Ruukki
Building your tomorrow.

Hot-dip galvanised building products

Environmental product declaration

In accordance with EN 15804 and ISO 14025

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General information

Owner of the declaration	Ruukki Construction Oy, Panuntie 11 00620 Helsinki. www.ruukki.com Terhi Leiviskä, terhi.leiviska@ruukki.com
Product	Hot-dip galvanised steel building products
Manufacturer	Ruukki Construction Oy, Panuntie 11 00620 Helsinki
Manufacturing sites	Vimpeli (Finland), Anderslöv, Järnforsen and Landsbro (Sweden), Pärnu (Estonia), Zyrardow (Poland) and Kopylov (Ukraine)
Product applications	Building roofs, roofing, floors, studs, exterior and interior cladding
Declared unit	1 kg of hot-dip galvanised steel building products
LCA performed by	Karin Lindeberg, Diego Peñaloza, Josefin Gunnarsson IVL Swedish Environmental Research Institute, Valhallavägen 81 00127 Stockholm. www.ivl.se
Verified by	Anastasia Sipari Bionova Oy, Hämeentie 7 A 00500 Helsinki. www.bionova.fi
Product category rules	RTS PCR (English version 14.6.2018)
Program operator, publisher	Building Information Foundation RTS, Malminkatu 16 A 00100 Helsinki. http://epd.rts.fi

This environmental product declaration covers the environmental impacts of hot-dip galvanised steel building products manufactured by Ruukki Construction Oy under Ruukki and Plannja brands. The results of environmental indicators stated in this declaration are average values for steel building products and covers all Ruukki manufacturing sites. The results have been calculated based on weighted average of yearly production volume. According to supplier notifications, none of the product components contains substances restricted under REACH or included on the candidate list of Substances of Very High Concern (SVHC).

The declaration has been prepared in accordance with EN 15804:2012+A1:2013 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version 14.6.2018). This declaration covers the life cycle stages from cradle to gate with options.

The EPD of construction products may not be comparable if they do not comply with EN 15804 and seen in building context.

Verified according to the requirements of EN 15804+A1 (product group rules)
Independent verification of the declaration, according to EN ISO 14025:2010

☒ External ☐ Internal

Third party verifier:

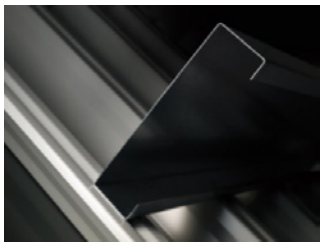
Anastasia Sipari / Bionova Oy
Verified 30.3.2020

Product

APPLICATION

Hot-dip galvanised construction products are used as roofing, decking, floors, studs, external and internal wall cladding. Typical applications are residential buildings, industrial and commercial buildings, sports facilities, warehouses and power plants. Metal coating improves the corrosion resistance of steel and prolongs product lifetime.
The products made of hot-dip galvanised steel are:

- Profiled and flat sheets for roofing
- Low-profiles for cladding
- Load-bearing profiles for decking
- Light weight purlins
- Studs
- Composite sheet



Steel construction products can positively affect the overall assessment of buildings for LEED and BREEAM certification. For more information, visit www.ruukki.com.

TECHNICAL INFORMATION

Zinc coating in steel provides a good level of corrosion protection for normal applications. The surface of the steel is normally protected by oil and Cr(VI)-free chemical passivation. The maximum weight of surface protection on each side of the sheet is

- 3.0 g/m^2 for oil
- 200 mg/m^2 for Cr(VI)-free chemical passivation

In Cr(VI)-free chemical passivation and oiling, the contents of the elements classified as hazardous do not exceed the maximum concentration limits set by EU legislation. Hot-dip galvanised steel is made in conformity with EN 10346.
The steel thickness of the products is 0.45 to 1.50 mm. The steel density is 7 850 kg/m^3. Product weight varies depending on steel and zinc coating thickness and profiling selected on the product. Table 1 describes product weight for typical hot-dip galvanised building products. Detailed technical information on products can be found on the Ruukki website at www.ruukki.com and on the Plannja website at www.plannja.com.

Table 1. Product weight for typical hot-dip galvanised building products

Product	Thickness (mm)	Weight (kg/m^2)
Flat sheet for roofing	0.40	3.1
	1.50	11.8
Load-bearing profiles	0.70	7.6–9.8
	1.50	19.0–21.0
Studs	0.50	3.9
	1.20	9.4
Composite profile	0.70	9.2
	1.10	14.4
Low-profile sheets	0.50	4.3
	0.70	7.6

Metal-coated steel is washable and easy to care for, and it can be painted to prolong its useful life.

Ruukki and Plannja have the right to use CE marking for the following product groups of hot-dip galvanised building products:

- Load-bearing profiles – EN 1090-1 and EN 1090-4
- Metal sheets for roofing, external cladding and internal lining – EN 14872, EN 14873
- Studs – EN 14195
- Pre-fabricated elements – EN 13830
- Safety equipment for the installation of ceilings – EN 795

By affixing CE marking to a product, the manufacturer indicates that the product conforms to all relevant legislative requirements in particular to health, safety and environmental protection requirements.

Product materials

Hot-dip galvanised building products are manufactured from cold-rolled steel. Steel is an alloy of mainly iron and carbon, with small amounts of elements used as alloying elements. These elements improve the chemical and physical properties of steel such as strength, durability and corrosion resistance. The alloying elements of steel are closely linked to its chemical matrix. The zinc coating (Z) 275-350 g/m^2 provides a good level of corrosion protection for normal applications. The zinc coating is lead-free and has a minimum zinc content of 99%.

INFORMATION ON RELEASE OF DANGEROUS SUBSTANCES

Soil and water impacts during the use phase have not been studied since harmonised testing methods of European product standards are not available.

Hot-dip galvanised building products main use of area is outdoor. Some hot-dip galvanised building products are used in indoor applications as well. Steel as a material produces no emissions. Hot-dip galvanised building products have not been subjected to any organic surface treatment that could release emissions into indoor air.

Product composition

Ruukki and Plannja actively tracks and anticipates future changes in environmental, safety and chemical legislation and complies with valid EU chemical regulations, such as REACH (1907/2006/EC) and CLP (1272/2008/EC). By monitoring the list of Substances of Very High Concern (SVHC) and other legislative requirements, we ensure that products meet legal and customer requirements. According to supplier notifications, none of the product components contains substances restricted under REACH or included on the candidate list (SVHC).

Table 2 shows an example of the typical chemical composition of hot-dip galvanised, cold-rolled formable building product (excluding packaging materials) when delivered to the customer. Product composition varies according to customer requirements and the selected materials. The information is based on steel produced at SSAB's steelworks in Finland.

Table 2. Chemical composition of hot-dip galvanised, cold-rolled formable steel (Dx51D)

Material	Material origin	Content (%) of total product weight	Name of ingredient	Content % (w/w) of total product weight	CAS number	Risk and hazard phrases
Hot-dip galvanised, cold-formed, formable steel (Dx15D) 0.50 mm; Z275	EU	100	**Steel**	≥ 92.6		
			Iron (Fe)	> 97	7439-89-6	-
			Manganese (Mn)	1.2	7439-96-5	-
			Silicon(Si)	0.5	7440-21-3	-
			Titanium (Ti)	0.3	7440-32-6	-
			Carbon (C)	0.18	7440-44-0	-
			Phosphorus (P)	0.12	N/A	N/A
			Sulphur (S)	0.045	7440-50-8	-
			Zinc layer > 99% Zinc (Zn)	≤ 7.4	7440-66-6	-

Measurements are done to a level of 0.02 µg/g (0.00000002%). Concentrations below this degree of measuring accuracy cannot be determined. More detailed information about the composition of different steels is available from national and international standards, as well as from SSAB´s website, www.ssab.com. The values provided are based on European Standards EN 10219-1, EN 10025-2, EN 10025-3, EN 10025-4, EN 10025-6, EN 10130, EN 10268, EN10346 and EN 10169 requirements on maximum concentrations.

Production

This environmental product declaration covers hot-dip galvanised products made by Ruukki in Vimpeli (Finland), Anderslöv (Sweden), Pärnu (Estonia), Zyrardow (Poland) and Kopylov (Ukraine) and by Plannja in Järnforsen and Landsbro (Sweden). Choice of production site is determined according to, for example, product requirements and construction site location. Prefabrication results in minimum waste at the construction site.

PRODUCTION PROCESS

Hot-dip galvanised building products have been made by cold-roll forming, edging and cutting to the required size at production lines and processes. Cold-rolled, metal-coated steel manufactured at SSAB's site in Hämeenlinna (Finland) is used as the raw material in the manufacture of hot-dip galvanised building products. The metal-coated steel is manufactured from hot-rolled steel produced at SSAB's steel mill in Raahe (Finland). The manufacture of the hot-rolled steel used as the raw material is based on the use of iron ore. The amount of total scrap steel used in hot-rolled steel is approximately 20% including pre- and post-consumer scrap.

When scrap steel is used instead of virgin raw materials in iron production, the carbon dioxide emissions originating in steel production decrease accordingly. Steel-making at SSAB Raahe production uses scrap material from SSAB's own production processes and material sourced from the scrap steel market. For reasons of process technology, the content of scrap steel in blast-furnace-based steel production cannot exceed around 30%. In addition, the amount of scrap steel in steel production is limited due to its availability. Once steel has been made, it can be recycled endlessly without weakening its properties.

Ruukki uses also steel from suppliers that manufacture steel from recycled steel scrap. The electric arc steel manufacturing method can use up to 100% of scrap steel in the process.

Information of energy in hot-dip galvanised building products manufacturing phase (A3) is described in Table 3.

Table 3. Energy in hot-dip galvanised building products manufacturing (A3)

Parameter	Value	Data quality
A3 Electricity information and CO_2 emissions kg CO_2 equiv. / kWh for Finnish production	0.171	Thinkstep dataset (2016) for Electricity grid mix in Finland
A3 Electricity information and CO_2 emissions kg CO_2 equiv. / kWh for Swedish production	0.036	Thinkstep dataset (2016) for Electricity grid mix in Sweden
A3 Electricity information and CO_2 emissions kg CO_2 equiv. / kWh for Ukrainian production	0.578	Thinkstep dataset (2016) for Electricity grid mix in Ukraine
A3 Electricity information and CO_2 emissions kg CO_2 equiv. / kWh for Estonian production	0.899	Thinkstep dataset (2016) for Electricity grid mix in Estonia
A3 Electricity information and CO_2 emissions kg CO_2 equiv. / kWh for Polish production	0.916	Thinkstep dataset (2016) for Electricity grid mix in Poland

PACKAGING

Hot-dip galvanised products are wrapped to protect products during handling and transport. Packaging can consist of plastic film, wooden pallets, plastic straps, stretch wrap, metal bands, corrugated plastic foam (EPS) plank wood and cardboard. All packaging materials are recyclable as material or alternatively utilised as waste to energy (WtE). Packaging materials are sorted at construction sites according to local regulations and customer preferences.

TRANSPORTATION

Raw materials are mostly transported to production sites by road. Finished products are transported by truck and boat combined. Ruukki's and Plannja´s logistics units are responsible for most of the transportation of raw materials and products. Logistics aims to optimise transport, maximise payloads and combine transport as efficiently as possible. Table 4 describes parameters for the A4 transport scenario.

Table 4. Technical information on transport (A4) from production to the building site

Parameter	Value
Fuel type and consumption of vehicle used for transport	Truck: maximum load capacity 40 t and average diesel consumption 0.30 l/km. Specific transport emissions 0.02 kg CO_2/tkm Ship: load capacity 10 000 t and average LFO consumption 69.2 l/km. Specific transport emissions 0.014 kg CO_2/tkm
Distance (km)	Average transport distance 370 km
Capacity utilization (%)	43–86% for truck and 70% for ship
Bulk density of transported products (kg/m^3)	7 850 kg/m^3
Volume capacity utilization factor	1

End-of-life recycling and waste processing

Waste materials from construction, repair and demolition are sorted and steel scrap is cycled back to the steel industry by the scrap trade. Steel has a strong market position: an average of 95% of the steel removed from buildings at the end of their life cycle is used in the production of new steel. Prefabricated structures can also be re-used. Table 5 describes scenario for the end-of-life processing.

Table 5. The end-of-life process description for hot-dip galvanised building products

Process flow	Unit	Value
Collection process specified by type	kg collected separately	1.0 kg
	kg collected with mixed construction waste	–
Recovery system specified by type	kg for reuse	–
	kg for recycling	0.95 kg
	kg for energy recovery	–
Disposal specified by type	kg product or material for final deposition	0.05 kg
Assumptions for scenario development	units as appropriate	On average, building products are transported 150 km by truck to recycling facility with a truck capacity utilisation of 45%

No hazardous waste is formed from hot-dip galvanised building products and steel does not harm the environment. According to the European Waste Catalogue, the waste code for steel products after their useful life is 17 04 05 (iron and steel).

Environmental profile

This environmental product declaration covers the following life cycle stages: A1 Raw material supply, A2 Transport, A3 Manufacturing and A4 Transportation of the product to construction site and end-of-life modules, C1 Deconstruction, C2 Transport end-of-life, C3 Waste processing and C4 Disposal, as well as module D benefits and loads beyond the system boundary; see Figures 1 and 2. The benefits of steel recycling in module D are calculated based on a recycling rate of 95% for steel.

System boundaries (X=included, MND=Module not declared, MNR=Module not relevant)

Product stage			Construc-tion stage	Use stage							End of life stage				Beyond the life cycle		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	MNR	MNR	X
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Mandatory modules
Mandatory as per the RTS PCR section 6.2.1 rules and terms
Optional modules based on scenarios

Figure 1. System boundaries of life cycle assessment (LCA)

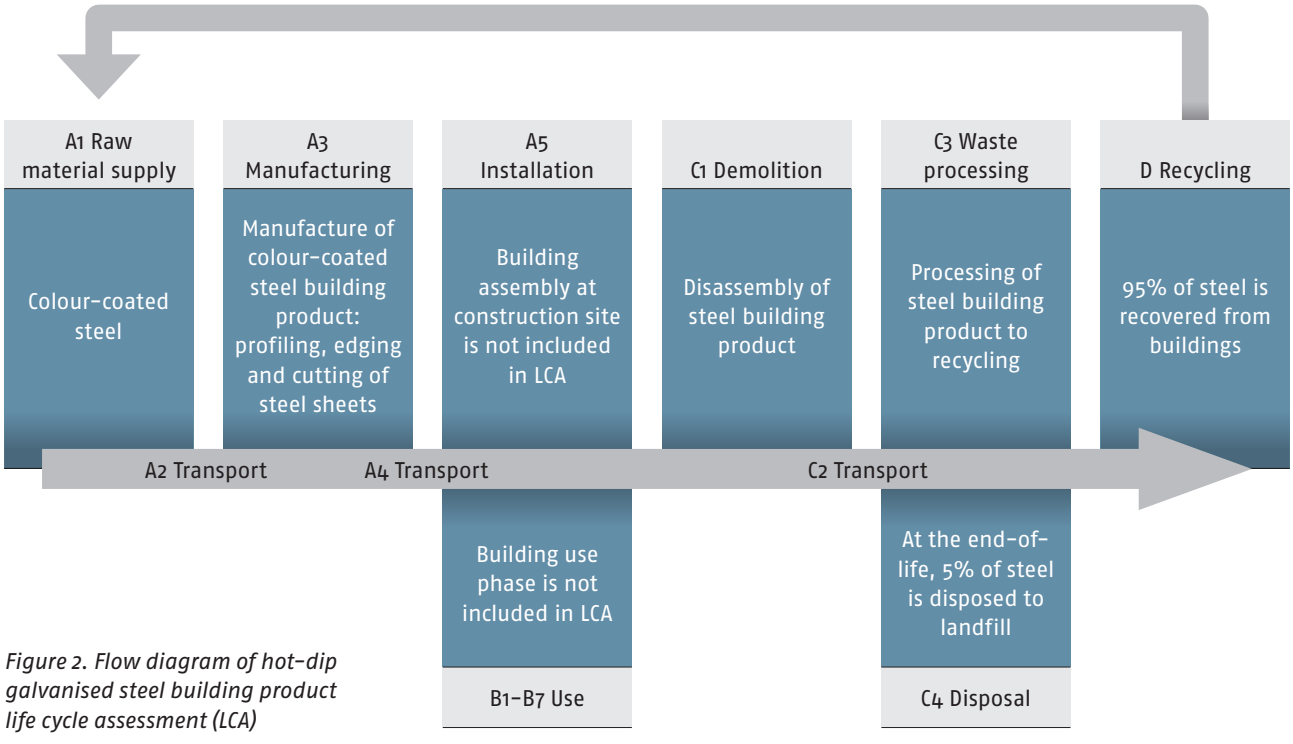


Figure 2. Flow diagram of hot-dip galvanised steel building product life cycle assessment (LCA)

DATA QUALITY

Life cycle inventory data has been collected from all production sites from 2018 production. When site specific data was not available, Vimpeli (Finland) production has been considered as representative of the other sites also. Steel made at SSAB steel mill in Raahe (Finland) and European steel is used in hot-dip galvanised building products. The steel data is from 2017. No data is more than 10 years old. Gabi 9 software was used to calculate the environmental impact categories.

CUT-OFF CRITERIA

Life cycle inventory data for a minimum of 99% of total material and energy input flows have been included in the life cycle analysis.

ALLOCATION

Physical allocation was applied for different product groups based on yearly production volumes (kg).

Environmental profile

All environmental impact values apply to 1 kg of hot-dip galvanised steel building products. The table 6 shows the environmental indicators based on the life cycle assessment of hot-dip galvanised building products.

The deviation in the environmental impact values related to the variation in zinc layer thickness of the products is not higher than 10%.

Reading example in environmental profile table: 3.51E-02 = $3.51*10^{-2}$ = 0.0351

Table 6. Environmental profile of hot-dip galvanised steel building products

		Life cycle stage				
Environmental impacts	**Unit**	**A1**	**A2**	**A3**	**A1–A3 TOTAL**	**A4**
GWP Global warming potential	kg CO_2 equiv.	2.55	3.51E-02	1.09E-02	2.60	3.31E-02
ODP Depletion potential of the stratospheric ozone layer	kg CFC-11 equiv.	1.83E-13	5.79E-18	5.49E-11	5.51E-11	5.34E-18
AP Acidification potential of soil and water sources	kg SO_2 equiv.	5.88E-03	7.64E-05	4.71E-05	6.00E-03	8.15E-05
EP Eutrophication potential	kg $(PO_4)^{3-}$ equiv.	6.11E-04	1.84E-05	8.88E-06	6.38E-04	1.94E-05
POCP Photochemical ozone creation potential	kg ethene equiv.	6.10E-04	-2.47E-05	3.13E-06	5.88E-04	-8.84E-06
ADP Abiotic depletion potential of resources – element	kg Sb equiv.	1.66E-04	2.49E-09	4.42E-09	1.66E-04	2.22E-09
ADP Abiotic depletion potential of resources – fossil fuel	MJ	28.5	0.480	0.290	29.3	0.446
Resource use and primary energy	**Unit**	**A1**	**A2**	**A3**	**A1–A3 Total**	**A4**
Use of renewable primary energy used as energy carrier	MJ	1.81	2.77E-02	0.380	2.22	2.40E-02
Use of renewable primary energy resources used as raw material	MJ	0	0	0	0	1.79E-10
Total use of renewable primary energy resources	MJ	1.81	2.77E-02	0.380	2.22	2.40E-02
Use of non-renewable primary energy used as energy carrier	MJ	29.9	0.480	0.540	30.9	0.447
Use of non-renewable primary energy used as raw material	MJ	0	0	0	0	2.17E-05
Total use of non-renewable primary energy resources	MJ	29.9	0.480	0.540	30.9	0.447
Use of secondary material	kg	3.03E-02	0	0	3.03E-02	0
Use of renewable secondary fuels	MJ	7.34E-23	0	0	7.34E-23	0
Use of non-renewable secondary fuels	MJ	8.62E-22	0	0	8.62E-22	0
Net use of fresh water	m^3	1.49E-03	4.68E-05	4.85E-04	2.02E-03	4.06E-05
Waste categories	**Unit**	**A1**	**A2**	**A3**	**A1–A3 Total**	**A4**
Hazardous waste disposed	kg	5.47E-02	2.66E-08	2.69E-06	5.47E-02	2.30E-08
Non-hazardous waste disposed	kg	7.88E-02	3.88E-05	3.68E-02	0.120	3.37E-05
Radioactive waste disposed	kg	4.76E-04	6.47E-07	1.03E-04	5.80E-04	0
Output flows	**Unit**	**A1**	**A2**	**A3**	**A1–A3 Total**	**A4**
Components for reuse	kg	0	0	2.83E-05	2.83E-05	0
Materials for recycling	kg	0	0	3.43E-02	3.43E-02	0
Materials for energy recovery	kg	0	0	2.05E-03	2.05E-03	0
Exported electrical energy	MJ	0	0	0	0	0
Exported thermal energy	MJ	0	0	0	0	0

		Life cycle stage				
Environmental impacts	**Unit**	**C1**	**C2**	**C3**	**C4**	**D**
GWP Global warming potential	kg CO2 equiv.	2.82E-02	1.67E-02	2.43E-03	7.81E-04	-1.41
ODP Depletion potential of the stratospheric ozone layer	kg CFC-11 equiv.	5.09E-09	2.73E-18	7.89E-18	4.32E-18	-8.59E-08
AP Acidification potential of soil and water sources	kg SO_2 equiv.	2.14E-04	4.41E-05	1.71E-05	4.42E-06	-6.10E-03
EP Eutrophication potential	kg $(PO_4)^{3-}$ equiv.	5.10E-05	1.08E-05	4.10E-06	5.00E-07	-2.44E-03
POCP Photochemical ozone creation potential	kg ethene equiv.	2.23E-05	-1.58E-05	1.89E-06	3.42E-07	-1.41E-03
ADP Abiotic depletion potential of resources – element	kg Sb equiv.	9.46E-09	1.18E-09	2.72E-09	7.41E-11	-1.08E-06
ADP Abiotic depletion potential of resources – fossil fuel	MJ	0.406	0.224	4.68E-02	1.04E-02	-20.2
Resource use and primary energy	**Unit**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy used as energy carrier	MJ	2.37E-03	1.31E-02	3.46E-03	1.37E-03	-0.917
Use of renewable primary energy resources used as raw material	MJ	0	0	0	0	0
Total use of renewable primary energy resources	MJ	2.37E-03	1.31E-02	3.46E-03	1.37E-03	-0.917
Use of non-renewable primary energy used as energy carrier	MJ	0.410	0.225	4.86E-02	1.08E-02	-22.2
Use of non-renewable primary energy used as raw material	MJ	2.07E-08	1.18E-05	1.77E-06	3.99E-07	-3.22E-06
Total use of non-renewable primary energy resources	MJ	0.410	0.225	4.86E-02	1.08E-02	-22.2
Use of secondary material	kg	0	0	0	0	0
Use of renewable secondary fuels	MJ	0	0	0	0	0
Use of non-renewable secondary fuels	MJ	0	0	0	0	0
Net use of fresh water	m^3	5.55E-05	2.21E-05	1.45E-05	2.72E-06	-8.18E-03
Waste categories	**Unit**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	0	1.26E-08	1.52E-09	1.84E-10	0
Non-hazardous waste disposed	kg	0	1.83E-05	9.85E-06	5.01E-02	0
Radioactive waste disposed	kg	0	0	0	0	0
Output flows	**Unit**	**C1**	**C2**	**C3**	**C4**	**D**
Components for reuse	kg	0	0	0	0	0
Materials for recycling	kg	0.950	0	0	0	0
Materials for energy recovery	kg	0	0	0	0	0
Exported electrical energy	MJ	0	0	0	0	0
Exported thermal energy	MJ	0	0	0	0	0

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We make steel-based products for walls and roofs, for both commercial buildings and private homes. We're a supplier of high-quality products, systems and solutions, developed sustainably and to live up to the highest demands on durability in harsh conditions.

CR1.005/EN/05.2020/LSB

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