EUROBLOC®

TECHNICAL GUIDE FOR END CARRIAGES

Characteristics (SI/50Hz)

English SUPDOCECNDATA4-0.ORD 9.7.2012

080654

SI

VERLINDE
LIFTING EQUIPMENT

SUPDOCECNDATA40100-0 PS12307 9.7.2012
Original instructions

Table of contents

1 GENERAL

The GRN, GTL and GTR end carriages are top running end carriages for industrial cranes. GRN is used with side connection, GTL and GTR with top connection joint plates.

The type codes for 2-wheel end carriages are GRN09, GRN11, GRN14, GRN16, GTL09, GTR09, GTR11, GTR14, GTR16, GTR20, GTR25, GTR32 and GTR40. 4-wheel end carriages are GTR20B, GTR25B, GTR32B and GTR40B, these are defined as bogie end trucks. The rail wheel diameters are 90, 110, 140, 160, 200, 250, 315 and 400 mm.

The maximum wheel loads of the rail wheels are calculated based on the steel structure, the permissible surface pressure of the rail wheel, the maximum bearing capacity and the service life of the bearings.

The rail wheels of the end carriage can not be re-aligned. The steel structure of the end carriage should not be changed or modified after machining, thus any kind of welding after machining is not allowed.

When selecting the correct end carriage, following checks shall be made

- allowed value of dynamic wheel load is not exceeded
- allowed value of steel structure is not exceeded
- allowed value of end carriage and main girder joint is not exceeded

The joint between the end carriage and the main girder is done as a bolt joint.

In following document single girder crane is abbreviated as SG and double girder crane as DG.

Permissible ambient temperature is as standard -20...+40 °C. As option, ambient temperature area can be increased to be minimum -40 or maximum +50 °C

Note! Ambient temperature being below -20 °C, be sure that used lubricants (for example for bearings and travel drives) and used electrical components, for example, are still suitable. Also, some rail heating, heating of the electrical panels or other additional features might be needed.

Note! Ambient temperature being over +40 °C, be sure that used electrical components, for example, are still suitable. Also, some cooling for electrical panels or other additional features might be needed.

Table 1. Grade of steel material of the end truck acc. to ambient temperature. Ref. EN13001-3-1:2012

			Standard material suitable for Ambient temperature T				
		Standard material	T ≥ 0	-10 ≤ T < 0	-20 ≤ T < -10	-30 ≤ T < -20	-40 ≤ T < -30
GTL09	t	S355J0	Yes	Yes	Yes	Yes	Yes
GTR09	t	S355J0	Yes	Yes	Yes	Yes	Yes
GTR11	t	S355J0	Yes	Yes	Yes	Yes	Yes
GTR14	t	S355J0	Yes	Yes	Yes	Yes	Yes
GTR16	t	S355J0	Yes	Yes	Yes	Yes	Yes
GTR20	t	S355J0	Yes	Yes	Yes	Yes	Yes
GTR25	t	S355J0	Yes	Yes	Yes	Yes	Yes
GTR32	w	S355J2	Yes	Yes	Yes	Yes	Yes
GTR40	w	S355J2	Yes	Yes	Yes	Yes	Yes
GRN09	t	S355J0	Yes	Yes	Yes	Yes	Yes
GRN11	t	S355J0	Yes	Yes	Yes	Yes	Yes
GRN14	t	S355J0	Yes	Yes	Yes	Yes	Yes
GRN16	t	S355J0	Yes	Yes	Yes	Yes	Yes

- *t = hollow tube construction*
- *w = welded box construction*
- *T = ambient temperature [°C]*
- *Materials S355J0 and S355J2 acc. to EN 10025-2*

Table 2. Grade of steel material of the weldable connection plates acc. to ambient temperature. Ref. EN13001-3-1:2012

			Standard material suitable for Ambient temperature T				
		Standard material	T ≥ 0	-10 ≤ T < 0	-20 ≤ T < -10	-30 ≤ T < -20	-40 ≤ T < -30
GTL09	top	S355J2	Yes	Yes	Yes	Yes	Yes
GTR09	top	S355J2	Yes	Yes	Yes	Yes	Yes
GTR11	top	S355J2	Yes	Yes	Yes	Yes	Yes
GTR14	top	S355J2	Yes	Yes	Yes	Yes	Yes
GTR16	top	S355J2	Yes	Yes	Yes	Yes	Yes
GTR20	top/sid	S355J2	Yes	Yes	Yes	Yes	Yes
GTR25	top/sid	S355J2	Yes	Yes	Yes	Yes	Yes
GTR32	top/sid	S355J2	Yes	Yes	Yes	Yes	Yes
GTR40	top/sid	S355J2	Yes	Yes	Yes	Yes	Yes
GRN09	sid	S355J2	Yes	Yes	Yes	Yes	Yes
GRN11	sid	S355J2	Yes	Yes	Yes	Yes	Yes
GRN14	sid	S355J2	Yes	Yes	Yes	Yes	Yes
GRN16	sid	S355J2	Yes	Yes	Yes	Yes	Yes

- *top = top connection*
- *sid = side connection*
- *T = ambient temperature [°C]*
- *Materials S355J2 acc. to EN 10025-2*

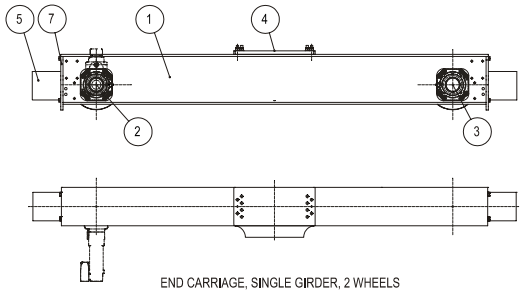
2 CONSTRUCTION

From Europeans standards EN 13001-1, EN 13001-2, Pr EN 13001-3-1 and EN 15011 together with Machine Directive have been used for designing and dimensioning these new end carriages. In addition to this, FEM1.001-1987/Revised edition 1998 and manufacturer's experience have been used in the dimensioning of the end carriages.

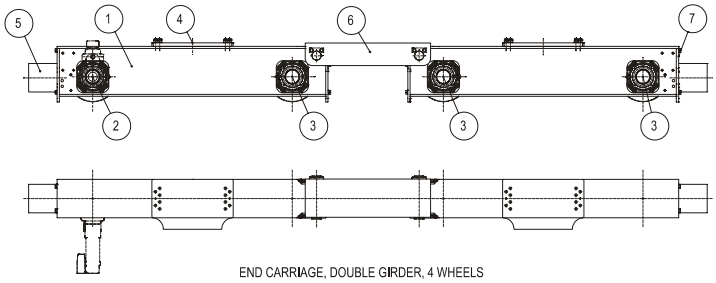
Acc. to EN standards, steel structure of these new end carriages have been dimensioned to stress history parameter value S2 and 63000 cycles with full crane load (return movement with empty crane). Wheels have been dimensioned to FEM 1Am and bearings to 800 hours with full crane load (return movement with empty crane), the design travelling speed being 32 or 40 m/min.

End carriages are designed for use in crane group FEM A4. The calculation group for machinery has been FEM M4 and for component FEM E3. In cases with higher classifications than FEM A6, FEM E5 and/or FEM M6 consult with product specialist.

Main parts of GTR and GRN end carriages

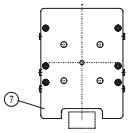


END CARRIAGE, SINGLE GIRDER, 2 WHEELS



END CARRIAGE, DOUBLE GIRDER, 4 WHEELS

1. End carriage
2. Rail wheel (driven)
3. Rail wheel (idle)
4. Joint plate
5. Buffer
6. Joint beam (bogie end trucks)
7. Integrated derailment support



2.1 Steel structure

The steel structure of the end carriage is designed to withstand of the dynamic wheel loads, which are shown in Appendix A.

The GRN& GTL09 and GTR09…25 end carriages are made of rectangular hollow section.

The GTR32 and GTR40 end carriages are manufactured as welded box type construction. The positions of the diaphragms are standardized with different joint plates. End carriages are supplied always with joint plates.

Machining for wheel fixing, joint plate fixing position and the bogie joint beam is made with one fixing after assembly welding, in this way the alignment of the wheels is accurate.

The end carriages are equipped with derailment supports at the ends of the end carriage.

The material of the steel structure of the welded box type is S355J2+N / EN10025. (Equivalent to Fe52D yield strength = min. 355 N/mm2). The material of the steel structure of the rectangular hollow section is min. S355J0/EN10025 (Equivalent to Fe52C). Typical material for rectangular hollow sections is S355J2H/EN10025.

2.2 Rail wheels

The rail wheel diameters are D90, D110, D140, D160, D200, D250, D315 and D400 mm and for standard cases they are supplied with flanges.

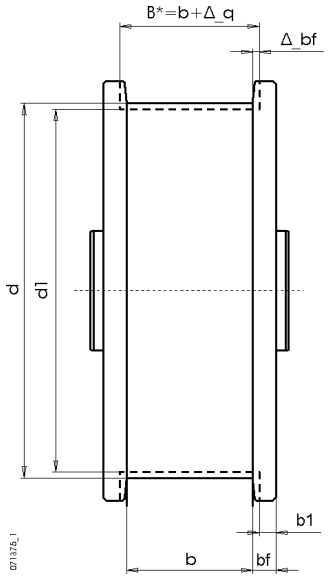
The material of the rail wheel is EN-GJS-700-2U (ductile iron). Running surface hardness is normally between 250… 310 HB. If higher hardness is needed please consult with product specialists.

The driving shafts and connections are individual for each end carriage. These shafts must be stated in the order of travelling unit. Exception is GTR40 with QM6 driving shaft, that must be ordered with end truck.

2.2.1 Wheel wearing limits

Table 3. 2-flange wheels

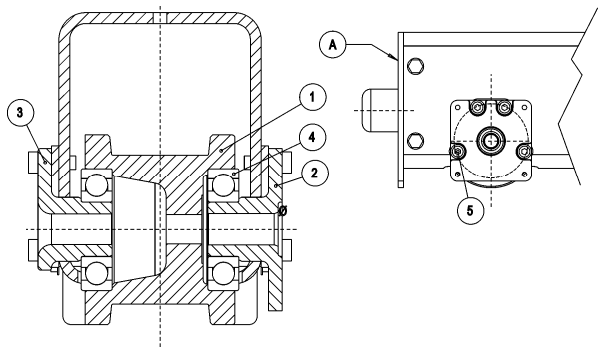
New wheel	Old wheel, d1	New wheel	New wheel	New wheel	Old wheel	Old wheel
Wheel diameter	**Min wheel diameter**	**Max groove**	**Min flange thickness (*)**	**Min flange thickness (**)**	**Max increase of groove**	**Min flange thickness (*)**
d	d1	b	bf	bf_min	d_bf	b1
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
90	86	70	10	9.7	4	6
110	105	87	12	12	4	8
140	135	84	13.5	12.5	4	8
160	154	84	13	12.9	4	9
200	193	99	15.5	15.2	4	11
250	242	89	15.5	15.2	4	11
315	307	99	17.5	17.2	5	12
400	392	120	20.5	20.3	6	14
(*) with max groove width, actual value for wheel (**) with max groove width, min. requirement acc. to EN 13135-2: 2004						



B* = max allowed groove (old wheel)

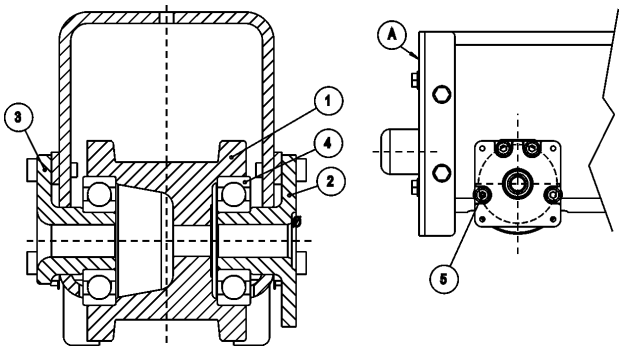
2.2.2 Detaching and replacing the driving wheel

- Disconnect the power supply plug from the motor.
- Open the fixing bolts of the machinery and remove the bolts.
- Pull out the machinery from the wheel spline.



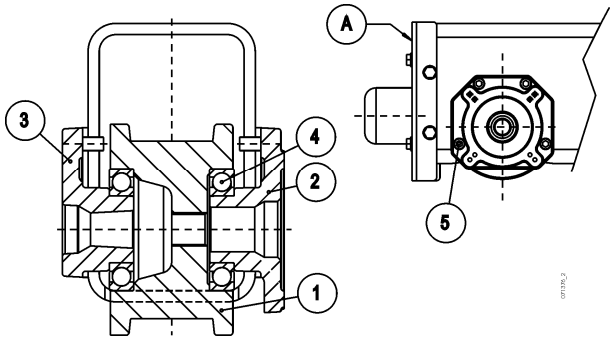
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and plate
4 Remove fixing bolts (5)
5 Pull out bearing housings (2), (3)
6 Remove wheel (1) from end of the end carriage
GTL09: Remove wheel from the bottom of the end carriage
7 Pull out bearings (4) from wheel
8 Replace new wheel, assembly in opposite order, see section 'Assembly of the driving wheel'

GRN/GTR09/11



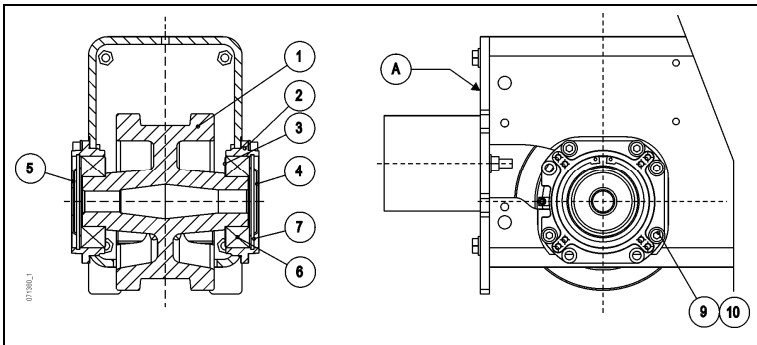
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and plate
4 Remove fixing bolts (5)
5 Pull out bearing housings (2), (3)
6 Remove wheel (1) from end of the end carriage
GTL09: Remove wheel from the bottom of the end carriage
7 Pull out bearings (4) from wheel
8 Replace new wheel, assembly in opposite order, see section 'Assembly of the driving wheel'

GRN/GTR14



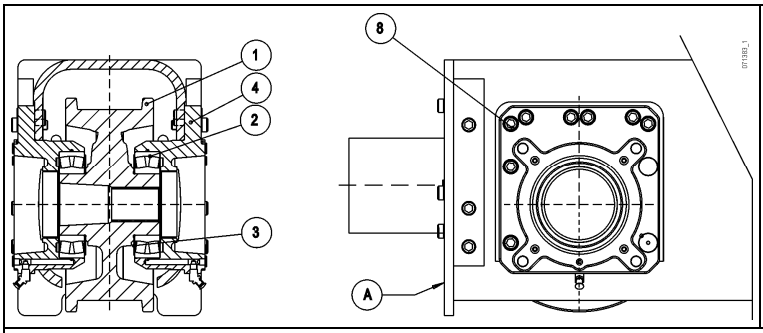
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and end plate
4 Remove fixing bolts (5)
5 Pull out bearing housings (2),(3)
6 Pull out wheel (1) from end of the end carriage
7 Pull out bearings (4) from wheel
8 Replace new wheel, assembly in opposite order see section 'Assembly of the driving wheel'

GRN/GTR16



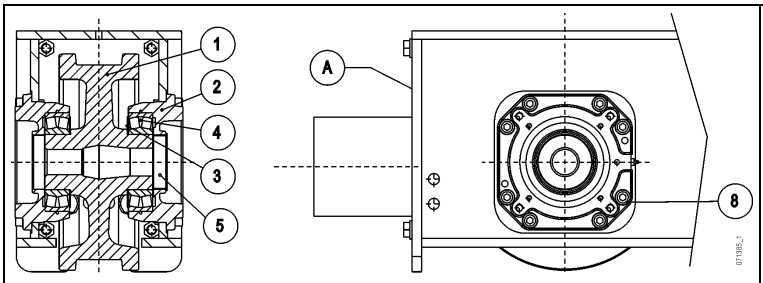
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and end plate
4 Remove retaining rings (7)
5 Remove outer grease plates (4,5)
6 Remove fixing bolts (9)
7 Pull out bearing housings (2)
8 Pull out bearings (6), if they stay to wheel
9 Remove inner grease plates (3)
10 Remove wheel (1) from end of end carriage
11 Replace new wheel, assembly in opposite order see section 'Assembly of the driving wheel'

GTR20/20B



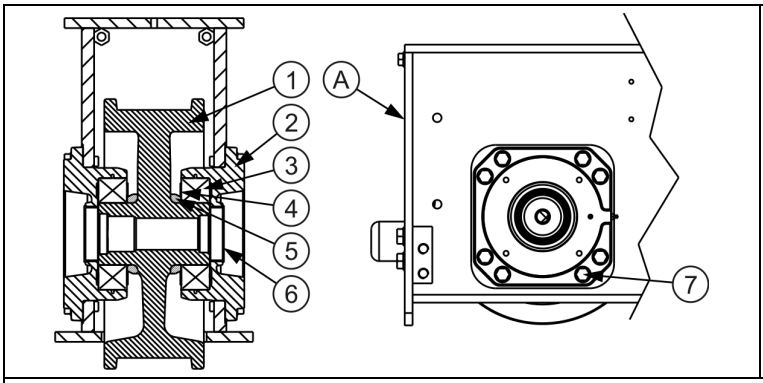
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and plate
4 Remove fixing bolts (8)
5 Pull out bearing housings (4)
6 Remove wheel (1) from end or bottom of the end carriage
7 Pull out bearings (2) from wheel
8 Remove inner grease plates (3)
9 Replace new wheel, assembly in opposite order see section 'Assembly of the driving wheel'

GTR25/25B



1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage end plate's (A) bolts and plate
4 Remove fixing bolts (8)
5 Pull out bearing housings (2)
6 Remove wheel (1) from end of the end carriage
7 Pull out bearings (4) from wheel
8 Remove inner grease plates (3)
9 Replace new wheel, assembly in opposite order see section 'Assembly of wheel the driving wheel'

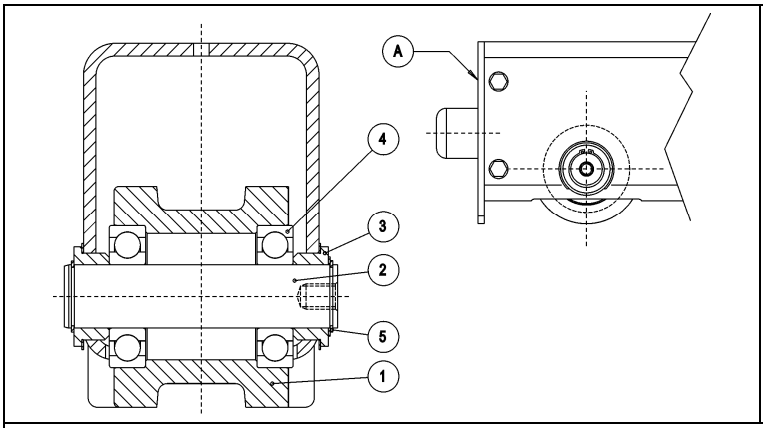
GTR32/32B



1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage end plate's (A) bolts and plate
4 Remove fixing bolts (7)
5 Pull out bearing housings (2)
6 Remove wheel (1) from end of the end carriage
7 Pull out bearings (3) from wheel
8 Remove inner grease plates (4) and distance ring (5)
9 Replace new wheel, assembly in opposite order see section "Assembly of wheel the driving wheel"

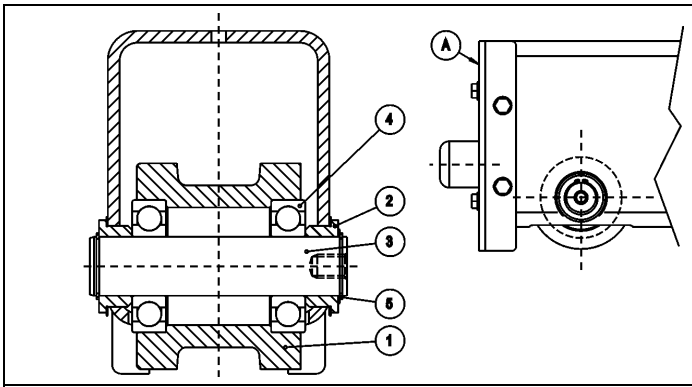
GTR40/40B

2.2.3 Detaching and replacing the idle wheel



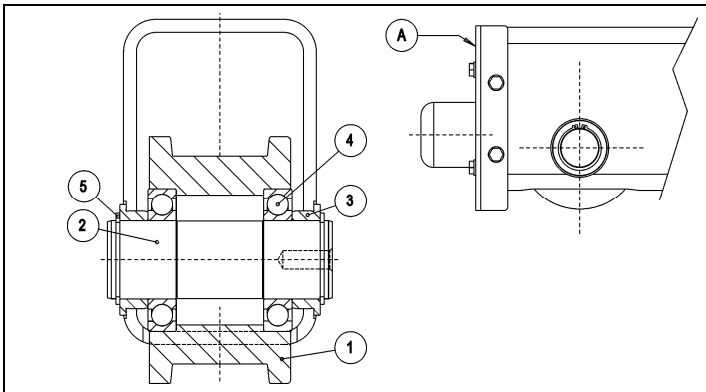
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and plate
4 Remove retaining rings (5)
5 Remove sleeves (3)
6 Remove shaft (2)
7 Remove wheel (1) from end of the end carriage
GTL09: Remove wheel from the bottom of the end carriage
8 Pull out bearings (4) from wheel
9 Replace new wheel, assembly in opposite order, see section 'Assembly of the idle wheel'

GRN/GTR09/11



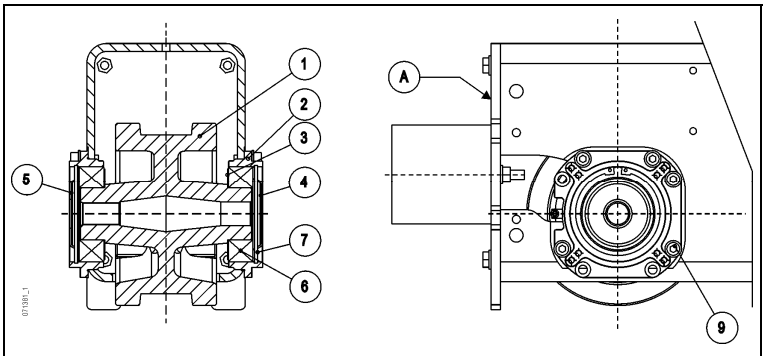
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and plate
4 Remove retaining rings (5)
5 Remove sleeves (3)
6 Remove shaft (2)
7 Remove wheel (1) from end of the end carriage
GTL09: Remove wheel from the bottom of the end carriage
8 Pull out bearings (4) from wheel
9 Replace new wheel, assembly in opposite order, see section 'Assembly of the idle wheel'

GRN/GTR14



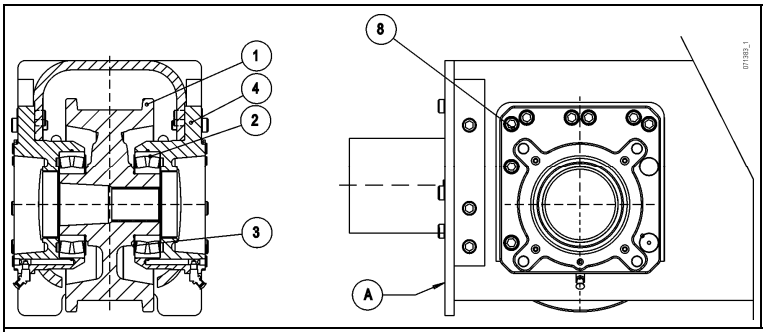
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and end plate
4 Remove retaining rings (5)
5 Remove sleeves (3)
6 Remove shaft (2)
7 Pull out wheel (1) from end of the end carriage
8 Pull out bearings (4) from wheel
9 Replace new wheel, assembly in opposite order see section 'Assembly of the idle wheel'

GRN/GTR16



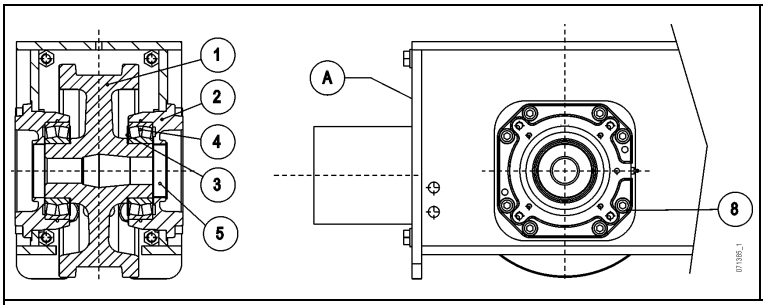
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and end plate
4 Remove retaining rings (7)
5 Remove outer grease plates (4,5)
6 Remove fixing bolts (9)
7 Pull out bearing housings (2)
8 Pull out bearings (6), if they stay to wheel
9 Remove inner grease plates (3)
10 Remove wheel (1) from the end of end carriage
11Replace new wheel, assembly in opposite order see section 'Assembly of the idle wheel'

GTR20/20B



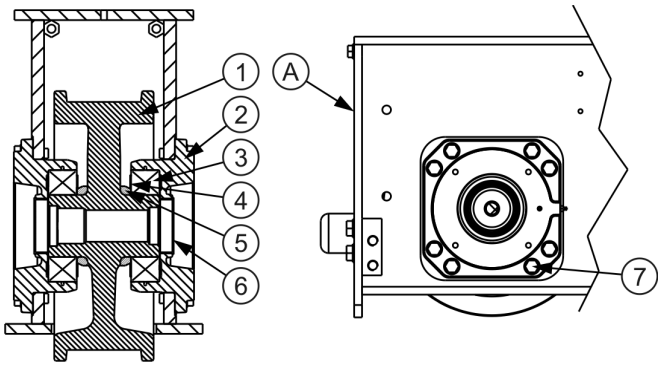
1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage's end plate (A) bolts and plate
4 Remove fixing bolts (8)
5 Pull out bearing housings (4)
6 Remove wheel (1) from end or bottom of the end carriage
7 Pull out bearings (2) from wheel
8 Remove inner grease plates (3)
9 Replace new wheel, assembly in opposite order see section 'Assembly of the idle wheel'

GTR25/25B



1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage end plate's (A) bolts and plate
4 Remove fixing bolts (8)
5 Pull out bearing housings (2)
6 Remove wheel (1) from end of the end carriage
7 Pull out bearings (4) from wheel
8 Remove inner grease plates (3)
9 Replace new wheel, assembly in opposite order see section 'Assembly of wheel the idle wheel'

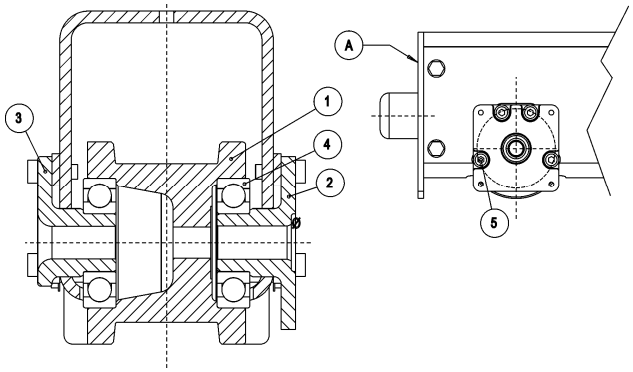
GTR32/32B



1 Jack up end carriage end
2 Support wheel to rail
3 Remove end carriage end plate's (A) bolts and plate
4 Remove fixing bolts (7)
5 Pull out bearing housings (2)
6 Remove wheel (1) from end of the end carriage
7 Pull out bearings (3) from wheel
8 Remove inner grease plates (4) and distance ring (5)
9 Replace new wheel, assembly in opposite order see section "Assembly of wheel the idle wheel".

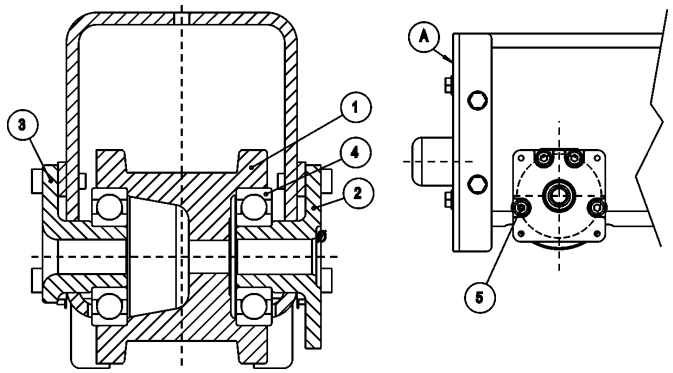
GTR40/40B

2.2.4 Assembly of the driving wheel



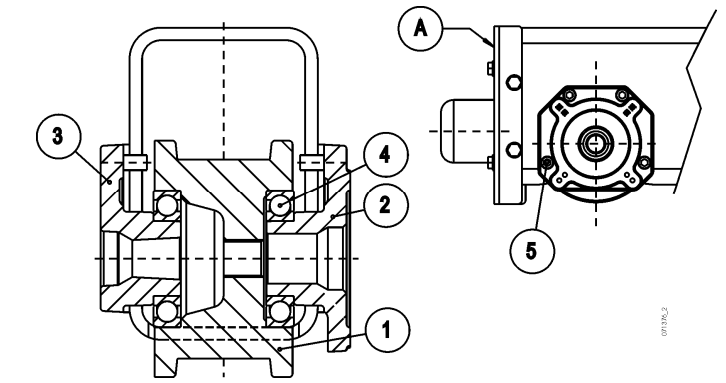
1 Press bearings (4) into wheel, avoid pressing from inner ring
2 Put wheel (1) including bearings into end carriage from end of the end carriage
GTL09: Put wheel into end carriage from the bottom of the end carriage
3 Mount bearing housings (2),(3) into end carriage and tighten bolts (5) according to 'Recommended tightening torques'
4 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'

GRN/GTR09/11



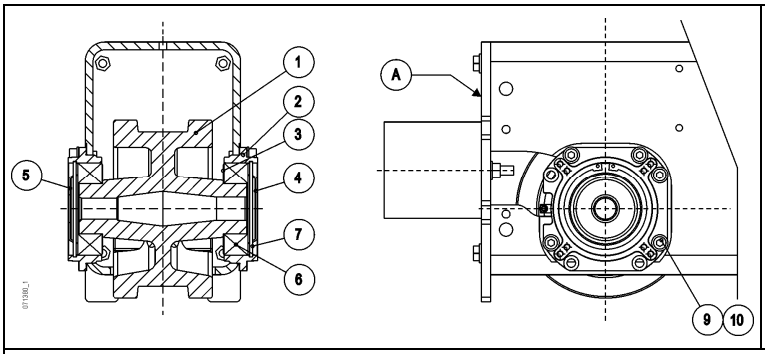
1 Press bearings (4) into wheel, avoid pressing from inner ring
2 Put wheel (1) including bearings into end carriage from end of the end carriage
GTL09: Put wheel into end carriage from the bottom of the end carriage
3 Mount bearing housings (2),(3) into end carriage and tighten bolts (5) according to 'Recommended tightening torques'
4 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'

GRN/GTR14



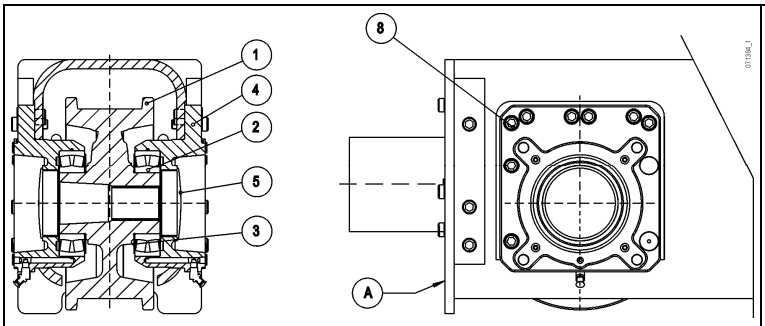
1 Press bearings (4) into wheel (1), avoid pressing from inner ring
2 Put wheel including bearings into end carriage from end of end carriage
3 Mount bearing housings (2),(3) into end carriage and tighten bolts (5) according to 'Recommended tightening torques'
4 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'

GRN/GTR16



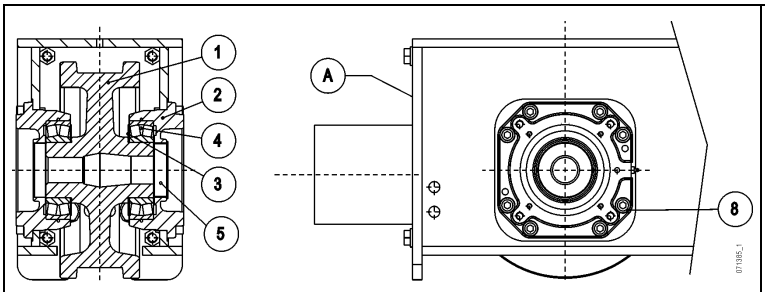
1 Put inner grease plates (3) into wheel shafts
2 Press the bearings (6) into the bearing housings (2), avoid pressing from the inner ring
3 Put the wheel into end carriage from end of the end carriage
4 Mount the bearing housings (2) to end carriage and wheel
5 Mount the outer grease plates (4),(5)
6 Mount the retaining rings (7)
7 Tighten the bolts (9) according to 'Recommended tightening torques'
8 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'
9 Lubricate the bearings acc. to Chapter Lubrication

GTR20/20B



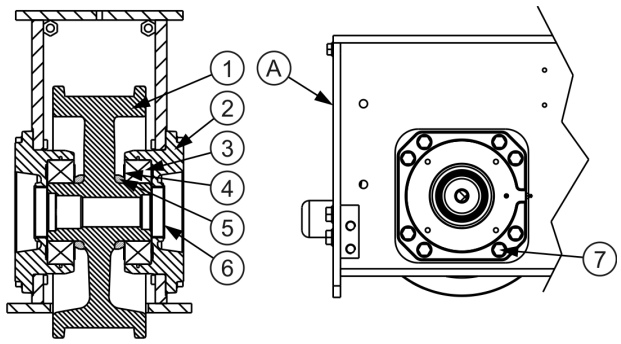
1 Put inner grease plates (3) on wheel shafts
2 Press bearings (2) on wheel shafts, avoid pressing from outer ring
3 Put wheel (1) including bearings into end carriage from end or bottom of the end carriage
4 Mount bearing housings (4) into end carriage and wheel
5 Tighten the bolts (8) according to 'Recommended tightening torques'
6 If removed, mount the covers (5) into wheel
7 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'
8 Lubricate the bearings acc. to Chapter Lubrication

GTR25/25B



1 Put inner grease plates (3) on wheel shafts
2 Press bearings (4) on wheel shafts, avoid pressing from outer ring
3 Put wheel (1) including bearings into end carriage from end of the end carriage
4 Mount bearing housings (2) into end carriage and wheel
5 Tighten the bolts (8) according to 'Recommended tightening torques'
6 If removed, mount the covers (5) into wheel
8 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'
9 Lubricate the bearings acc. to Chapter Lubrication

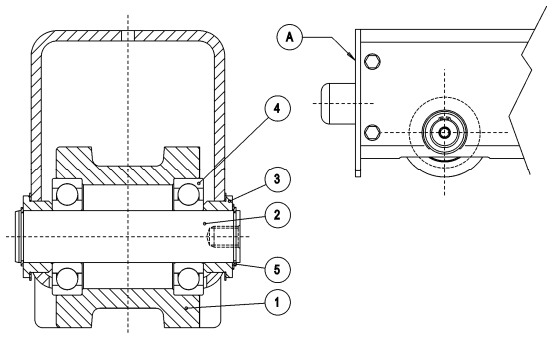
GTR32/32B

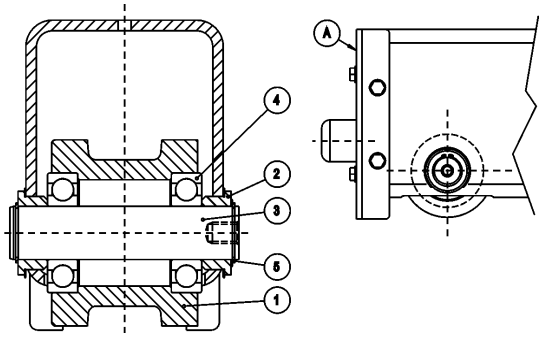
	1 Put distance ring (5) and inner grease plates (4) on wheel shafts 2 Press bearings (3) on wheel shafts, avoid pressing from outer ring 3 Put wheel (1) including bearings into end carriage from end of the end carriage 4 Mount bearing housings (2) into end carriage and wheel 5 Tighten the bolts (7) according to section 'Recommended tightening torques' 6 Lubricate the bearings according to section "Lubrication" 7 If removed, mount the covers (6) into wheel 8 Fix the end plate (A) and tighten the bolts according to section "Recommended tightening torques"
GTR40/40B	

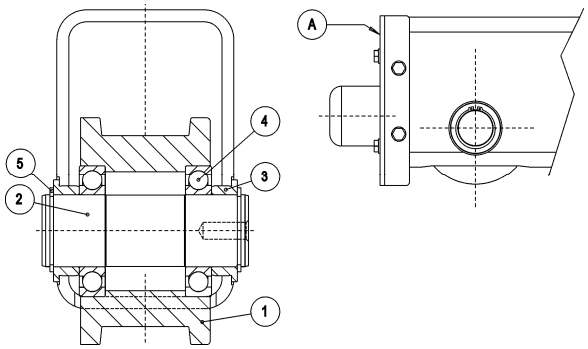
In the end:

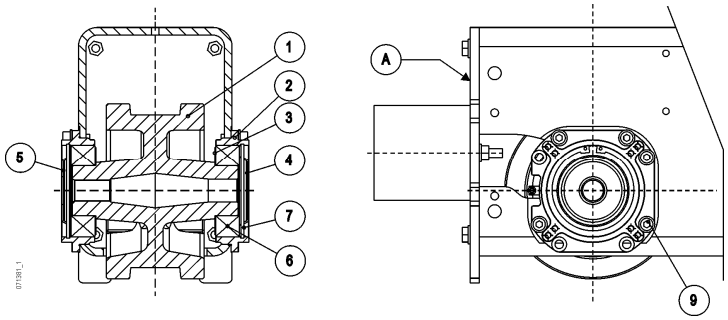
- Attach the travelling machinery to the wheel spline of end carriage
- Tighten the fixing bolts of the machinery to a correct torque (see section 'Recommended tightening torques')
- Connect the power supply plug to the motor

2.2.5 Assembly of the idle wheel

	1 Press bearings (4) into wheel, avoid pressing from inner ring 2 Put wheel (1) including bearings into end carriage from end of the end carriage GTL09: Put wheel into end carriage from the bottom of the end carriage 3 Mount shaft (2) and sleeves (3) 4 Lock shaft with retaining rings (5) 5 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'
GRN/GTR09/11	

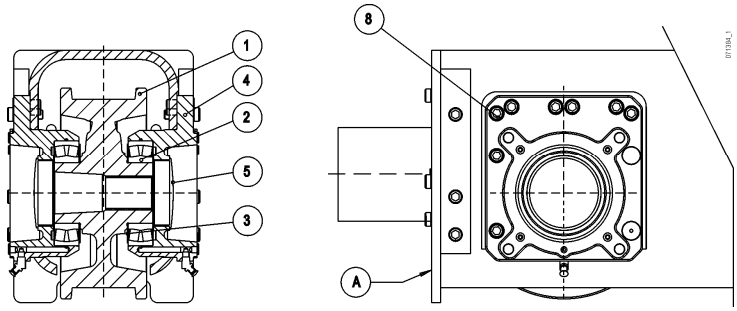
	1 Press bearings (4) into wheel, avoid pressing from inner ring 2 Put wheel (1) including bearings into end carriage from end of the end carriage GTL09: Put wheel into end carriage from the bottom of the end carriage 3 Mount shaft (2) and sleeves (3) 4 Lock shaft with retaining rings (5) 5 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'
GRN/GTR14	

	1 Press bearings (4) into wheel (1), avoid pressing from inner ring 2 Put wheel including bearings into end carriage from end of end carriage 3 Mount shaft (2) and sleeves (3) 4 Lock shaft with retaining rings (5) 5 Fix the end plate (A) and tighten the bolts according to 'Recommended tightening torques'
GRN/GTR16	



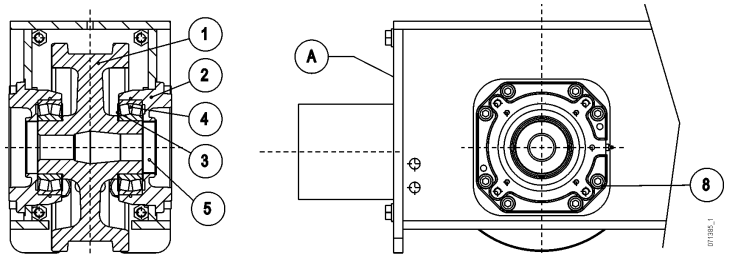
1 Put inner grease plates (3) into wheel shafts
2 Press the bearings (6) into the bearing housings (2), avoid pressing from inner ring
3 Put the wheel into end carriage from end of the end carriage
4 Mount the bearing housings (2) to end carriage and wheel
5 Mount the outer grease plates (4),(5)
6 Mount the retaining rings (7)
7 Tighten the bolts (9) according to section ‘Recommended tightening torques’
8 Fix the end plate (A) and tighten the bolts according to ‘Recommended tightening torques’
9 Lubricate the bearings acc. to Chapter Lubrication

GTR20/20B



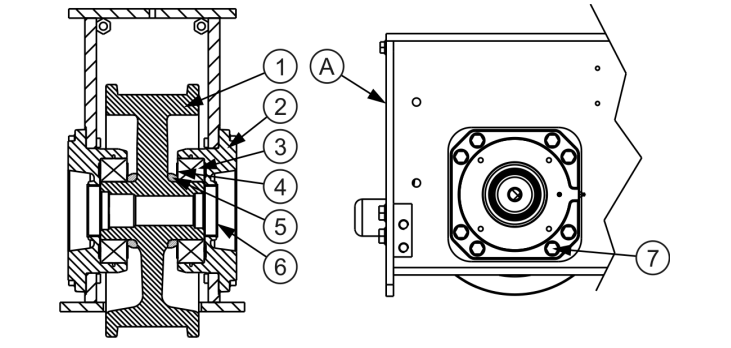
1 Put inner grease plates (3) on wheel shafts
2 Press bearings (2) on wheel shafts, avoid pressing from outer ring
3 Put wheel (1) including bearings into end carriage from end or bottom of the end carriage
4 Mount bearing housings (4) into end carriage and wheel
5 Tighten the bolts (8) according to section ‘Recommended tightening torques’
6 If removed, mount the covers (5) into wheel
7 Fix the end plate (A) and tighten the bolts according to ‘Recommended tightening torques’
8 Lubricate the bearings acc. to Chapter Lubrication

GTR25/25B



1 Put inner grease plates (3) on wheel shafts
2 Press bearings (4) on wheel shafts, avoid pressing from outer ring
3 Put wheel (1) including bearings into end carriage from end of the end carriage
4 Mount bearing housings (2) into end carriage and wheel
5 Tighten the bolts (8) according to section ‘Recommended tightening torques’
6 If removed, mount the covers (5) into wheel
8 Fix the end plate (A) and tighten the bolts according to ‘Recommended tightening torques’
9 Lubricate the bearings acc. to Chapter Lubrication

GTR32/32B



1 Put distance ring (5) and inner grease plates (4) on wheel shafts
2 Press bearings (3) on wheel shafts, avoid pressing from outer ring
3 Put wheel (1) including bearings into end carriage from end of the end carriage
4 Mount bearing housings (2) into end carriage and wheel
5 Tighten the bolts (7) according to section “Recommended tightening torques”
6 Lubricate the bearings according to section “Lubrication”
7 If removed, mount the covers (6) into wheel
8 Fix the end plate (A) and tighten the bolts according to section “Recommended tightening torques”

GTR40/40B

2.3 Lubrication (GTR20…40)

☞ Use of a low-grade or incompatible lubricant can damage the bearings. Use only the original lubricants recommended by the manufacturer.

Factory-installed lubricant unless otherwise specified:

Trade name and number	Operating temperature °C	Operating temperature °F
Mobilgrease XHP 222	-25…+150	-13…+302

Alternative lubricants:

Trade name and number	Operating temperature °C	Operating temperature °F
Shell Alpida Grease EP2	-20…+150	-4…+302
Esso Unirex EP2	-25…+150	-13…+302
Teboil Multi-purpose HT	-30…+150	-22…+302
Shell Alpida Grease HLS 2 S)	-35…+150	-31…+302
Mobilith SHC 460 S)	-40…+180	-40…+356
Shell Alpida Grease EMS S)	-50…+150	-58…+302
Kluberlub BE 41-542	-20…+140	-4…+284
SKF LGWM1	-30…+110	-22…+230

S) Synthetic lubricant

If the end carriage is operated for long periods in extremely cold conditions (colder than -25°C/-13°F) or extremely hot conditions (hotter than +55°C/+131°F), it is recommended that a synthetic lubricant is used.

2.3.1 Lubrication intervals

If the usage of the crane has been changed permanently in a longer time period or its usage methods are planned to be changed (e.g. moving crane usage from 1-shift to 3-shift) this has influence for the end carriage's lubrication intervals. Recommended lubrication intervals are shown below.

Type of use	Lubrication (Months)	Cleaning & Lubrication (Months)
1-Shift	12	60
2-Shift	6	48
3-Shift	6	36

2.3.2 Quantity of lubricant for re-lubrication

Suitable quantity of lubricant can be calculated by using formula:

$Gp = 0.005 * D * B,$

Where

Gp = grease quantity [g]

D = bearing outside diameter [mm]

B = total bearing width [mm]

Wheel dia [mm]	Bearing	D [mm]	B [mm]	Gp [g]
200	22213 CC	120	31	19
250	22216 CC	140	33	23
315	22218 CC	160	40	32
400	22220 CC	180	46	41

2.4 Travelling machineries

GRN / GTR end carriages are designed to be used with VES drives. The travelling machineries must always be ordered separately and are located as standard.

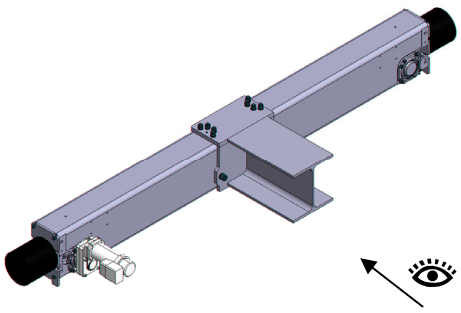
For GTR40, also optional QM6 drive is available and must be ordered separately. If QM6 drive is used, also separate fixing set is needed. The fixing set includes specific secondary shaft and torque support. To make sure, that correct parts are delivered with end truck in case of travel drive QM6, the last digit of end trucks code must be “E” and the technical sentences BG01 (Bridge travel gear type) and BG02 (Bridge travel gear size) must be brought to end trucks order line. The values must be:

- *BG01 = QM*
- *BG02 = 06*

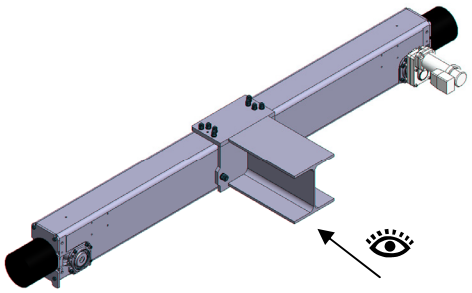
Be noted also, that QM6 travel drive is delivered without lubricant. Check suitable lubricants for QM6 travel drive from QM Owner’s manual.

2.4.1 Standard location of travelling machineries

Location of travelling machineries.



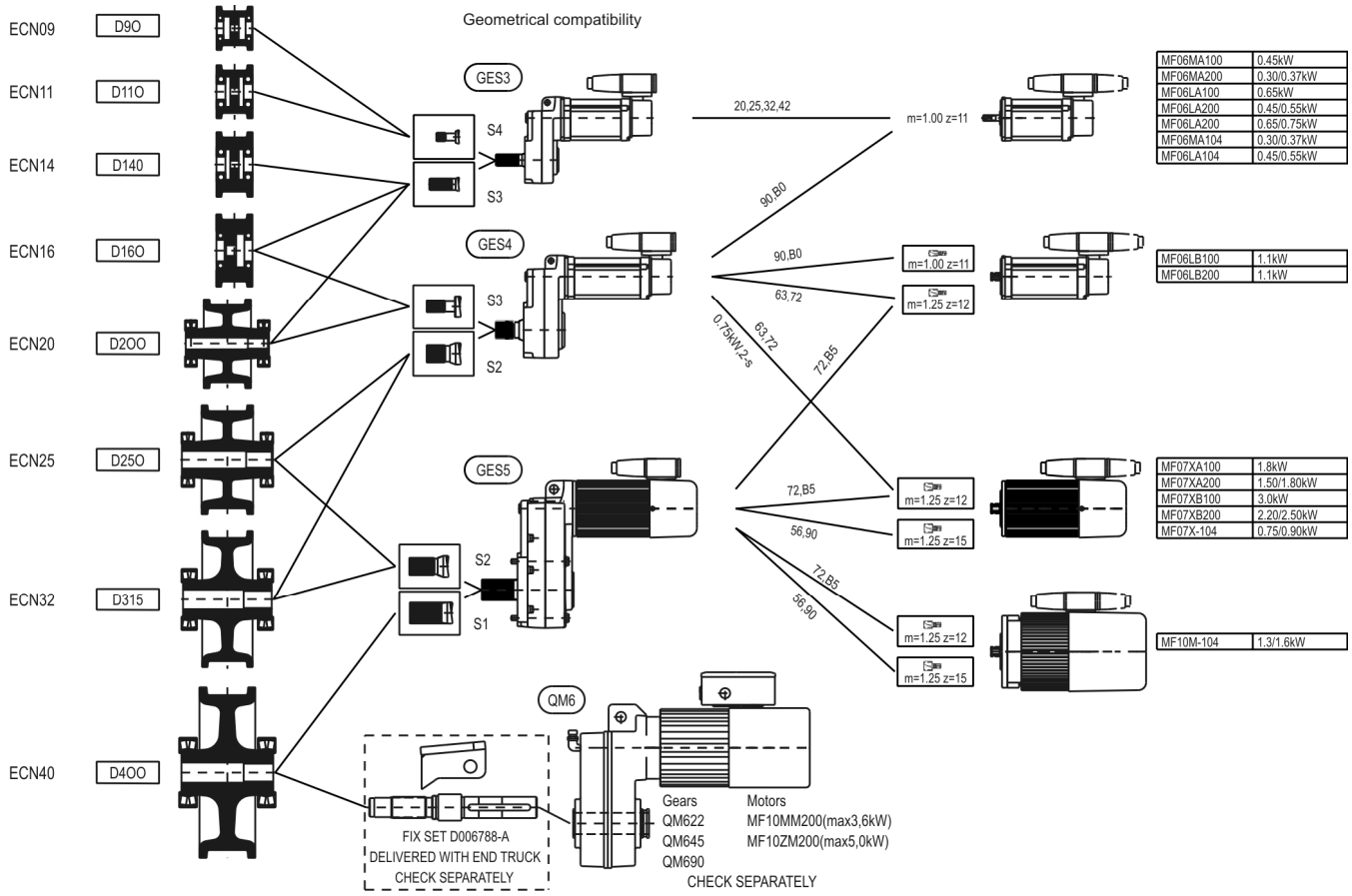
Left-handed



Right-handed

2.4.2 Suitable travelling machineries

GTR (GRN) end carriages and VES gears



2.5 End carriage and main girder connection

2.5.1 Code key

Code consist of 14 digits

1	2	3 4 5	6	7 8	9	10 11 12	13	14

1. Digit	P = Profile, B = Box
2. Digit	always –
3-5. Digit	TOP = TOP connection plate
	SID = SIDe connection plate
6. Digit	- = not reinforced connection
	T = T7 plate used in box girder end
	B = Boxed profile girder end
7-8. Digit	Joint plate: Top connection plates: A_types A3, A4, A6; B_types B4, B6; L_types L3,L4, L5, L6; H_types H4, H5, H7, H9, K_types K4, K5, K7, K9
	Side connection plates: S_types S6, S7, S9; R_types R3,R4, R5, R6; F_types F4, F5, F7, F8; Q_types Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q0
	Light side connection plates: GRN_types GRN09, GRN11, GRN14, GRN16
9. Digit	- = Nothing special in bottom flange
	R = Reinforced bottom flange
	S = Single girder type bottom flange
	D = Double girder type bottom flange
10-12. Digit	STD = STanDard main girder position to join plate
	LOW = LOW main girder position to joint plate
13. Digit	- = Normal bottom flange positioning
	H = High bottom flange positioning
	L = Low bottom flange positioning
14. Digit	S = Top flange Straight
	C = Top flange cutted
	L = Low standard, where main girder height ≤joint plate height
	E = Extended main girder end

Example: P-TOP-A4-STD-S = Profile, TOP connection plate, A4 joint plate, STanDard main girder position, Straight main girder end

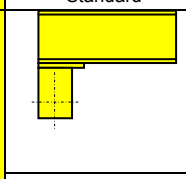
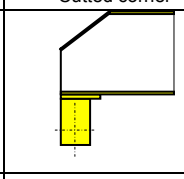
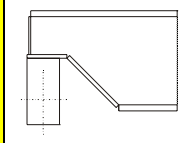
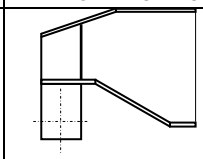
Example: P-SIDBR4-STD-S = Profile, SIDe connection plate, Boxed, R4 joint plate, STanDard main girder position, Straight main girder end

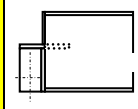
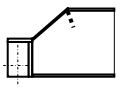
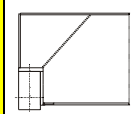
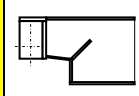
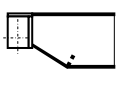
Example: B-SIDTR3-STD-C = Box, SIDE connection plate, T7 plate used, R3 joint plate, STanDard main girder position, Cutted main girder end

Example: B-SID-GRN-STD-S = Box, Light SIDE connection plate, GRN joint plate, STanDard main girder position, Straight main girder end

Example: B-SID-Q5-STD-E = Box, SIDE connection plate, Q5 joint plate, STanDard main girder position, Extended main girder end

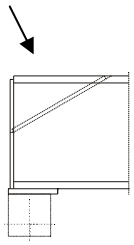
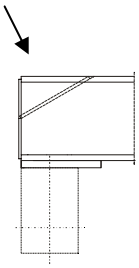
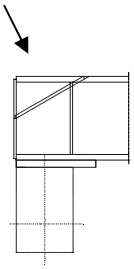
2.5.2 Possible joint and end carriage combinations

POSSIBLE JOINT & END CARRIAGE COMBINATIONS																								
TOP JOINTS																								
Joint type	End Carriage Type		GRN09		GRN11/14		GRN16		GTL09 GTR09		GTR11/14		GTR16		GTR20		GTR25		GTR32		GTR40	
	Girder type, profile/box		P	B	P	B	P	B	P	B	P	B	P	B	P	B	P	B	P	B	P	B
	Joint general drawing, typical application		Joint plates																			
	Standard	Cutted corner																				
STD			no	no	no	no	no	no	A3	A3	A4 A6	A4 A6	B4 B6	B4 B6	L3 L4 L5 L6	L3 L4 L5 L6	H4 H5 H7 H9	H4 H5 H7 H9	K4 K5 K7 K9	K4 K5 K7 K9	K4 K5 K7 K9	K4 K5 K7 K9
	P/B-TOPxxxxSTDxS	P/B-TOPxxxxSTDxC																				
MED			no	no	no	no	no	no	A3	A3	A4 A6	A4 A6	B4 B6	B4 B6	L3 L4 L5 L6	L3 L4 L5 L6	H4 H5 H7 H9	H4 H5 H7 H9	K4 K5 K7 K9	K4 K5 K7 K9	K4 K5 K7 K9	K4 K5 K7 K9
	P/B-TOPxxxxMEDxS	P/B-TOPxxxxMEDxC																				

POSSIBLE JOINT & END CARRIAGE COMBINATIONS																								
SIDE JOINTS																								
Joint type	End Carriage Type		GRN09		GRN11/14		GRN16		GTR09		GTR11/14		GTR16		GTR20		GTR25		GTR32		GTR40	
	Girder type, profile/box		P	B	P	B	P	B	P	B	P	B	P	B	P	B	P	B	P	B	P	B
	Joint general drawing, typical application		Joint plates																			
	Standard	Cutted corner																				
STD			GRN09-400x200	GRN09-400x200	GRN11-400x255	GRN11-400x255	GRN16-350x255 GRN16-450x305	GRN16-350x255 GRN16-450x305	no	no	no	no	no	no	R3 R4 R3r R4r R5r R6r	R3 R4 R5 R6	F4 F5 F7 F8	F4 F5 F7 F8	Q4 Q5 Q4r Q5r Q3	Q5 Q6 Q7 Q8 Q9 Q3	no no no	S6 S7 S9
	P/B-SIDxxxxSTDxS	P/B-SIDxxxxSTDxC																				
STD									no	no	no	no	no	no	R3 R4 R5 R6	R3 R4 R5 R6	F4 F5 F7 F8	F4 F5 F7 F8	Q4 Q5	Q4 Q5 Q6 Q7 Q8 Q9 Q0	no no no	S6 S7 S9
	P/B-SIDxxxxSTDxE																					
LOW			GRN09-400x200	GRN09-400x200	GRN11-400x255	GRN11-400x255	GRN16-350x255 GRN16-450x305	GRN16-350x255 GRN16-450x305	no	no	no	no	no	no	R3 R4 R3r R4r R5r R6r	R3 R4 R5 R6	F4 F5 F7 F8	F4 F5 F7 F8	Q4 Q5	Q4 Q5 Q6 Q7 Q8 Q9 Q0	no no no	S6 S7 S9
	Single Girder	Double Girder																				
	P/B-SIDxxxxLOWL	P/B-SIDxxxxLOWH																				

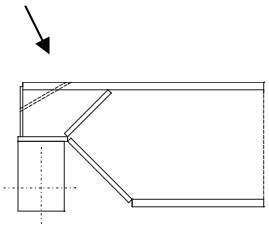
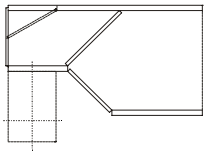
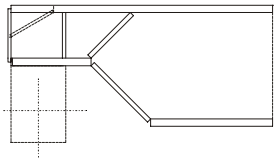
Main girder connection to the joint plate has to be calculated case by case and joint plate itself needs to be sized accordingly (max moment values for joint plates has to be checked). Examples of different joint types are shown below.

2.5.3 Top joints, standard

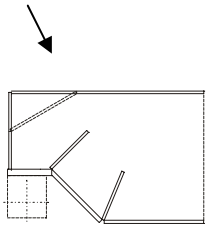
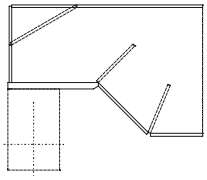
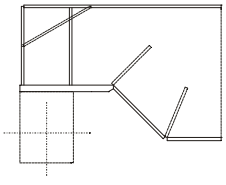
Cut corner type x-TOP-x_-STD-C  P-TOP-A_-STD-S B-TOP-A_-STD-S	Cut corner type x-TOP-x_-STD-C  P-TOP-L_-STD-S B-TOP-L_-STD-S P-TOP-B_-STD-S B-TOP-B_-STD-S	Cut corner type x-TOP-x_-STD-C  P-TOP-K_-STD-S B-TOP-K_-STD-S P-TOP-H_-STD-S B-TOP-H_-STD-S

2.5.4 Top joints, medium

PROFILE

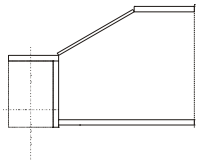
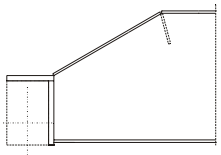
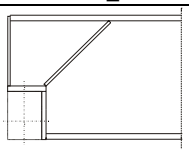
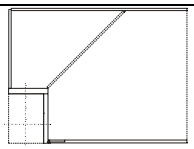
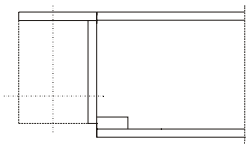
Cut corner type P-TOP-A_-MED-C  P-TOP-A_-MED-S	Cut corner type P-TOP-L_-MED-C P-TOP-B_-MED-C  P-TOP-L_-MED-S P-TOP-B_-MED-S	Cut corner type P-TOP-K_-MED-C P-TOP-H_-MED-C  P-TOP-K_-MED-S P-TOP-H_-MED-S

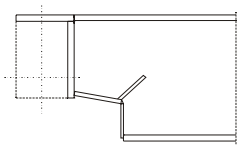
BOX

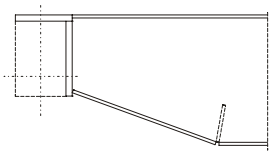
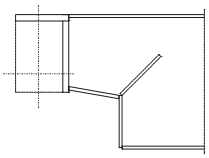
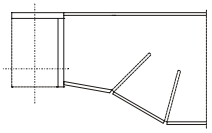
Cut corner type B-TOP-A_-MED-C  B-TOP-A_-MED-S	Cut corner type B-TOP-L_-MED-C B-TOP-B_-MED-C  B-TOP-L_-MED-S B-TOP-B_-MED-S	Cut corner type B-TOP-K_-MED-C B-TOP-H_-MED-C  B-TOP-K_-MED-S B-TOP-H_-MED-S

BOX-TOP.MED Connections
with web reinforcements:
B-TOPTx_-MED-x

2.5.5 Side joints

<table>
<tr><th colspan="2">PROFILE
GTR20…32</th><th colspan="2">BOX
GTR20…40</th></tr>
<tr><td rowspan="2">STD</td><td colspan="2"> 
P-SID-R_-STD-C
BOXED type:
P-SIDBR_-STD-C</td><td colspan="2"> 
B-SID-R_-STD-C</td></tr>
<tr><td colspan="2"> 
P-SID-R_-STD-E
P-SID-F_-STD-E
P-SID-Q_-STD-E</td><td colspan="2"> 
B-SID-R_-STD-E
B-SID-F_-STD-E
B-SID-Q_-STD-E</td></tr>
<tr><td rowspan="2">LOW</td><td> 
P-SID-R_-LOWH
P-SID-F_-LOWH
P-SID-Q_-LOWH

BOXED type:
P-SIDBR_-LOWH
P-SIDBF_-LOWH
P-SIDBQ_-LOWH</td><td> 
P-SID-R_-LOWL
P-SID-F_-LOWL
P-SID-Q_-LOWL

BOXED type:
P-SIDBR_-LOWL
P-SIDBF_-LOWL
P-SIDBQ_-LOWL</td><td> 
B-SID-R_-LOWH
B-SID-F_-LOWH
B-SID-Q_-LOWH
B-SID-S_-LOWH</td><td> 
B-SID-R_SLOWL
B-SID-F_SLOWL
B-SID-Q_SLOWL
B-SID-S_SLOWL</td></tr>
<tr><td></td><td> 
B-SID-R_DLOWL
B-SID-F_DLOWL
B-SID-Q_DLOWL
B-SID-S_DLOWL</td></tr>
</table>

"BOXED" PROFILE SIDE

connections for higher load: **Diagonal web stiffener**

P-SIDBX_-xxxxx **can be left out!**

↑

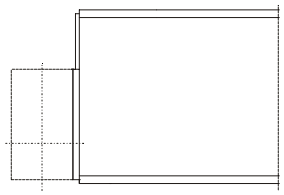
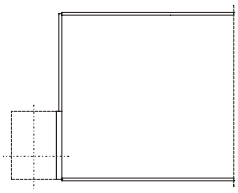
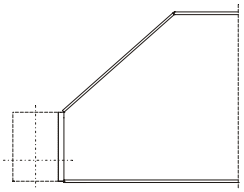
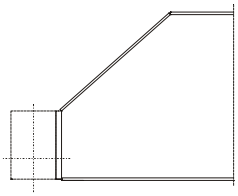
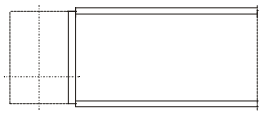
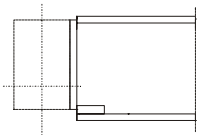
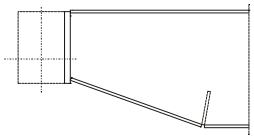
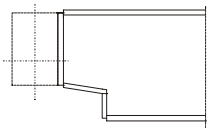
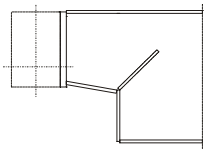
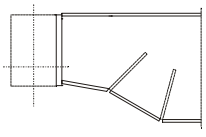
BOX SIDE Connections

with web reinforcements:

B-SIDTX_xxxxx

↑

2.5.6 Side light joints

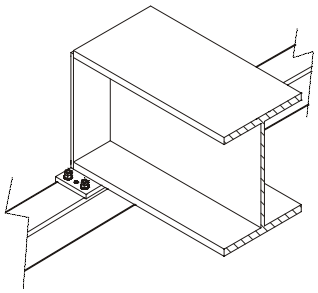
	PROFILE	BOX
STD	 P-SID-GRN-STD-S	 B-SID-GRN-STD-S
	 P-SID-GRN-STD-C	 B-SID-GRN-STD-C
	 P-SID-GRN-STD-L main girder height as big or smaller than joint plate height	
LOW	 P-SID-GRN-LOWH	 B-SID-GRN-LOWH
	 P-SID-GRN-LOWL	 B-SID-GRNSLOWL
		 B-SID-GRNDLOWL

BOX-SIDE-LIGHT Connections
with web reinforcements:
B-SIDTGRN**xxxxx**

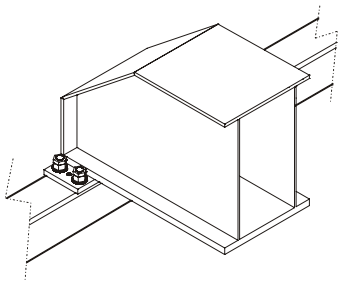
2.5.7 Top connection, A – top connection (profile or box girder)

The main girder is welded directly on the joint plate and the joint plate is locked on the end carriage with bolts.

On delivery the bolts are just pre-assembled, final tightening has to be done when assembled on the crane.



Example of A joint, standard, profile

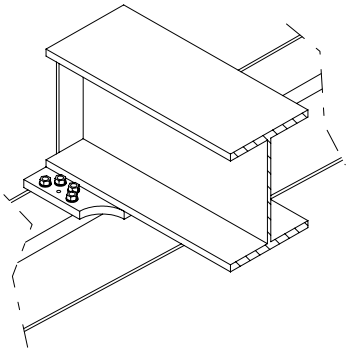


Example of A joint, standard, box, cut corner

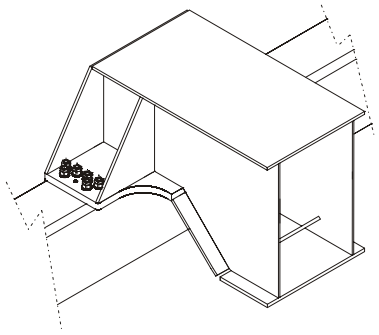
2.5.8 Top connection, B/L/K/H - top connection (profile or box girder).

The main girder is welded directly on the joint plate and the joint plate is locked on the end carriage with bolts.

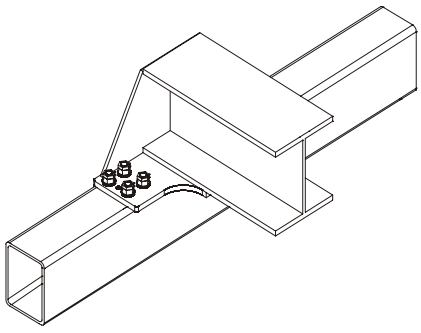
On delivery the bolts are just pre-assembled, final tightening has to be done when assembled on crane.



Example of L joint, standard, profile



Example of K joint, medium, box

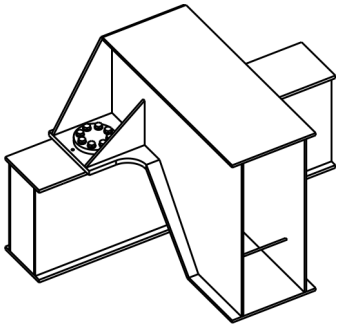


Example of B and H joint, standard, profile

2.5.9 Top connection, J-top connection (box girder).

This connection is same as SHBJ connection used in SHR process end trucks and is available for GTR40 as an option. The main girder is welded directly on the joint plate and the joint plate is locked on the end carriage with welded shear rings and the shear ring covers are locked to shear rings with bolts.

On delivery the shear rings are just tack welded and final welding must be done during assembly. After welding and painting, the shear ring cover must be locked to shear rings with bolts and special lock washers (Nordlock).

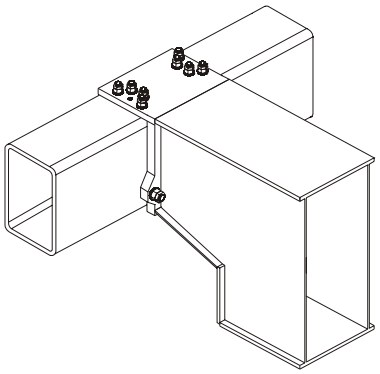


Top connection, J-connection (box girder)

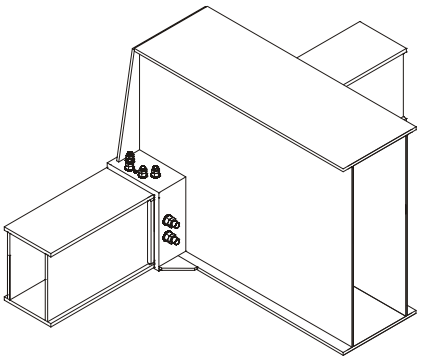
2.5.10 Side connection, R/Q/F/S - connection (profile or box girder)

The main girder is welded to joint plate. Joint plate is locked to the end carriage with bolts.

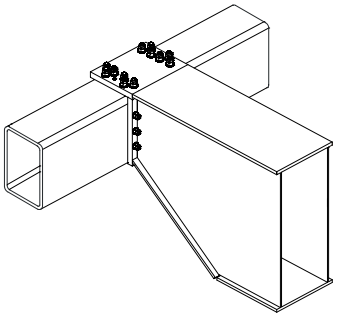
On delivery the bolts are just pre-assembled, final tightening has to be done when assembled on crane.



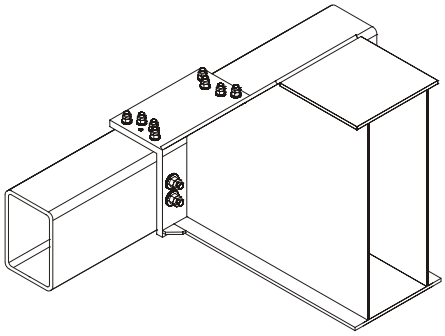
Example of R joint, low, box



Example of Q joint, standard extended, box



Example of S joint, low, box

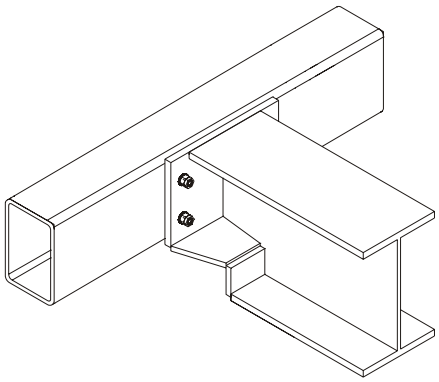


Example of F joint, standard, box

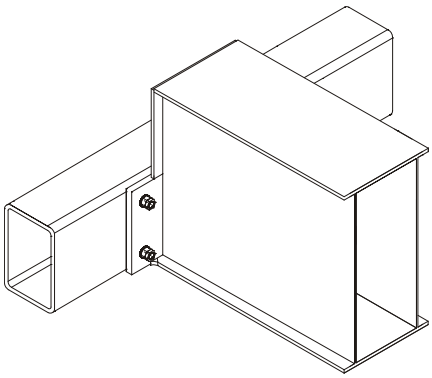
2.5.11 Side connection, GRN- connection (profile or box girder)

The main girder is welded to joint plate. Joint plate is locked to the end carriage with bolts.

On delivery the bolts are just pre-assembled, final tightening have to be done when assembled on crane.



GRN low joint, profile



GRN standard joint, box

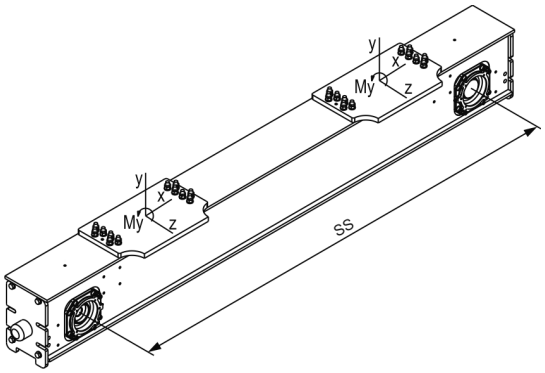
2.5.12 Maximum moments for joint plates

In some loading cases the max moment of the joint plate may be the limiting factor. The allowed moments are collected in the following table. The moments of the joints plate can be checked with formulas:

2 wheel end carriages:

Case I $$M_y = \frac{0{,}125 * P_{dyn}}{1{,}15} / N_{gir} * SS$$

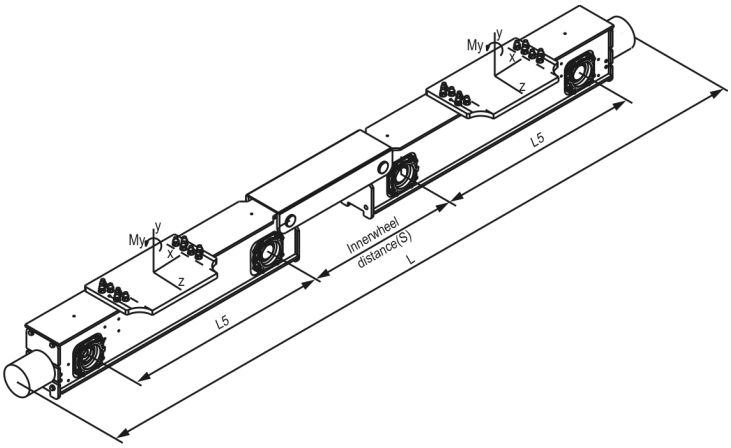
Case III $$M_y = \frac{0{,}3 * P_{dyn}}{1{,}15} / N_{gir} * SS$$



Bogie end carriages:

Case I $$M_y = \frac{0{,}125 * P_{dyn}}{1{,}15} * L5$$

Case III $$M_y = \frac{0{,}3 * P_{dyn}}{1{,}15} * L5$$



Where
Pdyn = max dynamic wheel load
SS = end carriage wheel base
Ngir = number of main girders
L5 = wheel base of single bogie block

Calculated max moments for joint plates:

Joint plate	Profile/box	My (I)	My (I)	My (I)	My (I)	My (III) max	Pstat max	Weight	Bolt type
		E2 [kNm]	E3 [kNm]	E4 [kNm]	E5 [kNm]	[kNm]		[kg]	
A3	yes/yes	21	21	16.8	13.4	28	as Pdyn max	7	1
A4	yes/yes	26	26	20.8	16.6	35	as Pdyn max	10	1
A6	yes/yes	36	36	28.8	23.0	49	as Pdyn max	13	1
B4	yes/yes	54	54	43.2	34.6	70	as Pdyn max	21	1
B6	yes/yes	77	77	61.6	49.28	101	as Pdyn max	29	1
L3	yes/yes	46	46	36.8	29.4	64	as Pdyn max	24	1
L4	yes/yes	60	60	48	38.4	80	as Pdyn max	25	1
L5	yes/yes	72	72	57.6	46.1	100	as Pdyn max	29	1
L6	yes/yes	88	88	70.4	56.3	120	as Pdyn max	24	1
H4	yes/yes	90	90	72	57.6	120	as Pdyn max	34	1
H5	yes/yes	110	110	88	70.4	140	as Pdyn max	40	1
H7	yes/yes	140	140	112	89.6	180	as Pdyn max	52	1
H9	yes/yes	170	170	136	108.8	220	as Pdyn max	66	1
F4 (profile)	yes/no	20	20	16	12.8	48	140 kN	81	1+2
F4 (box)	yes*/yes	40	40	32	25.6	96	as Pdyn max	81	1+2
F5 (profile)	yes/no	30	30	24	19.2	71	140 kN	109	1+2
F5 (box)	yes*/yes	59	59	47.2	37.8	142	as Pdyn max	109	1+2
F7	yes*/yes	63	63	50.4	40.3	151	as Pdyn max	142	1+2
F8	yes*/yes	63	63	50.4	40.3	151	as Pdyn max	161	1+2
K4	yes/yes	90	90	72	57.6	124	as Pdyn max	39	1
K5	yes/yes	110	110	88	70.4	148	as Pdyn max	47	1
K7	yes/yes	146	146	116.8	93.4	194	as Pdyn max	62	1
K9	no/yes	190	190	152	121.6	250	as Pdyn max	79	1
J1 (SHBJ-1)	no/yes	230	230	184	147.2	440	as Pdyn max	83	3
J2 (SHBJ-2)	no/yes	315	315	252	201.6	600	as Pdyn max	107	3
J3 (SHBJ-3)	no/yes	432	432	345.6	276.5	820	as Pdyn max	136	3
J4 (SHBJ-4)	no/yes	284	284	227.2	181.8	568	as Pdyn max	101	3
J5 (SHBJ-5)	no/yes	381	381	304.8	243.8	763	as Pdyn max	103	3
J6 (SHBJ-6)	no/yes	518	518	414.4	331.5	1038	as Pdyn max	155	3
J7 (SHBJ-7)	no/yes	272	272	265.2	212.2	518	as Pdyn max	96	3
J8 (SHBJ-8)	no/yes	331	331	264.8	211.8	638	as Pdyn max	112	3
J9 (SHBJ-9)	no/yes	355	355	284	227.2	676	as Pdyn max	121	3
J0 (SHBJ-10)	no/yes	428	428	342.4	273.9	842	as Pdyn max	135	3
R3(profile)	yes/no	15	15	12	9.6	36	90 kN	33	1+2
R3(box)	yes*/yes	28	28	22.4	17.9	69	as Pdyn max	33	1+2
R4	yes*/yes	34	34	27.2	21.8	82	as Pdyn max	43	1+2
R5	yes*/yes	41	41	32.8	26.2	105	as Pdyn max	53	1+2
R6	yes*/yes	51	51	40.8	32.6	130	as Pdyn max	63	1+2
Q3 (profile)	yes/no	25	25	20	16	60	190 kN	94	1+2
Q3 (box)	yes*/yes	50	50	40	32	120	as Pdyn max	94	1+2
Q4 (profile)	yes/no	30	30	24	19.2	70	190 kN	111	1+2
Q4 (box)	yes*/yes	60	60	48	38.2	140	as Pdyn max	111	1+2
Q5 (profile)	yes/no	35	35	28	22.4	85	190 kN	111	1+2
Q5 (box)	yes*/yes	70	70	56	44.8	170	as Pdyn max	111	1+2
Q6 (profile)	yes/no	40	40	32	25.6	95	190 kN	130	1+2
Q6 (box)	yes*/yes	80	80	64	51.2	190	as Pdyn max	130	1+2
Q7	yes*/yes	100	100	80	64	230	as Pdyn max	145	1+2
Q8	yes*/yes	110	110	88	70.4	260	as Pdyn max	169	1+2
Q9	yes*/yes	150	150	120	96	360	as Pdyn max	184	1+2
Q0	yes*/yes	170	170	136	108.8	390	as Pdyn max	214	1+2
S6	yes*/yes	106	106	84.8	67.8	254	as Pdyn max	139	1+2
S7	yes*/yes	162	162	129.6	103.7	390	as Pdyn max	185	1+2
S9	yes*/yes	162	162	129.6	103.7	390	as Pdyn max	265	1+2
GRN09(JPL=400)	yes*/yes	9	9	7.2	5.8	21.6	as Pdyn max	16	2
GRN11(JPL=400)	yes*/yes	19	19	15.2	12.2	45.7	as Pdyn max	26	2
GRN14(JPL=400)	yes*/yes	19	19	15.2	12.2	45.7	as Pdyn max	26	2
GRN16(JPL=350)	yes*/yes	17	17	13.6	10.8	41	as Pdyn max	23	2
GRN16(JPL=450)	yes*/yes	27	27	21.6	17.3	66	as Pdyn max	38	2

*=allowed to use profile girder with box values when the end of girder is boxed.

Bolt types and tightening torques:

Bolt type 1	DIN931-M16x__-10.9-FLZ-G, 300 Nm; nut DIN934-M16-10-FLZ-R
Bolt type 2	DIN931-M20x__-10.9-FLZ-G, 590 Nm; nut DIN934-M20-10-FLZ-R
Bolt type 3	DIN 931-M20x50-8.8-A3F, 80 Nm, washers DIN25201-M20-ZN45

FLZ-G = Zinc Flake coated, color Gray

FLZ-R = Zinc Flake coated, color Red

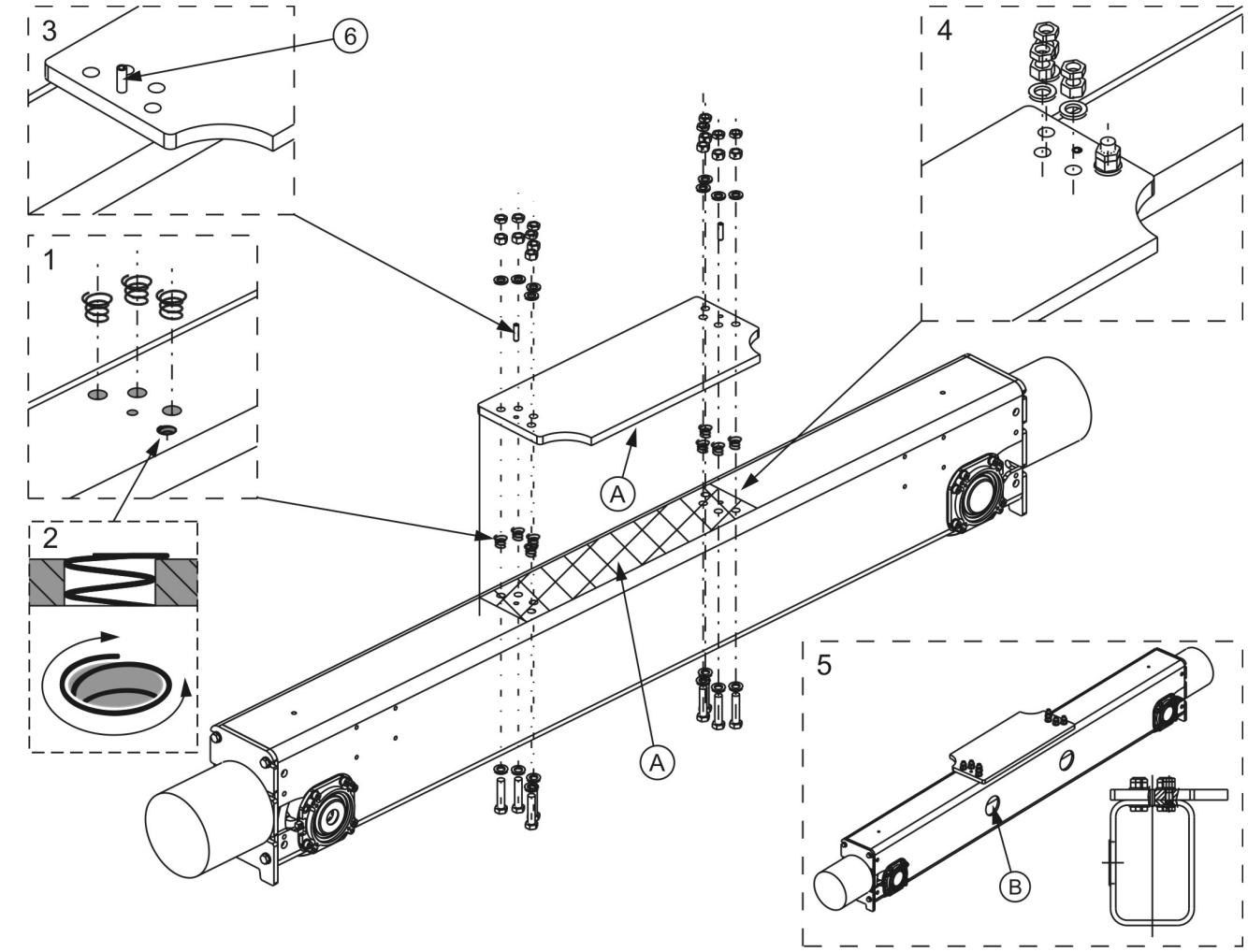
Suitable joint plates for end carriages:

End carriage	**Suitable joint plates**
GTL09, GTR09	A3
GTR11, GTR14	A4, A6
GTR16	B4,B6
GTR20	L3, L4, L5, L6, R3, R4, R5, R6, G1, G3, G5
GTR25	H4, H5, H7, H9, F4, F5, F7, F9, G1, G3, G5
GTR32	K4, K5, K7, K9, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q0, G2, G4, G6
GTR40	K5, K7, K9, S6, S7, S9, G2, G4, G6
GT50	K5, K7, K9, S6, S7, S9, G2, G4, G6

2.5.13 Joint plate assembly information

If the joint plate has been separate from end carriage put it back with following instruction.

2.5.13.1 Top joints (A3, A4, A6, B4, B6, L3-L6,H4-H9,K4-K9)



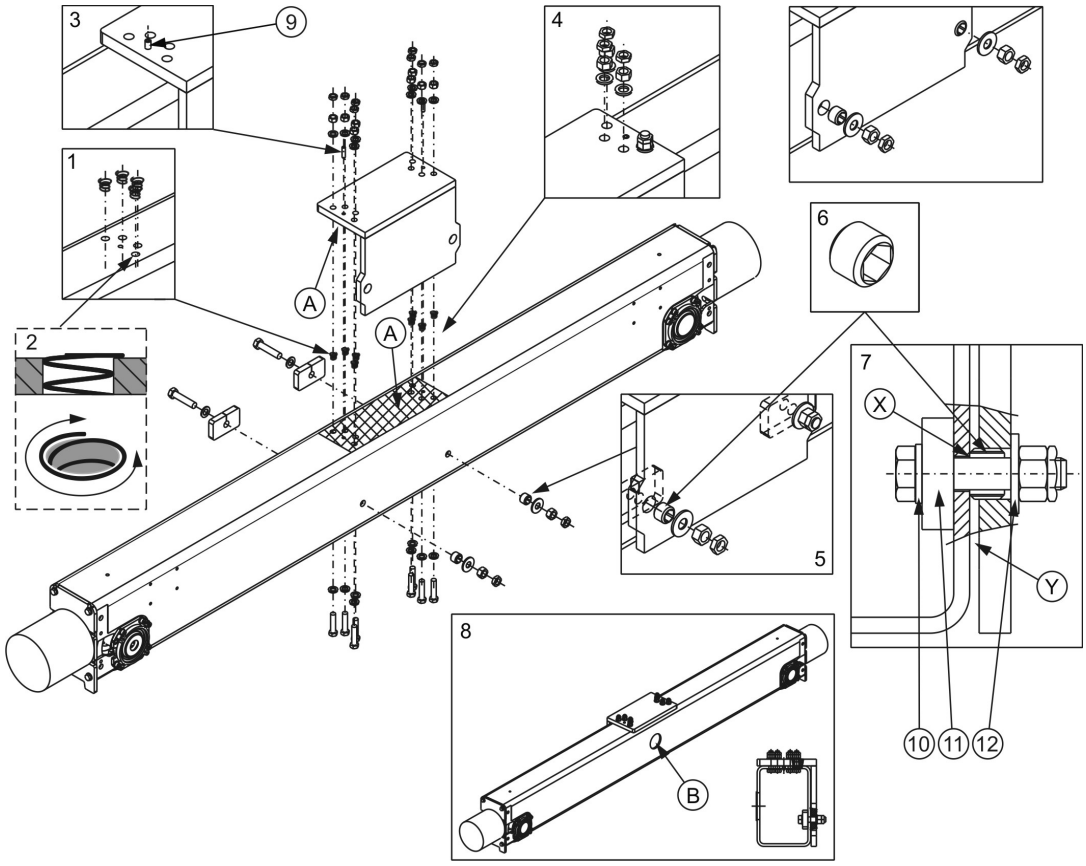
☞ In joint connection areas, marked with “A” in the picture, only workshop primer paint (thickness 20 microns) is allowed.

- Position the friction springs to the top holes of the end truck (picture 1).
- Make sure that the friction springs are positioned correctly. Approximately three-quarters of the top spiral should be located outside of the bolt hole (picture 2).
- Position joint plate (welded to the end of the main girder) on top of the end truck. Make sure that the friction springs stay on their positions.
- Hit guiding pins (pos. 6) through the joint plate and end carriage top flange. Make sure that the friction springs stay on their positions (picture 3).
- Fix bolts, washers and nuts (picture 4). Use hand holes on the side of the truck to fix the bolts (picture 5, pos. B).
- Tighten bolts to correct torque according to section “Recommended tightening torques”.
- Tightening of the bolts must be checked after crane tests.
- Tightening of the bolts must also be checked annually or according to section “Inspection and servicing intervals”.

Pos.	Connection	Friction rings
EB, EBN	Side connection	No
C, C-Gantry, G-Gantry	Top connection	No
P, L, A, K, B, H	Top connection	Yes
R, S, F, Q	Top connection / Side connection	Top yes, side no

Recommended tightening torques	
Screw size	**Tightening torque**
M16-10.9	300 Nm
M20-8.8	410 Nm
M20-10.9	590 Nm

2.5.13.2 Side joints (R3-R6, F4-F8, Q3-Q0, S6-S9)



☞ In joint connection areas, marked with “A” in the picture, only workshop primer paint (thickness 20 microns) is allowed.

- Position the friction springs to the top holes of the end truck (picture 1).
- Make sure that the friction springs are positioned correctly. Approximately three-quarters of the top spiral should be located outside of the bolt hole (picture 2).
- Position joint plate (welded to the end of the main girder) on top of the end truck. Make sure that the friction springs stay on their positions.
- Hit guiding pins (pos. 9) through the joint plate and end carriage top flange (picture 3).
- Fix bolts, washers and nuts on top of joint plate and tighten to correct torque (picture 4). Use hand holes on the side of the truck to fix the bolts (picture 8, pos. B).
- Remove the gap (X) between end carriage and threaded hex hole sleeve (picture 6) by tightening the threaded hex hole sleeve slightly (pictures 5 and 7).

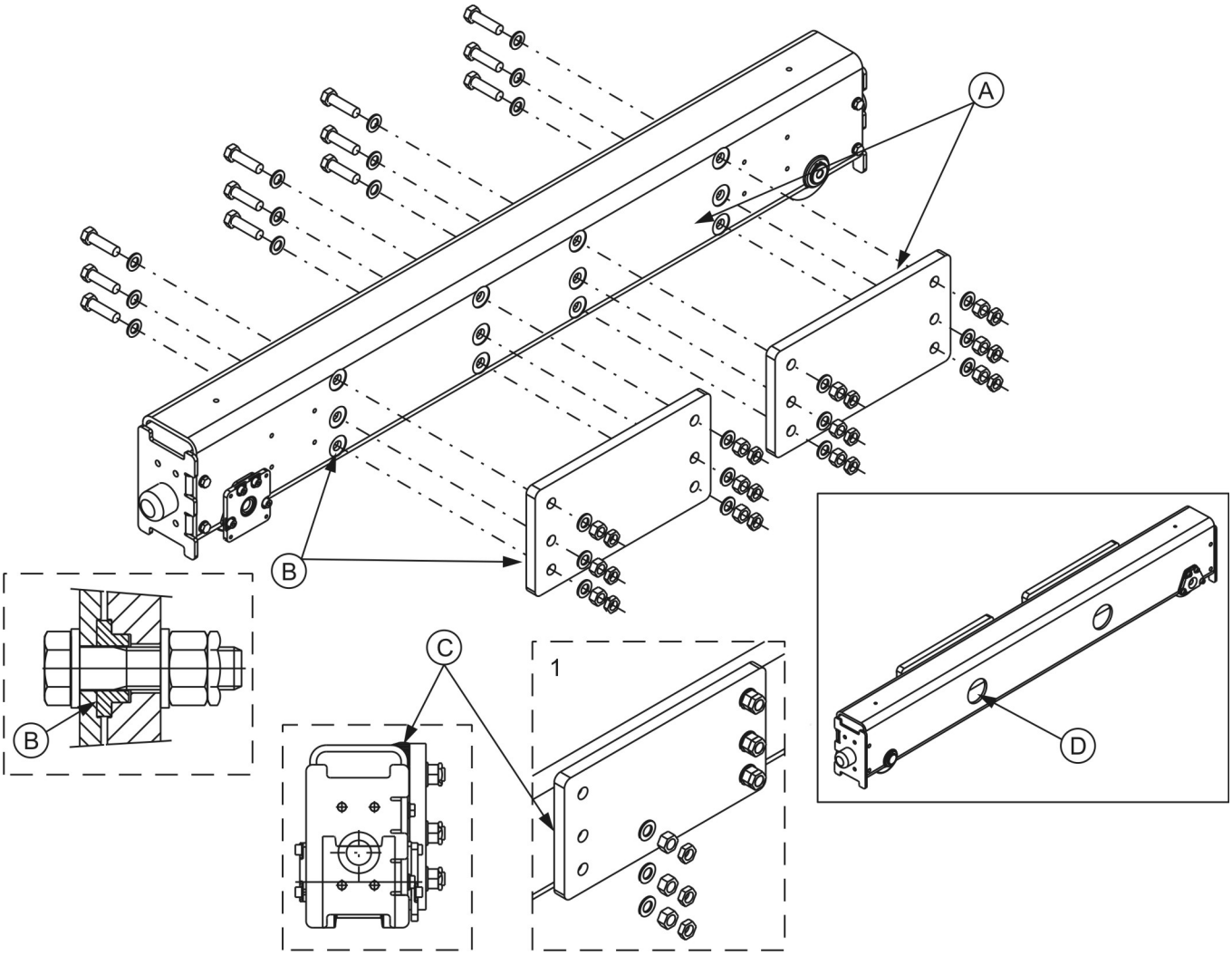
☞ Most likely, there remains the gap (Y) between side plate and end truck. This is normal and acceptable: key point is, that there is no gap between threaded hex sleeve and side of the end carriage.

- Fix bolts, washers and nuts on side: first place support plates (pos. 11) inside the end carriage box, then bolts from inside the end carriage box and through the threaded hex hole sleeves (picture 7). The smaller washers (pos. 10) are positioned to inside the end trucks box and the bigger washers (pos. 12) outside (picture 7).
- Tighten bolts to correct torque according to section “Recommended tightening torques”.
- Tightening of the bolts must be checked after crane tests.
- Tightening of the bolts must also be checked annually or according to section “Inspection and servicing intervals”.

Pos.	Connection	Friction rings
EB, EBN	Side connection	No
C, C-Gantry, G-Gantry	Top connection	No
P, L, A, K, B, H	Top connection	Yes
R, S, F, Q	Top connection / Side connection	Top yes, side no

Recommended tightening torques	
Screw size	**Tightening torque**
M16-10.9	300 Nm
M20-8.8	410 Nm
M20-10.9	590 Nm

2.5.13.3 Simple side joints (GRN09, GRN11, GRN14, GRN16)



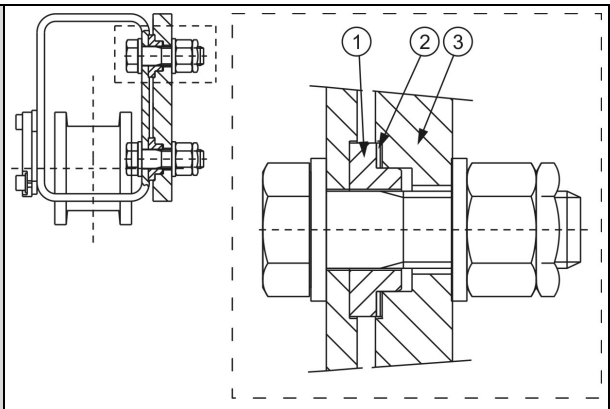
- Check that the contact surfaces (A) are clean from dirt, rust, paint and grease.
- Position joint plate (welded to the end of the main girder) to side of the end truck.
- Fix bolts, washers and nuts on side of joint plate and tighten to correct torque (picture 1). Use hand holes on the side of the truck to fix the bolts (pos. C).
- Tighten bolts to correct torque according to section “Recommended tightening torques”.
- Tightening of the bolts must be checked after crane tests.
- Tightening of the bolts must also be checked annually or according to section “Inspection and servicing intervals”.
- For outdoor applications, seal gap between connection plate and end carriage with sealant at top and sides (pos. B)

Pos.	Connection	Friction rings
EB, EBN	Side connection	No
C, C-Gantry, G-Gantry	Top connection	No
P, L, A, K, B, H	Top connection	Yes
R, S, F, Q	Top connection / Side connection	Top yes, side no

Recommended tightening torques	
Screw size	**Tightening torque**
M16-10.9	300 Nm
M20-8.8	410 Nm
M20-10.9	590 Nm

Correcting span

1



Insert adjusting washers (2) between connection plate (3) and flange bushing (1).

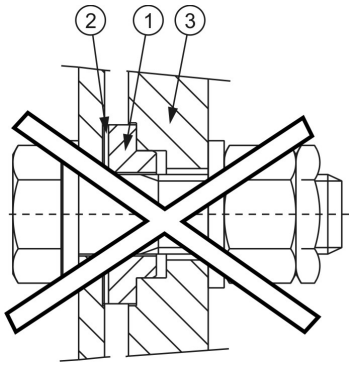
NOTE: Pay special attention to the position of the adjusting washer (2).

Span can be increased up to 4 mm, max. 2 mm on each end carriage

Minimum thickness for washer is 0.2 mm

Max. 3 washers on each end carriage

2

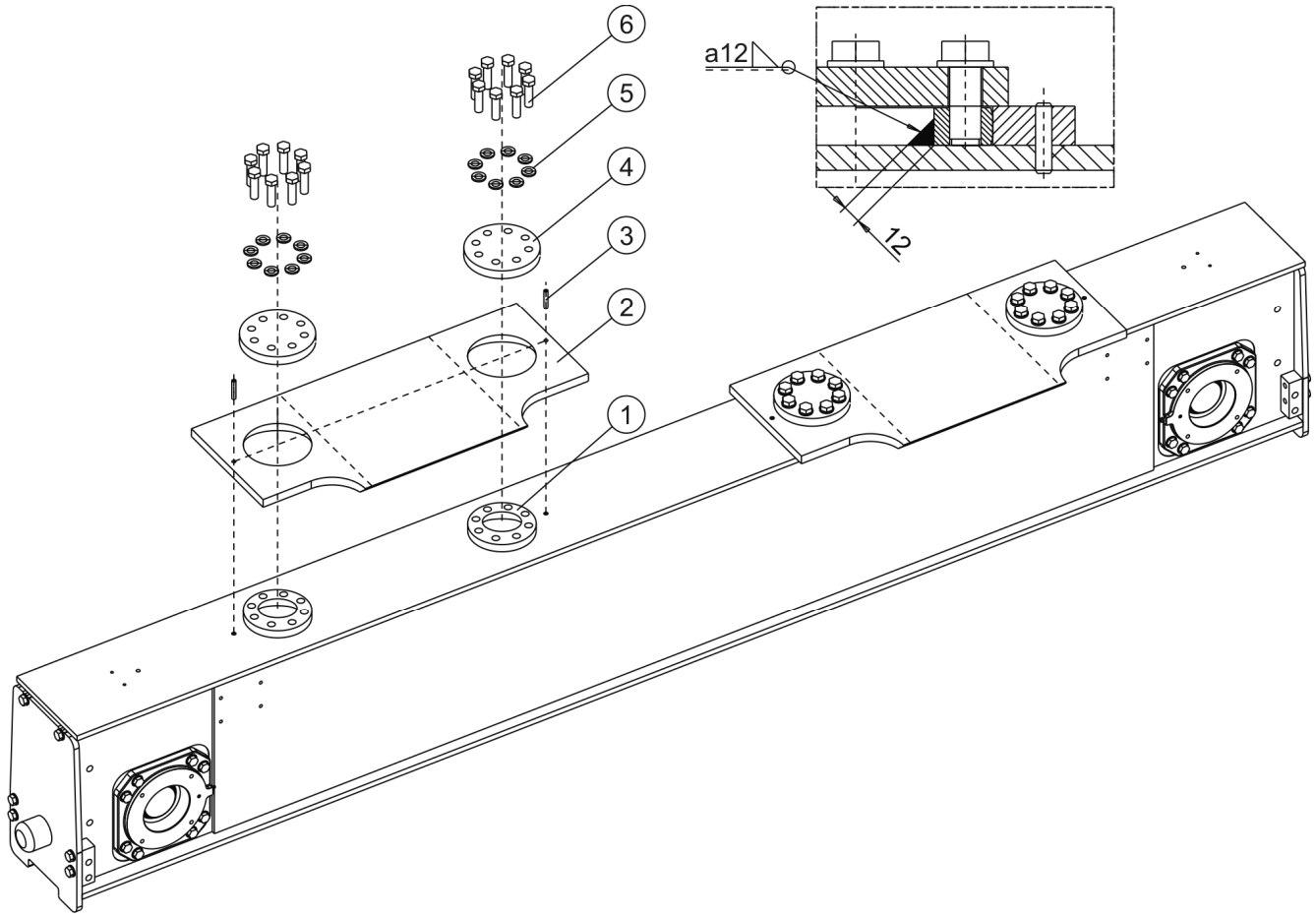


DO NOT mount adjusting washers (2) this way.

WARNING	**Incorrect mounting of adjusting washers can lead to loose bolt connections. Loose bolt connections could result in death or serious injury.**

2.5.13.4 Process crane joints (J1-J0)

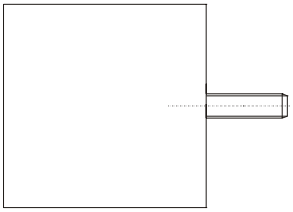
Process crane joints J1-J0 (SHBJ01-10) are available for GTR40.



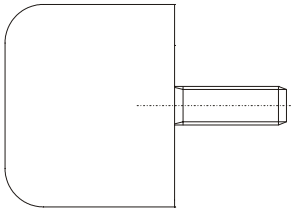
- Hit D10 guiding pins (3) through the joint plate (2) and end carriage top flange.
- Put the locking plates (1) to the joint plate holes.
- Weld the inner hole of locking plate to end carriage top flange (fillet weld, a = 12 mm)
- Fix the cover plates (4) on top locking plates with locking washers (5) and hex. bolts (6).

☞ NOTE! Special tightening torque 80 Nm

2.6 Buffers



Polyurethane buffer



Rubber buffer

The buffers are fixed to both ends of the end carriage by bolt connection, one bolt/buffer. The following buffer alternatives are available; rubber- and polyurethane buffers.

The buffers are selected case by case and the buffer type shall be included in the end carriage ordering code. The buffers suitability to the end carriages has to be checked separately (e.g. oversize buffers).

☞ Buffers may be supplied separately. In these cases they need to be fixed after transportation.

Buffer dimensions and suitability:

CODE	Diameter [mm]	Length[mm]	Weight [kg/pcs]	Material	End carriage
A	63	53	0.29	Rubber	GTR/GRN09, GTL09, GTR/GRN11, GTR/GRN16, GTR20
B	80	68	0.61	Rubber	GTR/GRN09, GTL09, GTR/GRN11, GTR/GRN16, GTR20, GTR25, GTR32, GT50
C	100	85	1.1	Rubber	GTR/GRN09, GTL09, GTR/GRN11, GTR/GRN16, GTR20, GTR25, GTR32, GT50
D	125	105	1.9	Rubber	GTR/GRN16, GTR20, GTR25, GTR32, GT50
K	80	80	0.5	Polyurethane	GTR/GRN09, GTL09, GTR/GRN11, GTR/GRN16
G	100	100	0.7	Polyurethane	GTR/GRN09, GTL09, GTR/GRN11, GTR/GRN16, GTR20
E	100	150	1	Polyurethane	GTR/GRN09, GTL09, GTR/GRN11, GTR/GRN16, GTR20, GTR25, GTR32, EC50
M	125	125	0.9	Polyurethane	GTR16, GTR20, GTR25, GTR32, GTR40, GT50
F	125	190	1.6	Polyurethane	GTR16, GTR20, GTR25, GTR32, GTR40, GT50
H	160	160	2.5	Polyurethane	GTR16, GTR20, GTR25, GTR32, GTR40, GT50
P	160	240	3.1	Polyurethane	GTR16, GTR20, GTR25, GTR32, GTR40, GT50
I	200	200	4.4	Polyurethane	GTR20, GTR25, GTR32, GTR40, GT50
S	200	300	5.6	Polyurethane	GTR20, GTR25, GTR32, GTR40, GT50
T *)	250	350	7.6	Polyurethane	GTR32, GTR40
Y *)	250	475	10.3	Polyurethane	GTR32, GTR40

*) needs special buffer extension adapter for GTR/GRN16. Additional length 100 mm.

**) needs special buffer extension adapter, fixing with M24 screw. Additional length 100 mm.

☞ Buffers where length is bigger than diameter, should not be used in cases, where two or more cranes on same runway

3 ADDITIONAL FEATURES

Additional features can be ordered with end carriages. When ordered, the last character in the code has to be E (N-when standard) and needed additional information has to be told by technical features (recommended) or free text. If multiple end carriage options are needed (e.g. guide rollers and anti-jump catches), special design is required.

Example:

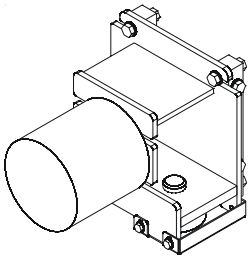
GTR09-1690-A30000C0000-E

OTH24	Anti-jump catches for one end carriage	2 PCS
BT32	Side of crane end carriage	SPAN SIDE
DIM23	L1 measure for anti-jump catches	10 MM
DIM24	L2 measure for anti-jump catches	60 MM

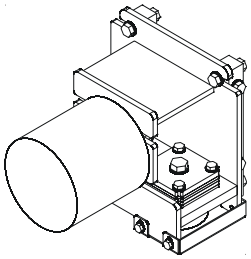
or

* Anti-jump catches, 2 pcs, Span side, L1=10 mm, L2=60mm

3.1 Guide rollers



Fixed guide roller, guide roller for GTR20 shown



Adjustable guide roller, guide roller for GTR20 shown

Ordering example:

GTR20-2584-L40000C0000-E

OTH25	Guide rollers for end carriage	TH
BT30	Width of crane runway rail	65 MM

* Adjustable guide roller

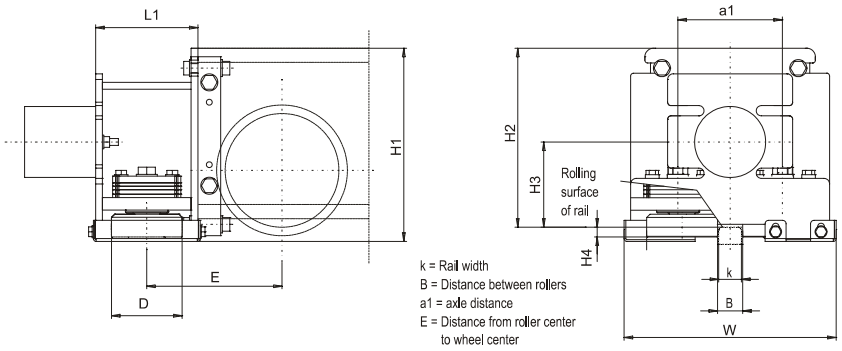
or

* Guide rollers, adjustable, rail width 65 mm.

Standard guide roller boxes are designed separately for each wheel size and they can take the same horizontal forces as end carriages. The guide rollers are fixed to the ends of the end carriages by bolt joint. The guide rollers are available as fixed or adjustable. It is strongly recommended to use only adjustable guide rollers. Re-alignment for adjustable guide rollers can be done by turning the eccentric shafts, the rollers can be adjusted in the sideward direction ± 10mm (GTR/GRN09, GTR/GRN11), ± 15mm (GTR/GRN14, GTR/GRN16, GTR20, GTR25, GTR32) or ± 11 mm (GTR40)

Guide rollers are available when needed; they can also be added afterwards. The guide rollers can be used when the rail is fixed by welding or with rail clamps, but the space between guide roller and clamp/welding seam must be checked case by case. The guide rollers must be mentioned separately in the end carriage order (special properties).

NOTE! Used rail width must be mentioned. It also has to be told if the guide roller is fixed to right or left handed end carriage.



Adjustable guide roller, dimensions
Guide roller for GTR20 shown

Adjustable guide roller dimensions:

End carriage type	Rail width [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	B [mm]	W [mm]	a1 [mm]	L1 [mm]	D [mm]	E [mm]
GRN09	40	229	170	100	20	44	230	116	135	62	200
GTR09	45	229	170	100	20	49	230	116	135	62	200
	50	229	170	100	20	54	230	116	135	62	200
	55	235	170	100	26	59	230	116	135	62	200
	60	235	170	100	26	64	230	116	135	62	200
	65	235	170	100	26	69	230	136	135	62	200
	70	235	170	100	26	74	230	136	135	62	200
	75	235	170	100	26	79	230	136	135	62	200
	80	235	170	100	26	84	230	136	135	62	200
GRN11	40	289	170	100	20	44	230	116	135	62	200
GTR11	45	289	170	100	20	49	230	116	135	62	200
	50	289	170	100	20	54	230	116	135	62	200
	55	295	170	100	26	59	230	116	135	62	200
	60	295	170	100	26	64	230	116	135	62	200
	65	295	170	100	26	69	230	136	135	62	200
	70	295	170	100	26	74	230	136	135	62	200
	75	295	170	100	26	79	230	136	135	62	200
	80	295	170	100	26	84	230	136	135	62	200
GRN14	40	289	265	100	19	44	278	139	160	80	210
GTR14	45	289	265	100	19	49	278	139	160	80	210
	50	289	265	100	19	54	278	139	160	80	210
	55	297	265	100	27	59	278	139	160	80	210
	60	297	265	100	27	64	278	139	160	80	210
	65	297	265	100	27	69	278	139	160	80	210
	70	297	265	100	27	74	278	139	160	80	210
	75	305	265	100	35	79	278	169	160	80	210
	80	305	265	100	35	84	278	169	160	80	210
	90	305	265	100	35	94	278	169	160	80	210
	100	305	265	100	35	104	278	169	160	80	210
GRN16	40	289.1	265.1	100	19	44	278	139	160	80	230
GTR16	45	289.1	265.1	100	19	49	278	139	160	80	230
	50	289.1	265.1	100	19	54	278	139	160	80	230
	55	297.1	265.1	100	27	59	278	139	160	80	230
	60	297.1	265.1	100	27	64	278	139	160	80	230
	65	297.1	265.1	100	27	69	278	139	160	80	230
	70	297.1	265.1	100	27	74	278	139	160	80	230
	75	305.1	265.1	100	35	79	278	169	160	80	230

End carriage type	Rail width [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	B [mm]	W [mm]	a1 [mm]	L1 [mm]	D [mm]	E [mm]
	80	305.1	265.1	100	35	84	278	169	160	80	230
	90	305.1	265.1	100	35	94	278	169	160	80	230
	100	305.1	265.1	100	35	104	278	169	160	80	230
GTR20	40	340	315	150	17	44	373	184	180	125	238
	45	340	315	150	17	49	373	184	180	125	238
	50	340	315	150	17	54	373	184	180	125	238
	55	348	315	150	25	59	373	184	180	125	238
	60	348	315	150	25	64	373	184	180	125	238
	65	348	315	150	25	69	373	184	180	125	238
	70	348	315	150	25	74	373	184	180	125	238
	75	354	315	150	31	79	373	214	180	125	238
	80	354	315	150	31	84	373	214	180	125	238
	90	354	315	150	31	94	373	214	180	125	238
	100	354	315	150	31	104	373	214	180	125	238
	105	361	315	150	39	109	403	244	180	125	238
	110	361	315	150	39	114	403	244	180	125	238
	115	361	315	150	39	119	403	244	180	125	238
	120	361	315	150	39	124	403	244	180	125	238
	125	361	315	150	39	129	403	244	180	125	238
	130	361	315	150	39	134	403	244	180	125	238
GTR25	40	340.2	315.2	150	19	44	397	199	194	140	261
	45	340.2	315.2	150	19	49	397	199	194	140	261
	50	340.2	315.2	150	19	54	397	199	194	140	261
	55	348.2	315.2	150	27	59	397	199	194	140	261
	60	348.2	315.2	150	27	64	397	199	194	140	261
	65	348.2	315.2	150	27	65	397	199	194	140	261
	70	348.2	315.2	150	27	74	397	199	194	140	261
	75	356.2	315.2	150	35	79	397	229	194	140	261
	80	356.2	315.2	150	35	84	397	229	194	140	261
	90	356.2	315.2	150	35	94	397	229	194	140	261
	100	356.2	315.2	150	35	104	397	229	194	140	261
	105	360.2	315.2	150	39	109	427	259	194	140	261
	110	360.2	315.2	150	39	114	427	259	194	140	261
	115	360.2	315.2	150	39	119	427	259	194	140	261
	120	360.2	315.2	150	39	124	427	259	194	140	261
	125	360.2	315.2	150	39	129	427	259	194	140	261
	130	360.2	315.2	150	39	134	427	259	194	140	261
GTR32	45	381.3	456.3	150	20	49	490	240	236	180	350
	50	381.3	456.3	150	20	55	490	240	236	180	350
	55	381.3	456.3	150	20	60	490	240	236	180	350
	60	387.3	456.3	150	26	65	490	240	236	180	350
	65	387.3	456.3	150	26	70	490	240	236	180	350
	70	387.3	456.3	150	26	74	490	240	236	180	350
	75	395.3	456.3	150	34	79	490	240	236	180	350
	80	395.3	456.3	150	34	85	490	270	236	180	350
	90	395.3	456.3	150	34	95	490	270	236	180	350
	100	395.3	456.3	150	34	104	490	270	236	180	350
	105	400.3	356.3	150	39	109	520	300	236	180	350
	110	400.3	356.3	150	39	114	520	300	236	180	350
	115	400.3	356.3	150	39	119	520	300	236	180	350
	120	400.3	356.3	150	39	124	520	300	236	180	350
	125	400.3	356.3	150	39	159	520	300	236	180	350
	130	400.3	356.3	150	39	134	520	300	236	180	350
GTR40	40	558.4	532.4	150	20	44	650	301	316	250	422
	45	558.4	532.4	150	20	49	650	301	316	250	422
	50	558.4	532.4	150	20	54	650	301	316	250	422
	55	558.4	532.4	150	20	59	650	301	316	250	422
	60	566.4	532.4	150	28	64	650	323	316	250	422

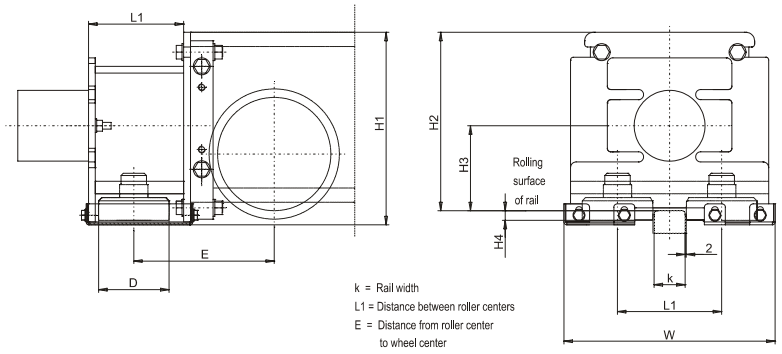
End carriage type	Rail width [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	B [mm]	W [mm]	a1 [mm]	L1 [mm]	D [mm]	E [mm]
	65	566.4	532.4	150	28	69	650	323	316	250	422
	70	566.4	532.4	150	28	74	650	323	316	250	422
	75	578.4	532.4	150	40	79	650	345	316	250	422
	80	578.4	532.4	150	40	84	650	345	316	250	422
	85	578.4	532.4	150	40	89	650	345	316	250	422
	90	578.4	532.4	150	40	94	650	345	316	250	422
	95	578.4	532.4	150	40	99	650	345	316	250	422
	100	578.4	532.4	150	40	104	650	345	316	250	422
	110	578.4	532.4	150	40	114	650	367	316	250	422
	120	578.4	532.4	150	40	124	650	367	316	250	422
	130	578.4	532.4	150	40	134	680	389	316	250	422
	140	578.4	532.4	150	40	144	680	389	316	250	422
	150	578.4	532.4	150	40	154	680	411	316	250	422
	160	578.4	532.4	150	40	164	680	411	316	250	422

1) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 250 mm. Add 50 mm for tube height 300 mm.

2) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 300 mm. Add 100 mm for tube height 400 mm.

3) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 350 mm. Add 100 mm for tube height 450 mm and add 175 mm for tube height 525 mm.

4) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 532 mm. Add 120 mm for tube height 652 mm.



Fixed guide roller, dimensions
Guide roller for GTR20 shown

Fixed guide roller dimensions:

End carriage type	Rail width [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	W [mm]	a1 [mm]	L1 [mm]	D [mm]	E [mm]
GTR09	40	229	170	100	20	230	106	135	62	198
GRN09	45	229	170	100	20	230	111	135	62	198
	50	229	170	100	20	230	116	135	62	198
	55	235	170	100	26	230	121	135	62	198
	60	235	170	100	26	230	126	135	62	198
	65	235	170	100	26	230	131	135	62	198
	70	235	170	100	26	230	136	135	62	198
	75	235	170	100	26	230	141	135	62	198
	80	235	170	100	26	230	146	135	62	198
GRN11	40	289	170	100	20	230	106	135	62	198
GTR11	45	289	170	100	20	230	111	135	62	198
	50	289	170	100	20	230	116	135	62	198
	55	295	170	100	26	230	121	135	62	198
	60	295	170	100	26	230	126	135	62	198
	65	295	170	100	26	230	131	135	62	198
	70	295	170	100	26	230	136	135	62	198
	75	295	170	100	26	230	141	135	62	198
	80	295	170	100	26	230	146	135	62	198
GRN14	40	289	265	100	19	278	124	160	80	210
GTR14	45	289	265	100	19	278	129	160	80	210
	50	289	265	100	19	278	134	160	80	210
	55	297	265	100	27	278	139	160	80	210
	60	297	265	100	27	278	144	160	80	210
	65	297	265	100	27	278	149	160	80	210
	70	297	265	100	27	278	154	160	80	210
	75	305	265	100	35	278	159	160	80	210
	80	305	265	100	35	278	164	160	80	210
	85	305	265	100	35	278	169	160	80	210
	90	305	265	100	35	278	174	160	80	210
	95	305	265	100	35	278	179	160	80	210
	100	305	265	100	35	278	184	160	80	210
GRN16	40	289.1	265.1	100	19	278	124	160	80	230
GTR16	45	289.1	265.1	100	19	278	129	160	80	230
	50	289.1	265.1	100	19	278	134	160	80	230
	55	297.1	265.1	100	27	278	139	160	80	230
	60	297.1	265.1	100	27	278	144	160	80	230
	65	297.1	265.1	100	27	278	149	160	80	230
	70	297.1	265.1	100	27	278	154	160	80	230

End carriage type	Rail width [mm]	H1 [mm]	H2 [mm]	H3 [mm]	H4 [mm]	W [mm]	a1 [mm]	L1 [mm]	D [mm]	E [mm]
	75	305.1	265.1	100	35	278	159	160	80	230
	80	305.1	265.1	100	35	278	164	160	80	230
	90	305.1	265.1	100	35	278	174	160	80	230
	100	305.1	265.1	100	35	278	184	160	80	230
GTR20	40	340	315	150	17	373	169	180	125	248
	45	340	315	150	17	373	174	180	125	248
	50	340	315	150	17	373	179	180	125	248
	55	348	315	150	25	373	184	180	125	248
	60	348	315	150	25	373	189	180	125	248
	65	348	315	150	25	373	194	180	125	248
	70	348	315	150	25	373	199	180	125	248
	75	354	315	150	31	373	204	180	125	248
	80	354	315	150	31	373	209	180	125	248
	100	354	315	150	31	373	229	180	125	248
GTR25	40	340.2	315.2	150	19	395	184	194	140	263
	45	340.2	315.2	150	19	395	189	194	140	263
	50	340.2	315.2	150	19	395	194	194	140	263
	55	348.2	315.2	150	27	395	199	194	140	263
	60	348.2	315.2	150	27	395	204	194	140	263
	65	348.2	315.2	150	27	395	209	194	140	263
	70	348.2	315.2	150	27	395	214	194	140	263
	75	356.2	315.2	150	35	395	219	194	140	263
	80	356.2	315.2	150	35	395	224	194	140	263
	100	356.2	315.2	150	35	395	244	194	140	263
GTR32	45	381.3	356.3	150	20	490	229	236	180	350
	50	381.3	356.3	150	20	490	234	236	180	350
	55	381.3	356.3	150	20	490	239	236	180	350
	60	387.3	356.3	150	26	490	244	236	180	350
	65	387.3	356.3	150	26	490	249	236	180	350
	70	387.3	356.3	150	26	490	254	236	180	350
	75	395.3	356.3	150	34	490	259	236	180	350
	80	395.3	356.3	150	34	490	264	236	180	350
	100	395.3	356.3	150	34	490	284	236	180	350
GTR40	40	558.4	532.4	150	20	650	294	316	250	422
	50	558.4	532.4	150	20	650	304	316	250	422
	55	558.4	532.4	150	20	650	309	316	250	422
	60	566.4	532.4	150	28	650	314	316	250	422
	65	566.4	532.4	150	28	650	319	316	250	422
	70	566.4	532.4	150	28	650	324	316	250	422
	75	578.4	532.4	150	40	650	329	316	250	422
	80	578.4	532.4	150	40	650	334	316	250	422
	100	578.4	532.4	150	40	650	354	316	250	422
	120	578.4	532.4	150	40	650	374	316	250	422

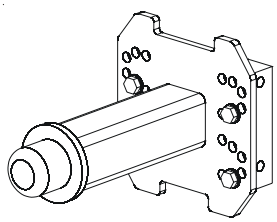
1) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 250 mm. Add 50 mm for tube height 300 mm.

2) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 300 mm. Add 100 mm for tube height 400 mm.

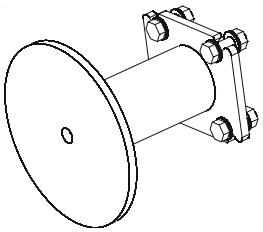
3) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 350 mm. Add 100 mm for tube height 450 mm and add 175 mm for tube height 525 mm.

4) Dimensions change according to wheel base and thus according to tube height. Dimensions in this table are valid for tube height 532 mm. Add 120 mm for tube height 652 mm.

3.2 Buffer extension



Buffer extension for GTR09/11, shown with buffer



Buffer extension for GTR32, shown without buffer

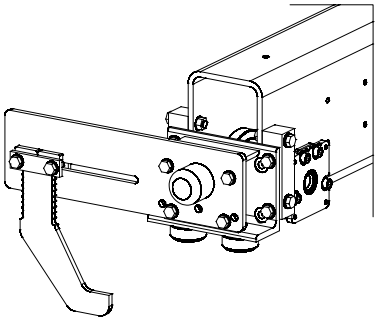
Ordering example:

GTR32-5074-K40000C0000-E

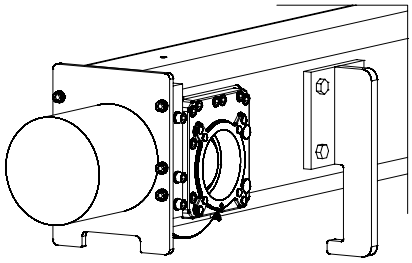
DES44 Crane buffer extension 1 250 mm
DES50 Crane buffer extension 2 250 mm

End carriage	Standard buffer extension lengths [mm] (without buffer)
GTL09	-
GRN/GTR09	100, 250, 500,1000, 1500
GRN/GTR11	100, 250, 500, 1000, 1500
GRN/GTR14	100, 148, 250, 500, 750, 1000, 1500
GRN/GTR16	100, 148. 250, 500, 750, 1000, 1500
GTR20	100, 168, 250, 500, 750, 1000, 1500
GTR25	100, 182, 250, 500, 750, 1000, 1500
GTR32	100, 222, 250, 322, 500, 750, 1000, 1500
GTR40	100, 250, 300, 400, 500, 750, 1000, 1500

3.3 Anti-jump catches



Anti-jump catch, GTR/GRN 09/11/16



Anti-jump catch, GTR 20…40

GRN and GTR end carriages can be equipped with anti-jump catches. The anti-jump catches must be mentioned separately in the end carriage order (special properties).

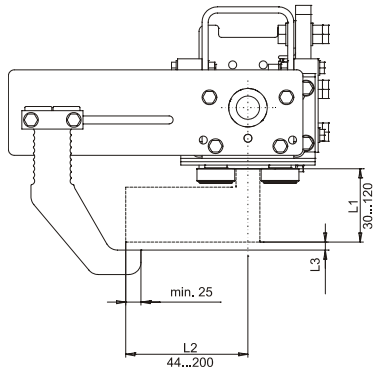
Ordering example:

GTR32-5074-K40000C0000-E

OTH24	Anti-jump catches for one end carriage	2
BT32	Side of crane end carriage	SPAN SIDE
DIM23	L1 measure for anti-jump catches	59 MM
DIM24	L2 measture for anti-jump catches	103 MM

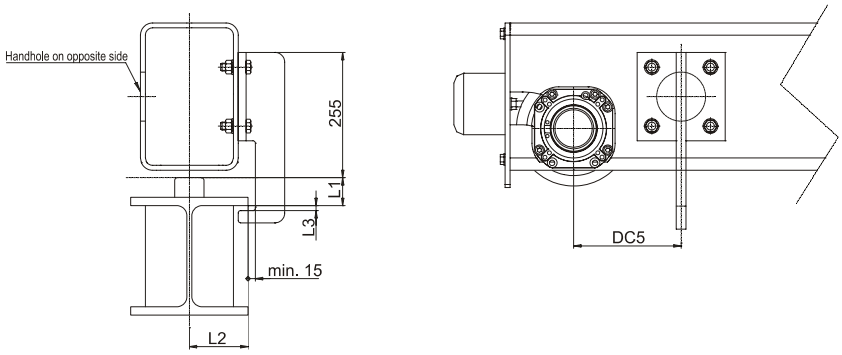
or

* Anti-jump catches, 2 pcs, Span side, L1=50 mm, L2=160mm



Dimensions
Anti-jump catch, GTR/GRN 09…16

End carriage	Max holding force [kN]	Max. L3 [mm]
GRN/GTR09	10.5	5
GRN/GTR11	14.4	7.5
GRN/GTR14	24	7.5
GRN/GTR16	24	7.5



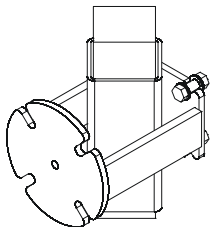
Dimensions, Anti-jump catch, GTR20…40

End carriage	min. DC5 [mm]	max. L3 [mm]	Max holding force [kN]
GTR20	330	7.5	40
GTR25	365	7.5	56
GTR32 (SS ≤ 32)	365	10	80
GTR32 (SS ≥ 40)	325	10	80
GTR40 (SS ≤ 25)	330	10	121
GTR40 (SS ≥ 25)	355	10	121

NOTE! When anti-jump catch for GTR 20…40 is ordered, dimensions L1, L2 and DC5 must be mentioned. Location of the catches must be mentioned (right or left handed end carriage or both, driving unit side or opposite side of end carriage, dimension from driving wheel on GTR 20…40).

For earthquake area anti-jumping catches are recommended to be added on each corner.

3.4 Rail sweeps



Rail sweep

GRN/GTR end carriages can be equipped with rail sweeps. Sweeps can be ordered separately, but it has to be told to which end carriage it will be fixed. Sweeper is working with gravity, type Wood is wooden block, which is easy to replace when it wears out. Also type Steel is available, where the sweeper is flat steel bar instead of wooden block. However, the Wood is recommended.

Ordering example:

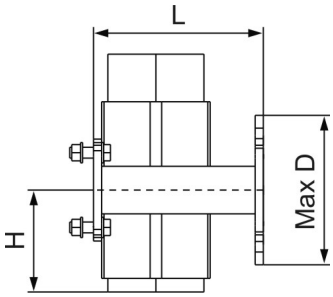
GTR32-5074-K40000C0000-E

OTH21 Rail sweeps for crane end carriage WOOD

or

Rail sweeps, wood

☞ NOTE! Rail sweeps will add dimension from wheel to the end, as buffer extension.

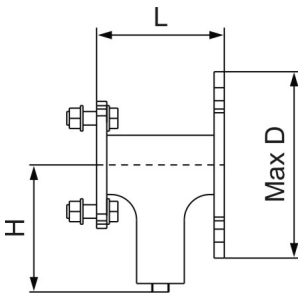


Rail sweep dimensions

End carriage	L [mm]	H [mm]	Max D [mm]	Weight [kg]
GTR09/GRN09/GTL09	170	100	160	7
GTR11/GRN11	170	100	160	7
GTR14/GRN14	170	100	160	7
GTR16/GRN16	170	100	160	7
GTR20	250	150	220	18
GTR25	250	150	220	18
GTR32	250	150	220	18
GTR40	250	150	220	18

Rail sweeps, Steel

☞ NOTE! Rail sweeps will add dimension from wheel to the end, as buffer extension.

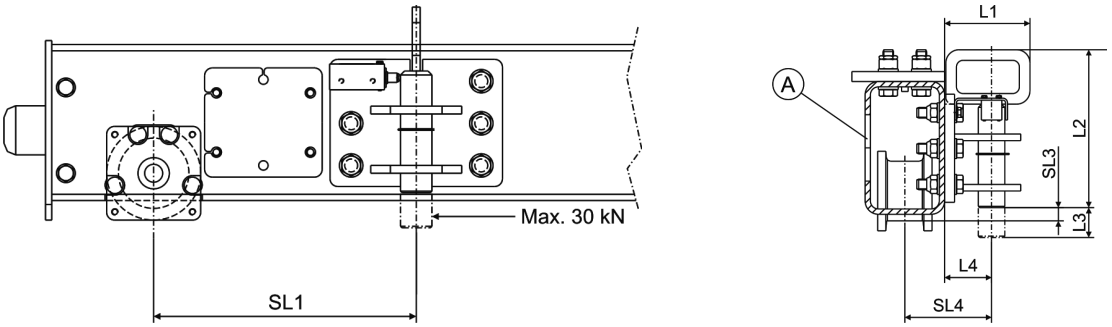


Rail sweep dimensions

End carriage	L (mm)	H [mm]	Max D [mm]	Weight [kg]
GTR09/GRN09/GTL09	150	100	160	9
GTR11/GRN11	150	100	160	9
GTR14/GRN14	150	100	160	9
GTR16/GRN16	150	100	160	9
GTR20	150	150	220	16.5
GTR25	150	150	220	16.5
GTR32	150	150	220	16.5
GTR40	150	150	220	16.5

3.5 Storm lock

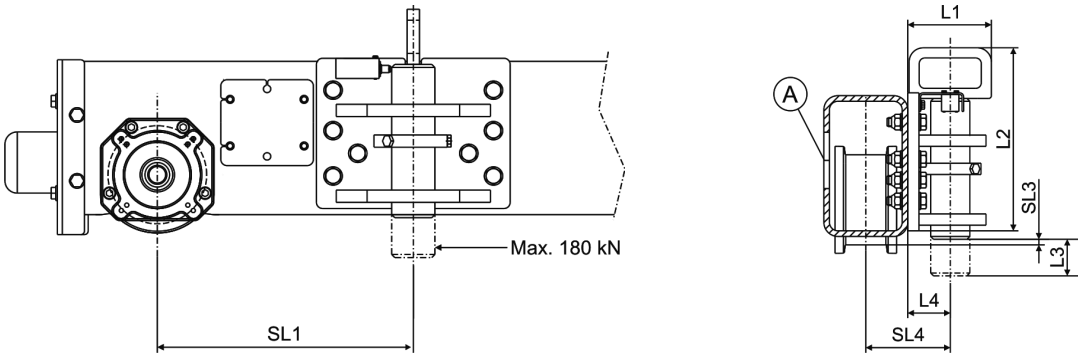
3.5.1 Mechanical, GTL09, GRN/GTR09, GRN/GTR11, GRN/GTR14



A. Hand hole
L1 = 129 mm
L2 = 230 mm
L3 = max 45 (stroke), Horizontal force located 22 mm below rail top level.

Storm lock dimensions				
End carriage	**min. SL1**	**SL3**	**SL4**	**Weight [kg]**
GTL09	335	7	119	9
GRN/GTR09	335	20	131	9
GRN/GTR11	335	25	146	9
GRN/GTR14	335	25	146	9

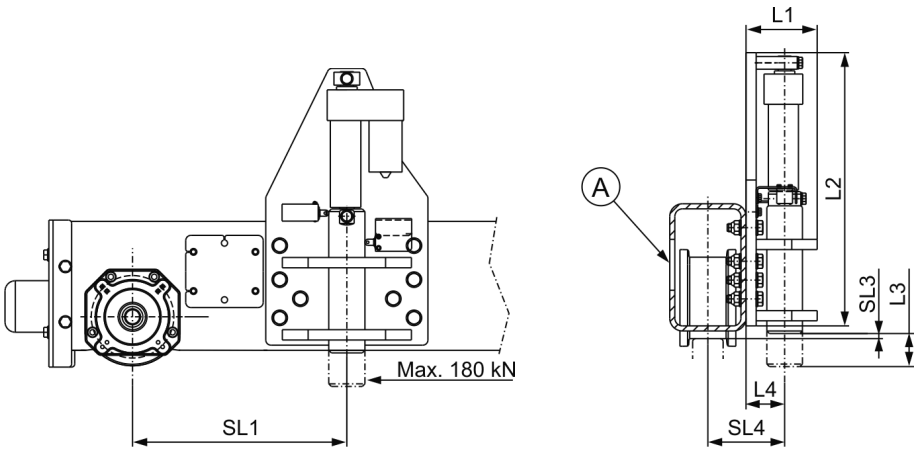
3.5.2 Mechanical, GRN/GTR16, GTR20, GTR25, GTR32, GTR40, GT50



A. Hand hole
L1 = 150 mm
L2 = 325 mm
L3 = max 65 (stroke), Horizontal force located 22 mm below rail top level

Storm lock dimensions				
End carriage	**min. SL1**	**SL3**	**SL4**	**Weight [kg]**
GRN/GTR16	415	10	151	30
GTR20 – R/L	402	15	176	30
GTR20 - G	557	15	176	30
GTR25 – H/F	427	15	176	30
GTR25 - G	557	15	176	30
GTR32 – K/Q; SS=25…32	427	20	218	40
GTR32 – K/Q; SS=40…55	467	20	226	40
GTR32 – G, SS=25…32	557	20	218	40
GTR32 – G, SS=40…55	557	20	226	40
GTR32 Bogie	427	20	218	40
GTR40 – S/J/K, SS=32…55	455	20	253	46
GTR40 - G	530	20	253	46
GTR40, SS=25 / Bogie	455	20	243	46
GT50	485	25	233	40

3.5.3 Electrical, GRN/GTR16, GTR20, GTR25, GTR32, GTR40, GT50



A. Hand hole
L1 = 140 mm
L2 = 537 mm
L3 = max 65 (stroke), Horizontal force located 22 mm below rail top level

Storm lock dimensions				
End carriage	**min. SL1**	**SL3**	**SL4**	**Weight [kg]**
GRN/GTR16	415	10	151	45
GTR20 – R/L	402	15	176	45
GTR20 – G	557	15	176	45
GTR25 – H/F	427	15	176	45
GTR25 – G	557	15	176	45
GTR32 – K/Q; SS=25…32	427	20	218	54
GTR32 – K/Q; SS=40…55	467	20	226	54
GTR32 – G, SS=25…32	557	20	218	54
GTR – G, SS=40…55	557	20	226	54
GTR32 Bogie	427	20	218	54
GTR40 – S/J/K, SS=32…55	455	20	253	61
GTR40 – G	530	20	253	61
GTR40, SS=25 / Bogie	455	20	243	61
GT50	485	25	233	54

Ordering example:

GTR32-5074-K40000C0000-E

OTH22	Storm lock device	MANUAL
DIM25	SL1 dimension for storm lock device	500 MM
BT32	Side of crane end carriage	OUTSIDE

or

* Storm lock, outside, SL1=500mm

Storm locks are always delivered with limit switches to avoid crane travel start, if lock is active.

☞ NOTE! When ordered, location of the lock must be mentioned (right or left handed end carriage, driving unit side or opposite side of end carriage, dimension from diving wheel SL1).

3.6 Polyuretane flat wheels

GRN/GTR end carriages can be equipped with wheels which have running surfaces coated with polyurethane plastic. Nominal diameter range is from 140 mm to 400 mm. Both idle and driving wheel as non flanged types are available. The wheel body has equal outer dimension and markings as equivalent casted wheel. Coated wheels can be used in corresponding end carriages as casted wheels. The polyurethan flat wheels must be mentioned separately in the end carriage order (special properties), contact product specialists for more information.

In general polyurethane coating has following characteristics:

- Ensure silent, smooth running and lower surface pressure under wheel
- Increased friction between rail and wheel
- Rolling resistance about. 1,5…2 times of steel wheel
- High resistance to wearing and tearing and good resistance to mineral oils and greases
- The colour of coating may get darker during time, which doesn't effect to properties

Maximum wheel loads with non flanged wheels are presented in table below. The values are limited to following conditions:

- Thickness of coating according to given figures
- Maximum travelling speed 63m/min
- Material of coating: special PU-V-40 from Vulkollan®; hardness 95° Sha
- Operating temperature range -10°C…+40°C
- If operating conditions of the wheel are wet (humidity close to 100 %, water or other liquid on track), please contact product specialist, since standard material cannot be used
- Running surface can be of steel, concrete or eq. and should be smooth and free from loose particles
- If the wheel is standing still for very long time with load on, there may be small compression in surface, which will disappear during use. It is recommended to drive crane weekly.

Maximum wheel loads for Vulkollan® coated wheels:

Available wheel sizes					
Diameter of wheel D [mm]	140	160	200	250	315
Thickness of coating H [mm]	15	15	21.5	26.5	34
Width of flangeless wheel B [mm]	110	130	130	120	134
Max Dyn wheel load [kN]	36	39	61	70	100
Max allowed wear of coat thickness [mm]	2	2	2	3	3

3.7 Hardened wheels

Contact product specialists for more information.

4 ORDERING THE END CARRIAGE

The order code defines an order for one end carriage. When two end carriages are ordered those are manufactured as a pair; one left- and one right-handed. When only one end carriage is ordered, it has to be told if it is left- or right-handed. See section “Travelling Machinery”.

4.1 Factory code example (Factory:ECL)

ECL	09	-	16	60	-	A3	0000	C	0000	-	N
GE19	WHE01		WHE02	BT08		DES08		(DES09)	DIM29	(PAI04/ PAI05)	
1-3	4,5	6	7,8	9,10	11	12,13	14-17	18	19-22	23	24

Pos.	Code	Feature code	Feature	Available properties			
1-3	**ECL**	GE19	Short product name	ECL	Factory code		
4,5	**09**	WHE01	Wheel diameter	09	90 mm		
6	**-**		Description	-	Standard	C	Asymmetrical joint with single girder
7,8	**16**	WHE02	Wheelbase	Wheel base dimension		Applicable end carriage	
				13	1250 mm	ECL09	
				16	1600 mm	ECL09	
				20	2000 mm	ECL09	
9,10	**60**	BT08	Groove width		Applicable end carriage		
				50-70	ECL09 (rail head width + 10 mm), guide rollers not allowed, not available		
11	**-**		Number of driving wheels	-	One driving wheel/end carriage		
				D	Two driving wheels/end carriage		
12,13	**A3**	DES08	Joint type		Top joints		Applicable end carriage
				A3	4-bolt connection (B<310mm)		ECL09, ECN09
14-17	**0000**		Bolt joint distance	####	Joint plates distance between alignment pin centers with double girder.	0000	With single girder, dimension from driving wheel to pin with asymmetrical joint.
18	**C**	(DES09)	Buffer type	ECL09	A, B, C, K, G, E	A, B, C	Rubber buffers
						K, G, E	PUR buffers
						0	No buffer
19-22	**0000**	DIM29	Bogie inner wheel distance	0000	No bogie type end carriage		
23	**-**	PAI04 PAI05	Colour code	-	Standard primary paint	KC5 (workshop primer paint)	
				P	Special primary paint	KC2	
				K	Standard finishing paint	KC1, RAL 1028 (Yellow)	
24	**N**		Special properties	N	Standard	E	Special

4.2 Verlinde code example (Verlinde: GTL, Factory: GTL)

GTL	09	-	16	60	-	A3	0000	C	0000	-	N
(GE19)	WHE01		WHE02	BT08		DES08		(DES09)	DIM29	(PAI04/ PAI05)	
1-3	4,5	6	7,8	9,10	11	12,13	14-17	18	19-22	23	24

Pos.	Code	Feature code	Feature	Available properties			
1-3	**GTL**	(GE19)	Short product name	GE19 value GTL	Verlinde ECL		
4,5	**09**	WHE01	Wheel diameter	09	90 mm		
6	**-**		Description	-	Standard	C	Asymmetrical joint with single girder
7,8	**16**	WHE02	Wheelbase	Wheel base dimension 13 16 20	 1250 mm 1600 mm 2000 mm	Applicable end carriage GTL09 GTL09 GTL09	
9,10	**60**	BT08	Groove width	Applicable end carriage 50-70	GTL09 (rail head width + 10 mm), guide rollers not allowed, not available		
11	**-**		Number of driving wheels	- D	One driving wheel/end carriage Two driving wheels/end carriage		
12,13	**A3**	DES08	Joint type	Top joints A3	4-bolt connection (B<310mm)	Applicable end carriage	GTL09, ECN09
14-17	**0000**		Bolt joint distance	####	Joint plates distance between alignment pin centers with double girder.	0000	With single girder, dimension from driving wheel to pin with asymmetrical joint.
18	**C**	(DES09)	Buffer type	GTL09	A, B, C, K, G, E	A, B, C K, G, E 0	Rubber buffers PUR buffers No buffer
19-22	**0000**	DIM29	Bogie inner wheel distance	0000	No bogie type end carriage		
23	**-**	PAI04 PAI05	Colour code	- P K	Standard primary paint Special primary paint Standard finishing paint	KC5 (workshop primer paint) KC2 KC1, RAL 1028 (Yellow)	
24	**N**		Special properties	N	Standard	E	Special

4.3 Factory code example (Factory:ECN)

ECN	40	-	40	85	-	K5	0000	C	0000	-	N
GE19	WHE01		WHE02	BT08		DES08		(DES09)	DIM29	(PAI05/ PAI04)	
1-3	4,5	6	7,8	9,10	11	12,13	14-17	18	19-22	23	24

Pos.	Code	Feature code	Feature	Available properties			
1-3	**ECN**	GE19	Short product name	ECN	Factory code (End carriage)		
4,5	**40**	WHE01	Wheel diameter	09	90 mm	20	200 mm
				11	110 mm	25	250 mm
				14	140 mm	32	315 mm
				16	160 mm	40	400 mm
6	**-**		Description	-	Standard	C	Asymmetrical joint with single girder
				B	Bogie (only ECN20 and bigger)		
7,8	**40**	WHE02	Wheelbase	Wheel base dimension		Applicable end carriage	
				12	1200 mm	ECN20	
				13	1250 mm	ECN09	
				14	1400 mm	ECN20, ECN25, ECN32	
				16	1600 mm	ECN09,ECN11, ECN14,ECN16, ECN20, ECN25, ECN32, ECN40	
				18	1800 mm	ECN20, ECN25, ECN32, ECN40	
				20	2000 mm	ECN09,ECN11,ECN14,ECN16, ECN20, ECN25, ECN32, ECN40	
				22	2200 mm	ECN25, ECN40	
				25	2500 mm	ECN09,ECN11,ECN14,ECN16, ECN20, ECN25, ECN32, ECN40	
				32	3150 mm	ECN11, ECN14, ECN16, ECN20, ECN25, ECN32, ECN40	
				35	3500 mm	ECN14	
				40	4000 mm	ECN14, ECN16, ECN20, ECN25, ECN32, ECN40	
				45	4500 mm	ECN16, ECN20, ECN25, ECN32, ECN40	
				50	5000 mm	ECN32, ECN40	
				55	5500 mm	ECN32, ECN40	
9,10	**85**	BT08	Groove width		Applicable end carriage		
				50-70	ECN09 (rail head width + 10 mm), rail head width up to 80 mm with guide rollers		
				52-87	ECN11 (rail head width + 12 mm), rail head width up to 80 mm with guide rollers		
				54-84	ECN14 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers		
				54-84	ECN16 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers		
				54-99	ECN20 (rail head width + 14 mm), rail head width up to 130 mm with guide rollers		
				54-89	ECN25 (rail head width + 14 mm), rail head width up to 130 mm with guide rollers		
				64-99	ECN32 (rail head width + 14 mm), rail head width up to 130 mm with guide rollers		
				55-120	ECN40 (rail head width + 15 mm), rail head width up to 150 mm with guide rollers		
11	**-**		Number of driving wheels	-	One driving wheel/end carriage	S	One driving wheel/travel bogie pair
				D	Two driving wheels/end carriage	D	Two driving wheels/driving bogie pair
12,13	**K5**	DES08	Joint type		Top joints		Applicable end carriage
				A3	4-bolt connection (B<310 mm)		ECN09
				A4	4-bolt connection (B<360 mm)		ECN11, ECN14
				A6	4-bolt connection (B<550 mm)		ECN11, ECN14
				B4	8-bolt connection (B<350 mm)		ECN16
				B6	8-bolt connection (B<550 mm)		ECN16
				L3	8-bolt connection (B<300 mm)		ECN20
				L4	8-bolt connection (B<410 mm)		ECN20
				L5	8-bolt connection (B<520 mm)		ECN20
				L6	8-bolt connection (B<630 mm)		ECN20
				H4	12-bolt connection (B<410 mm)		ECN25
				H5	12-bolt connection (B<520 mm)		ECN25
				H7	12-bolt connection (B<740 mm)		ECN25
				H9	12-bolt connection (B<990 mm)		ECN25
				K4	12-bolt connection (B<410 mm)		ECN32
				K5	12-bolt connection (B<520 mm)		ECN32, ECN40
				K7	12-bolt connection (B<740 mm)		ECN32, ECN40
				K9	12-bolt connection (B<990 mm)		ECN32, ECN40
				J1	Shear ring connection		ECN40
				J2	Shear ring connection		ECN40
				J3	Shear ring connection		ECN40
				J4	Shear ring connection		ECN40
				J5	Shear ring connection		ECN40
				J6	Shear ring connection		ECN40
				J7	Shear ring connection		ECN40
				J8	Shear ring connection		ECN40
				J9	Shear ring connection		ECN40

Pos.	Code	Feature code	Feature	Available properties			
				J0	Shear ring connection	ECN40	
					Side joints	Applicable end carriage	
				R3	8 top bolts and 2 side bolts (B<300 mm)	ECN20	
				R4	8 top bolts and 2 side bolts (B<410 mm)	ECN20	
				R5	8 top bolts and 2 side bolts (B<520 mm)	ECN20	
				R6	8 top bolts and 2 side bolts (B<630 mm)	ECN20	
				F4	8 top bolts and 4 side bolts (B<410 mm)	ECN25	
				F5	12 top bolts and 4 side bolts (B<520 mm)	ECN25	
				F7	12 top bolts and 4 side bolts (B<750 mm)	ECN25	
				F8	12 top bolts and 4 side bolts (B<890 mm)	ECN25	
				Q3	12 top bolts and 4 side bolts (B<410 mm)	ECN32	
				Q4	12 top bolts and 6 side bolts (B<410 mm)	ECN32	
				Q5	12 top bolts and 4 side bolts (B<520 mm)	ECN32	
				Q6	12 top bolts and 6 side bolts (B<520 mm)	ECN32	
				Q7	12 top bolts and 4 side bolts (B<740 mm)	ECN32	
				Q8	12 top bolts and 6 side bolts (B<740 mm)	ECN32	
				Q9	12 top bolts and 4 side bolts (B<990 mm)	ECN32	
				Q0	12 top bolts and 6 side bolts (B<990 mm)	ECN32	
				S6	12 top bolts and 6 side bolts (B<520 mm)	ECN40	
				S7	12 top bolts and 6 side bolts (B<740 mm)	ECN40	
				S9	12 top bolts and 6 side bolts (B<990 mm)	ECN40	
14-17	**0000**		Bolt joint distance	####	Joint plates distance between alignment pin centers with double girder.	0000	With single girder, dimension from driving wheel to pin with asymmetrical joint.
18	**C**	(DES09)	Buffer type	ECN09	A, B, C, K, G, E	A, B, C, D	Rubber buffers
				ECN11	A, B, C, K, G, E,	K, G, E,	PUR buffers
				ECN14	A, B, C, D, K, G. E, M, F, H, P	M, F, H, P	PUR buffers
				ECN16	A, B, C, D, K, G, E, M, F, H, P	I, S, T, Y	PUR buffers
				ECN20	A, B, C, D, K, G, E, M, F, H, P, I, S	0	No buffer
				ECN25	B, C, D, K, G, E, M, F, H, P, I, S		
				ECN32	B, C, D, K, G, E, M, F, H, P, I, S, T, Y		
				ECN40	B, C, D, K, G, E, M, F, H, P, I, S, T, Y		
19-22	**0000**	DIM29	Bogie inner wheel distance	0000	No bogie type end carriage		
23	**-**	PAI04 PAI05	Colour code	-	Standard primer paint	KC5 (workshop primer paint)	
				S	Special primer paint	KC2	
				K	Standard finishing paint	KC1, RAL 1028 (Yellow)	
24	**N**		Special properties	N	Standard	E	Special

4.4 Verlinde code example (Verlinde: GTR, Factory: GTR)

GTR	40	-	40	85	-	K5	0000	C	0000	-	N
(GE19)	WHE01		WHE02	BT08		DES08		(DES09)	DIM29	(PAI04/ PAI05)	
1-3	4,5	6	7,8	9,10	11	12,13	14-17	18	19-22	23	24

Pos.	Code	Feature code	Feature	Available properties			
1-3	**GTR**	(GE19)	Short product name	GE19 value GTR	Verlinde	ECN	
4,5	**40**	WHE01	Wheel diameter	09 11 14 16	90 mm 110 mm 140 mm 160 mm	20 25 32 40	200 mm 250 mm 315 mm 400 mm
6	**-**		Description	- B	Standard Bogie (only GTR20 and bigger)	C	Asymmetrical joint with single girder
7,8	**40**	WHE02	Wheelbase	Wheel base dimension 12 13 14 16 18 20 22 25 32 35 40 45 50 55	Applicable end carriage 1200 mm GTR20 1250 mm GTR09 1400 mm GTR20, GTR25, GTR32 1600 mm GTR09,GTR11, GTR14,GTR16, GTR20, GTR25, GTR32, GTR40 1800 mm GTR20, GTR25, GTR32, GTR40 2000 mm GTR09, GTR11,GTR14,GTR16, GTR20, GTR25, GTR32, GTR40 2200 mm GTR25, GTR40 2500 mm GTR09, GTR11,GTR14,GTR16, GTR20, GTR25, GTR32, GTR40 3150 mm GTR11, GTR14, GTR16, GTR20, GTR25, GTR32, GTR40 3500 mm GTR14 4000 mm GTR14, GTR16, GTR20, GTR25, GTR32, GTR40 4500 mm GTR16, GTR20, GTR25, GTR32, GTR40 5000 mm GTR32, GTR40 5500 mm GTR32, GTR40		
9,10	**85**	BT08	Groove width	Applicable end carriage 50-70 52-87 54-84 54-84 54-99 54-89 64-99 55-120	GTR09 (rail head width + 10 mm), rail head width up to 80 mm with guide rollers GTR11 (rail head width + 12 mm), rail head width up to 80 mm with guide rollers GTR14 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers GTR16 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers GTR20 (rail head width + 14 mm), rail head width up to 130 mm with guide rollers GTR25 (rail head width + 14 mm), rail head width up to 130 mm with guide rollers GTR32 (rail head width + 14 mm), rail head width up to 130 mm with guide rollers GTR40 (rail head width + 15 mm), rail head width up to 150 mm with guide rollers		
11	**-**		Number of driving wheels	- D	One driving wheel/end carriage Two driving wheels/end carriage	S D	One driving wheel/travel bogie pair Two driving wheels/driving bogie pair
12,13	**K5**	DES08	Joint type	Top joints A3 A4 A6 B4 B6 L3 L4 L5 L6 H4 H5 H7 H9 K4 K5 K7 K9 J1 J2 J3 J4 J5 J6 J7 J8	Applicable end carriage 4-bolt connection (B<310 mm) GTR09 4-bolt connection (B<360 mm) GTR11, GTR14 4-bolt connection (B<550 mm) GTR11, GTR14 8-bolt connection (B<350 mm) GTR16 8-bolt connection (B<550 mm) GTR16 8-bolt connection (B<300 mm) GTR20 8-bolt connection (B<410 mm) GTR20 8-bolt connection (B<520 mm) GTR20 8-bolt connection (B<630 mm) GTR20 12-bolt connection (B<410 mm) GTR25 12-bolt connection (B<520 mm) GTR25 12-bolt connection (B<740 mm) GTR25 12-bolt connection (B<990 mm) GTR25 12-bolt connection (B<410 mm) GTR32 12-bolt connection (B<520 mm) GTR32, GTR40 12-bolt connection (B<740 mm) GTR32, GTR40 12-bolt connection (B<990 mm) GTR32, GTR40 Shear ring connection GTR40 Shear ring connection GTR40 Shear ring connection GTR40 Shear ring connection GTR40 Shear ring connection GTR40 Shear ring connection GTR40 Shear ring connection GTR40 Shear ring connection GTR40		

Pos.	Code	Feature code	Feature	Available properties			
				J9	Shear ring connection	GTR40	
				J0	Shear ring connection	GTR40	
					Side joints	Applicable end carriage	
				R3	8 top bolts and 2 side bolts (B<300 mm)	GTR20	
				R4	8 top bolts and 2 side bolts (B<410 mm)	GTR20	
				R5	8 top bolts and 2 side bolts (B<520 mm)	GTR20	
				R6	8 top bolts and 2 side bolts (B<630 mm)	GTR20	
				F4	8 top bolts and 4 side bolts (B<410 mm)	GTR25	
				F5	12 top bolts and 4 side bolts (B<520 mm)	GTR25	
				F7	12 top bolts and 4 side bolts (B<750 mm)	GTR25	
				F8	12 top bolts and 4 side bolts (B<890 mm)	GTR25	
				Q3	12 top bolts and 4 side bolts (B<410 mm)	GTR32	
				Q4	12 top bolts and 6 side bolts (B<410 mm)	GTR32	
				Q5	12 top bolts and 4 side bolts (B<520 mm)	GTR32	
				Q6	12 top bolts and 6 side bolts (B<520 mm)	GTR32	
				Q7	12 top bolts and 4 side bolts (B<740 mm)	GTR32	
				Q8	12 top bolts and 6 side bolts (B<740 mm)	GTR32	
				Q9	12 top bolts and 4 side bolts (B<990 mm)	GTR32	
				Q0	12 top bolts and 6 side bolts (B<990 mm)	GTR32	
				S6	12 top bolts and 6 side bolts (B<520 mm)	GTR40	
				S7	12 top bolts and 6 side bolts (B<740 mm)	GTR40	
				S9	12 top bolts and 6 side bolts (B<990 mm)	GTR40	
14-17	**0000**		Bolt joint distance	####	Joint plates distance between alignment pin centers with double girder.	0000	With single girder, dimension from driving wheel to pin with asymmetrical joint.
18	**C**	(DES09)	Buffer type	GTR09	A, B, C, K, G, E	A, B, C, D	Rubber buffers
				GTR11	A, B, C, K, G, E,	K, G, E,	PUR buffers
				GTR14	A, B, C, D, K, G. E, M, F, H, P	M, F, H, P	PUR buffers
				GTR16	A, B, C, D, K, G, E, M, F, H, P	I, S, T, Y	PUR buffers
				GTR20	A, B, C, D, K, G, E, M, F, H, P, I, S	0	No buffer
				GTR25	B, C, D, K, G, E, M, F, H, P, I, S		
				GTR32	B, C, D, K, G, E, M, F, H, P, I, S, T, Y		
				GTR40	B, C, D, K, G, E, M, F, H, P, I, S, T, Y		
19-22	**0000**	DIM29	Bogie inner wheel distance	0000	No bogie type end carriage		
23	**-**	PAI04 PAI05	Colour code	-	Standard primer paint	KC5 (workshop primer paint)	
				S	Special primer paint	KC2	
				K	Standard finishing paint	KC1, RAL 1028 (Yellow)	
24	**N**		Special properties	N	Standard	E	Special

4.5 Factory code example (Factory:EBN)

EBN	09	-	16	74	-	400	200	C	0000	-	N
GE19	WHE01		WHE02	BT08				(DES09)			
1-3	4,5	6	7,8	9,10	11	12-14	15-17	18	19-22	23	24

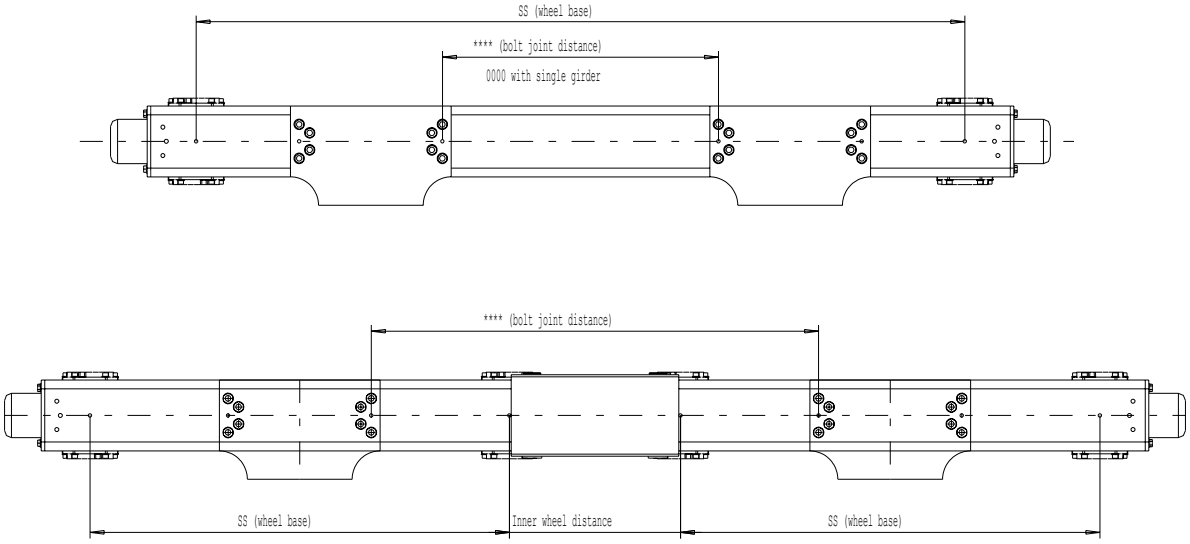
Pos.	Code	Feature code	Feature	Available properties			
1-3	**EBN**	GE19	Short product name	EBN	Factory code		
4,5	**09**	AHE01	Wheel diameter	09 11	90 mm 110 mm	14 16	140 mm 160 mm
6	**-**		Description	-	Standard	C	Asymmetrical joint with single girder
7,8	**16**	WHE02	Wheelbase (100 mm)	Wheelbase dimension 13 16 20 25 32 35 40 45	Applicable end carriage 1250 mm EBN09 1600 mm EBN09, EBN11, EBN14, EBN16 2000 mm EBN09, EBN11, EBN14, EBN16 2500 mm EBN09, EBN11, EBN14, EBN16 3150 mm EBN11, EBN14, EBN16 3500 mm EBN14 4000 mm EBN14, EBN16 4500 mm EBN16		
9,10	**74**	BT08	Groove width	50-70 52-87 54-84 54-84 00	EBN09 (rail head width + 10 mm), rail head width up to 80 mm with guide rollers EBN11 (rail head width + 12 mm), rail head width up to 80 mm with guide rollers EBN14 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers EBN16 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers Flat wheel		
11	**-**		Number of driving wheels	-	One driving wheel/end carriage	D	Two driving wheels/end carriage
12-14	**400**		Joint plate length (mm) (distance between bolts)		Description		
				400	EBN09 Profile girder, B = 400		
				400	EBN11 Box girder, B = 400		
				400	EBN14 Profile and box girder, B = 350		
				350, 450	EBN16 Box girder, B = 500		
15-17	**200**		Joint plate height	200	EBN09 Joint plates: 200x400		
				255	EBN11 Joint plates: 255x400		
				255	EBN14 Joint plates: 255x400		
				255, 305	EBN16 Joint plates: 255x350, 305x450		
18	**C**	(DES09)	Buffer type	EBN09 EBN11 EBN14 EBN16	A, B, C, K, G, E A, B, C, K, G, E A, B, C, D, K, G, E, M, F, H, P A, B, C, D, K, G, E, M, F, H, P	A, B, C, D K, G, E M, F, H, P 0	Rubber buffer Polyurethane buffer Polyurethane buffer No buffer
19-22	**0000**		Bolt joint distance (mm)	####	Joint plate distance from bolt centers with double girder.	0000	with single girder, dimension from driving wheel to bolt with asymmetrical joint
23	**-**	PAI04 PAI05	Colour code	- S K	Standard primary paint Special primer paint Standard finishing paintK	KC5 (workshop primer paint) KC2 KC1, RAL 1028 (Yellow)	
24	**N**		Special properties	N	Standard	E	Special

4.6 Verlinde code example (Verlinde: GRN, Factory: EBN)

GRN	09	-	16	74	-	400	200	C	0000	-	N
(GE19)	WHE01		WHE02	BT08				(DES09)			
1-3	4,5	6	7,8	9,10	11	12-14	15-17	18	19-22	23	24

Pos.	Code	Feature code	Feature	Available properties			
1-3	**GRN**	(GE19)	Short product name	GE19 value GRN	Verlinde	EBN	
4,5	**09**	AHE01	Wheel diameter	09 11	90 mm 110 mm	14 16	140 mm 160 mm
6	**-**		Description	-	Standard	C	Asymmetrical joint with single girder
7,8	**16**	WHE02	Wheelbase (100 mm)	Wheelbase dimension 13 16 20 25 32 35 40 45		Applicable end carriage 1250 mm GRN09 1600 mm GRN09, GRN11, GRN14, GRN16 2000 mm GRN09, GRN11, GRN14, GRN16 2500 mm GRN09, GRN11, GRN14, GRN16 3150 mm GRN11, GRN14, GRN16 3500 mm GRN14 4000 mm GRN14, GRN16 4500 mm GRN16	
9,10	**74**	BT08	Groove width	50-70 52-87 54-84 54-84 00		GRN09 (rail head width + 10 mm), rail head width up to 80 mm with guide rollers GRN11 (rail head width + 12 mm), rail head width up to 80 mm with guide rollers GRN14 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers GRN16 (rail head width + 14 mm), rail head width up to 100 mm with guide rollers Flat wheel	
11	**-**		Number of driving wheels	-	One driving wheel/end carriage	D	Two driving wheels/end carriage
12-14	**400**		Joint plate length (mm) (distance between bolts)			Description Profile girder, B = 400 Box girder, B = 400 Profile and box girder, B = 350 Box girder, B = 500	
15-17	**200**		Joint plate height	200 255 255 255, 305	GRN09 GRN11 GRN14 GRN16	Joint plates: 200x400 Joint plates: 255x400 Joint plates: 255x400 Joint plates: 255x350, 305x450	
18	**C**	(DES09)	Buffer type	GRN09 GRN11 GRN14 GRN16	A, B, C, K, G, E A, B, C, K, G, E A, B, C, D, K, G, E, M, F, H, P A, B, C, D, K, G, E, M, F, H, P	A, B, C, D K, G, E M, F, H, P 0	Rubber buffer Polyurethane buffer Polyurethane buffer No buffer
19-22	**0000**		Bolt joint distance (mm)	####	Joint plate distance from bolt centers with double girder.	0000	with single girder, dimension from driving wheel to bolt with asymmetrical joint
23	**-**	PAI04 PAI05	Colour code	- S K	Standard primary paint Special primer paint Standard finishing paintK	KC5 (workshop primer paint) KC2 KC1, RAL 1028 (Yellow)	
24	**N**		Special properties	N	Standard	E	Special

4.7 Dimensions needed when ordering end carriages



Bolt joint distance is dimension between alignment pins of joint plates. When asymmetrical joint is needed with single girder, this is dimension from driving wheel centre to closest alignment pin of joint plate.

Groove width 100mm is marked 99 in code. When the rail wheel is wanted without flanges it is marked 00.

4.8 Data info of the end carriage

End carriage	Wheel base	Wheel base (bogie)	Wheel groove width	x	Joint plates
GRN09	13,16,20,25	-	50,55,60,65,70,00	10	400200
GTR09	13,16,20,25	-	50,55,60,65,70,00	10	A3
GTL09	13,16,20	-	50,55,60,65,70,00	10	A3
GRN11	16,20,25,32	-	52,57,62,67,72,77,82,87,00	12	400255
GTR11	16,20,25,32	-	52,57,62,67,72,77,82,87,00	12	A4,A6
GRN14	16,20,25,32,38,40	-	54,59,64,69,74,79,84,00	14	A4,A6,400255
GTR14	16,20,25,32,38,40	-	54,59,64,69,74,79,84,00	14	A4,A6,400255
GRN16	16,20,25,32,40,45	-	54,59,64,69,74,79,84,00	14	EBN16
GTR16	16,20,25,32,40,45	-	54,59,64,69,74,79,84,00	14	B4,B6
GTR20	16,20,25,32,40,45	12,14,16,18,20	54,59,64,69,74,79,84,89,94,99,00	14	L3,L4,L5,L6,R3,R4,R5,R6,G1,G3,G5
GTR25	20,25,32,40,45,50,55	14,16,18,20,22,25	54,59,64,69,74,79,84,89,00	14	H4,H5,H7,H9,F4,F5,F7,F9,G1,G3,G5
GTR32	25,32,40,45,50,55	14,16,18,20	64,69,74,79,84,89,94,99,00	14	K4,K5,K7,K9,Q3,Q4,Q5,Q6,Q7,Q8,Q9, Q0,G2,G4,G6
GTR40	25,32,40,45,50,55	16,18,20,23,25	55,60,65,70,75,80,85,90,95,100, 105,110,115,120,00	15	K4,K5,K7,K9,S6,S7,S9,G2,G4,G6, J1,J2,J3,J4,J5,J6,J7,J8,J9,J0

Span (S)	Needed wheel groove *) B = rail head width
S ≤ 20	B + x
20≤S≤30	B + x + 5
30≤S≤35	B + x + 10
S≥35	B + x + 15

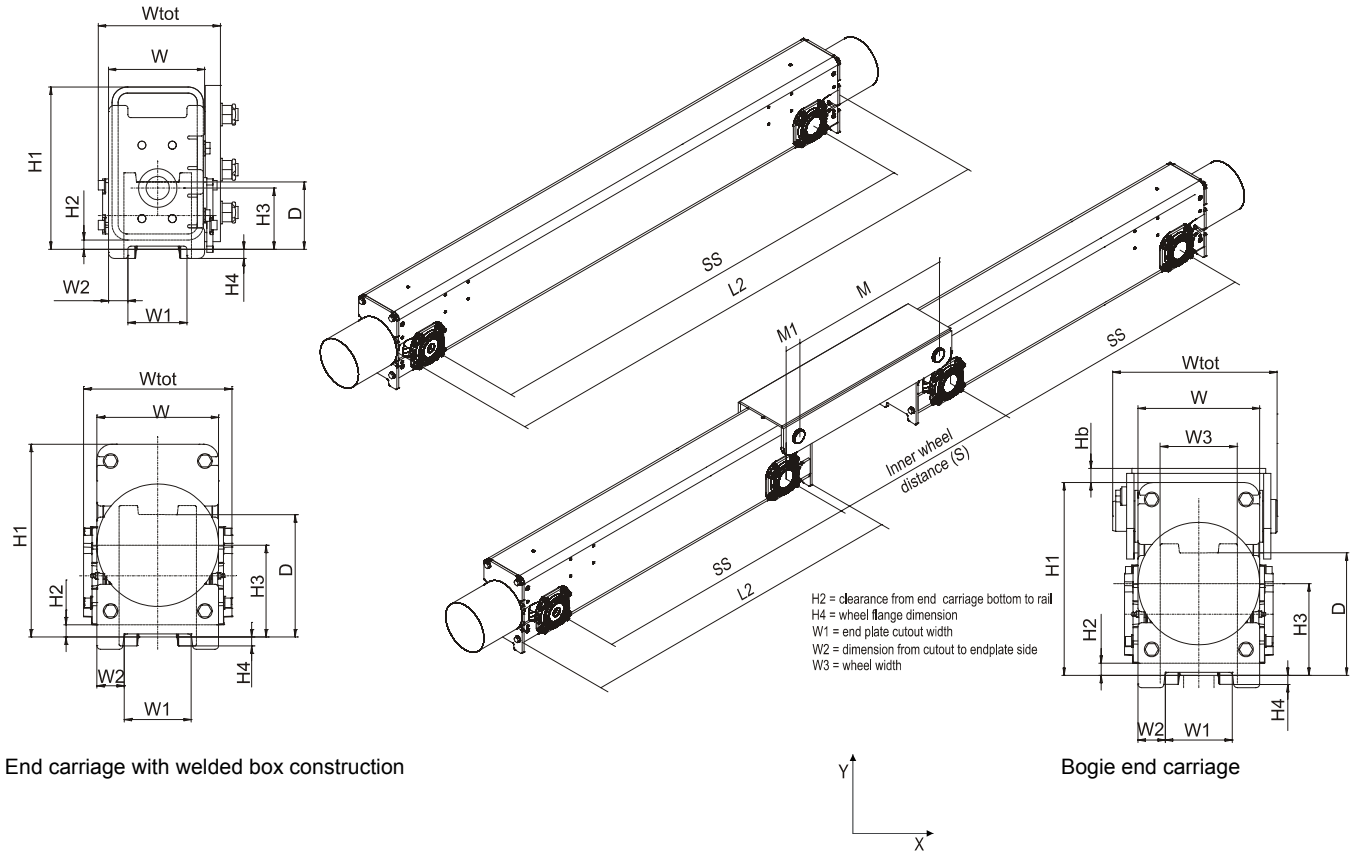
*) or based on specific wheel groove optimization calculation, where main girder stiffness, runway tolerances and main girder/end carriage geometry is taken into account.

**) wheel grooves over 100 mm for GTR40:

Groove	Marking in code
100	99
105	05
110	10
115	15
120	20

5 DIMENSIONS AND VALUES OF END CARRIAGES

End carriage with rectangular hollow section



End carriage with welded box construction

Bogie end carriage

5.1 End carriage dimensions, 2-wheel end carriages

End carriage	SS	L2	D	H1	H2	H3	H4	Wtot	W	W1	W2	W3	Cross-section A/mm^2	Iy 10^4mm^4	Ix 10^4mm^4
GTL09	1250	1606	90	160	10	100	15	165	128	80	24	90	2643	562	562
	1600	1956	90	160	10	100	15	165	128	80	24	90	2643	562	562
	2000	2356	90	160	10	100	15	165	128	80	24	90	2643	562	562
GRN09	1250	1526	90	210	10	100	15	167	128	80	24	90	4644	1079	2386
	1600	1876	90	210	10	100	15	167	128	80	24	90	4644	1079	2386
	2000	2276	90	210	10	100	15	167	128	80	24	90	4644	1079	2386
	2500	2776	90	210	10	100	15	167	128	80	24	90	4644	1079	2386
GTR09	1250	1526	90	210	10	100	15	165	128	80	24	90	4644	1079	2386
	1600	1876	90	210	10	100	15	165	128	80	24	90	4644	1079	2386
	2000	2276	90	210	10	100	15	165	128	80	24	90	4644	1079	2386
	2500	2776	90	210	10	100	15	165	128	80	24	90	4644	1079	2386
GRN11	1600	1876	110	265	15	100	15	201	158	97	32	111	7256	2634	5824
	2000	2276	110	265	15	100	15	201	158	97	32	111	7256	2634	5824
	2500	2776	110	265	15	100	15	201	158	97	32	111	7256	2634	5824
	3150	3426	110	265	15	100	15	201	158	97	32	111	7256	2634	5824
GTR11	1600	1876	110	265	15	100	15	195	158	97	32	111	5924	2219	4885
	2000	2276	110	265	15	100	15	195	158	97	32	111	5924	2219	4885
	2500	2776	110	265	15	100	15	195	158	97	32	111	5924	2219	4885
	3150	3426	110	265	15	100	15	195	158	97	32	111	5924	2219	4885
GRN14	1600	1884	140	268	15	100	15	201	162	100	31	111	7256	2634	5824
	2000	2284	140	268	15	100	15	201	162	100	31	111	7256	2634	5824
	2500	2784	140	268	15	100	15	201	162	100	31	111	7256	2634	5824
	3150	3434	140	268	15	100	15	201	162	100	31	111	7256	2634	5824
	3500	3784	140	268	15	100	15	201	162	100	31	111	7256	2634	5824
	4000	4284	140	268	15	100	15	201	162	100	31	111	7256	2634	5824

End carriage	SS	L2	D	H1	H2	H3	H4	Wtot	W	W1	W2	W3	Cross-section A/mm^2	Iy 10^4mm^4	Ix 10^4mm^4
GTR14	1600	1884	140	268	15	100	15	196	162	100	31	111	5924	2219	4885
	2000	2284	140	268	15	100	15	196	162	100	31	111	5924	2219	4885
	2500	3784	140	268	15	100	15	196	162	100	31	111	5924	2219	4885
	3150	3434	140	268	15	100	15	196	162	100	31	111	5924	2219	4885
	3500	3784	140	268	15	100	15	196	162	100	31	111	5924	2219	4885
	4000	4284	140	268	15	100	15	196	162	100	31	111	5924	2219	4885
GRN16	1600	1924	160	268	15	100	15	202	162	100	31	110	7256	2634	5824
	2000	2324	160	268	15	100	15	202	162	100	31	110	7256	2634	5824
	2500	2824	160	268	15	100	15	202	162	100	31	110	7256	2634	5824
DG	3150	3474	160	268	15	100	15	202	162	100	31	110	7256	2634	5824
SG	3150	3474	160	318	15	100	15	202	162	100	31	110	8256	3125	9208
	4000	4324	160	318	15	100	15	202	162	100	31	110	8256	3125	9208
	4500	4824	160	318	15	100	15	202	162	100	31	110	8256	3125	9208
GTR16	1600	1924	160	265	15	100	15	199	162	100	31	110	7256	2634	5824
	2000	2324	160	265	15	100	15	199	162	100	31	110	7256	2634	5824
	2500	2824	160	265	15	100	15	199	162	100	31	110	7256	2634	5824
DG	3150	3474	160	265	15	100	15	199	162	100	31	110	7256	2634	5824
SG	3150	3474	160	315	15	100	15	199	162	100	31	110	8256	3125	9208
	4000	4324	160	315	15	100	15	199	162	100	31	110	8256	3125	9208
	4500	4824	160	315	15	100	15	199	162	100	31	110	8256	3125	9208
GTR20	1600	1920	200	315	15	150	15	244	200	110	45	127	9256	6057	11311
	2000	2320	200	315	15	150	15	244	200	110	45	127	9256	6057	11311
	2500	2820	200	315	15	150	15	244	200	110	45	127	9256	6057	11311
	3150	3470	200	315	15	150	15	244	200	110	45	127	9256	6057	11311
	4000	4320	200	315	15	150	15	244	200	110	45	127	9256	6057	11311
	4500	4820	200	315	15	150	15	244	200	110	45	127	9256	6057	11311
GTR25	2000	2330	250	315	15	150	15	257	200	125	62.5	115	10936	6767	12534
	2500	2830	250	315	15	150	15	257	200	125	62.5	115	10936	6767	12534
DG	3150	3480	250	315	15	150	15	257	200	125	62.5	115	10936	6767	12534
SG	3150	3480	250	415	15	150	15	257	200	125	62.5	115	13436	8968	25970
	4000	4330	250	415	15	150	15	257	200	125	62.5	115	13436	8968	25970
	4500	4830	250	415	15	150	15	257	200	125	62.5	115	13436	8968	25970
GTR32	2500	3000	315	370	20	150	17.5	273	270	125	62.5	130	16576	14548	29140
	3150	3650	315	370	20	150	17.5	273	270	125	62.5	130	16576	14548	29140
	4000	4500	315	470	20	150	17.5	273	270	125	62.5	130	14312	13681	45961
	4500	5000	315	470	20	150	17.5	273	270	125	62.5	130	14312	13681	45961
	5000	5500	315	545	20	150	17.5	273	270	125	62.5	130	15512	15297	65733
	5500	6000	315	545	20	150	17.5	273	270	125	62.5	130	15512	15297	65733
GTR40	2500	3060	400	548	26	150	17.5	320	290	145	87.5	161	29360	30126	101660
	3150	3710	400	548	26	150	17.5	320	290	145	87.5	161	19560	22215	82026
	4000	4560	400	552	22	150	17.5	320	290	145	87.5	161	22000	24121	98873
	4500	5060	400	668	26	150	17.5	320	290	145	87.5	161	21960	25790	133366
	5000	5560	400	672	22	150	17.5	320	290	145	87.5	161	24400	27695	158779
	5500	6060	400	672	22	150	17.5	320	290	145	87.5	161	24400	27695	158779
GTR40G	2500	3060	400	548	26	150	17.5	320	290	145	87.7	161	29360	30126	101660
	3150	3710	400	548	26	150	17.5	320	290	145	87.5	161	19560	22215	82026
	4000	4560	400	552	22	150	17.5	320	290	145	87.5	161	22000	24121	98873
	4500	5060	400	552	22	150	17.5	320	290	145	87.5	161	22000	24121	98873
	5000	5560	400	552	22	150	17.5	320	290	145	87.5	161	22000	24121	98873
	5500	6060	400	552	22	150	17.5	320	290	145	87.5	161	22000	24121	98873

*) Special lower box to get space for VES5G gantry travel drive.

5.2 End carriage dimensions, 4-wheel end carriages

End carriage	SS	L2	D	H1	H2	H3	H4	Hb	Wtot	W	W1	W2	W3	M1	Cross-section A/mm^2	Iy 10^4mm^4	Ix 10^4mm^4
GTR20B	1200	1520	200	315	15	150	15	23	270	200	110	45	127	65	9256	6057	11311
	1400	1720	200	315	15	150	15	23	270	200	110	45	127	65	9256	6057	11311
	1600	1920	200	315	15	150	15	23	270	200	110	45	127	65	9256	6057	11311
	1800	2120	200	315	15	150	15	23	270	200	110	45	127	65	9256	6057	11311
	2000	2320	200	315	15	150	15	23	270	200	110	45	127	65	9256	6057	11311
GTR25B	1400	1849	250	315	15	150	15	27	276	200	125	62.5	115	175	11150	7002	13050
	1600	2049	250	315	15	150	15	27	276	200	125	62.5	115	175	11150	7002	13050
	1800	2249	250	315	15	150	15	27	276	200	125	62.5	115	175	11150	7002	13050
	2000	2449	250	315	15	150	15	27	276	200	125	62.5	115	175	11150	7002	13050
	2200	2649	250	315	15	150	15	27	276	200	125	62.5	115	175	11150	7002	13050
	2500	2949	250	315	15	150	15	27	276	200	125	62.5	115	175	11150	7002	13050
GTR32B	1400	1900	315	370	20	150	17.5	24	304	270	125	62.5	130	170	16576	14548	29140
	1600	2100	315	370	20	150	17.5	24	304	270	125	62.5	130	170	16576	14548	29140
	1800	2300	315	370	20	150	17.5	24	304	270	125	62.5	130	170	16576	14548	29140
	2000	2500	315	370	20	150	17.5	24	304	270	125	62.5	130	170	16576	14548	29140
GTR40B	1600	2160	400	548	26	150	17.5	26	320	290	145	87.5	161	190	29360	30126	101660
	1800	2360	400	548	26	150	17.5	26	320	290	145	87.5	161	190	29360	30126	101660
	2000	2560	400	548	26	150	17.5	26	320	290	145	87.5	161	190	29360	30126	101660
	2200	2760	400	548	26	150	17.5	26	320	290	145	87.5	161	190	29360	30126	101660
	2500	3060	400	548	26	150	17.5	26	320	290	145	87.5	161	190	29360	30126	101660

5.3 End carriage weights, 2-wheel end carriages

Weights without buffer, calculated with smallest rail width, joint plate included.

Total weight for one end carriage:

W_TOT= W_SS + 2*W_B + W_OPT

W_B=Weight of the buffer, W_OPT=Weight of the options

W_SS [Weight (kg) / pcs]			
End carriage	SS	SG	DG
GTL09	1250	56	
	1600	63	69
	2000	71	77
GRN09	1250	87	
	1600	100	115
	2000	114	120
	2500	133	148
GTR09	1250	76	
	1600	89	97
	2000	103	111
	2500	122	129

W_SS [Weight (kg) / pcs]					
End carriage	**SS**	**SG**		**DG**	
GRN11	1600	156		184	
	2000	178		206	
	2500	206		234	
	3150	246		274	
GTR11		**SG**		**DG**	
		Joint plate type			
	SS	**A4**	**A6**	**A4**	**A6**
	1600	118	121	127	134
	2000	137	140	146	153
	2500	160	163	169	176
	3150	190	193	199	206

W_SS [Weight (kg) / pcs]					
End carriage	**SS**	**SG**		**DG**	
GRN14	1600	171		199	
	2000	194		222	
	2500	222		250	
	3150	259		287	
	3500	279		307	
	4000	309		337	
GTR14		**SG**		**DG**	
		Joint plate type			
	SS	**A4**	**A6**	**A4**	**A6**
	1600	134	138	143	-
	2000	153	157	162	170
	2500	176	180	185	193
	3150	206	210	215	223
	3500	223	227	232	240
	4000	246	250	255	263

Weight (kg)/pcs					
End carriage		**SG**		**DG**	
GRN16		**Joint plate type (JPH/JPL)**		**Joint plate type (JPH/JPL)**	
	SS	**255/350**	**305/450**	**255/350**	**305/450**
	1600	178	-	201	-
	2000	201	-	224	-
	2500	229	-	252	-
	3150	-	312	289	-
	4000	-	367	-	405
	4500	-	400	-	438
GTR16		**SG**		**DG**	
		Joint plate type		**Joint plate type**	
	SS	**B4**	**B6**	**B4**	**B6**
	1600	175	183	195	211
	2000	198	206	218	234
	2500	227	235	246	262
	3150	294	302	283	299
	4000	349	357	368	384
	4500	381	389	401	417

Weight (kg)/pcs												
End carriage		Joint plate type										
GTR20/SG	SS	L3	L4	L5	L6	R3	R4	R5	R6	G1	G3	G5
	1600	228	229	234	239	237	247	257	267	-	-	-
	2000	257	258	263	268	266	276	286	296	-	-	-
	2500	294	295	300	305	303	313	323	333	-	-	-
	3150	341	342	347	352	350	360	370	380	-	-	-
	4000	403	404	409	414	412	422	432	442	-	-	-
	4500	439	440	445	450	448	458	468	478	-	-	-
GTR20/DG		Joint plate type										
	SS	L3	L4	L5	L6	R3	R4	R5	R6	G1	G3	G5
	1600	251	252	257	261	270	290	310	330	-	-	-
	2000	280	281	286	290	299	319	339	359	-	-	-
	2500	317	318	323	327	336	356	376	396	337	385	471
	3150	364	365	370	374	383	403	423	443	384	432	518
	4000	426	427	432	436	445	465	485	505	446	494	580
	4500	462	463	458	472	481	501	521	541	482	530	616

W_SS [Weight (kg)/pcs]												
End carriage		Joint plate type										
GTR25/SG	SS	H4	H5	H7	H9	F4	F5	F7	F8	G1	G3	G5
	2000	362	369	380	394	410	439	471	490	-	-	-
	2500	408	414	426	440	456	485	517	536	-	-	-
	3200	540	546	558	572	588	617	649	668	-	-	-
	4000	632	638	650	664	680	709	741	760	-	-	-
	4500	686	692	704	718	734	763	795	814	-	-	-
GTR25/DG		Joint plate type										
	SS	H4	H5	H7	H9	F4	F5	F7	F8	G1	G3	G5
	2000	-	-	-	-	-	-	-	-	-	-	-
	2500	439	451	476	503	535	592	657	696	441	489	575
	3200	496	508	533	560	592	649	714	753	499	547	633
	4000	663	675	700	727	759	816	881	920	665	713	799
	4500	717	729	754	781	813	870	935	974	719	767	853

W_SS [Weight (kg)/pcs]															
End carriage		Joint plate type													
GTR32/SG	SS	K4	K5	K7	K9	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q0	G2	G4
	2500	582	590	605	622	660	677	677	696	711	735	750	780	-	-
	3150	667	649	690	707	745	762	762	781	796	820	835	865	-	-
	4000	762	770	785	802	841	858	858	877	892	916	931	961	-	-
	4500	818	826	841	858	897	914	914	933	948	972	987	1017	-	-
	5000	942	950	965	982	1024	1041	1041	1060	1075	1099	1114	1144	-	-
	5500	1003	1011	1026	1043	1085	1102	1102	1121	1136	1160	1175	1205	-	-
GTR32/DG		Joint plate type													
	SS	K4	K5	K7	K9	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q0	G2	G4
	2500	624	640	670	704	779	813	813	851	881	929	959	1019	638	700
	3150	709	725	755	789	864	898	898	936	966	1014	1044	1104	723	785
	4000	807	823	853	887	964	998	998	1035	1066	1114	1144	1204	820	882
	4500	863	879	909	943	1020	1054	1054	1092	1122	1170	1200	1260	876	938
	5000	989	1005	1035	1069	1153	1187	1187	1225	1255	1303	1333	1393	1002	1064
	5500	1050	1066	1096	1130	1214	1248	1248	1286	1316	1364	1394	1454	1063	1125

W_SS [Weight (kg)/pcs]											
End carriage		Joint plate type									
GTR40/SG	SS	K4	K5	K7	K9	S6	S7	S9	G2	G4	G6
	2500	1034	1042	1057	1074	1167	1213	1293	-	-	-
	3150	1000	1008	1023	1040	1127	1173	1253	-	-	-
	4000	1213	1221	1236	1253	1340	1386	1466	-	-	-
	4500	1350	1358	1373	1390	1484	1530	1610	-	-	-
	5000	1537	1545	1560	1577	1671	1717	1797	-	-	-
	5500	1633	1641	1656	1673	1767	1813	1893	-	-	-
GTR40/DG		Joint plate type									
	SS	K4	K5	K7	K9	S6	S7	S9	G2	G4	G6
	2500	1077	1093	1123	1157	1343	1435	1595	1093	1155	1259
	3150	1045	1061	1091	1125	1300	1392	1552	1061	1123	1227
	4000	1258	1274	1304	1338	1514	1606	1766	1274	1336	1440
	4500	1398	1414	1444	1478	1667	1759	1919	1370	1432	1536
	5000	1585	1601	1631	1665	1853	1945	2105	1456	1518	1622
	5500	1681	1697	1727	1761	1949	2041	2201	1542	1604	1708

5.4 End carriage weights, 4-wheel end carriages

Weights without buffer, calculated with smallest rail width.

Total weight for one end carriage:

W_TOT= W_SS + W_BOG+ 2* W_B + W_OPT

W_B = Weight of the buffer, W_OPT=Weight of the options

W_SS [Weight (kg) / pcs], 1 pcs = 2 steel structures + 4 wheels									Weight bogie beam kg/m
End carriage GTR20B	SS	Joint plate type							
		L3	L4	L5	L6	R3	R4	R5	R6	
	1200	402	404	412	422	420	440	460	480	48
	1400	431	433	441	451	449	469	489	509	48
	1600	461	462	470	480	479	499	519	539	48
	1800	490	492	500	510	508	528	548	568	48
	2000	519	521	529	539	537	557	577	597	48

W_BOG= 25 kg + 48 kg/m * (S - 0.38 m)

W_SS [Weight (kg)/pcs], 1 pcs = 2 steel structures + 4 wheels									Weight bogie beam kg/m
End carriage GTR25B	SS	Joint plate type							
		H4	H5	H7	H9	F4	F5	F7	F8	
	1400	586	598	622	650	689	745	811	849	50
	1600	622	634	658	686	724	780	846	884	50
	1800	657	669	693	721	759	815	881	919	50
	2000	692	704	728	756	795	851	917	955	50
	2200	727	739	763	791	830	886	952	990	50
	2500	780	792	816	844	883	939	1005	1043	50

W_BOG = 24 kg + 50 kg/m * (S - 0.53 m)

Weight (kg)/pcs, 1 pcs = 2 steel structures + 4 wheels									Weight bogie beam kg/m
End carriage GTR32B	SS	Joint plate type							
		K4	K5	K7	K9	Q3	Q5	Q7	Q9	
	1400	881	897	927	961	1037	1071	1139	1217	71
	1600	933	949	979	1013	1091	1125	1193	1271	71
	1800	985	1001	1031	1065	1143	1177	1245	1323	71
	2000	1037	1053	1083	1117	1195	1229	1297	1375	71

W_BOG= 42 kg + 71 kg/m * (S-0.56 m)

Weight (kg)/pcs, 1 pcs = 2 steel structures + 4 wheels								Weight bogie beam kg/m
End carriage GTR40B	SS	Joint plate type						
		K5	K7	K9	S6	S7	S9	
	1600	1666	1696	1730	1920	2012	2172	92
	1800	1758	1788	1822	2012	2104	2264	92
	2000	1852	1882	1916	2106	2198	2358	92
	2200	1944	1974	2008	2198	2290	2450	92
	2500	2082	2112	2146	2338	2430	2590	92

W_BOG= 61 kg + 92 kg/m * (S - 0.67 m)

5.5 Option weights

5.5.1 Guide rollers

End carriages GTR/GRN 09…11, weight kg/pcs

End carriage	Fixed guide rollers	Adjustable guide rollers
	Rail width k [mm]	Rail width k [mm]
	40, 45, 50, 55, 60, 65, 70, 75, 80	40…80
GRN/GTR09	15	18
GRN/GTR11	15	18

End carriages GTR/GRN14/16, guide roller weight kg/pcs

End carriage	Fixed guide roller	Adjustable guide roller		
	Rail width k [mm]	Rail width k [mm]		
	40, 45, 50, 55, 60, 65, 70, 75, 80*60, 100	40…50	51…70	71…100
GRN/GTR14	25	29	29	29
GRN/GTR16, tube height 250	25	29	29	29
GRN/GTR16, tube height 300	26	30	30	30

End carriages GTR20 and GTR25, guide roller weight kg/pcs

End carriage	Fixed guide roller	Adjustable guide roller			
	Rail width k [mm]	Rail width k [mm]			
	40, 45, 50, 55, 60, 65, 70, 75, 80, 100	40… 50	51…70	71…100	101…130
GTR20	48	53	52	51	56
GTR25, tube height 300	50	58	57	56	59
GTR25, tube height 300	56	61	60	59	62

End carriages GTR32, guide roller weight kg/pcs

Wheel base	Fixed guide roller	Adjustable guide roller			
	Rail types	Rail width (k)			
	A45, 50*30, A55, 60*40, A65, 70*40, A75, 80*60, A100	45…55	56…70	71…100	101…130
14...32	69	77	76	75	80
40...45	73	81	80	79	84
50...55	76	84	83	82	87

If buffers T or Y used, add 9 kg for buffer extension weight

End carriages GTR40, guide roller weight kg/pcs

Wheel base	Fixed guide roller	Adjustable guide roller			
	Rail width k [mm]	Rail width k [mm]			
	40, 50, 55, 60, 65, 70,75, 80, 100, 120	40…57	58…79	80…123	124…150
16…40	120	128	127	126	130
45…55	125	133	132	131	135

If buffers T or Y used, add 9 kg for buffer extension weight

5.5.2 Buffer extensions

Weight kg/pcs

	L (Extension length without buffer)													
End carriage type	**100**	**148+)**	**150**	**168+)**	**182+)**	**222+)**	**250**	**300+)**	**322*+)**	**400*+)**	**500**	**750**	**1000**	**1500**
GTL09	2.4	-	3.9	-	-	-	3.9	-	-	-	6.3	-	17.8	22.7
GRN/GTR09	2.4	-	3.9	-	-	-	3.9	-	-	-	6.3	-	17.8	22.7
GRN/GTR11	2.4	-	3.9	-	-	-	3.9	-	-	-	6.3	-	17.8	22.7
GRN/GTR14	3.8	4.3	-	-	-	-	5.3	-	-	-	7.7	10.2	12.6	17.4
GRN/GTR16	3.8	4.3	-	-	-		5.3	-	-	-	7.7	10.2	12.6	17.4
GTR/GRN20	7.3	-	-	7.7	-	-	9.3	-	-	-	14	18.7	23.4	32.9
GTR/GRN25	7.3	-	-	-	8	-	9.3	-	-	-	14	18.7	23.4	32.9
GTR/GRN32	7.3	-	-	-	-	8.7	9.3	-	12.5	-	14	18.7	23.4	32.9
GTR/GRN40	7.3	-	-	-	-	-	9.3	10.2	-	14	14	18.7	23.4	32.9

*) Used only with other options

+) Used, when other end truck has guide rollers

*+) Used, when other end truck has guide rollers and T/Y buffers

5.5.3 Anti-jump catches

End carriage type	weight kg/pcs
GTL09	-
GTR/GRN09	7
GTR/GRN11	7
GRN/GTR14	15
GRN/GTR16	15
GTR20	9
GTR25	10
GTR32	11
GTR40	14

*) Weight estimated with smallest runway width

6 SURFACE TREATMENT

GRN/GTR/GTL end trucks are normally delivered as workshop primary painted. There are two different primary painting systems: workshop primary paint and primary paint. Normally final painting is made together with crane steel structure by using painting system used for crane steel structure, but it is also possible to order end trucks with final painting. The possible paintings are shown in the table below.

Standard painting systems for GRN/GTR/GTL end trucks

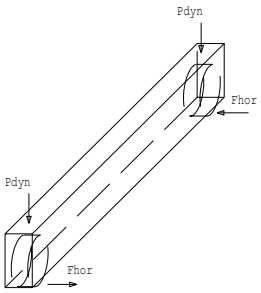
Painting	Technical feature	Value	Painting	Thickness	Manufacturer's painting system
Workshop primer paint	PAI05	-	Epoxy, red (RAL 3009)	20 microns	KC5
Primer paint	PAI05	S	Epoxy, light gray RAL 7038	60 microns	KC2
Final paint	PAI04	K	Epoxy, yellow RAL 1028	120 Microns	KC1
Final paint	PAI04	E	Epoxy, color acc. to order	Acc. to order	KC1

Before painting: shot blasting SA2 ½

Painting is done acc. to: EN-ISO 12944

7 CALCULATION INSTRUCTIONS FOR CHECKING THE RAIL WHEELS ACCORDING TO FEM

When choosing end carriages the rail wheel must be checked considering the highest allowed surface pressure and the wheel bearing capacity.



Horizontal forces according to table below have been used when designing the end carriages.

Design horizontal forces for the end carriages:

Loading case	2-wheel end carriage Pstat = static wheel load	Due to
Case I	Fhor=12.5% * Pstat	inertia
Case II bogie end truck and flanged wheels	Fhor=25% * Pstat	skewing
Case II flat wheel end carriages and guide rollers	Fhor=20% * Pstat	skewing
Case III	Fhor=30% * Pdyn, Ψ=1	accident

7.23 Checking the rail wheels considering the allowed surface pressure

Following things must be checked when choosing the wheel size.

- *the static load on the rail wheel*
- *the rail type*
- *the speed*
- *the group classification of the mechanism*

The surface pressure is checked by the following formula:

$$\frac{P_{mean}}{b_{eff} * D * c_1 * c_2} \leq P_L$$

D the wheel diameter [mm]
b_{eff} the effective width of the rail [mm]
P_L the permissible surface pressure of the wheel [N/mm^2]
c_1 a coefficient depending on the speed of crane (FEM-std.)
c_2 a coefficient depending on the group of the mechanism (FEM-std.)
P_{mean} the mean load

Rail widths:

Crane rail type A, DIN536 Blatt 1		
Rail	**Rail width b**	**b_{eff}**
A45	45	39.6
A55	55	48.3
A65	65	57
A75	75	64.3
A100	100	86.6
A120	120	106.6

Flat rail		
Rail	**Rail width b**	**b_{eff}**
50 x 30	50	44
60 x 40	60	54
70 x 40	70	64
80 x 60	80	74
100 x 60	100	94

7.23.1 Determining the mean load

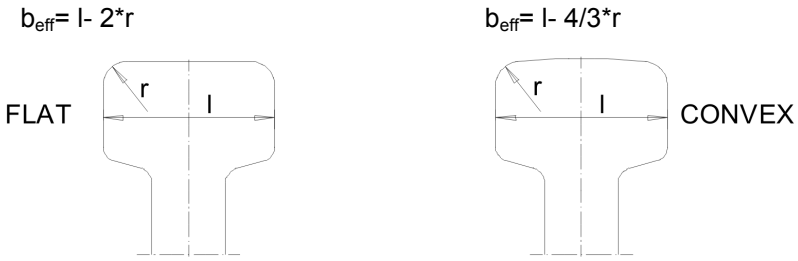
P_{mean} is determined by $P_{statmin}$ and $P_{statmax}$. Dynamic coefficient ψ is not included in the calculation.

$$P_{mean} = \frac{P_{stat\,min} + 2*(P_{stat\,max})}{3}$$

$P_{statmin}$ = minimum static wheel load, $P_{statmax}$ = maximum static wheel load

7.23.2 Determining the mean effective rail width b_{eff}

For rails having a flat or a convex bearing surface and a total width l with rounded corners of radius r at each side:



7.23.3 Determining the limiting pressure P_L valid for GTR-end carriages

The ultimate tensile strength for the wheel material is 700 N/mm^2. The permissible surface pressure used is P_L = 6,7 N/mm^2.

Rail strength should be S355 or better. If rail strength is S235or equal, rail width should be one step wider.

7.23.4 Determining the coefficient c_1

The values of c_1 are given in table as a function of the wheel diameter and the speed.

Wheel	Values of c_1 for travel speeds [m/min]										
diameter [mm]	10	12.5	16	20	25	31.5	40	50	63	80	100
90	1	0.96	0.92	0.88	0.85	0.8	0.75	0.69	0.63	0.59	0.41
110	1.02	0.99	0.95	0.91	0.88	0.84	0.79	0.74	0.68	0.62	0.58
140	1,05	1.02	0.99	0.95	0.92	0.88	0.84	0.8	0.75	0.68	0.62
160	1.06	1.04	1	0.97	0.94	0.9	0.86	0.82	0.78	0.72	0.66
200	1.09	1.06	1.03	1	0.97	0.93	0.9	0.86	0.82	0.77	0.72
250	1.11	1.09	1.06	1.03	1	0.97	0.93	0.9	0.86	0.82	0.78
315	1.13	1.11	1.09	1.06	1.04	1	0.97	0.94	0.9	0.86	0.82
400	1,14	1.13	1.11	1.09	1.06	1.03	1,00	0.97	0.94	0,90	0.86

7.23.5 Determining the coefficient c_2

The coefficient c_2 depends on the group classification of the mechanism and is given in table.

Group classification of mechanism (FEM)	c_2
M4	1.12
M5	1.0
M6	0.9

7.24 Checking the rail wheels considering the allowed load due to the bearings

Account shall be taken of the oscillations caused when lifting the load by multiplying the static loads by the "dynamic coefficient ψ". The result of this is compared with the allowed dynamic load of the bearing. P_{maxdyn} may not be higher than the allowed load due to bearing.

8 INFORMATIVE APPENDIX A

Permissible dynamic wheel loads determined by the fatigue strength of the steel structure according to component groups for GTR09-GTR40, 2-wheel end carriages with flanged wheels or guide rollers. (SG).

End carriage	Type (wheel base)	absolut Pdynmax [kN]	casel Hlmax [kN]	caselll Hlllmax [kN]	P_{dynmax} [kN]			
					E2	E3	E4	E5
GTL09	1250	28	3.0	7.3	28	28	28	22.4
	1600	23	3.0	7.3	23	23	23	18.4
	2000	18	3.0	7.3	18	18	18	14.4
GRN09	1250	35	3.8	9.1	35	28	28	22.4
	1600	35	3.8	9.1	35	28	28	22.4
	2000	35	3.8	9.1	35	28	28	22.4
	2500	35	3.8	9.1	35	28	28	22.4
GTR09	1250	35	3.8	9.1	35	28	28	22.4
	1600	35	3.8	9.1	35	28	28	22.4
	2000	35	3.8	9.1	35	28	28	22.4
	2500	35	3.8	9.1	35	28	28	22.4
GRN11	1600	48	5.2	12.5	48	46	46	36.8
	2000	48	5.2	12.5	48	46	46	36.8
	2500	48	5.2	12.5	48	46	46	36.8
	3150	48	5.2	12.5	48	46	46	36.8
GTR11	1600	48	5.2	12.5	48	46	46	36.8
	2000	48	5.2	12.5	48	46	46	36.8
	2500	48	5.2	12.5	48	46	46	36.8
	3150	47	5.2	12.5	47	46	46	36.8
GRN14	1600	55	6.0	14.3	55	47	47	37.6
	2000	55	6.0	14.3	55	47	47	37.6
	2500	55	6.0	14.3	55	47	47	37.6
	3150	47	6.0	14.3	47	47	47	37.6
	3500	40	6.0	14.3	40	40	40	32
	4000	32	6.0	14.3	32	32	32	25.6
GTR14	1600	69	7.5	18	69	55	55	44.2
	2000	69	7.5	18	69	55	55	44.2
	2500	69	7.5	18	69	55	55	44.2
	3150	58	7.5	18	58	55	55	44.2
	3500	48	7.5	18	48	48	48	38.4
	4000	32	7.5	18	32	32	32	25.6
GRN16	1600	80	8.7	20.9	80	69	69	55.2
	2000	80	8.7	20.9	80	69	69	55.2
	2500	80	8.7	20.9	80	69	69	55.2
	3150	80	8.7	20.9	80	69	69	55.2
	4000	63	8.7	20.9	63	63	63	50.4
	4500	44	8.7	20.9	44	44	44	35.2
GTR16	1600	80	8.7	20.9	80	69	69	55.2
	2000	80	8.7	20.9	80	69	69	55.2
	2500	80	8.7	20.9	80	69	69	55.2
	3150	80	8.7	20.9	80	69	69	55.2
	4000	63	8.7	20.9	63	63	63	50.4
	4500	44	8.7	20.9	44	44	44	35.2
GTR20	1600	132	14.3	34.4	132	120	120	97
	2000	132	14.3	34.4	132	120	120	97
	2500	132	14.3	34.4	132	120	120	97
	3150	112	14.3	34.4	112	112	106	86
	4000	75	14.3	34.4	75	75	75	61
	4500	53	14.3	34.4	53	53	53	43
GTR25	2000	185	20.1	48.3	185	185	185	148
	2500	171	20.1	48.3	171	171	155	124

End carriage	Type (wheel base)	absolut Pdynmax [kN]	casel HImax [kN]	caseIII HIIImax [kN]	P_{dynmax} [kN]			
					E2	E3	E4	E5
	3150	170	20.1	48.3	170	170	170	136
	4000	158	20.1	48.3	158	158	143	114
	4500	128	20.1	48.3	128	128	128	102
GTR32	2500	253	27.5	66.0	253	225	225	180
	3150	200	27.5	66.0	200	200	200	160
	4000	208	27.5	66.0	208	208	179	143
	4500	185	27.5	66.0	185	185	156	125
	5000	200	27.5	66.0	200	200	169	135
	5500	182	27.5	66.0	182	182	152	122
GTR40	2500	400	43.5	104	400	350	350	280
	3150	400	43.5	104	400	345	345	276
	4000	360	43.5	104	360	307	307	246
	4500	350	43.5	104	350	300	300	240
	5000	350	43.5	104	350	304	304	243
	5500	330	43.5	104	330	278	278	222

Permissible dynamic wheel loads determined by the fatigue strength of the steel structure according to component groups for GTR09-GTR40, 2-wheel end carriages with flanged wheels or guide rollers. (DG, Rail gauge=1200/1400, empty row=joint plates don't fit on end carriage with this wheel base/rail gauge).

End carriage	SS	absolut P_{dynmax} [kN]	casel HI_{max} [kN]	caseIII $HIII_{max}$ [kN]	P_{dynmax} [kN]			
					E2	E3	E4	E5
GTL (RG1200)	1250							
	1600	28	3.0	7.3	28	28	28	22.4
	2000	28	3.0	7.3	28	28	28	22.4
GTR09 RG1200)	1250							
	1600	35	3.8	9.1	35	28	28	22.4
	2000	35	3.8	9.1	35	28	28	22.4
	2500	35	3.8	9.1	35	28	28	22.4
GRN09 RG1200)	1250							
	1600	35	3.8	9.1	35	28	28	22.4
	2000	35	3.8	9.1	35	28	28	22.4
	2500	35	3.8	9.1	35	28	28	22.4
GRN11/GTR11 (RG1200)	1600	48	5.2	12.5	48	46	46	36.8
	2000	48	5.2	12.5	48	46	46	36.8
	2500	48	5.2	12.5	48	46	46	36.8
	3150	48	5.2	12.5	48	46	46	36.8
GRN/GTR14 (RG 1200)	1600	69	7.5	18	69	55	55	44
	2000	69	7.5	18	69	55	55	44
	2500	69	7.5	18	69	55	55	44
	3150	69	7.5	18	69	55	55	44
	3500	55	7.5	18	55	55	55	44
	4000	37	7.5	18	37	37	37	29.6
GRN16/GTR16 (RG1200)	1600	80	8.7	20.9	80	69	69	55.2
	2000	80	8.7	20.9	80	69	69	55.2
	2500	80	8.7	20.9	80	69	69	55.2
	3150	80	8.7	20.9	80	69	69	55.2
	4000	69	8.7	20.9	69	69	69	55.2
	4500	48	8.7	20.9	48	48	48	38.2
GTR20 (RG1200)	1600	132	13.4	31.3	132	120	120	97
	2000	132	13.4	31.3	132	120	120	97
	2500	132	13.4	31.3	132	120	120	97
	3150	132	13.4	31.3	132	120	120	97
	4000	85	13.4	31.3	85	85	85	68
	4500	59	13.4	31.3	59	59	59	47.2
GTR25	2000							

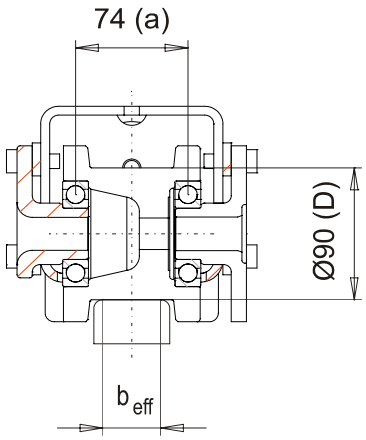
(RG1400)	2500	185	20.1	48.3	185	185	185	148
	3150	185	20.1	48.3	185	185	185	148
	4000	185	20.1	48.3	185	185	185	148
	4500	139	20.1	48.3	139	139	139	111
GTR32	2500	253	27.5	66.0	253	225	225	180
(RG1400)	3150	253	27.5	66.0	253	225	225	180
	4000	253	27.5	66.0	253	225	225	180
	4500	243	27.5	66.0	243	225	208	166
	5000	253	27.5	66.0	253	225	215	172
	5500	225	27.5	66.0	225	225	190	152
GTR40	25	400	43.5	104	400	350	350	280
(RG1400)	32	400	43.5	104	400	350	350	280
	40	400	43.5	104	400	350	350	280
	45	400	43.5	104	400	350	350	280
	50	400	43.5	104	400	350	350	280
	55	400	43.5	104	400	345	345	276
GTR40G (RG1400)	25	400	43.5	104	400	400	350	280
GTR40G (RG1400)	32	400	43.5	104	400	400	350	280
GTR40G (RG2000)	40	400	43.5	104	400	400	350	280
GTR40G (RG2500)	45	400	43.5	104	400	400	350	280
GTR40G (RG2500)	50	400	43.5	104	400	400	350	280
GTR40G (RG3000)	55	400	43.5	104	400	400	350	280

*) GTR40G45/50/55: special lower box to get space for VES5G gantry travel drive.

9 DYNAMIC WHEEL LOADS FOR WD090 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



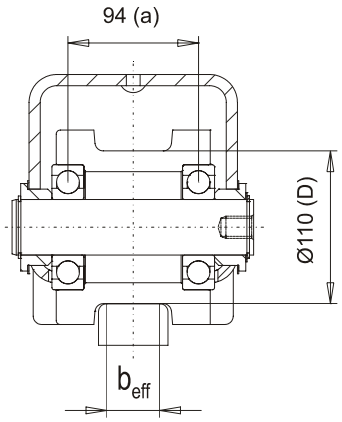
Wheel Diameter	D/mm	90		**NOTE: Pdy nam ax/kN**	
Bearing (6207-2Z)	C0=15,3kN, C=25,5kN				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

		CRANE RAILS TYPE A (DIN536 Blatt1)						FLAT RAILS				
			Rail width B (be ff)					Rail width B (be ff)				
FEM	Speed	Due to bearing	75	65	55	45		80	70	60	50	40
Duty	m/min		64.3	57	48.3	38.3		74	64	54	44	34
M4	20	35	35	35	35	33		35	35	35	35	30
	25	35	35	35	35	32		35	35	35	35	29
	32	35	35	35	35	30		35	35	35	35	27
	40	35	35	35	35	29		35	35	35	33	25
	50	32	32	32	32	26		32	32	32	30	23
	63	30	30	30	30	24		30	30	30	28	21
	80	28	28	28	28	22		28	28	28	26	20
	100	26	26	26	26	21		26	26	26	24	19
M5	20	28	28	28	28	28		28	28	28	28	27
	25	28	28	28	28	28		28	28	28	28	26
	32	28	28	28	28	27		28	28	28	28	24
	40	28	28	28	28	25		28	28	28	28	23
	50	26	26	26	26	23		26	26	26	26	21
	63	24	24	24	24	21		24	24	24	24	19
	80	22	22	22	22	20		22	22	22	22	18
	100	20	20	20	20	19		20	20	20	20	17
M6	20	28	28	28	28	27		28	28	28	28	24
	25	26	26	26	26	26		28	28	28	28	23
	32	24	24	24	24	24		28	28	28	28	22
	40	22	22	22	22	22		28	28	28	28	20
	50	20	20	20	20	20		26	26	26	26	19
	63	19	19	19	19	19		24	24	24	24	17
	80	17	17	17	17	17		22	22	22	22	16
	100	16	16	16	16	16		20	20	20	20	15

10 DYNAMIC WHEEL LOADS FOR WD110 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



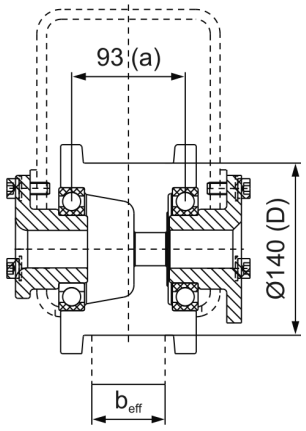
Wheel Diameter	D/mm	110		**NOTE: Pdy nam ax/kN**	
Bearing (6308-2Z)	C0=24,00kN, C=41,00kN				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

		CRANE RAILS TYPE A (DIN536 Blatt1)						FLAT RAILS				
			Rail width B (be ff)					Rail width B (be ff)				
FEM	Speed	Due to bearing	75	65	55	45		80	70	60	50	40
Duty	m/min		64.3	57	48.3	38.3		74	64	54	44	34
M4	20	48	48	48	48	42		48	48	48	48	38
	25	48	48	48	48	41		48	48	48	47	36
	32	48	48	48	48	39		48	48	48	45	34
	40	48	48	48	47	37		48	48	48	42	33
	50	48	48	48	44	35		48	48	48	40	31
	63	48	48	47	40	32		48	48	45	36	28
	80	48	48	43	36	29		48	48	41	33	25
	100	45	45	40	34	27		45	45	38	31	24
M5	20	46	46	46	46	38		46	46	46	44	34
	25	46	46	46	46	36		46	46	46	42	32
	32	46	46	46	44	35		46	46	46	40	31
	40	46	46	46	42	33		46	46	46	38	29
	50	45	45	45	39	31		45	45	43	35	27
	63	42	42	42	36	28		42	42	40	32	25
	80	39	39	38	32	26		39	39	36	29	23
	100	36	36	36	30	24		36	36	34	28	21
M6	20	46	46	46	43	34		46	46	46	39	30
	25	45	45	45	41	33		45	45	45	38	29
	32	41	41	41	39	31		41	41	41	36	28
	40	39	39	39	37	30		39	39	39	34	26
	50	36	36	36	35	28		36	36	36	32	25
	63	33	33	33	32	25		33	33	33	29	23
	80	31	31	31	29	23		31	31	31	27	20
	100	28	28	28	27	22		28	28	28	25	19

11 DYNAMIC WHEEL LOADS FOR WD140 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



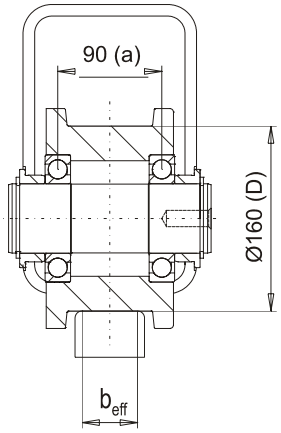
Wheel Diameter	D/mm	140		**NOTE: Pdy nam ax/kN**	
Bearing (6211-2Z)	C0=29,00kN, C=43,6kN				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

		CRANE RAILS TYPE A (DIN536 Blatt1)						FLAT RAILS				
			Rail width B (be ff)					Rail width B (be ff)				
FEM	Speed	Due to bearing	75	65	55	45		80	70	60	50	40
Duty	m/min		64.3	57	48.3	38.3		74	64	54	44	34
M4	20	86	86	84	71	56		86	86	79	65	50
	25	80	80	80	69	54		80	80	77	62	48
	32	73	73	73	66	52		73	73	73	60	46
	40	68	68	68	63	50		68	68	68	57	44
	50	63	63	63	60	47		63	63	63	54	42
	63	58	58	58	56	44		58	58	58	51	39
	80	54	54	54	51	40		54	54	54	46	36
	100	50	50	50	46	37		50	50	50	42	33
M5	20	68	68	68	63	50		68	68	68	58	45
	25	63	63	63	61	49		63	63	63	56	43
	32	58	58	58	58	46		58	58	58	53	41
	40	54	54	54	54	44		54	54	54	51	39
	50	50	50	50	50	42		50	50	50	49	38
	63	46	46	46	46	40		46	46	46	45	35
	80	43	43	43	43	36		43	43	43	41	32
	100	40	40	40	40	33		40	40	40	38	29
M6	20	54	54	54	54	45		54	54	54	52	40
	25	50	50	50	50	44		50	50	50	50	39
	32	46	46	46	46	42		46	46	46	46	37
	40	43	43	43	43	40		43	43	43	43	35
	50	40	40	40	40	38		40	40	40	40	34
	63	37	37	37	37	36		37	37	37	37	32
	80	34	34	34	34	32		34	34	34	34	29
	100	31	31	31	31	29		31	31	31	31	26

12 DYNAMIC WHEEL LOADS FOR WD160 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



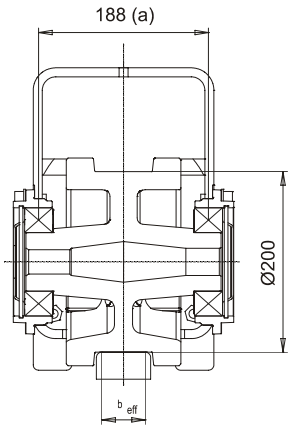
Wheel Diameter	D/mm	160		**NOTE: Pdy nam ax/kN**	
Bearing (6212-2Z)	C0=36,00kN, C=55,3kN				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

		CRANE RAILS TYPE A (DIN536 Blatt1)						FLAT RAILS				
			Rail width B (be ff)					Rail width B (be ff)				
FEM	Speed	Due to bearing	75	65	55	45		80	70	60	50	40
Duty	m/min		64.3	57	48.3	38.3		74	64	54	44	34
M4	20	80	80	80	80	66		80	80	80	75	58
	25	80	80	80	80	63		80	80	80	73	56
	32	80	80	80	77	61		80	80	80	70	54
	40	80	80	80	74	58		80	80	80	67	52
	50	80	80	80	70	56		80	80	78	64	49
	63	76	76	76	66	53		76	76	74	60	47
	80	70	70	70	61	48		70	70	68	56	43
	100	65	65	65	56	44		65	65	62	51	39
M5	20	69	69	69	69	59		69	69	69	67	52
	25	69	69	69	69	57		69	69	69	65	50
	32	69	69	69	68	54		69	69	69	62	48
	40	69	69	69	66	52		69	69	69	60	46
	50	65	65	65	63	50		65	65	65	57	44
	63	60	60	60	59	47		60	60	60	54	42
	80	55	55	55	55	43		55	55	55	50	38
	100	51	51	51	50	39		51	51	51	45	35
M6	20	69	69	69	67	53		69	69	69	61	47
	25	65	65	65	64	51		65	65	65	59	45
	32	60	60	60	60	49		60	60	60	56	43
	40	55	55	55	55	47		55	55	55	54	42
	50	51	51	51	51	45		51	51	51	51	40
	63	48	48	48	48	42		48	48	48	48	37
	80	44	44	44	44	39		44	44	44	44	35
	100	41	41	41	41	36		41	41	41	41	32

13 DYNAMIC WHEEL LOADS FOR WD200 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



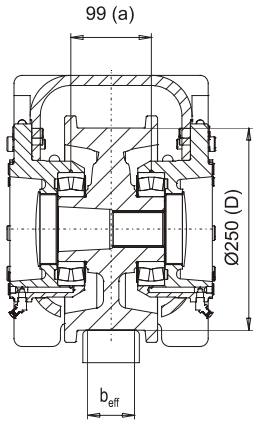
Wheel Diameter	D/mm	200		**NOTE: Pdy nam ax/kN**	
Bearing (22213CC)	C0=183,00kN, C=148,0kN, Y0=2.8, Y1=2.8				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

			CRANE RAILS TYPE A (DIN536 Blatt1)					FLAT RAILS			
			Rail width B (be ff)					Rail width B (be ff)			
FEM	Speed	Due to bearing	100	75	65	55		80	70	60	50
Duty	m/min		86.6	64.3	57	48.3		74	64	54	44
M4	20	132	132	132	126	106		132	132	119	97
	25	132	132	132	122	103		132	132	115	94
	32	132	132	132	117	99		132	131	111	90
	40	132	132	128	113	96		132	127	107	87
	50	132	132	122	108	92		132	121	102	83
	63	132	132	116	103	87		132	116	98	80
	80	132	132	109	97	82		126	109	92	75
	100	132	132	102	90	77		117	102	86	70
M5	20	120	120	120	112	95		120	120	106	87
	25	120	120	120	109	92		120	120	103	84
	32	120	120	118	104	88		120	117	99	81
	40	120	120	114	101	86		120	113	96	78
	50	120	120	109	96	82		120	108	91	74
	63	120	120	104	92	78		119	103	87	71
	80	120	120	97	86	73		112	97	82	67
	100	117	117	91	81	68		105	91	77	62
M6	20	120	120	114	101	86		120	113	96	78
	25	120	120	110	98	83		120	110	93	76
	32	120	120	106	94	80		120	105	89	72
	40	120	120	102	91	77		118	102	86	70
	50	117	117	98	87	74		113	97	82	67
	63	109	109	93	83	70		107	93	78	64
	80	101	101	88	78	66		101	87	74	60
	100	95	95	82	73	62		94	82	69	56

14 DYNAMIC WHEEL LOADS FOR WD250 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



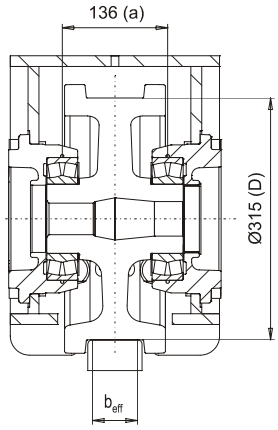
Wheel Diameter	D/mm	250		**NOTE: Pdy nam ax/kN**	
Bearing (22216CC)	C0=228,00kN, C=176,0Kn, Y=2.8, Y1=3.0				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

		CRANE RAILS TYPE A (DIN536 Blatt1)						FLAT RAILS				
			Rail width B (be ff)					Rail width B (be ff)				
FEM	Speed	Due to bearing	100	75	65	55		80	70	60	50	40
Duty	m/min		86.6	64.3	57	48.3		74	64	54	44	34
M4	20	185	185	182	162	137		185	182	153	125	96
	25	185	185	177	157	133		185	176	149	121	94
	32	185	185	172	152	129		185	171	144	118	91
	40	185	185	167	148	125		185	166	140	114	88
	50	185	185	161	143	121		185	160	135	110	85
	63	185	185	154	137	116		177	153	129	105	82
	80	177	177	145	129	109		167	145	122	99	77
	100	165	165	136	121	102		157	136	115	93	72
M5	20	185	185	163	144	122		185	162	137	111	86
	25	185	185	158	140	119		182	157	133	108	84
	32	185	185	153	136	115		177	153	129	105	81
	40	177	177	149	132	112		171	148	125	102	79
	50	165	165	144	128	108		165	143	121	99	76
	63	154	154	138	122	103		154	137	116	94	73
	80	144	144	130	115	97		144	129	109	89	69
	100	134	134	122	108	92		134	121	102	83	64
M6	20	177	177	147	130	110		169	146	123	100	78
	25	165	165	142	126	107		164	142	120	97	75
	32	154	154	138	122	104		154	137	116	95	73
	40	144	144	134	119	100		144	133	112	92	71
	50	134	134	130	115	97		134	129	109	89	69
	63	125	125	124	110	93		125	123	104	85	66
	80	117	117	117	103	88		117	116	98	80	62
	100	109	109	109	97	82		109	109	92	75	58

15 DYNAMIC WHEEL LOADS FOR WD315 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



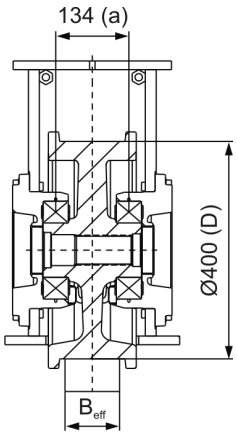
Wheel Diameter	D/mm	315		**NOTE: Pdy nam ax/kN**	
Bearing (22218CC)	C0=340,00kN, C=253,0kN, Y0=2.8, Y1=2.9				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

			CRANE RAILS TYPE A (DIN536 Blatt1)					FLAT RAILS				
			Rail width B (be ff)					Rail width B (be ff)				
FEM	Speed	Due to bearing	100	75	65	55		80	70	60	50	40
Duty	m/min		86.6	64.3	57	48.3		74	64	54	44	34
M4	20	253	253	237	210	178		253	235	199	162	125
	25	253	253	232	206	174		253	231	195	159	123
	32	253	253	223	198	168		253	222	187	153	118
	40	253	253	216	192	163		249	215	182	148	114
	50	253	253	210	186	158		241	209	176	144	111
	63	253	253	201	178	151		231	200	169	137	106
	80	253	253	192	170	144		221	191	161	131	102
	100	253	246	183	162	137		211	182	154	125	97
M5	20	225	225	211	187	159		225	210	177	145	112
	25	225	225	207	184	156		225	206	174	142	110
	32	225	225	199	177	150		225	198	167	136	105
	40	225	225	193	171	145		222	192	162	132	102
	50	225	225	187	166	141		216	186	157	128	99
	63	225	225	179	159	135		206	179	151	123	95
	80	225	225	169	152	129		197	171	144	117	91
	100	212	212	163	145	123		188	163	137	112	86
M6	20	225	225	190	169	143		219	189	160	130	101
	25	225	225	187	165	140		215	186	157	128	99
	32	225	225	179	159	135		206	179	151	123	95
	40	225	225	174	154	131		200	173	146	119	92
	50	212	212	169	149	127		194	168	142	115	89
	63	197	197	161	143	121		186	161	136	110	85
	80	184	184	154	137	116		178	154	130	106	82
	100	172	172	147	130	110		169	146	124	101	78

16 DYNAMIC WHEEL LOADS FOR WD400 END CARRIAGES

Permissible dynamic wheel loads determined by the wheel bearings and the surface pressure of the wheels.

NOTE: When bearing capacity becomes less than wheel capacity, bearing capacity is shown!



Wheel Diameter	D/mm	400		**NOTE: Pdy nam ax/kN**	
Bearing (22220CC)	C0=415,00kN, C=311,0kN, Y0=2.8, Y1=2.8				
Basic technical facts	PL N/mm^2	6,7	Rail effective width=be ff		
	P dyn/P stat =	**1.15**	**P stat min/P stat max = 0.35**		

			CRANE RAILS TYPE A (DIN536 Blatt1)						FLAT RAILS					
			Rail width B (be ff)						Rail width B (be ff)					
FEM	Speed	Due to bearing	120	100	75	65	55		100	80	70	60	50	40
Duty	m/min		106.6	86.6	64.3	57	48.3		94	74	64	54	44	34
M4	20	400	400	400	308	273	232		400	355	307	259	211	159
	25	400	400	400	302	267	227		400	347	300	253	206	156
	32	400	400	395	293	260	220		400	337	292	246	201	150
	40	400	400	384	285	252	214		400	328	283	239	195	145
	50	400	400	371	276	244	207		400	317	274	231	189	141
	63	385	385	358	266	235	199		385	306	264	223	182	135
	80	359	359	343	255	226	191		359	293	254	214	174	129
	100	335	335	329	245	217	184		335	281	243	205	167	123
M5	20	350	350	350	275	244	207		350	317	274	231	188	146
	25	350	350	350	269	239	202		350	310	268	226	184	142
	32	350	350	350	262	232	197		350	301	261	220	179	138
	40	350	350	342	254	225	191		350	293	253	214	174	134
	50	335	335	331	246	218	185		335	283	245	207	168	130
	63	310	310	310	237	210	178		310	273	236	199	162	125
	80	290	290	290	221	202	171		290	262	227	191	156	120
	100	270	270	270	218	194	164		270	251	217	183	149	115
M6	20	350	350	334	248	220	186		350	285	247	208	170	131
	25	335	335	326	242	215	182		335	279	241	204	166	128
	32	310	310	310	236	209	177		310	271	235	198	161	125
	40	290	290	290	229	203	172		290	263	228	192	157	121
	50	270	270	270	221	196	166		270	255	220	186	152	117
	63	254	254	254	213	189	160		254	246	212	179	146	113
	80	235	235	235	205	182	154		235	235	204	172	140	108
	100	220	220	220	197	174	148		220	220	196	165	135	104