

elfin 20.e

Annex 1 Specifications and standard equipment

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Type

Side-by-side high performance electro/hybrid aircraft/glider
FAI 20 m two-seater class.

Program

Reiner Stemme established a new company to meet the challenge of electro-hybrid powered flight **for a new class of aircraft and glider in ONE** closing the gap between two worlds of aviation:

- Competition soaring up to long distance level
- A-to-B travelling and soaring safaris as in “Wandersegelflug” of Wolf Hirth

The enabling concept is Reiner Stemme’s patented retractable propeller system and an electric propulsion system. Resulting in:

- Fuselage with zero drag penalties and low mass for high soaring performance
- Long-range capability made possible by a quick-mount hybrid underwing RangeExtender* with generator and IC engine.
- Stepless adjustable power with a single lever for control of propeller/power ON-OFF enabling a dynamic flight experience and safe startup



Current versions

elfin 20.e: electric self-launch base model with one-hour electric powered level flight, competition soaring performance of 1:50 glide ratio class, universal tow release for winch and aerotow*

elfin 20.ex: 1,000 km (540 NM) touring/travel performance with RangeExtender* (under wing hybrid power pod), quick-mount-system.

General design features

- Fuselage with side-by-side cockpit in front of wing with panoramic view and low entry sill, T-tail
- 3 three section wing, full carbon prepreg design (same as fuselage)
- Retractable propeller system and directly coupled 72 kW (98 hp) electric motor in fuselage nose, automatic opening and closing of nose cone acc. to power setting
- High efficiency fixed pitch prop. Designed for e-mot characteristic and circular cross section of nose cone
- 2 battery packs in rear fuselage, nominal capacity 21 kWh, each with 3 modules of 18 kg (40 lbs)
- Quick mount device in right wing for 35 kW (48 hp) RangeExtender, fuel tank (90 l) in inner wing
- Specific wing airfoil 20e-143 without premature lift plateau, seamlessly optimized* over the entire wing span, turbulent root section airfoil and root twist, ambitious wing-to-fuselage intersection design with fillets for drag reduction
- 100 l water ballast in inner wing
- Outer wings foldable* to 11 m (36 ft) wingspan for taxiing and hangaring
- Inner wing lengthwise pivoting over fuselage for 11.5 m x 2 m (38 x 6.5 sqft) overall footprint

Safety

The key target of the overall new safety concept of the *elfin* 20.e is a substantial reduction of operation complexity, thus

- Allowing the pilot to focus on flight and airspace
- Allowing the operation in syndicates and flight clubs with different pilot skills
- Offering best advanced soaring training and scenic flying

The aircraft will be equipped as standard with a ballistic parachute system (BPS) to enhance survivability in emergencies. In addition, the seats are designed for use of individual pilot safety parachutes, if desired. The canopy can be jettisoned by a single handle (“Rögerhook” design). Additional safety features include:

- audio-visual warning system alerts for airbrake mispositioning (the source of numerous accidents)
- cockpit integrity structure complying with increased demands of EASA CS-22
- position lights integrated into airfoil*; strobe* for better visibility
- ELT system*
- two oxygen tanks* in the cockpit rear wall.

Data

External dimensions

Wing span	20 m (65.6 ft)
Wing aspect ratio	24,7
Wing area	16,2 m ² (174 ft ²)
Length overall	8,7 m (28.5 ft)
Height tail plane	1,7 m (5.6 ft)
Wheel track	1,2 m (3.9 ft)
Wheelbase	5,5 m (18 ft)

Internal dimensions

Cockpit width	1.25 m (4.1 ft)
Cockpit height	0.98 m (3.2 ft)
Cockpit entry sill	0.96 m (3.1 ft)

Weights and loading

Operating Empty Weight	540 kg (1,190 lbs)
Operating Empty Weight (with GRS)	570 kg (1,257 lbs)
MTOW	900 kg (1,984 lbs)
MTOW without water	820 kg (1,808 lbs)
Max. cockpit Loading	200 kg (441 lbs)
Min. cockpit Loading	70 kg (155 lbs)
Wing loading	38 – 55.5 kg/m ² (7.8 – 11.4 lbs/ft ²)
Max. water ballast	100 kg (220 lbs)

Performance (unpowered)

Glide ratio L/D	1:50 class
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Performance (both batteries installed)

Never-exceed speed. V _{NE}	280 km/h (151 kts)
Maneuvering speed V _A	210 km/h (113 kts)
Stall speed. V _{S0}	78 km/h (42 kts)
Range	T/O to 500 m (1,640 ft) + 1h powered flight

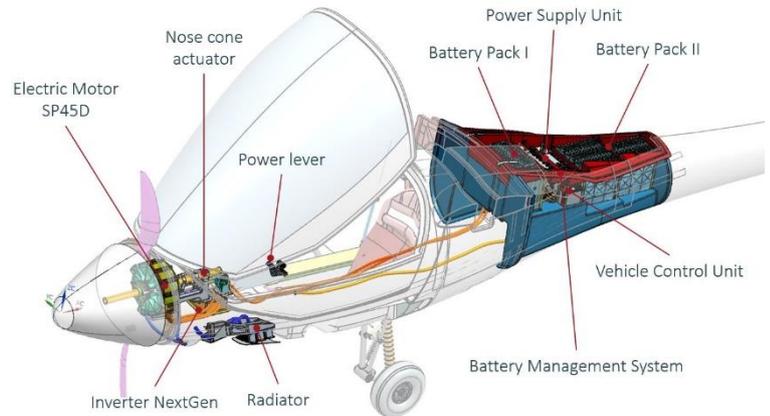
Performance (with RangeExtender*) *elfin* 20.ex

Range	>1.000 km (>540 NM)
Cruise @ FL 100	215 km/h (115 kTAS)

Propulsion/ battery system

Siemens SP70D at 72 kW peak / 55 kW continuous power, mounted in aircraft nose; liquid cooling; Reiner Stemme's automatically actuated retractable propeller system; two power packs, each consisting of three modules, in total 21 kWh; power packs will be of the 2019 design, constantly benefitting from progress in the automotive industry; Battery packs located in the tail boom with free access from the top; Battery fire protection fully complying with stringent EASA/FAA demands.

Reiner Stemme's patented retractable propeller system, high efficiency fixed pitch propeller design for e-mot characteristic and carbon prepreg propeller blades, metal erosion shield at the leading edge of Propeller for protection, circular cross section of nose cone for improved performance.



SIEMENS

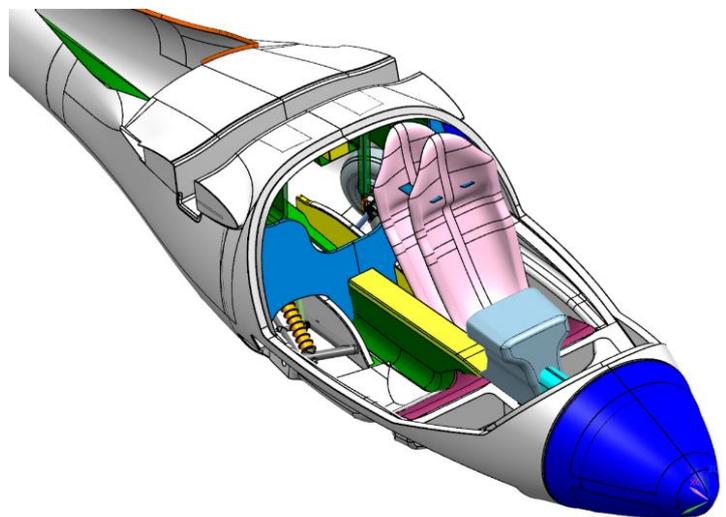
RangeExtender*

ICE and e-generator system for 35 kW continuous power; weight about 65 kg (143 lbs); easy one-person mounting by integrated lifting device inside the wing (ground handling like pulling a trolley); fuel tank inside center wing; quick mounting in less than 5 minutes. RangeExtender* has negligible impact on flight mechanics and aerodynamics in powered mode; only minor impact in gliding mode because of clean aerodynamic design.



Structure

Entire structure is made of innovative carbon fibre prepreps to achieve considerable weight reduction which translates directly into larger power packs; The fuselage is built as a single unit, reinforced by four stringers running from the rear fuselage to the forward bulkhead. In the bottom center of the fuselage heavy-duty stringers protect the airframe in case of a gear-up emergency landing. The single spar wing in three sections is of sandwich shell design (same is fuselage shell). Center wing span runs to 9.9 m (33 ft); outer wing mass is less than 30 kg (66 lbs). A 100 kg (220 lbs) water ballast tanks and a fuel tanks for the RangeExtender* pod are included in the center wing. The *elfin* 20.e comes with an internal luggage compartment.



Landing gear

Retractable main gear, electrically actuated, wheel size 5.00-5 for soft grass fields, rubber column suspension struts for high energy absorption; Electrically retractable and steerable tailwheel.

Flight controls

- Dual controls
- Automatic electric flaperon control for improved flight performance
- Schempp-Hirth type airbrakes in center wing
- Autopilot*



Cabin for competition and touring

Two pilots, side by side; unobstructed panoramic view; seats adjustable for position and rake for pilots between 1.6 m to 2 m (5.3 to 6.6 ft) height; forward hinged canopy with gas struts; low sill height of 96 cm (38") for easy entry and exit; oxygen bottles* (two); efficient ventilation

Electric systems

12 V system. Electrical actuators for main landing gear and retractable tailwheel, retractable propeller system and automatic flaperon control system, position lights*, landing light*, strobe for high visibility*

Avionics/ instrumentation

Basic “fly away” version with altitude, speed, variometer, compass, Flarm, motor/battery management, radio, transponder as well as customer tailored versions*.

Ground handling

Outer wing folding* to 9.9 m (33 ft) span for taxiing and hangaring; pivoting inner wing 90° to lengthwise position over fuselage for storage in trailer* or on 11.5 m x 2 m (38 x 6.5 ft) hangar space.

Maintenance

Maintenance costs of the e-powered motor glider are significantly reduced by up to 80% when compared to a conventional powered motor glider of the same class. Status check by mobile phone.

Further options and services

please see separate option and services list

Flexibility of operation:

Competition

150 kg (397 lbs) water ballast and main battery only for optimized wing loading of 38–55.5 kg/m² (7.8 – 11.4 lbs/sqft) ; take-off either by self-launch or aero-/winch-/car- tow* with enough battery capacity remaining to ensure airfield landing.

Best allround soaring

Full battery capacity installed; take-off by self-launch; 1 h electric flight after self-launch to 500 m (1,640 ft); up to 200 kg (440 lbs) cockpit load plus 20 kg (44 lbs) baggage

Touring and scenic flying

Main battery and RangeExtender* installed; more than 6 hours powered flight at 100 kts (185 km/h), >1,000 km (>540 NM) range; up to 200 kg (440 lbs) cockpit load plus 20 kg (44 lbs) baggage

Pure soaring

Basic *elfin* 20.e is a high-performance two-seat glider and can be launched by winch-, air- or car-tow