can be inactivated by oxidation and to some extent by nonionic surfactants and plastics. Activity of the sorbates may be reduced by increases in pH.1

Cook W. Sorbic acid. In: Rowe RC, et al., eds. Handbook of pharmaceutical excipients. 5th ed. London and Chicago: The Pharmaceutical Press and the American Pharmaceutical Associ-ation, 2006: 710–12.

Adverse Effects and Precautions

The sorbates can be irritant and have caused contact dermatitis.

Hypersensitivity. References to allergic-type skin reactions¹ and non-allergic irritant-type reactions^{2,3} with potassium sorbate or sorbic acid.

- 1. Saihan EM, Harman RRM. Contact sensitivity to sorbic acid in
- Sainan EM, Frafman KKM. Contact sensitivity to sorbic acid in 'Unguentum Merck'. Br J Dermatol 1978; 99: 583-4.
 Soschin D, Leyden JJ. Sorbic acid-induced erythema and edema. J Am Acad Dermatol 1986; 14: 234-41.
 Fisher AA. Erythema limited to the face due to sorbic acid. Cutis
- 1987: 40: 395-7.

Uses

Potassium sorbate and sorbic acid possess antifungal, and to a lesser extent antibacterial, activity. They are relatively ineffective above a pH of about 6. They are used as preservatives in pharmaceutical preparations in concentrations of up to 0.2%, in enteral formulas, foods, and in cosmetic preparations.

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: Austral.: Caprilate; Ger.: Klysma Sorbit; Saseem; Ital.: Evasen Dischetti; Evasen Liquido; Mex.: Adapettes; UK: Relaxit; USA: Clear Eyes Contact Lens Relief; Venez.: Saxacid.

Sulfites and Sulfur Dioxide

Sulfitos y dióxido de azufre.

Potassium Bisulfite

Bisulfito potásico; E228; Potassium Bisulphite; Potassium Hydrogen Sulphite.

 $KHSO_3 = 120.2.$ CAS = 7773-03-7.

Potassium Metabisulfite

Dipotassium Pyrosulphite; Disiřičitan draselný; E224; Kalii Disulfis; Kalii metabisulfis; Kalio metabisulfitas; Kaliummetabisulfiitti; Kaliummetabisulfit; Metabisulfito potásico; Potassium, métabisulfite de; Potassium Metabisulphite; Potassium Pyrosulphite; Potasu pirosiarczyn.

K₂S₂O₅ = 222.3. CAS — 16731-55-8.

Pharmacopoeias. In Eur. (see p.vii). Also in USNF.

Ph. Eur. 6.2 (Potassium Metabisulphite). A white or almost white powder or colourless crystals. Freely soluble in water; slightly soluble in alcohol. A 5% solution in water has a pH of 3.0 to 4.5. Store in airtight containers. Protect from light.

USNF 26 (Potassium Metabisulfite). White or colourless, freeflowing crystals, crystalline powder, or granules, usually with an odour of sulfur dioxide. Gradually oxidises in air to the sulfate. Soluble in water: insoluble in alcohol. Its solutions are acid to litmus. Store in well-filled airtight containers at a temperature not exceeding 40°

Incompatibility and stability. The incompatibility and stability of sulfites are discussed under Sulfur Dioxide, below.

Sodium Bisulfite

Bisulfito sódico; E222; Sodium Bisulphite; Sodium Hydrogen Sulphite.

 $NaHSO_3 = 104.1.$ CAS — 7631-90-5.

Pharmacopoeias. In Chin. and Jpn, described in both as consisting of a mixture of sodium bisulfite and sodium metabisulfite.

Sodium Metabisulfite

Disiřičitan sodný; Disodium Pyrosulphite; E223; Metabisulfito sódico: Natrii Disulfis: Natrii metabisulfis: Natrii Pyrosulfis: Natrio metabisulfitas; Nátrium-diszulfit; Natriummetabisulfiitti; Natriummetabisulfit; Sodium Disulphite; Sodium, métabisulfite de; Sodium Metabisulphite; Sodium Pyrosulphite; Sodu pirosiarczyn. $Na_2S_2O_5 = 190.1$. CAS = 7681-57-4.

Pharmacopoeias. In Chin., Eur. (see p.vii), and Jpn. Also in

Ph. Eur. 6.2 (Sodium Metabisulphite). Colourless crystals or a white or almost white crystalline powder. Freely soluble in water; slightly soluble in alcohol. A 5% solution in water has a pH of 3.5 to 5.0. Protect from light.

USNF 26 (Sodium Metabisulfite). White crystals or a white to yellowish crystalline powder with an odour of sulfur dioxide. Freely soluble in water and in glycerol; slightly soluble in alcohol. Store in well-filled airtight containers at a temperature not exceeding 40°.