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European Organisation for
Technical Assessment
Organisation Européenne
pour l'évaluation technique

European Technical Assessment – ETA 13/0878 of 19/06/2019

(English language translation; the original version is in Italian)

GENERAL PART

Trade name of the construction product

F20

Product family to which the construction product belongs

PAC 34: BUILDING KITS, UNITS, AND PREFABRICATED ELEMENTS.
Prefabricated stair kits.

Manufacturer

Solidarietà Intrapresa Soc. Coop. Sociale Onlus
Via Campo dei Fiori, 3/b – I – 47122 Forlì (FC) – Italy

Manufacturing plant

Via Campo dei Fiori, 3/b – I – 47122 Forlì (FC) – Italy

This European Technical Assessment contains:

13 pages, including 9 Annexes which form an integral part of this Assessment

This European Technical Assessment is issued in accordance with Regulation (EU) n° 305/2011, on the basis of

European Assessment Document (EAD) 340006-00-0506

This European Technical Assessment is the revision of

European Technical Assessment 13/0878 issued on 20.06.2018

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SPECIFIC PARTS

1. TECHNICAL DESCRIPTION OF THE PRODUCT

"F20" is a stair kit based on a set of prefabricated components (steps, spacers, etc.) which, once assembled, form a spiral staircase. The load bearing structure is made up of a concealed steel tie-rod, "central post", 76 mm in external diameter and 2,5 mm in thickness. All around the post, which is fixed at its ends and under tensile stress, the steps and spacers are arranged which are, therefore, under compression. Metal steps are bolted to the central post, as shown in Annex 1. The stairs are available in either square or round plan with external dimensions 110, 120, 130, 140, 150 and 160 cm and may be installed in either square or round openings. The steps are made of 3 mm thick press-formed steel which can be either coated with an epoxy-polyester finish or hot dip galvanized. Risers may be adjusted by placing Nylon spacers between the steps allowing the risers to be varied by 210 mm to 230 mm with 5 mm increments. The stairs consist of 12 steps placed every 360° and may have up to 16 risers.

The railing is made of \varnothing 20 mm painted steel round balusters. The dimension of the plastic handrail is 42 mm in diameter.

The direction of rotation, clockwise or anticlockwise, is set on the installation site.

Geometry, dimensions and construction details are illustrated in Annexes 1 to 7 to this ETA.

2. SPECIFICATION OF THE INTENDED USE IN ACCORDANCE WITH EUROPEAN ASSESSMENT DOCUMENT N° EAD 340006-00-0506

"F20" stairs are intended to be used as indoor stairs in buildings of category "A" according to EN 1990 with air temperature between +5°C and +30°C and relative humidity between 30% and 70%.

The provisions made in this European Technical Assessment are based on an assumed working life of the stairs of at least 50 years, provided that the conditions laid down in clause 2.1 for installation, packaging, transport and storage as well as for appropriate use, maintenance and repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the Manufacturer, but are to be regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

2.1 Aspects related to the performance of the product

This ETA is issued for stair kit "F20" on the basis of admitted information/data, deposited with ITC-CNR, which identify the kit that was assessed.

The characteristics of the components and of the system not mentioned in this ETA nor in the Annexes shall correspond to the respective values laid down in the Technical Documentation of this ETA, checked by ITC-CNR.

Manufacturing process scheme is deposited with ITC-CNR. Packaging, transport and storage of the components has to be such that they are protected from moisture during transport and storage. The components have to be protected against damage and well identified as part of the kit.

The information about installation and recommendations about installers' qualification and maintenance are provided with the technical documentation from the Manufacturer (Installation Manual), and it is his responsibility to assure that the information about design and installation of the system "F20" is effectively communicated to the concerned people. The information can be given using reproductions of the respective parts of this European Technical Assessment; furthermore, all the data concerning the execution shall be indicated clearly on the packaging and/or on the enclosed instruction sheets using one or several illustrations. In any case, it is appropriate to comply with national regulations, and particularly concerning fire.

The Manufacturer recommends that, in all possible layouts of the kit, the staircase is reinforced by means of a fastening device connecting the railing to a side wall, which may be placed every 4 steps as far as the staircase with a square plan is concerned and every 6 steps as far as the staircase with a round plan is concerned.

The first maintenance service is carried out after twelve months and consists in evaluating the fastening state of all the connecting screws of the different components. For the maintenance operations of the “F20” stairs the Manufacturer recommends to follow the following instructions. The stairs can be cleaned with a water-moist cloth or, if required, with a non-aggressive detergent. All cleaning tools that may cause wear on the surface of the components of the stair and all products containing abrasive agents and chemical solvents of any kind whatsoever, shall be avoided in any case.

Any localised damage due to accidental actions shall be timely repaired.

3. PERFORMANCES OF THE PRODUCT AND REFERENCE TO THE METHODS USED FOR ITS ASSESSMENT

The calculations and tests for performance assessment of “F20” were carried out in compliance with EAD 340006-00-0506 according to the methods reported herein; performances are valid as long as the components of the kit fully correspond to those described in § 1.

Essential characteristic	Performance
BWR 1: Mechanical resistance and stability	
Load-bearing capacity of the stair	See Annex 8
Load-Displacement behaviour	See Annex 8
Vibration behaviour of the stair	See Annex 8
Prevention of progressive collapse	Failure of individual components of the stair does not lead to a progressive collapse of the complete stair
Residual load-bearing capacity	Local material failure does not lead to an abrupt total loss of the load-bearing capacity of the steps
Long-term behaviour	Load-bearing capacity is ensured under an appropriate use and maintenance over the indicated working life
Resistance to earthquake	The system has been verified (see Annex 9) according to EN 1998-1. Type of soil: “C” Seismic zone: 2 Site factor: S = 1,150 Structural type: frame structure with structure factor 1 Ductility class: DCM (medium) Structure factor: single-storey one-span structure
Durability against physical, chemical, biological agents of the components of the stair	Acceptable for the intended use under appropriate use and maintenance
BWR 2: Safety in case of fire	
Reaction to fire: classification of the components of the kit	
Assessment without the need for testing according to EC Decisions	Class
Steel components according to Decisions 96/603/EC and 2000/605/EC	A1
Polyamide components	No Performance Assessed
Resistance to fire	No Performance Assessed
BWR 3: Hygiene, health and the environment	
Release of formaldehyde	Not relevant
Release of pentachlorophenol	Not relevant
Radioactive emissions	Not relevant
BWR 4: Safety and accessibility in use	
Geometry	See Annexes 1 to 7
Slipperiness	No Performance Assessed
Safety equipment	No Performance Assessed
Safe breakage	No brittle failure of individual components
Impact resistance	No Performance Assessed

4. ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE (AVCP) SYSTEM APPLIED, WITH REFERENCE TO ITS LEGAL BASE

4.1 System of assessment and verification of constancy of performance

According to the Decision n. 1999/89/EC of the European Commission, the system of assessment and verification of constancy of performance (AVCP) applied to this product (see Annex V to Regulation (EU) 305/2011) is System 2+.

In addition, with regard to reaction to fire, the AVCP system applied according to Decision n. 2001/596/EC is System 4.

4.2 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

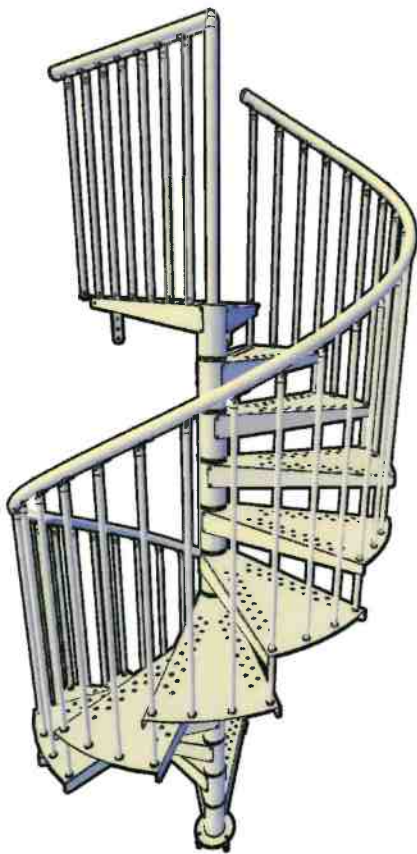
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ITC-CNR.

**Issued in San Giuliano Milanese, Italy on 19/06/2019
by ITC – CNR**

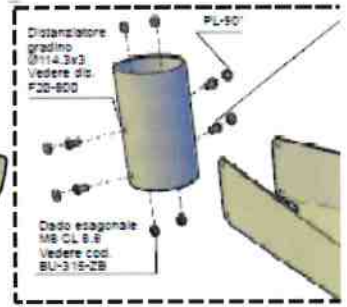
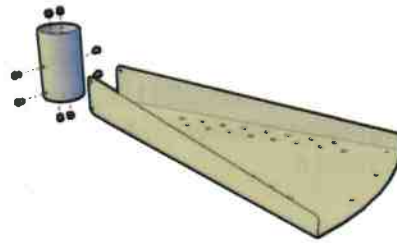
**Prof. Antonio Occhiuzzi
Director of ITC-CNR**



Annex 1 of European Technical Assessment 13/0878: Spiral staircase “F20”

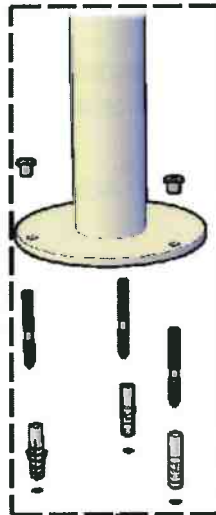


Assembling the steps

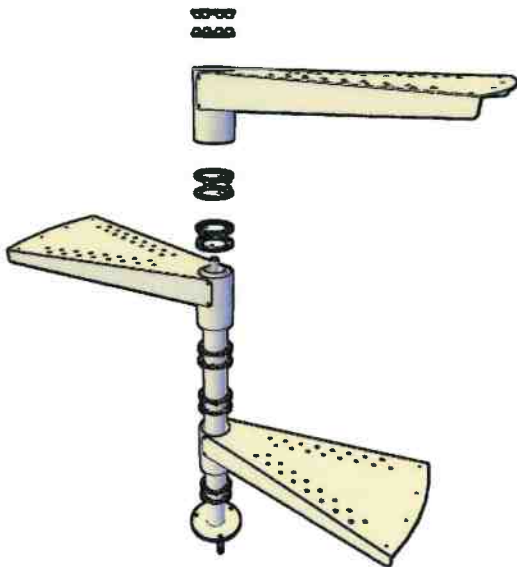


The central post

Fixing to ground of the plate



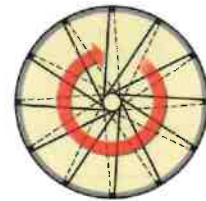
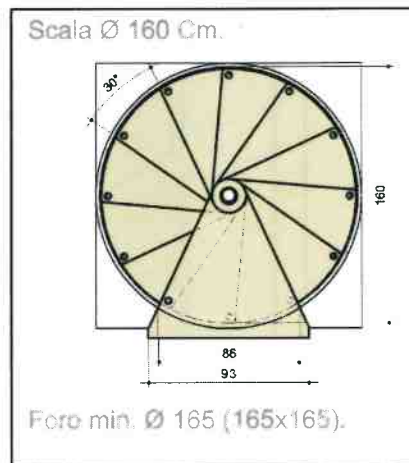
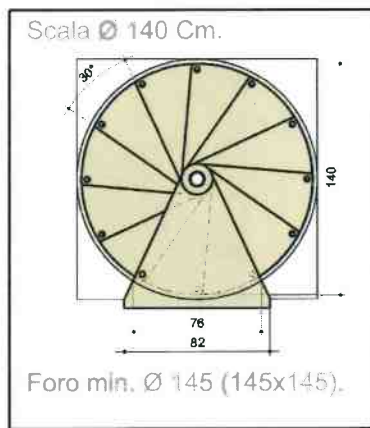
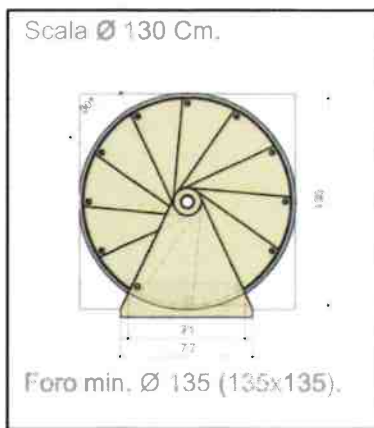
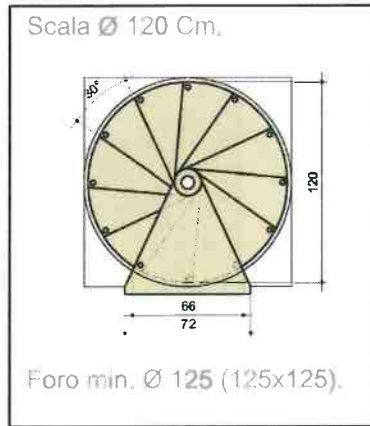
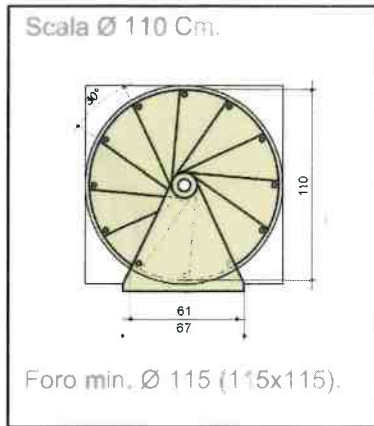
Assembling the steps to the central post



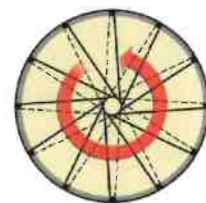
“F20”	Annex 1
Type and geometry of the stairs, details of the landing step and structure	of European Technical Assessment 13/0878: metal spiral stairs “F20”

Annex 2 of European Technical Assessment 13/0878: Spiral staircase “F20”

STAIRCASE WITH ROUND PLAN



Senso di salita "ORARIO"

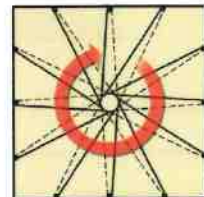
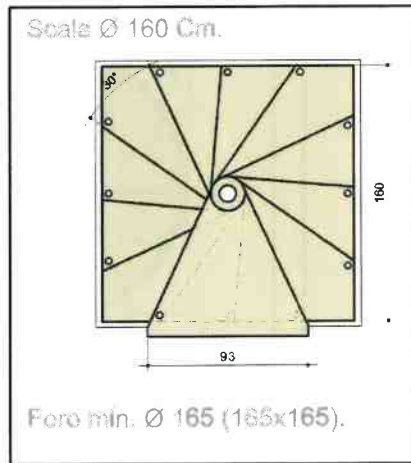
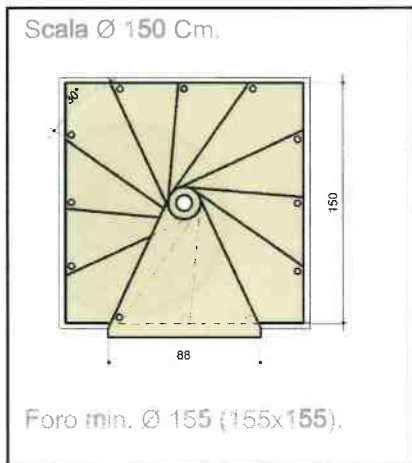
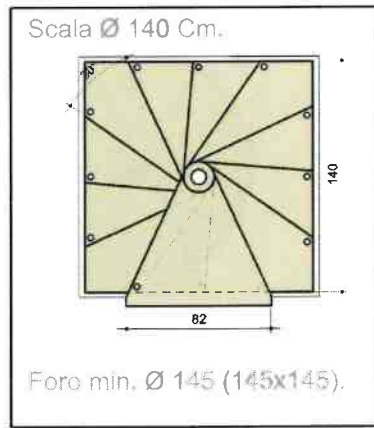
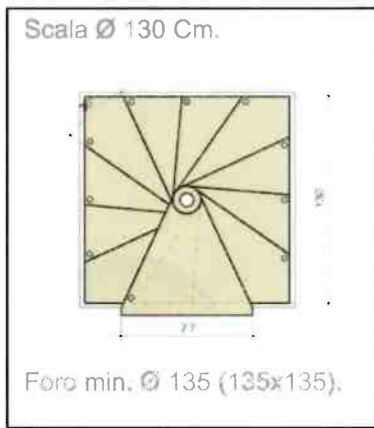
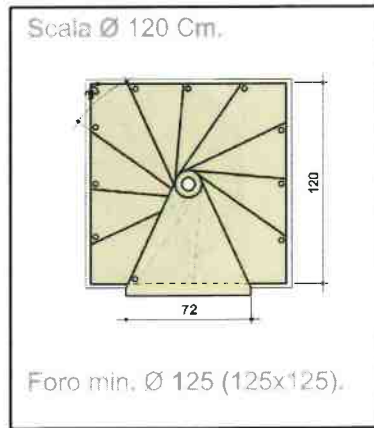
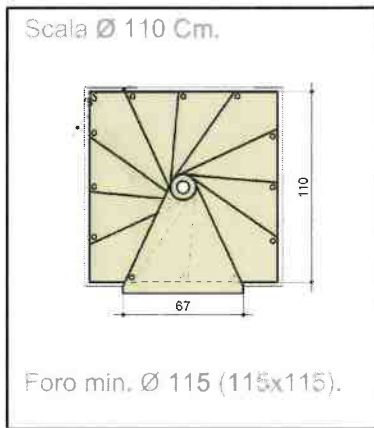


Senso di salita "ANTIORARIO"

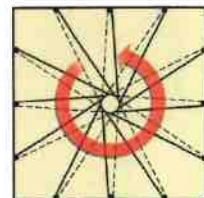
"F20"	Annex 2
Type and geometry of the stairs round plan	of European Technical Assessment 13/0878: metal spiral stairs "F20"

Annex 3 of European Technical Assessment 13/0878: Spiral staircase “F20”

STAIRCASE WITH SQUARE PLAN



Senso di salita "ORARIO"

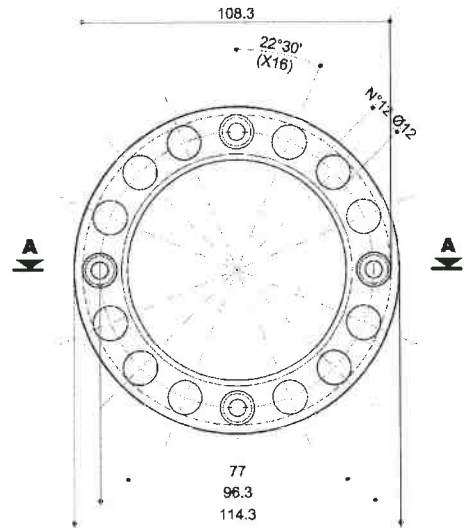
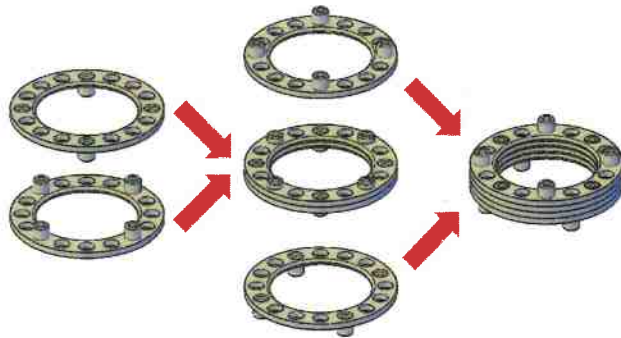


Senso di salita "ANTI-ORARIO"

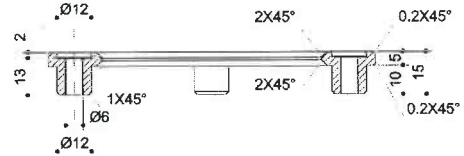
"F20"	Annex 3 of European Technical Assessment 13/0878: metal spiral stairs "F20"
Type and geometry of the stairs square plan	

Annex 4 of European Technical Assessment 13/0878: Spiral staircase "F20"

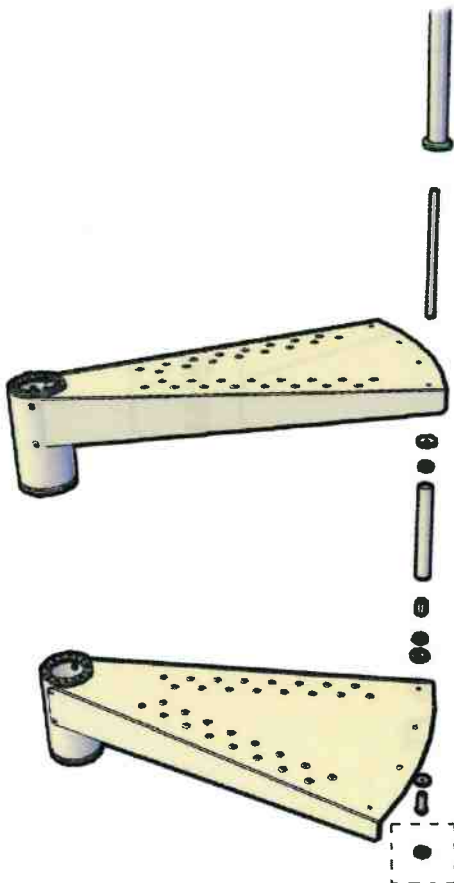
Polyamide spacers



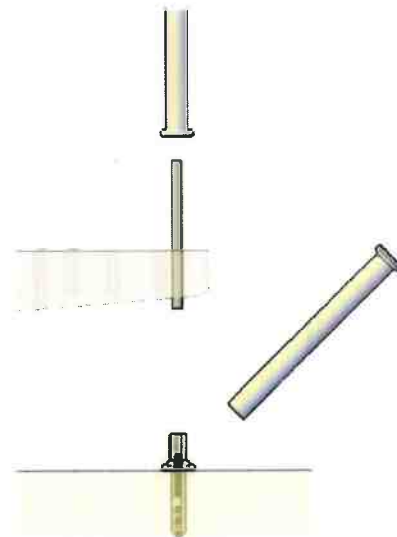
Sezione A-A



Connection "R2" railing - steps



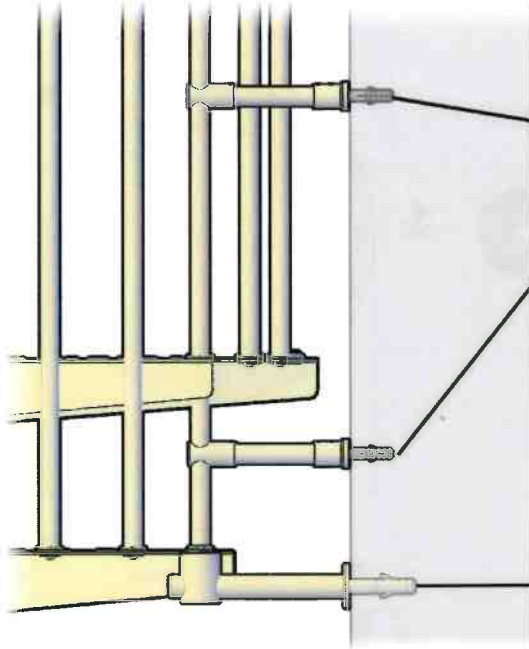
Fixing to ground of "R2" railing



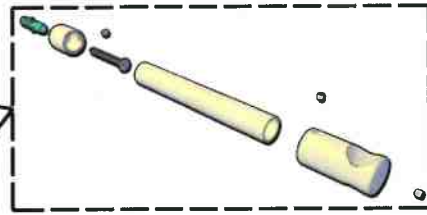
"F20"	Annex 4
Polyamide spacers for the riser construction, assembly of the steps and fixing of "R2" type railing as a junction	of European Technical Assessment 13/0878: metal spiral stairs "F20"

Annex 5 of European Technical Assessment 13/0878: Spiral staircase “F20”

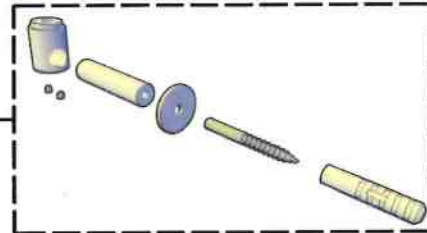
Fixing on side



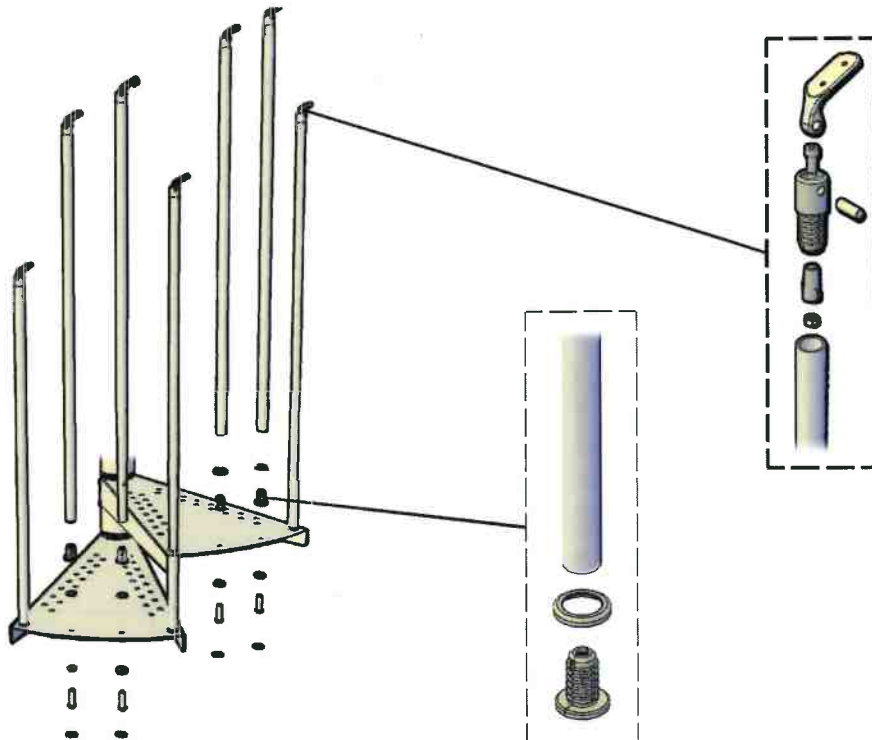
Fixing of the railing to the side wall



Fixing of the step to the side wall



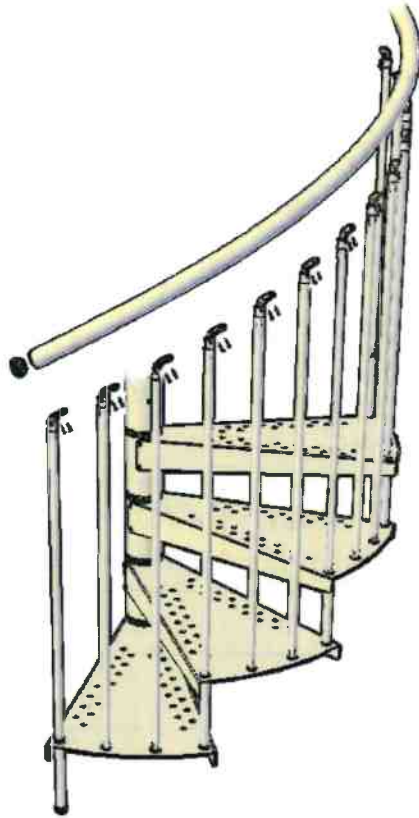
Fixing of “R2” railing to the step and columns fastened to the handrail



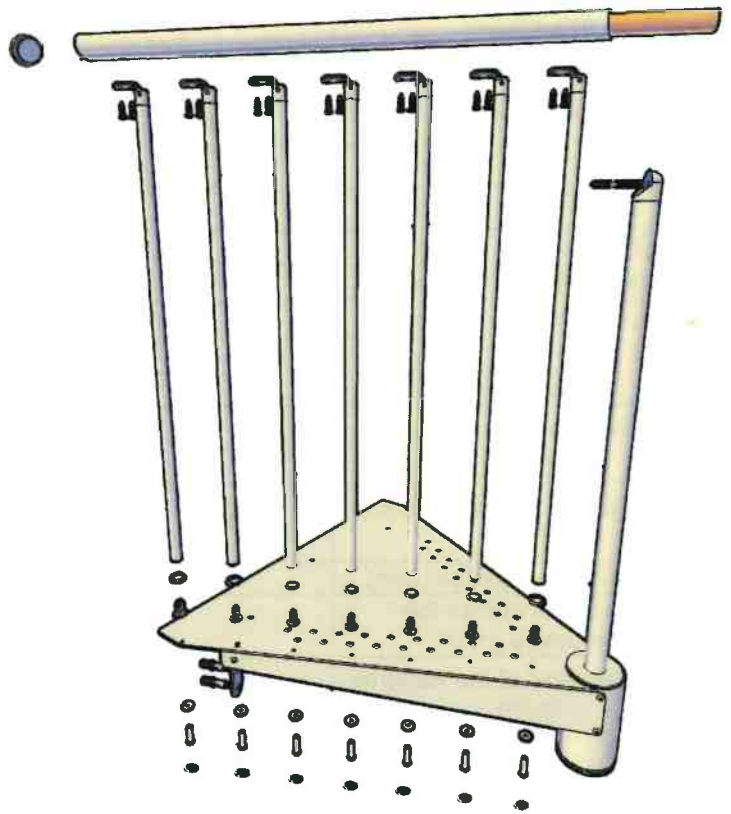
“F20”	Annex 5 of European Technical Assessment 13/0878: metal spiral stairs “F20”
Details of “R2” railing	

Annex 6 of European Technical Assessment 13/0878: Spiral staircase “F20”

Fixing of the plastic handrail to the upper part of “R2” columns



“R2” railing mounted as a barrier on the landing step



“F20”	Annex 6
Fastening of the handrail to columns and barrier system on the landing step as a protection of the opposite side to the ascending way	of European Technical Assessment 13/0878: metal spiral stairs “F20”

Annex 7 of European Technical Assessment 13/0878: Spiral staircase “F20”

Parameter		Stair F20 diameters (mm)					
Diameter – round plan (mm)		1100	1200	1300	1400	1500	1600
Diameter – square plan (mm)		1100x1100	1200x1200	1300x1300	1400x1400	1500x1500	1600x1600
Maximum height between floors (mm)		3680	3680	3680	3680	3680	3680
Steps every 360° (No.)		12					
Number of risers (n)		16					
Riser (mm)	Min	210	210	210	210	210	210
	Max	230	230	230	230	230	230
Tread round steps (mm)	Min	23					
	Max	261	287	313	338	364	390
Tread square steps (mm)	Min	23					
	Max	283	312	340	370	399	427
Step width (mm)		447	497	547	597	647	697
Thickness of the metal step (mm)		3					
Length of the flight middle line ⁽¹⁾ (mm)		5630	5950	6300	6660	7020	7400
Height of the handrail (mm)		From 980 to 1145					
Outer diameter of the balusters (mm)		20					
Outer diameter of the handrail (mm)		42					
Gap between balusters (mm)	Min	71,5	80	89	98	75	81,5
	Max	117	130	99	109	106,5	115

⁽¹⁾ with maximum tread and average riser for stairs with 16 risers

Components	Materials	Type	Mechanical characteristics
Structure: central tie-rod, spacers and balusters	Steel	S235 JR EN 10025	$f_{tk} = 360 \text{ N/mm}^2$
		S275 JR EN 10025	$f_{tk} = 430 \text{ N/mm}^2$
		S355 JR EN 10025	$f_{tk} = 510 \text{ N/mm}^2$
Nuts and bolts	Steel	Class 8.8	$f_{tk} = 800 \text{ N/mm}^2$ $f_{vk} = 640 \text{ N/mm}^2$ $f_{d,N} = 560 \text{ N/mm}^2$ $f_{d,V} = 396 \text{ N/mm}^2$
Spacers, top/bottom of the central post and accessories	Polyamide	PAV 6 30% glass fibres	$f_{tk} = 66 \text{ N/mm}^2$ $f_{yk} = 38 \text{ N/mm}^2$

“F20”	Annex 7 of European Technical Assessment 13/0878: metal spiral stairs “F20”
Geometry and materials of the stairs	

Annex 8 of European Technical Assessment 13/0878: Spiral staircase “F20”

Load-bearing capacity of the stair at ultimate limit state - Characteristic values of resistance

Assessment according to the limit state design method as proposed in EN 1990, by testing and calculation

Type of loading	Level kN	Level kN/m ²	Level kN/m	γ_M^1
Vertical variable point load acting on a step in the most unfavourable position Q_{RK}	3,00			$\gamma_s = 1,05$
Vertical variable uniformly distributed load q_{RK}		3,00		$\gamma_Q = 1,5$
Horizontal variable uniformly distributed load acting on the barrier at the level of the handrail h_{RK}			NPA	$\gamma_P = 2,0$

1) γ_s = partial safety factor of steel

γ_P = partial safety factor of polymers

γ_Q = partial safety factor taking account of the model's uncertainties and dimensional variations (EN 1990:2002/A1:2005/AC)

Load-displacement behaviour at serviceability limit state – Deflections under loading

Assessment by testing and calculation – worst cases considered

		Level
Deflection of the step under service load F_s (point load $Q = 2,00$ kN) related to the clear width of the stair w_Q	$l = \text{width}$	$\leq l/150$
Deflection of the stair under service load F_s (uniformly distributed load $q = 2,00$ kN/m ²) related to the clear width of the stair w_q	$l = \text{width}$	$\leq l/200$

Proof of serviceability limit state is only given if the design value of the loads (F_k) does not exceed the values (F_d): $F_k \leq F_d$

Load-bearing capacity – Admissible loads

Minimum values from proof of ultimate limit state and serviceability limit state			
Vertical variable uniformly distributed load	$q =$	2,00	[kN/m ²]
Vertical variable point load	$Q =$	2,00	[kN]
Horizontal variable uniformly distributed load	$h_s =$		NPA

Vibration behaviour of the stair under single point load

Assessment by testing

Deflection and proper oscillation frequency		
Single point load of $F = 1$ kN acting on the most unfavourable point		
f_1 = proper oscillation frequency	f_1	w
w = deflection of the stair	Level	Level
	Hz	mm
“F20” $h = \text{mm } 3200, \varnothing = 1600$ mm, 16 risers	8,71	4,90

“F20”	Annex 8 of European Technical Assessment 13/0878: metal spiral stairs “F20”
Load-bearing capacity	

Annex 9 of European Technical Assessment 13/0878: Spiral staircase “F20”

Assessment by calculation

Resistance to earthquake					
SL	-	-	-	-	T*c
		Years	g		Seconds
SLO	81,0	30,0	0,066	2,400	0,260
SLD	63,0	50,0	0,084	2,390	0,270
SLV	10,0	475,0	0,205	2,430	0,300
SLC	5,0	975,0	0,257	2,480	0,320

ag: maximum horizontal acceleration of the ground;

Fo: maximum value of the amplification factor of the spectrum in horizontal acceleration;

T*c: initial period corresponding to the constant speed branch of the spectrum in horizontal acceleration;

Pver: exceedance probability;

Tr: return period.

“F20”	Annex 9 of European Technical Assessment 13/0878: metal spiral stairs “F20”
Resistance to earthquake	