



SVETSINSTRUKTION

WELDING INSTRUCTION

TELAHOKKIEN HITSAUSOHJE

INSTRUKTIONEN ZUM SCHWEISSEN

INSTRUÇÕES PARA SOLDADURA

INSTRUCCIONES DE SOLDADURA

INSTRUCTIONS POUR LE SOUDAGE

ИНСТРУКЦИИ ПО СВАРОЧНЫМ РАБОТАМ



WELDING INSTRUCTION

THE STRUCTURE OF BORON STEEL

Hardened boron steel has a very high yield point of 1000 – 1200 [MPa] and has a high carbon equivalent, CEW (0.55), CET (0.41), which directly affects the risk of cold/hydrogen cracking.

COLD CRACKS

Cold cracks occur in areas adjacent to the welding bead at low temperatures when hydrogen (from moisture, rust and snow) accumulates in areas with high tension and “explodes” the steel, forming small cracks. This means that the piece to be welded must be preheated, and electrodes must be kept as dry and clean as possible. Electrodes from an opened package must be dried in a drying cabinet before use. In addition, the material to be welded must be clean and dry.

Rutile flux-cored wires must not be used since they capture hydrogen.

HOT CRACKS

Hot cracks/solidification cracks are accumulations of an alloying element and contaminants (carbon, sulphur and phosphorus), in the centre of the weld. Welding using a high amperage and a low welding speed can produce this type of cracking.

FATIGUE

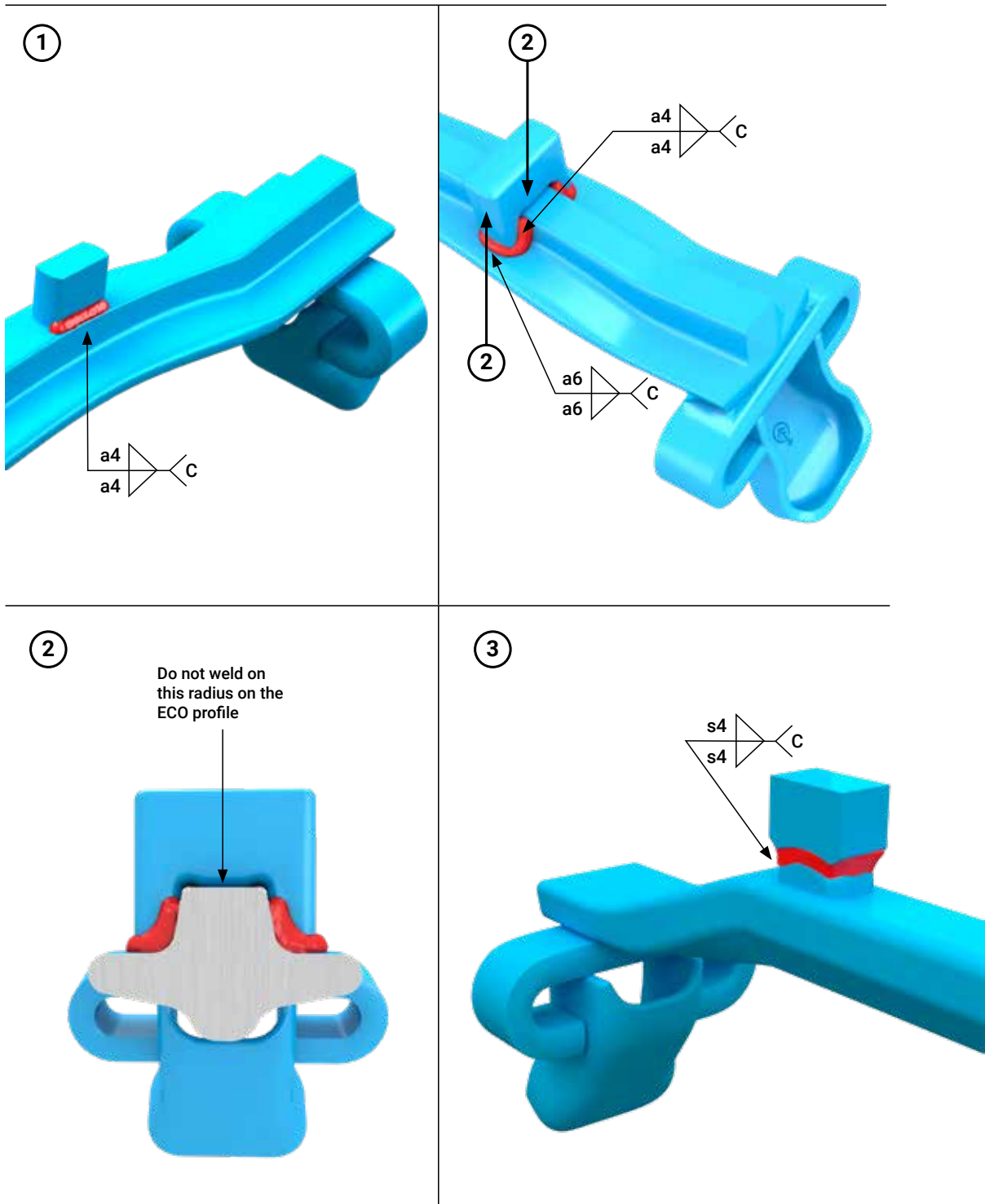
Fatigue properties of a joint are improved by a smooth transition between the weld and the base material.

RECOMMENDATIONS

Extensive tests have been carried out at Olofsfors AB and we recommend that you follow the information below and attached weld data sheets for best results. In all cases, welding must only take place after snow, dirt and any rust has been removed from the material.

When welding cleats, the main weld must be along the length of the crossbar; no welding across the crossbar must take place.

Preheat the material according to the WPS. When welding in an environment where moisture can accumulate on the steel, the steel must always be heated first. The welding dimension is a4.



ESAB OK Autrod 12,50/12.51

represents the MAG method and must be welded with the base material preheated to about + 50 [°C] to avoid cold cracks.
See WPS135PA04-03


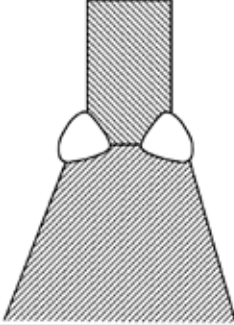
ESAB OK 67,45 is a stainless austenitic filler metal and can be welded without pre-heating if the crossbar is free from snow, dirt, moisture and warmer than the surrounding.

See WPS111PA02-03


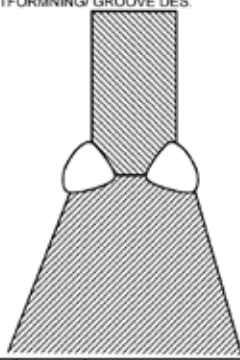
ESAB OK 48,00 is a black filler metal and should be welded with the base material preheated to + 75 [°C] to avoid cold cracks.

See WPS111PA01-03


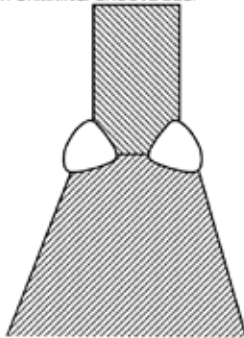
WELDING PROCEDURE SPECIFICATION

		STANDARD SVETSPROCEDUR WELDING PROCEDURE SPECIFICATION						WPS 111PA01-03 <small>REV: 01</small>			
Svetsdatablad WPS Welding Procedure Specification		111		FOGUTFORMNING/ GROOVE DES.		SVETSFÖLJID/ WELDING SEQ.					
WPAR No <small>Intrångningsgodkännande Penetration approval</small>		WPAR111PA01-00 <small>se svetsprover see welding tests</small>									
GRUNDMATERIAL	BASE MATERIAL	MATERIALTYP MATERIAL TYPE OR GRADE	W03		POS	GLTIGHETSOMRÅDE RANGE OF POSITION QUA.	PA, PB				
		TJOCKLEKSOMRÅDE TH. RANGE QUALIFIED	5 - 50mm								
		KOLEKVIVALENT Cew (I BW) CARBON EQUIVALENT Cew									
TILLSATSMATERIAL	FILLER MATERIAL	FABRIKAT TRADE NAME	ESAB		FÖRVARMNING	PREHEAT	FÖRVARMNINGSTEMP. PRE HEAT TEMP.	75° C			
		BENÄMNING DIN / EN CODE	OK 48.00 EN 499: E 42 4 B 42 HS				MELLANSTRÅNGSTEMP. INTERPASS TEMP.	150-200° C			
		TORKNING AV ELEKTRODER DRYING OF ELECTRODES	ENL. LEVERANTÖR ACC. SUPPLIER				VÄRMININGSMETOD APPL. METHOD	Acetylen/ Propan Acetylene/ Propane			
		PULVER FLUX					MÄTMETOD METHOD OF MEASUREMENT	Krita, termometer Chalk, thermometer			
		ROTSTÖD BACKING					VÄRMININGSKYLN. HAST. HEATING/COOLING RATE				
		SKYDDSGAS TYPE OF SHIELDING					HÄLLTEMPERATUR SOAKING TEMP.				
SKYDDSGAS	SHIELDING GAS	SAMMANSÄTTNING COMPOSITION			VÄRMEBEHANDLING	POST WELD HEAT TREATM.	VÄRMININGSMETOD APPLICATION METHOD				
		FLÖDE FLOW RATE					HÄLLTID SOAKING TIME				
		ROTGAS GAS BACKING									
		FABRIKAT TRADE NAME									
TEKNIK	TECHNIQUE	STRÅNG, PENDING STRING, WEAVE BEAD	STRÅNG STRING		Anmärkning/ remarks	Avlägsna snö, smuts och rost. Remove snow, dirt and rust. Materialet måste vara helt torrt före svetsning. The material must be completely dry before welding. Svetsa ej på kortsida brodd. Do not weld cleat on the short side. Motsvets för önskad intrångning: 5 - 10 grader Backhand welding for best deep penetration: 5-10 degree Welder: NORM CODE					
		RENGÖRINGSMETOD CLEANING METHOD	SLIP GRINDING								
		HÄFTNINGSMETOD FIT UP METHOD	SVETS WELDING								
		ROTSIDANS BEHANDLING ROOT PREPARATION									
		ENKEL/DUBBELEKTROD SINGLE/MULTIPLE ELECTRODE									
STRÅNG BEAD	METOD PROC.	TILLSATSMATERIAL FILLER MATERIAL									
			StickOut mm	VARUNAMN TRADE NAME	DIAM.	AC DC	POL. (+)	AMPERE MIN MAX	VOLT MIN MAX	CM/ MIN TRAVELSP.	STRÄCKENERGI HEATINPUT
1	111			OK 48.00	3,2	DC	(+)	95 105	24 - 26	11 - 17	1,0
2 - 5	111			OK 48.00	3,2	DC	(+)	140 150	25 - 27	16 - 24	1,2
GODKÄNNANDE APPROVALS	OLOFSFORS		KUND CLIENT						MYNDIGHET		
	DATUM DATE	2012-06-11		DATUM DATE						DATUM DATE	

WELDING PROCEDURE SPECIFICATION

		STANDARD SVETSPROCEDUR WELDING PROCEDURE SPECIFICATION						WPS 111PA02-03					
Svetsdatablad WPS Welding Procedure Specification		111						FOGUTFORMNING/ GROOVE DES				SVETSFÖLJD/ WELDING SEQ.	
WPAR No Inträgningsgodkännande Penetration approval		WPAR111PA02-00 se svetsprover see welding tests											
GRUNDMATERIAL	BASE MATERIAL	MATERIALTYP MATERIAL TYPE OR GRADE		W03		POS	GILTIGHETSOMRÅDE RANGE OF POSITION QUA.		PA, PB				
		TJOCKLEKSOMRÅDE TH. RANGE QUALIFIED		5 - 50mm									
TILLSATSMATERIAL	FILLER MATERIAL	FABRIKAT TRADE NAME		ESAB		FÖRVARMNING PREHEAT	FÖRVARMNINGS TEMP. PREHEAT TEMP.		Min. 20 °C Min. 68 °F				
		BENÄMNING DIN / EN CODE		OK 67.45 EN 1600: E 18 8 Mn B 4 2			MELLANSTRÄNGSTEMP. INTERPASS TEMP.		150-200° C 302-392° F				
		TORKNING AV ELEKTRODER DRYING OF ELECTRODES		ENL. LEVERANTÖR ACC. SUPPLIER			VÄRMNINGSMETOD APPL. METHOD		Acetylen/Propan Acetylene/Propane				
		PULVER FLUX					MÄTMETOD METHOD OF MEASUREMENT		Krita, termometer Chalk, thermometer				
		ROTSTÖD BACKING					VÄRMNING/KYLN. HAST. HEATING/COOLING RATE						
		SKYDDSGAS TYPE OF SHIELDING					HÄLLTEMPERATUR SOAKING TEMP.						
SKYDDSGAS	SHIELDING GAS	SÄMMANSÄTTNING COMPOSITION				VÄRMEBEHANDLING POST WELD HEAT TREATM.	HÄLLTID SOAKING TIME						
		FLÖDE FLOW RATE					VÄRMNINGSMETOD APPLICATION METHOD						
		ROTGAS GAS BACKING											
		FABRIKAT TRADE NAME											
TEKNIK	TECHNIQUE	STRÄNG, PENDING STRING, WEAVE BEAD		STRÄNG STRING		Anmärkning/ remarks Avlägsna snö, smuts och rost. Remove snow, dirt and rust. Materialet måste vara helt torrt före svetsning. The material must be completely dry before welding. Svetsa ej på kortsida brodd. Do not weld cleat on the short side Motsvets för önskad inträngning: 5 - 10 grader Backhand welding for best deep penetration: 5-10 degree							
		RENGÖRINGSMETOD CLEANING METHOD		SLIP GRINDING									
		HÄFTNINGSMETOD FIT UP METHOD		SVETS WELDING									
		ROTSIDANS BEHANDLING ROOT PREPARATION											
		ENKEL/DUBBELEKTROD SINGLE/MULTIPLE ELECTRODE											
STRÄNG BEAD	METOD PROC.	TILLSATSMATERIAL FILLER MATERIAL											
		StickOut mm	VARUNAMN TRADE NAME	DIAM.	AC DC	POL. (+)	AMPERE MIN MAX	VOLT MIN MAX	CM/ MIN TRAVELSP.	STRÄCKENERGI HEATINPUT			
1 - 4	111		OK 67.45	3,2	DC	(+)	90 100	22 25	11 - 14	1.0			
GODKÄNNANDE APPROVALS		OLOFSFORS			KUND CLIENT			MYNDIGHET					
		DATUM DATE			2012-05-24			DATUM DATE					

WELDING PROCEDURE SPECIFICATION

		STANDARD SVETSPROCEDUR WELDING PROCEDURE SPECIFICATION					WPS 135PA04-03 <small>REV: 01</small>					
Svetsdatablad WPS Welding Procedure Specification		135					FOGUTFORMNING/ GROOVE DES.			SVETSFÖLJD/ WELDING SEQ.		
WPAR No <small>Intrångningsgodkännade</small> <small>Penetration approval</small>		WPAR135PA04-00 <small>se svetsprover</small> <small>see welding tests</small>										
GRUNDMATERIAL	BASE MATERIAL	MATERIALTYP	W03			POS	GILTIGHETSOMRÅDE			PA, PB		
		MATERIAL TYPE OR GRADE					RANGE OF POSITION QUA.					
		TJOCKLEKSOMRÅDE	5 - 50mm				FÖRVARMNINGS TEMP.			50° C		
		TH. RANGE QUALIFIED					PRE HEAT TEMP.			122° F		
TILLSATSMATERIAL	FILLER MATERIAL	FABRIKAT	ESAB			FÖRVARMNING	MELLANSTRÅNGSTEMP.			150-200° C		
		BENÄMNING	AUTOROD 12.50/51				INTERPASS TEMP.			302-392° F		
		DIN / EN CODE	EN 440: G 42 3 M G3Si1				VÄRMNINGSMETOD			Acetylen/ Propan		
		TORKNING AV ELEKTRODER	ENL. LEVERANTÖR				APPL. METHOD			Acetylene/ Propane		
SKYDDSGAS	SHIELDING GAS	DYRING AV ELEKTRODES	ACC. SUPPLIER			VÄRMBEHANDLING	MÄTMETOD			Krita, termometer		
		PULVER					METHOD OF MEASUREMENT			Chalk, thermometer		
		FLUX					VÄRMNING/KYLN. HAST.					
		ROTSTÖD					HEATING/COOLING RATE					
TEKNIK	TECHNIQUE	BACKING				HÅLLTEMPERATUR						
		SKYDDSGAS	ATAL			SOAKING TEMP.						
		SAMMANSÄTTNING	Ar + 18% CO2			HÅLLTID						
		COMPOSITION				SOAKING TIME						
STRÅNG	METOD	FLÖDE	16 - 22 L/min			VÄRMNINGSMETOD						
		FLOW RATE				APPLICATION METHOD						
		ROTGAS				Anmärkning/ remarks						
		GAS BACKING				Avlägsna snö, smuts och rost.			Remove snow, dirt and rust.			
STRÅNG	METOD	FABRIKAT	AirLiquid			Material måste vara helt torrt före svetsning.			The material must be completely dry before welding.			
		TRADE NAME				Svetsa ej på kortsida brodd.			Do not weld cleat on the short side			
		STRÅNG, PENDING	STRÅNG			Welder:						
		STRING, WEAVE BEAD	SLIP			NORM						
STRÅNG	METOD	RENGÖRINGSMETOD	GRINDING			CODE						
		CLEANING METHOD										
		HÄFTNINGSMETOD	SVETS									
		FIT UP METHOD	WELDING									
STRÅNG	METOD	ROTSIDANS BEHANDLING										
		ROOT PREPARATION										
STRÅNG	METOD	ENKEL/DUBBELEKTROD										
		SINGLE/MULTIPLE ELECTRODE										
STRÅNG	METOD	TILLSATSMATERIAL										
		FILLER MATERIAL										
STRÅNG	METOD	StickOut	VARUNAMN	DIAM.	AC	POL.	AMPERE	VOLT	CM/ MIN	STRÄCKENERGI		
		mm	TRADE NAME		DC		MIN	MAX	MIN	MAX	TRAVELSP.	HEATINPUT
1	135	15-17	AUTOROD 12.50	1,2	DC	(+)	140	150	20 - 22	17 - 20	0,9	
2 - 5	135	15-17	AUTOROD 12.50	1,2	DC	(+)	230	265	29 - 30	34 - 45	1,0	
GODKÄNNANDE	APPROVALS	OLOFSFORS			KUND			MYNDIGHET				
		DATUM			CLIENT			DATUM				
DATE			2012-05-24			DATE			DATE			



OBS! I det markerade området får inte broddsvetsas.

Note! Don't weld cleat in the marked area.

Huomio! Älä hitsaa telahokkeja punaisella merkatuille alueille!

Hinweis! Schweißplatte nicht im markierten Bereich schweißen.

Nota! Não solde grampos na área marcada.

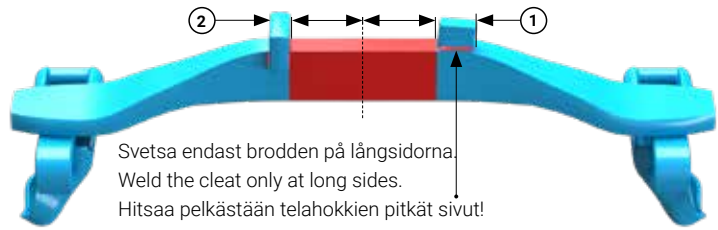
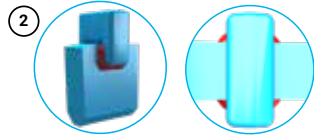
Nota: No suelde tacos en las áreas marcadas.

Note ! Ne pas souder le taquet dans la zone marquée.

Заметка! Не сваривайте шипы в отмеченной области.

EX

Rekommenderad brodd, två alternativ
Recommended cleat, two options
Suositeltava telahokki, kaksi vaihtoehtoa
Empfohlen Stacheln, zwei Optionen
Grampo recomendado, duas opções
Taco recomendado (dos opciones)
Taquet recommandé, deux options
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
Статья: 022-415720 (1)
Art.nr/Part no/Tuoteno/
Статья: 022-483156 (2)



Svetsa endast brodden på långsidorna.
Weld the cleat only at long sides.
Hitsaa pelkästään telahokkien pitkät sivut!
Schweißen Sie die Cleat nur an langen Seiten.
Soldar o grampo apenas em lados longos.
Suelde los tacos sólo por una de las caras largas.
Souder le taquet seulement sur les côtés longs.
Сваривать шип только в самом широком месте трака

OF

Rekommenderad brodd
Recommended cleat
Suositeltava telahokki
Empfohlen Stacheln
Grampo recomendado
Taco recomendado
Taquet recommandé
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
Статья: 022-488200



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EVO

Rekommenderad brodd
Recommended cleat
Suositeltava telahokki
Empfohlen Stacheln
Grampo recomendado
Taco recomendado
Taquet recommandé
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
Статья: 022-488205

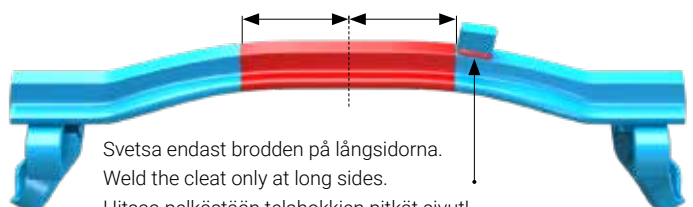
Lätta band
Light tracks
Keveisiin koneisiin
Leichte Bänder
Lagartas leves
Orugas ligeras
Chenilles légères
Легкие гусеницы
Art.nr/Part no/Tuoteno/
Статья: 022-488200



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ECO

Rekommenderad brodd
Recommended cleat
Suositeltava telahokki
Empfohlen Stacheln
Grampo recomendado
Taco recomendado
Taquet recommandé
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
Статья: 022-415720
Art.nr/Part no/Tuoteno/
Статья: 022-483155



Svetsa endast brodden på långsidorna.
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Сваривать шип только в самом широком месте трака



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Nota! Não solde grampos na área marcada.

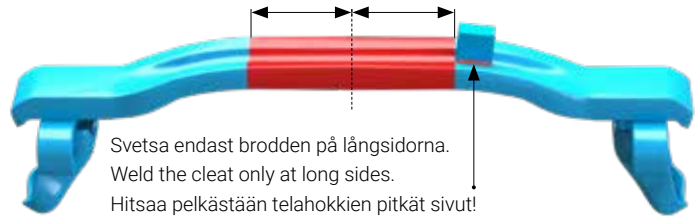
Note: No suelde tacos en las áreas marcadas.

Note ! Ne pas souder le taquet dans la zone marquée.

Заметка! Не сваривайте шипы в отмеченной области.

KOVAX

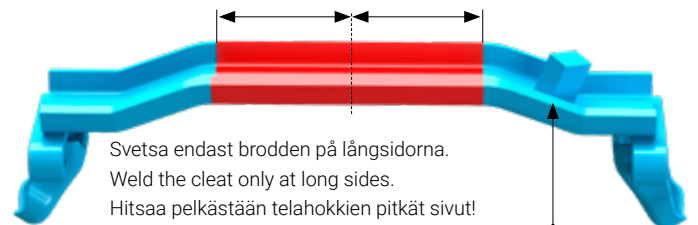
Rekommenderad brodd
Recommended cleat
Suositeltava telahokki
Empfohlen Stacheln
Grampo recomendado
Taco recomendado
Taquet recommandé
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
Статья: 022-488205



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U

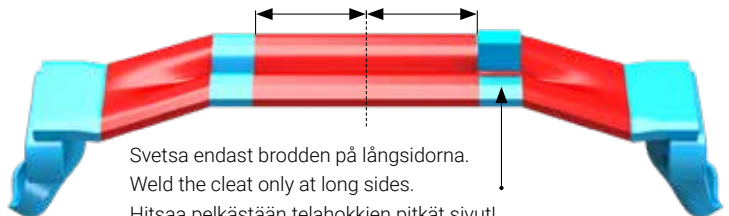
Rekommenderad brodd
Recommended cleat
Suositeltava telahokki
Empfohlen Stacheln
Grampo recomendado
Taco recomendado
Taquet recommandé
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
Статья: 022-415710



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BALTIC

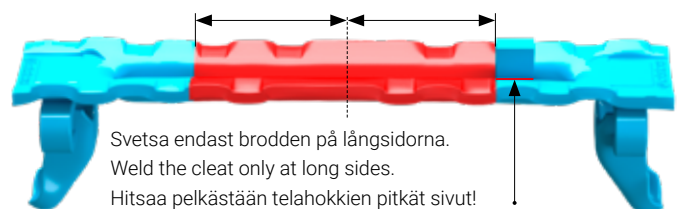
Rekommenderad brodd
Recommended cleat
Suositeltava telahokki
Empfohlen Stacheln
Grampo recomendado
Taco recomendado
Taquet recommandé
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
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Сваривать шип только в самом широком месте трака

CoverX

Rekommenderad brodd
Recommended cleat
Suositeltava telahokki
Empfohlen Stacheln
Grampo recomendado
Taco recomendado
Taquet recommandé
Рекомендуемая очистка
Art.nr/Part no/Tuoteno/
Статья: 022-488205



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