Assembly Instruction
Deck Tractor with Tow Bar
DT-4800, assembly DTR-10000 rev B

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Table of Contents

Document Revision History 3

List of Figures 3

List of Tables 3

1. Introduction 5

Description 5
Key Facts 5
Overview 6
Options 6

2. Parts List 7

3. Tools, Equipment and Safety 10

Personal Protective Equipment 10
Lifting and Slinging 10
Grease Points 11

4. Assembly Procedure 12

Step 1 – Frame on stands, lifting eye bolts 13
Step 2 – Front and rear axles 14
Step 3 – Wheels, criss-cross tightening 15
Step 4 – Power module and battery box 17
Step 5 – Ballast plates (option BL) 18
Step 6 – Air-start unit sub-frame 19
Step 7 – Air-start unit module 20
Step 8 – Operator well: liner, seat base and seat 21
Step 9 – Steering pedestal and steering column 22
Step 10 – Body panels 23
Step 11 – Hood and rear deck panel 24
Step 12 – Access doors 25
Step 13 – Bumpers, chevron tape and corner marks 26
Step 14 – Tow hitches, hitch pins and tie-down hooks 27
Step 15 – Lamps 28
Step 16 – Air-start hose and hose brackets 29
Step 17 – Tow bar: casters 30
Step 18 – Tow head (option TH) 31
Step 19 – Couple the tow bar to the rear hitch 33

5. Functional Checks and Assembly Record 34

Commissioning 34

6. Assembled Tractor 36

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Document Revision History

Rev	Description of Changes	Updated by	Approved by	Date
A	First issue as a scale model (DT-48, DTK-10000). Withdrawn.	Engineering OS	—	8/11/26
B	Complete rework as a full-size deck tractor: made from assembly drawing **DTR-10000 rev B** (3 sheets), the weldment drawings **DTR-11000** and **DTR-17000**, the BOM and the 3D model. Industrial fasteners and torques, lifting, lubrication and functional checks. Fictional product, made for demonstration.	Engineering OS	—	8/11/26

List of Figures

Figure 1-A: Deck Tractor with Tow Bar – exploded overview, configuration A, with the item numbers of the parts list (made and purchased parts; fasteners: see the steps)
Figure 4-A: Step 1: Frame on stands, lifting eye bolts
Figure 4-B: Step 2: Front and rear axles
Figure 4-C: Step 3: Wheels, criss-cross tightening
Figure 4-D: Wheel nuts: positions 1 to 6 of the star order 1-4-2-5-3-6 (front left wheel, seen from the outside)
Figure 4-E: Step 4: Power module and battery box
Figure 4-F: Step 5: Ballast plates (option BL) – variants A and B
Figure 4-G: Step 6: Air-start unit sub-frame
Figure 4-H: Step 7: Air-start unit module
Figure 4-I: Step 8: Operator well: liner, seat base and seat
Figure 4-J: Step 9: Steering pedestal and steering column
Figure 4-K: Step 10: Body panels
Figure 4-L: Step 11: Hood and rear deck panel
Figure 4-M: Step 12: Access doors
Figure 4-N: Step 13: Bumpers, chevron tape and corner marks
Figure 4-O: Step 14: Tow hitches, hitch pins and tie-down hooks
Figure 4-P: Step 15: Lamps
Figure 4-Q: Step 16: Air-start hose and hose brackets
Figure 4-R: Step 17: Tow bar: casters
Figure 4-S: Step 18: Tow head (option TH) – variants A and B
Figure 4-T: Step 19: Couple the tow bar to the rear hitch
Figure 6-A: Deck Tractor with Tow Bar, front three-quarter view on a flight deck (render from the 3D model)
Figure 6-B: Left side with the operator seat and the tow bar coupled (render from the 3D model)
Figure 6-C: Seen from above: hood, operator well, rear deck with the air-start hose (render from the 3D model)

List of Tables

Table 1-A: Options of the tractor
Table 2-A: Parts list (from BOM **DTR-10000**, items as on Drawing **DTR-10000 rev B**)
Table 3-A: Tools and equipment
Table 4-A: Parts and materials of step 1
Table 4-B: Parts and materials of step 2
Table 4-C: Parts and materials of step 3
Table 4-D: Parts and materials of step 4
Table 4-E: Parts and materials of step 5
Table 4-F: Parts and materials of step 6
Table 4-G: Parts and materials of step 7
Table 4-H: Parts and materials of step 8

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Table 4-I: Parts and materials of step 9
Table 4-J: Parts and materials of step 10
Table 4-K: Parts and materials of step 11
Table 4-L: Parts and materials of step 12
Table 4-M: Parts and materials of step 13
Table 4-N: Parts and materials of step 14
Table 4-O: Parts and materials of step 15
Table 4-P: Parts and materials of step 16
Table 4-Q: Parts and materials of step 17
Table 4-R: Parts and materials of step 18
Table 4-S: Parts and materials of step 19
Table 5-A: Functional checks – results
Table 5-B: Assembly record – steps

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1. Introduction

Description

The Deck Tractor with Tow Bar DT-4800 (**DTR-10000 rev B**) is a low shipboard aircraft towing tractor with an A-frame tow bar. A welded steel chassis frame (1, **DTR-11000**) carries a front steering axle (23) and a rear drive axle (24) on four 10.00-15 tyres, a diesel power module with hydrostatic drive (28) under the hood, an air-start unit (30) in the raised rear body and an open operator seat (32) on the left side. Bolted steel body panels, chevron bumpers front and rear, red tow hitches (3) and round LED lamps complete the tractor. The tow bar (20, **DTR-17000**) couples to the rear hitch and runs on two casters. This document gives the assembly steps with the parts, tools and torques of each step, the lifting and lubrication rules, the functional checks and the record that the assembler and QC fill in.

DEMONSTRATION DOCUMENT. The Deck Tractor with Tow Bar is a fictional product, made to demonstrate Engineering OS; it belongs to no real product and no real maker. Sources: assembly drawing **DTR-10000 rev B** (3 sheets), weldment drawings **DTR-11000** and **DTR-17000**, the BOM and the 3D model. The figures are exploded views built from the 3D model; arrows, leader labels and the tightening order were added by Engineering OS; item numbers follow the parts list of the drawing. Torques are the design values of the joint schedule on drawing sheet 3. No engineering review of this document has taken place.

Blue arrows show the direction of installation. Each figure also shows the parts installed in the earlier steps, in their final positions. **Red** marks torques and tightening order. **Dark blue bold** marks part numbers (P/N) and drawing revisions (rev). Steps with a choice show both variants: **A** is the build of the drawing and the 3D model, **B** the alternative. Choose one before you start the step.

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Key Facts

- Tractor 4428 × 2236 × 1529 mm (length over the hitches × width × height over the eye bolts), about 4496 kg with ballast; tow bar 193 kg; tractor with the tow bar coupled 9868 mm long (estimates from the 3D model).
- 69 items in the parts list: 22 made parts and weldments, 21 purchased units, 22 standard fasteners and 4 consumables.
- Fasteners ISO 4017, 4014, 4162, 7380-2 and 4762, property classes 8.8 and 10.9, zinc-flake coated. Torques from the joint schedule of Drawing **DTR-10000 rev B**, sheet 3, for lightly oiled threads, tolerance ±10 %; mark every tightened fastener with a paint line.
- **Lift the tractor only at the 4 eye bolts (44) with a lifting frame, every leg vertical. Never work under a load that hangs on the crane; put the frame on axle stands.**
- **Wheel nuts: star order 1-4-2-5-3-6, two passes; re-torque after 50 km or 10 operating hours.**
- Two options, each chosen with A or B: ballast in the rear body (BL) and the tow head at the aircraft end (TH).

Source: Drawing **DTR-10000 rev B**, BOM DTR-10000_BOM.xlsx and the 3D model DTR-10000_DT-4800_assembly.step. Quantities match the parts list of the drawing.

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Overview

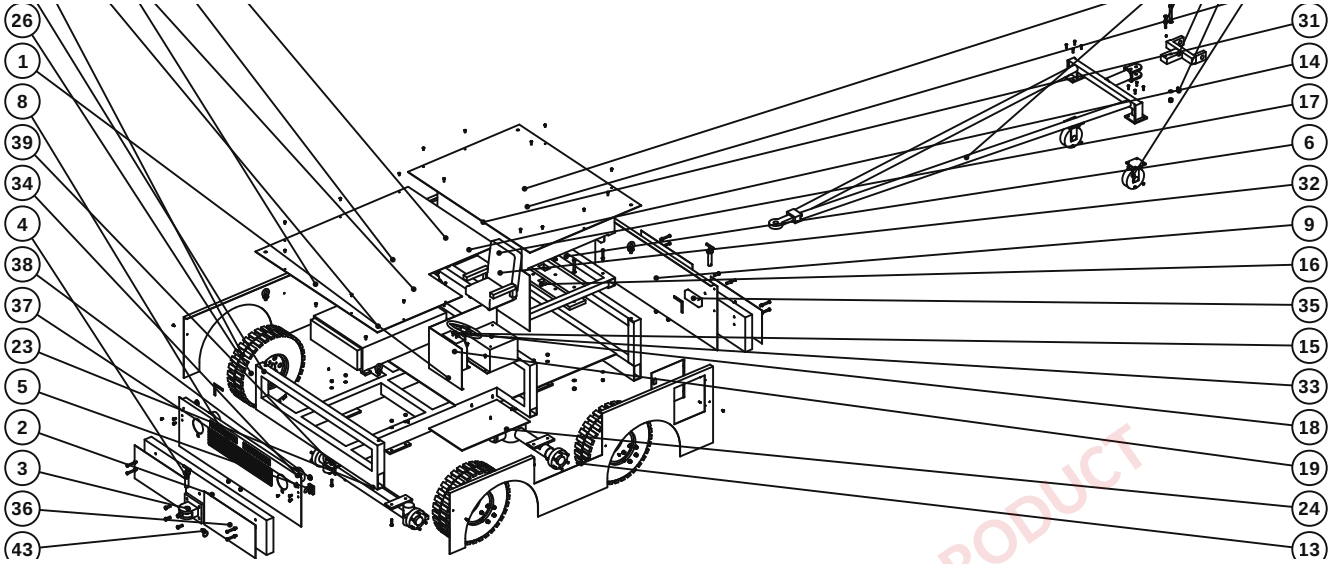


Figure 1-A: Deck Tractor with Tow Bar – exploded overview, configuration A, with the item numbers of the parts list (made and purchased parts; fasteners: see the steps)

Options

Table 1-A: Options of the tractor

ID	Option	A (as drawn)	B	Step
BL	Ballast in the rear body	2 ballast plates fitted (**DTR-12010**)	no ballast	5
TH	Tow head (aircraft end)	fork type, two lugs (**DTR-17020**)	pin type (**DTR-17030**)	18

Option B parts are not in the assembly STEP of configuration A; their own STEP files are in the 3D model package.

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2. Parts List

Table 2-A: Parts list (from BOM DTR-10000, items as on Drawing DTR-10000 rev B)

Item	P/N	Description	Material / specification	Qty	Step
1	DTR-11000	Chassis frame weldment	S355J2H (EN 10219) RHS, S355J2+N plate	1	1
2	DTR-11010	Bumper weldment, full width	S355J2+N plate 6, box 460x100	2	13
3	DTR-11020	Tow hitch jaw weldment	S355J2+N plate 25 / 30	2	14
4	DTR-11021	Hitch pin d40 with T-handle	C45 (1.0503) +QT	2	14, 19
5	DTR-11025	Tie-down hook with base plate	S355J2+N plate 20, forged hook 42CrMo4 +QT	2	14
6	DTR-11030	Air-start unit sub-frame weldment	S355J2H SHS 100x100x5, 80x80x5	1	6
7	DTR-12001	Side panel, right	S235JR sheet 4	1	10
8	DTR-12002	Front panel with radiator grille and vents	S235JR sheet 4, bars 18x8, mesh 3	1	10
9	DTR-12003	Rear panel	S235JR sheet 4	1	10
10	DTR-12004	Hood (front deck panel)	S235JR plate 5	1	11
11	DTR-12005	Rear deck panel, tread plate	Aluminium tread plate EN AW-5754 H114, 5/6.5	1	11
12	DTR-12006	Access door with piano hinge and two latches	S235JR sheet 3, stainless hinge	2	12
13	DTR-12007	Side panel, left, with operator-well opening	S235JR sheet 4	1	10
14	DTR-12008	Rear body front wall	S235JR sheet 4	1	10
15	DTR-12009	Operator-well liner	S235JR sheet 3	1	8
16	DTR-12010	Ballast plate 40	S235JR plate 40	2	5
17	DTR-12020	Hose stowage bracket	S235JR plate 6	2	16
18	DTR-13001	Seat base	S235JR sheet 3	1	8
19	DTR-13002	Steering pedestal with instrument panel	S235JR sheet 3, 24 V instruments	1	9
20	DTR-17000	Tow bar weldment, A-frame	S355J2H tubes 76.1x4 and 114.3x6.3, RHS 80x80x5, plate	1	17, 19
21	DTR-17020	Tow head, fork type	S355J2+N plate, 42CrMo4 +QT lugs	1	18
22	DTR-17030	Tow head, pin type	S355J2+N plate, 42CrMo4 +QT socket	1	18
23	DTR-20001	Front steering axle with hubs, 4 t	Purchased unit, hubs with M18x1.5 studs	1	2
24	DTR-20002	Rear drive axle with differential, 6 t	Purchased unit, hubs with M18x1.5 studs	1	2
25	DTR-20003	Disc wheel 7.50-15, deep dish, 6 holes	Steel, PCD 205	4	3
26	DTR-20004	Tyre 10.00-15 18PR, block tread, tube type	Pneumatic, 8.0 bar	4	3
27	DTR-20005	Wheel nut M18x1.5 with conical washer	Steel, class 10	24	3

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28	DTR-20010	Power module, diesel 55 kW, with hydrostatic pump and radiator	Purchased unit, 4 mounting feet	1	4
29	DTR-20011	Battery box 24 V, 2 x 12 V 140 Ah	Purchased unit	1	4
30	DTR-20012	Air-start unit module, 1.2 kg/s at 3.5 bar	Purchased unit, 4 mounting feet	1	7
31	DTR-20014	Air-start hose 3 in x 8 m with coupling	Rubber hose, 7 bar; coupling aluminium	1	16
32	DTR-20015	Operator seat with suspension, armrests and seat belt	Purchased unit	1	8
33	DTR-20016	Steering column with steering wheel	Purchased unit, hydrostatic steering	1	9
34	DTR-20020	Head lamp LED 24 V, round 7 in	Purchased, IP67, glass lens	2	15
35	DTR-20021	Rear combination lamp LED 24 V	Purchased, IP67	2	15
36	DTR-20022	Chevron warning tape black/white, reflective, 440 x 925	Retro-reflective film, self-adhesive	4	13
37	DTR-20023	Position lamp LED 24 V, round 46, clear	Purchased, IP67	2	15
38	DTR-20024	Marker lamp LED 24 V, round 52, blue	Purchased, IP67	2	15
39	DTR-20025	Corner mark, yellow retro-reflective, L 150 x 150	Retro-reflective film, self-adhesive	4	13
40	DTR-20030	Swivel caster 250 x 80, solid rubber, 600 kg	Purchased, top plate 160 x 160	2	17
41	DTR-20031	Shear pin d16, calibrated	42CrMo4, rated shear load 60 kN	1	18
42	DTR-20032	R-clip 4	Spring steel	1	18
43	DTR-20033	Linch pin d10 with ring	Spring steel	2	14, 19
44	DIN 580 M24	Lifting eye bolt M24	C15E, WLL 1.8 t (vertical)	4	1
45	DIN 71412 AM8x1	Grease nipple M8x1, straight	Steel	3	2, 18
46	ISO 4017 M16x70-8.8	Hexagon head screw M16 x 70	Steel 8.8	8	2
47	ISO 4017 M16x130-8.8	Hexagon head screw M16 x 130	Steel 8.8	8	13
48	ISO 4014 M16x140-8.8	Hexagon head bolt M16 x 140	Steel 8.8	4	6
49	ISO 4032 M16-8	Hexagon nut M16	Steel 8	12	2, 6
50	ISO 7089-16-200HV	Plain washer 16	Steel 200 HV	24	2, 6, 13
51	ISO 4017 M20x60-10.9	Hexagon head screw M20 x 60	Steel 10.9	8	14
52	ISO 4014 M20x120-8.8	Hexagon head bolt M20 x 120	Steel 8.8	4	5
53	ISO 4032 M20-10	Hexagon nut M20	Steel 10	12	5, 14
54	ISO 7089-20-300HV	Plain washer 20	Steel 300 HV	16	5, 14
55	ISO 4014 M24x160-8.8	Hexagon head bolt M24 x 160	Steel 8.8	1	18
56	ISO 7040 M24-8	Prevailing torque nut M24, nylon insert	Steel 8	1	18
57	ISO 7089-24-200HV	Plain washer 24	Steel 200 HV	2	18

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58	ISO 4017 M12x40-8.8	Hexagon head screw M12 x 40	Steel 8.8	12	7, 17
59	ISO 4162 M12x30-8.8	Hexagon flange bolt M12 x 30	Steel 8.8	8	4, 14
60	ISO 7040 M12-8	Prevailing torque nut M12, nylon insert	Steel 8	8	17
61	ISO 7089-12-200HV	Plain washer 12	Steel 200 HV	4	7
62	ISO 4162 M10x25-8.8	Hexagon flange bolt M10 x 25	Steel 8.8	16	4, 8, 9, 16
63	ISO 7380-2 M10x25-10.9	Button head screw with collar M10 x 25	Steel 10.9	34	8, 10, 11
64	ISO 4762 M10x30-8.8	Socket head cap screw M10 x 30	Steel 8.8	4	9
65	ISO 4762 M8x20-8.8	Socket head cap screw M8 x 20	Steel 8.8	8	8, 12
66	**DTR-30001**	Threadlocker, medium strength	Anaerobic, 50 ml, for M6 to M20	1 bottle	7, 8, 9, 12, 14
67	**DTR-30002**	Grease, lithium complex EP2	NLGI 2, cartridge 400 g	1 cartridge	2, 18
68	**DTR-30003**	Touch-up paint RAL 9016	2K PU, 250 ml	1 can	final
69	**DTR-30004**	Surface cleaner, solvent based	For the tape and mark areas, 500 ml	1 bottle	13

Every item of the parts list is used in the step(s) named in the last column; the instruction builder checks this and checks that the fastener quantities of the steps add up to the parts list.

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3. Tools, Equipment and Safety

Table 3-A: Tools and equipment

Picture	Name	Use	Steps
	**Torque wrenches 20–100, 60–340 and 150–750 N·m**	Calibrated; 3/8, 1/2 and 3/4 in drive. All torques of the joint schedule, 25 to 580 N·m	2–18
	**Sockets and ring spanners 15, 18, 24, 27, 30 mm**	Flange bolts M10 and M12, hexagon screws M12, M16, M20, wheel nuts M18×1.5	2–17
	**Hex bits 6 and 8 mm**	Button head screws M10 (ISO 7380-2) and socket head screws M8, M10 (ISO 4762)	8–12
	**Crane 6 t, lifting frame with 4 vertical legs**	Lifting the frame, the tractor and the purchased units; chain slings with a valid test certificate	1, 4, 7, 19
	**4 axle stands, 6 t each; 2 trestles**	The frame stands on the axle stands from step 1 to step 3; the tow bar on the trestles in steps 17 and 18	1–3, 17, 18
	**Grease gun with grease DTR-30002**	Grease points G1 to G3 (section 3)	2, 18
	**Threadlocker DTR-30001, medium strength**	Only where the joint schedule says so	7–9, 12, 14
	**Tyre gauge, inflation line with clip-on chuck**	Tyre pressure 8.0 bar cold; inflate only in a tyre cage	3, final

Socket sizes follow the standards of the fasteners (ISO 4017, ISO 4162) and the 3D model.

Personal Protective Equipment



Wear a hard hat, safety shoes with toe caps, work gloves and safety glasses in every step. Wear a hard hat whenever a load hangs on the crane. Wear chemical-resistant gloves when you use threadlocker, cleaner or grease.

Lifting and Slinging



a) Lift the frame and the tractor only at the 4 lifting eye bolts DIN 580 M24 (44) on the corner posts. Each eye bolt carries 1.8 t with a vertical pull only.

b) Use a lifting frame (spreader) with 4 vertical chain legs, max. 6° from vertical. The tractor weighs about 4496 kg; the crane, the lifting frame and the chains must be rated for at least 6 t.

c) Screw the eye bolts in until the collar sits flat on the deck plate, hand tight. Turn the eye in the direction of the leg. Do not use an eye bolt with a bent eye or a damaged thread.

d) Uncouple the tow bar before you lift the tractor. Lift the tow bar alone (about 193 kg) with 2 round slings at the cross tube and the centre tube.

e) Keep everybody out of the area under the load. Put the load down on axle stands or on its wheels before anybody works on it.

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Grease Points

There are 3 grease nipples M8×1 (45): **G1** and **G2** on the king pins of the front axle (step 2) and **G3** on the tow-head pivot (step 18). Grease them with grease **DTR-30002** at assembly until fresh grease comes out of the joint, then every 50 operating hours. The axle hubs, the steering column and the casters are sealed by their suppliers.

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4. Assembly Procedure

Before each step: check the parts of the step against the parts list of the step, clean threads and seating faces, and read the warnings. Tighten every fastener with a calibrated torque wrench to the torque of the step and mark it with a paint line. Sign the row at the end of each step.

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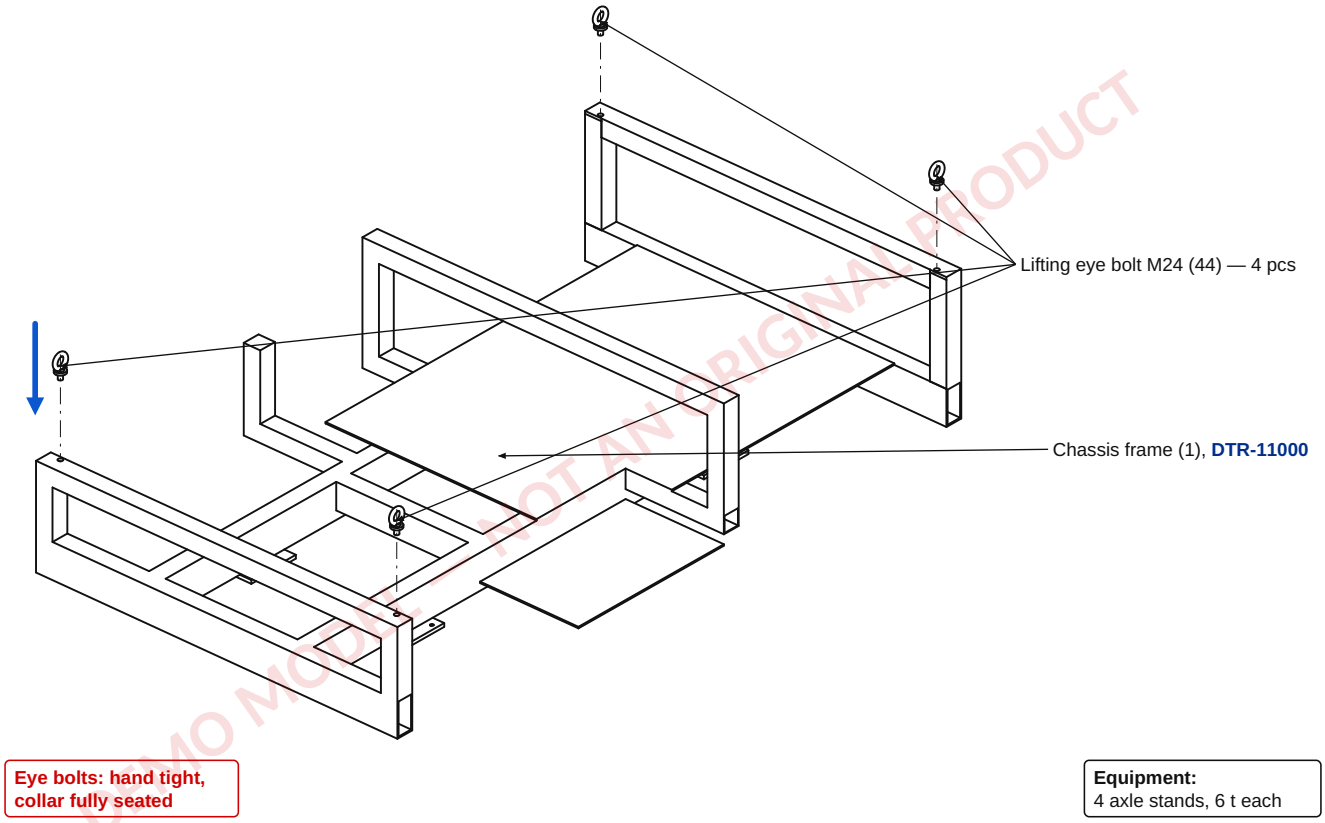
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Step 1 – Frame on stands, lifting eye bolts



a) Set up 4 axle stands of 6 t on a flat, level floor. Fit a lifting frame to the crane.
b) Screw the 4 lifting eye bolts DIN 580 M24 (44) into the threaded holes of the 4 corner posts of the chassis frame (1, **DTR-11000**). Hand tight; the collar sits flat on the post top plate.
c) Lift the frame with 4 vertical legs and lower it onto the axle stands under the 4 corner posts, rails level.

WARNING
Do not stand under the frame while it hangs on the crane. Lower it onto the 4 axle stands before you work on it.



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Figure 4-A: Step 1: Frame on stands, lifting eye bolts

Table 4-A: Parts and materials of step 1

Item	P/N	Name	Qty
1	DTR-11000	Chassis frame weldment	1
44	DIN 580 M24	Lifting eye bolt M24	4

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 1, 44

Step 1 done	Assembler name	Employee no.	Signature	Date
Step no. 1				

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Step 2 – Front and rear axles

a) Roll the front steering axle (23, **DTR-20001**) under the axle plates at the front of the frame on a jack. Lift it until its mounting pads touch the axle plates. Put a hexagon head screw M16×70-8.8 (46) through each of the 4 holes from below; a washer 16 (50) and a nut M16 (49) on top.

b) Do the same with the rear drive axle (24, **DTR-20002**) at the rear axle plates.

c) Tighten the 4 nuts crosswise on each axle: 210 N·m.

d) Screw a grease nipple M8×1 (45) into each king pin of the front axle (G1, G2) and grease them (section 3).

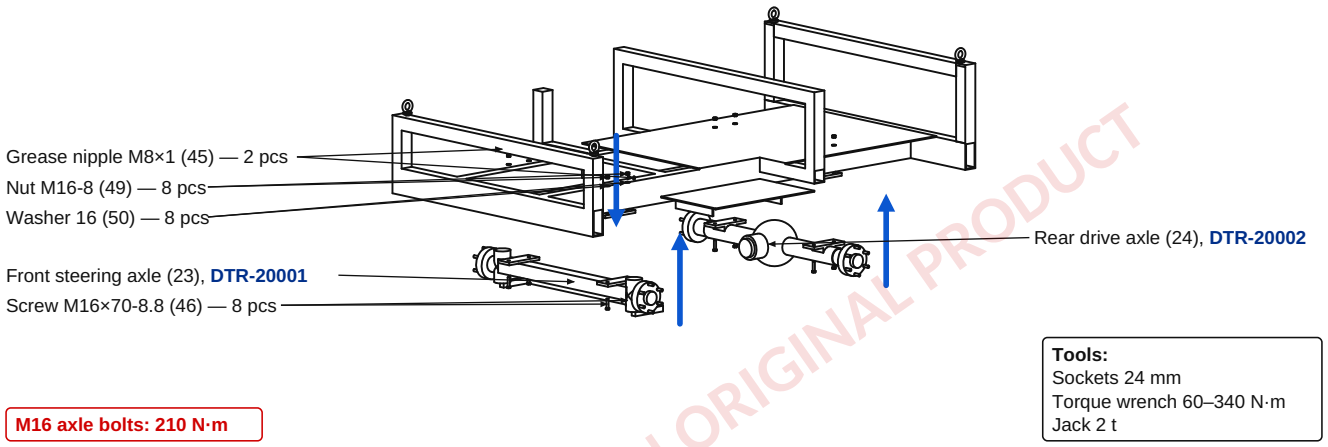


Figure 4-B: Step 2: Front and rear axles

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Table 4-B: Parts and materials of step 2

Item	P/N	Name	Qty
23	DTR-20001	Front steering axle with hubs, 4 t	1
24	DTR-20002	Rear drive axle with differential, 6 t	1
46	ISO 4017 M16x70-8.8	Hexagon head screw M16 x 70	8
50	ISO 7089-16-200HV	Plain washer 16	8
49	ISO 4032 M16-8	Hexagon nut M16	8
45	DIN 71412 AM8x1	Grease nipple M8x1, straight	2
67	DTR-30002	Grease, lithium complex EP2	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 23, 24, 46, 50, 49, 45, 67

Step 2 done	Assembler name	Employee no.	Signature	Date
Step no. 2				

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Step 3 – Wheels, criss-cross tightening

a) The tyres (26) come fitted on the disc wheels (25) and inflated to 8.0 bar by the tyre service. Check the pressure cold.

b) Lift each wheel onto the studs of its hub, valve to the outside. Turn on the 6 wheel nuts M18×1.5 (27), conical side to the wheel, by hand.

c) Tighten the nuts in the star order 1-4-2-5-3-6 (red numbers in the figure) in two passes: pass 1 to 50 %, about 150 N·m; pass 2, same order: 300 N·m.

d) Lift the frame off the axle stands with the crane and put the tractor down on its wheels. Check the torque of every wheel nut again on the wheels. Re-torque after 50 km or 10 operating hours.

WARNING

A tyre at 8.0 bar holds a large amount of energy. Inflate tyres only in a tyre cage, with a clip-on chuck and a remote gauge.

CAUTION

Clean the stud threads and the seating faces of the wheels and nuts. No paint, oil or grease on the seating faces.

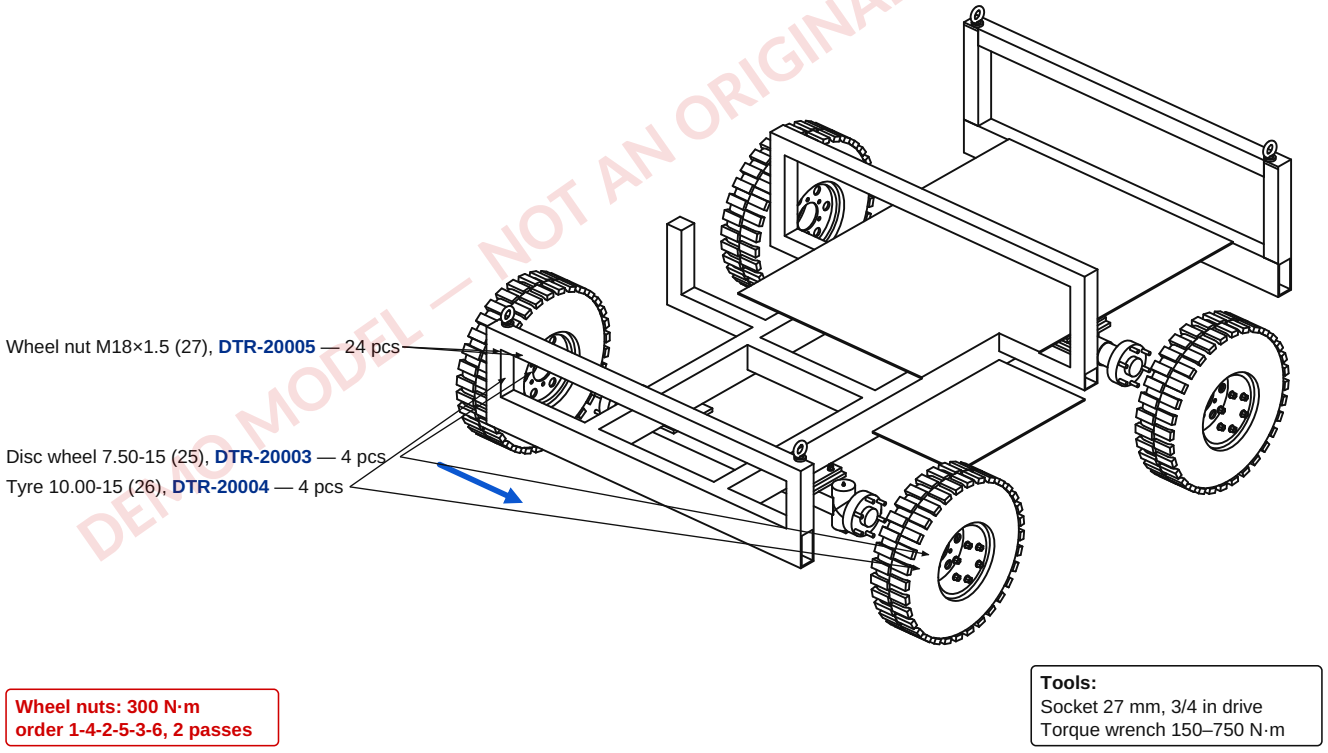


Figure 4-C: Step 3: Wheels, criss-cross tightening

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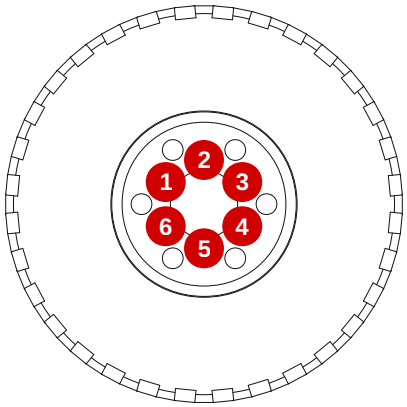


Figure 4-D: Wheel nuts: positions 1 to 6 of the star order 1-4-2-5-3-6 (front left wheel, seen from the outside)

Table 4-C: Parts and materials of step 3

Item	P/N	Name	Qty
25	DTR-20003	Disc wheel 7.50-15, deep dish, 6 holes	4
26	DTR-20004	Tyre 10.00-15 18PR, block tread, tube type	4
27	DTR-20005	Wheel nut M18x1.5 with conical washer	24

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 25, 26, 27

Step 3 done	Assembler name	Employee no.	Signature	Date
Step no. 3				

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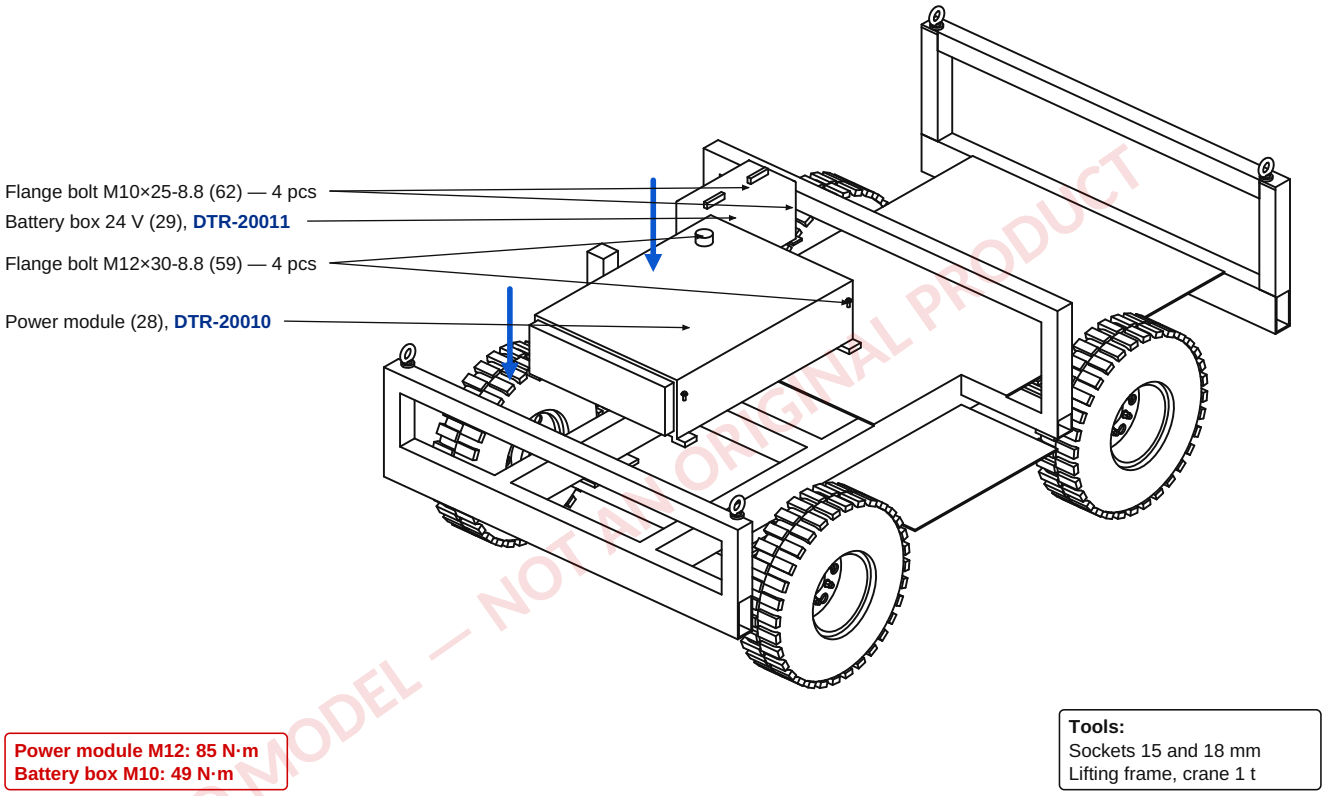
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Step 4 – Power module and battery box

a) Lift the power module (28, **DTR-20010**) with the lifting frame at its 4 lifting points. Lower it onto the frame rails, radiator to the front, until its 4 feet sit on the weld nuts.

b) Fit 4 flange bolts M12×30-8.8 (59) and tighten them crosswise: 85 N·m.

c) Put the battery box (29, **DTR-20011**) on the floor plate behind the power module. Fit 4 flange bolts M10×25-8.8 (62): 49 N·m. Do not connect the battery yet.



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Figure 4-E: Step 4: Power module and battery box

Table 4-D: Parts and materials of step 4

Item	P/N	Name	Qty
28	DTR-20010	Power module, diesel 55 kW, with hydrostatic pump and radiator	1
59	ISO 4162 M12x30-8.8	Hexagon flange bolt M12 x 30	4
29	DTR-20011	Battery box 24 V, 2 x 12 V 140 Ah	1
62	ISO 4162 M10x25-8.8	Hexagon flange bolt M10 x 25	4

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 28, 59, 29, 62

Step 4 done	Assembler name	Employee no.	Signature	Date
Step no. 4				

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Step 5 – Ballast plates (option BL)

Option A, ballast: lay the 2 ballast plates 40 (16, **DTR-12010**) on the floor plate in the rear body, one on the other, lifting slots aligned. Put a washer 20 (54) on each of 4 bolts M20×120-8.8 (52), put the bolts through the plates and the floor plate from above; a washer 20 and a nut M20 (53) below. Tighten crosswise: 410 N·m.

Option B, no ballast: leave the floor plate free. The tractor is about 560 kg lighter; the tow capacity is lower (see the power-module data).

NOTICE

Choose option BL now. With option B the 8 washers 20, the 4 nuts M20 and the 4 bolts M20×120 of this step are not used.

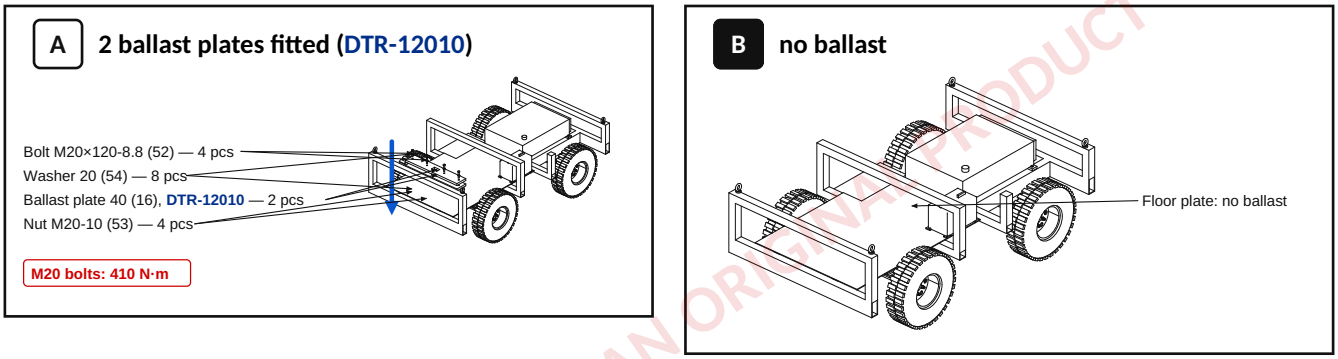


Figure 4-F: Step 5: Ballast plates (option BL) – variants A and B

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Table 4-E: Parts and materials of step 5

Item	P/N	Name	Qty
16	DTR-12010	Ballast plate 40 *(option BL-A)*	2
52	ISO 4014 M20x120-8.8	Hexagon head bolt M20 x 120 *(option BL-A)*	4
54	ISO 7089-20-300HV	Plain washer 20	8
53	ISO 4032 M20-10	Hexagon nut M20	4

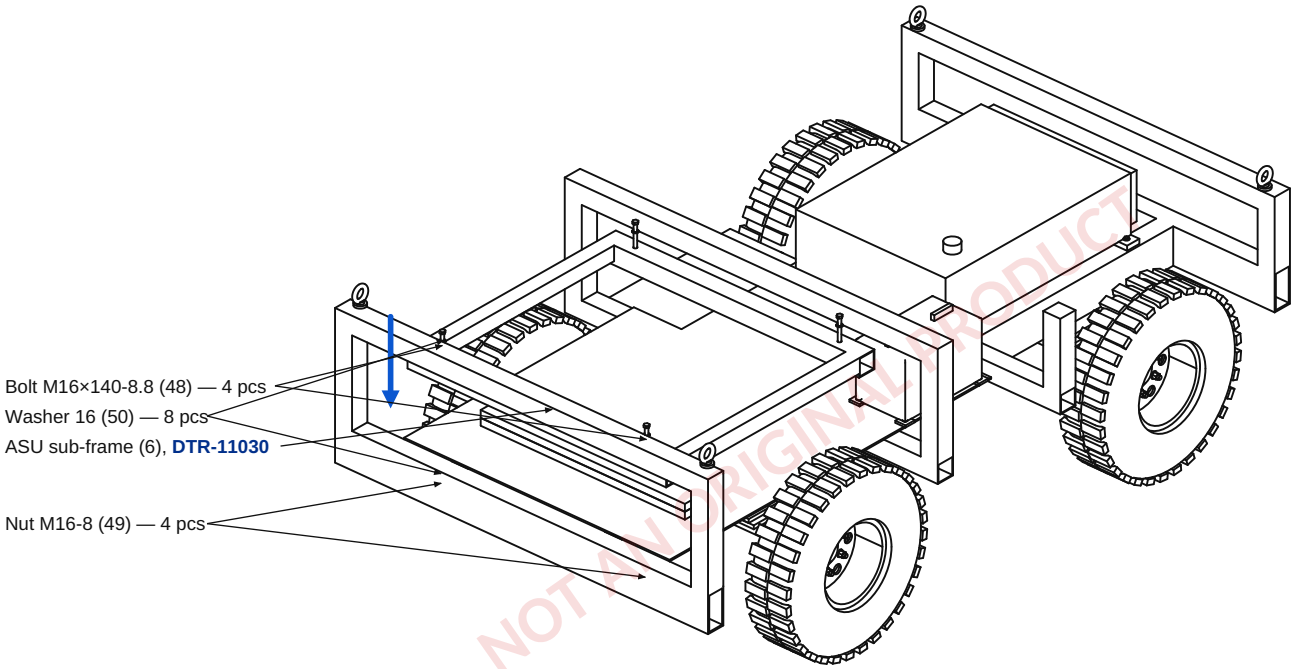
Drawing **DTR-10000 rev B**, sheets 1 to 3; options table, sheet 2; items 16, 52, 54, 53

Step 5 done	Assembler name	Employee no.	Signature	Date
Step no. 5				

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Step 6 – Air-start unit sub-frame

a) Put the air-start unit sub-frame (6, **DTR-11030**) on the floor plate in the rear body, over the 4 holes.
b) Put a washer 16 (50) on each of 4 bolts M16×140-8.8 (48). Put the bolts through the sub-frame and the floor plate from above; a washer 16 and a nut M16 (49) below.
c) Tighten crosswise: 210 N·m.



M16 bolts: 210 N·m

Tools:
Sockets 24 mm
Ring spanner 24 mm

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Figure 4-G: Step 6: Air-start unit sub-frame

Table 4-F: Parts and materials of step 6

Item	P/N	Name	Qty
6	DTR-11030	Air-start unit sub-frame weldment	1
48	ISO 4014 M16x140-8.8	Hexagon head bolt M16 x 140	4
50	ISO 7089-16-200HV	Plain washer 16	8
49	ISO 4032 M16-8	Hexagon nut M16	4

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 6, 48, 50, 49

Step 6 done	Assembler name	Employee no.	Signature	Date
Step no. 6				

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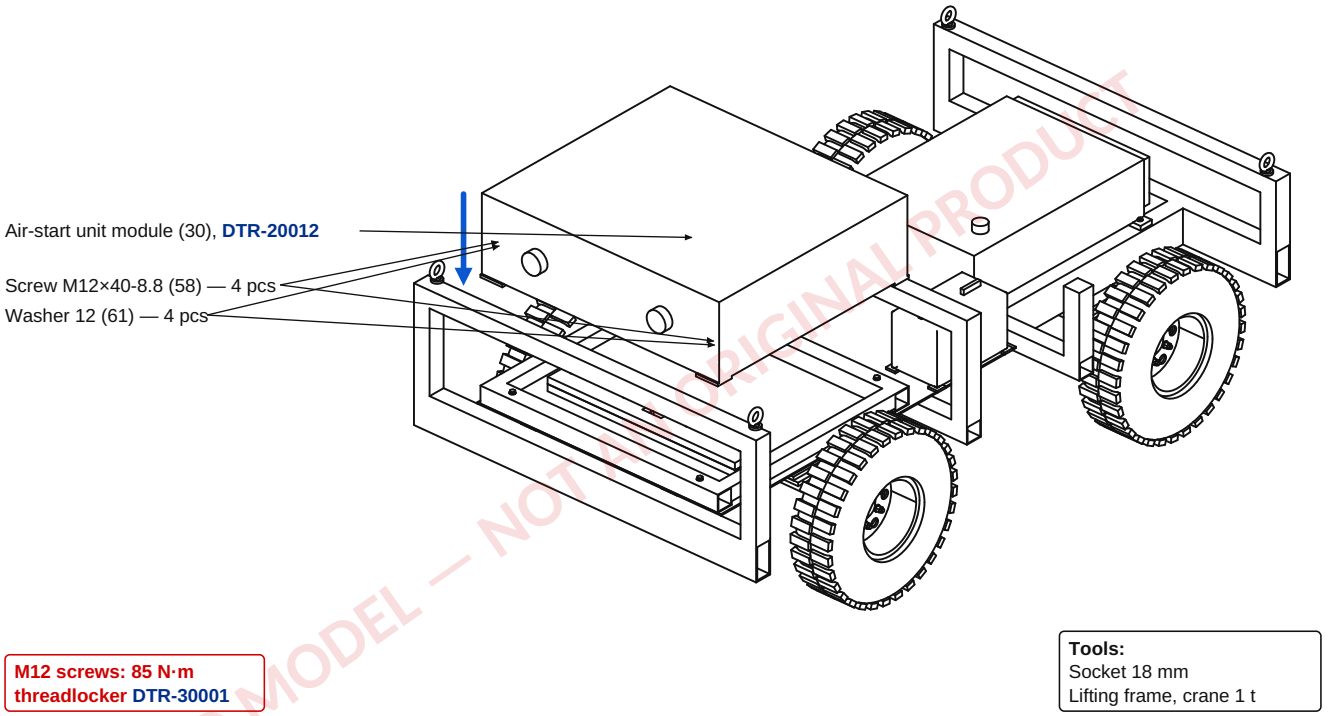
Step 7 – Air-start unit module

a) Lift the air-start unit module (30, **DTR-20012**) with the lifting frame. Lower it onto the sub-frame, air outlets to the rear.

b) Put threadlocker **DTR-30001** on the 4 screws M12×40-8.8 (58), a washer 12 (61) on each, and turn them into the feet of the module. Tighten crosswise: 85 N·m.

WARNING

The air-start unit module weighs about 690 kg. Lift it only at its lifting points with the lifting frame.



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Figure 4-H: Step 7: Air-start unit module

Table 4-G: Parts and materials of step 7

Item	P/N	Name	Qty
30	DTR-20012	Air-start unit module, 1.2 kg/s at 3.5 bar	1
58	ISO 4017 M12x40-8.8	Hexagon head screw M12 x 40	4
61	ISO 7089-12-200HV	Plain washer 12	4
66	DTR-30001	Threadlocker, medium strength	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 30, 58, 61, 66

Step 7 done	Assembler name	Employee no.	Signature	Date
Step no. 7				

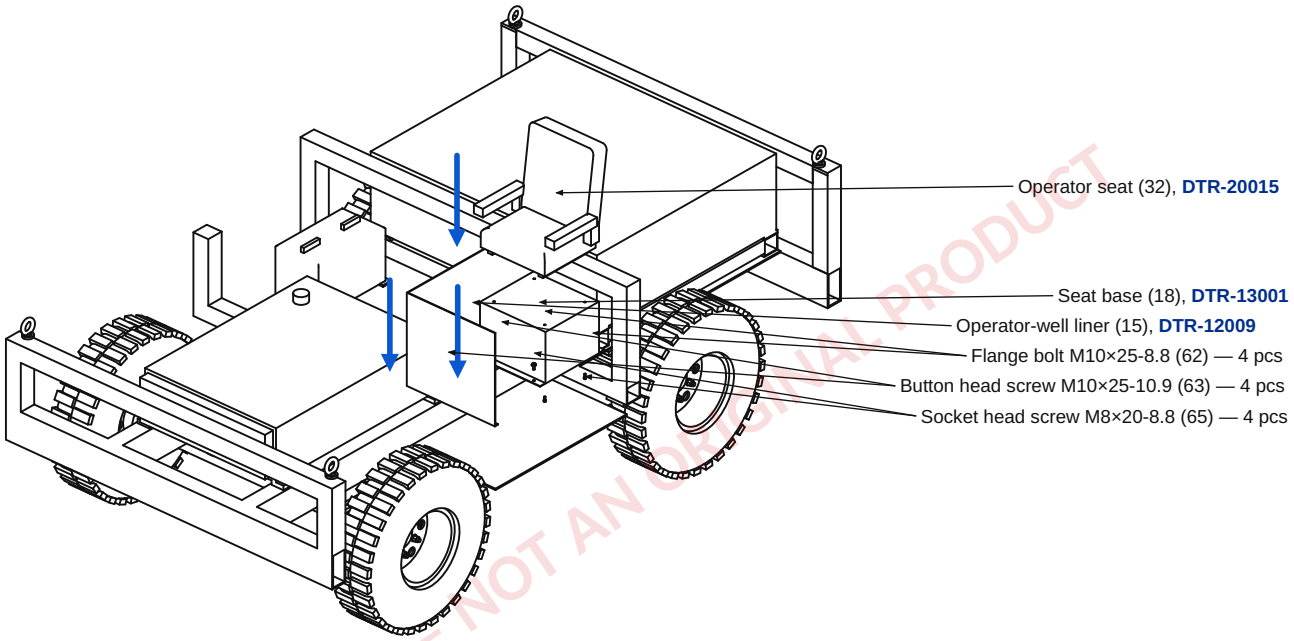
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Step 8 – Operator well: liner, seat base and seat

a) Put the operator-well liner (15, **DTR-12009**) into the operator well. Fit 4 button head screws M10×25 (63): 40 N·m.

b) Put the seat base (18, **DTR-13001**) on the well floor. Fit 4 flange bolts M10×25 (62): 49 N·m.

c) Put the operator seat (32, **DTR-20015**) on the seat base, backrest to the rear. Put threadlocker on the 4 socket head screws M8×20 (65) and fit them from below: 25 N·m. Check that the seat slides and locks.



Liner M10: 40 N·m
Seat base M10: 49 N·m
Seat M8: 25 N·m, threadlocker

Tools:
Hex bits 6 mm
Socket 15 mm
Torque wrench 20–100 N·m

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Figure 4-I: Step 8: Operator well: liner, seat base and seat

Table 4-H: Parts and materials of step 8

Item	P/N	Name	Qty
15	**DTR-12009**	Operator-well liner	1
63	ISO 7380-2 M10x25-10.9	Button head screw with collar M10 x 25	4
18	**DTR-13001**	Seat base	1
62	ISO 4162 M10x25-8.8	Hexagon flange bolt M10 x 25	4
32	**DTR-20015**	Operator seat with suspension, armrests and seat belt	1
65	ISO 4762 M8x20-8.8	Socket head cap screw M8 x 20	4
66	**DTR-30001**	Threadlocker, medium strength	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 15, 63, 18, 62, 32, 65, 66

Step 8 done	Assembler name	Employee no.	Signature	Date
Step no. 8				

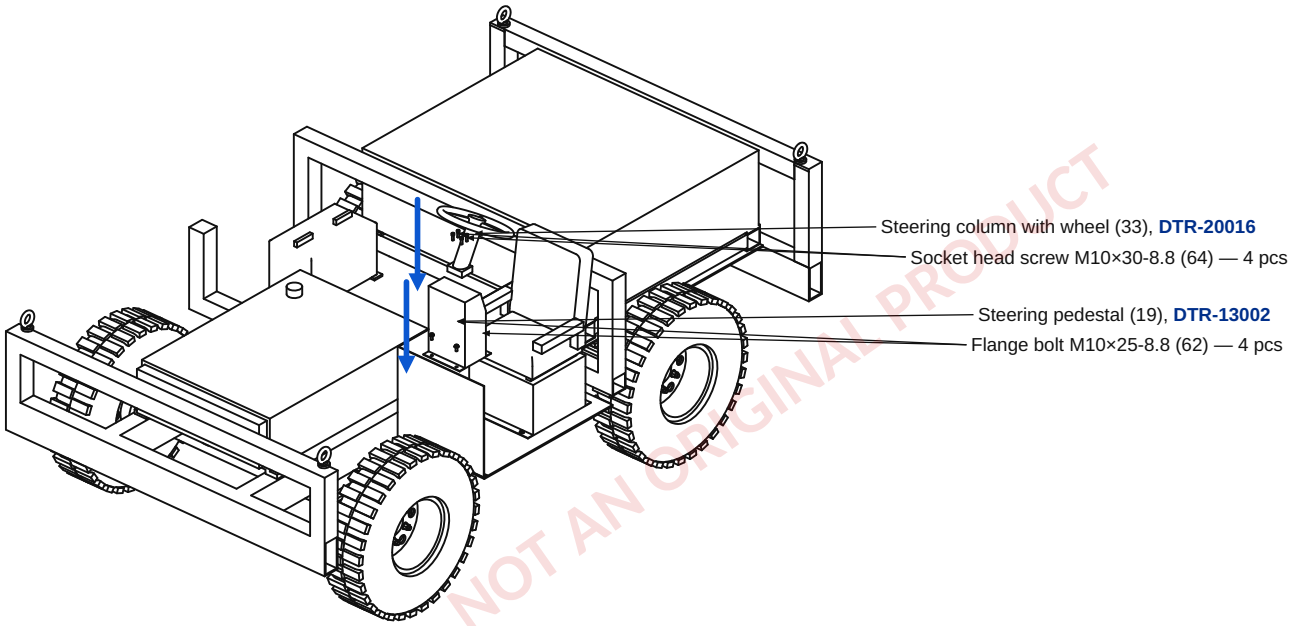
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Step 9 – Steering pedestal and steering column

a) Put the steering pedestal (19, **DTR-13002**) on the well floor in front of the seat. Fit 4 flange bolts M10×25 (62): 49 N·m.

b) Put the steering column with the steering wheel (33, **DTR-20016**) on the top of the pedestal. Put threadlocker on the 4 socket head screws M10×30 (64) and fit them: 49 N·m.

c) Connect the hydraulic hoses of the steering unit to the power module per the supplier documents.



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Figure 4-J: Step 9: Steering pedestal and steering column

Table 4-I: Parts and materials of step 9

Item	P/N	Name	Qty
19	DTR-13002	Steering pedestal with instrument panel	1
62	ISO 4162 M10x25-8.8	Hexagon flange bolt M10 x 25	4
33	DTR-20016	Steering column with steering wheel	1
64	ISO 4762 M10x30-8.8	Socket head cap screw M10 x 30	4
66	DTR-30001	Threadlocker, medium strength	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 19, 62, 33, 64, 66

Step 9 done	Assembler name	Employee no.	Signature	Date
Step no. 9				

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Step 10 – Body panels

a) Hang the side panel, right (7, **DTR-12001**) and the side panel, left with the operator-well opening (13, **DTR-12007**) on the posts. Fit the front panel (8, **DTR-12002**), the rear panel (9, **DTR-12003**) and the rear body front wall (14, **DTR-12008**).

b) Turn in all button head screws M10×25 (63) of the panels by hand, then tighten them from the middle of each panel outward: 40 N·m.

CAUTION

Body panels have sharp edges and weigh up to 70 kg. Two persons or a panel lifter; wear gloves.

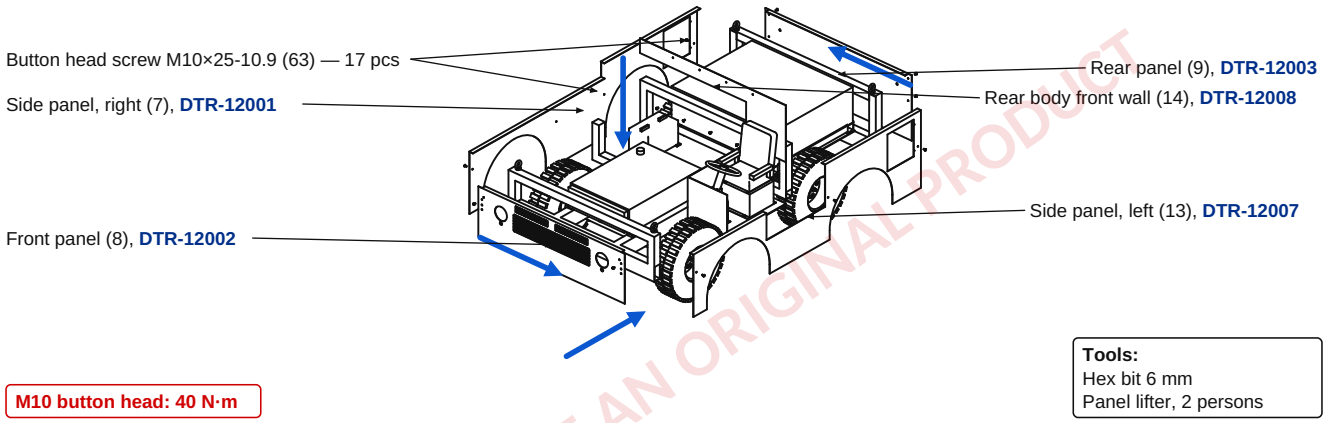


Figure 4-K: Step 10: Body panels

Table 4-J: Parts and materials of step 10

Item	P/N	Name	Qty
7	DTR-12001	Side panel, right	1
13	DTR-12007	Side panel, left, with operator-well opening	1
8	DTR-12002	Front panel with radiator grille and vents	1
9	DTR-12003	Rear panel	1
14	DTR-12008	Rear body front wall	1
63	ISO 7380-2 M10x25-10.9	Button head screw with collar M10 x 25	17

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 7, 13, 8, 9, 14, 63

Step 10 done	Assembler name	Employee no.	Signature	Date
Step no. 10				

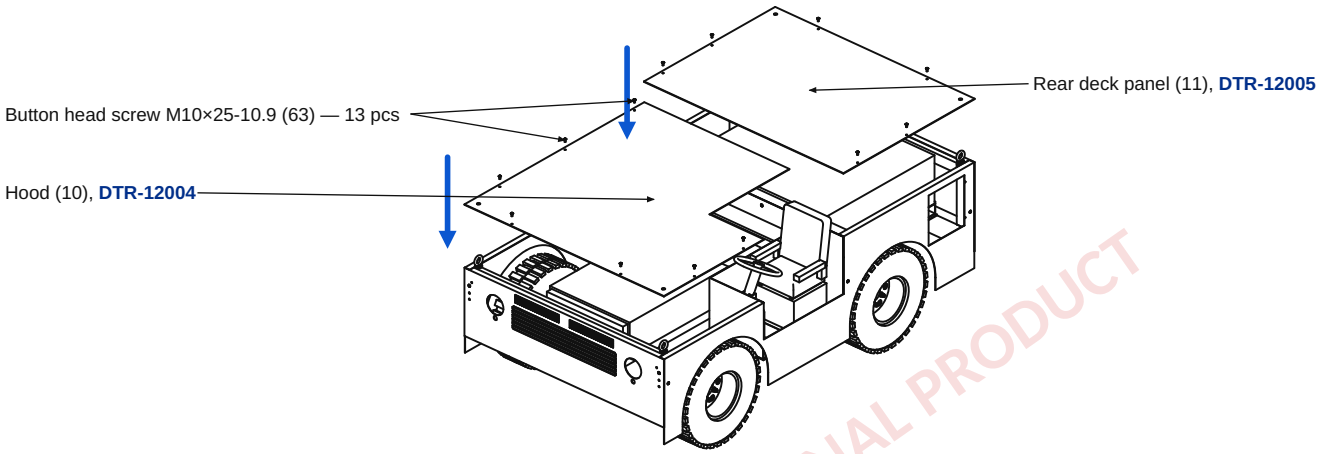
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Step 11 – Hood and rear deck panel

a) Lay the hood (10, **DTR-12004**) on the front body and the rear deck panel (11, **DTR-12005**) on the rear body. The eye bolts (44) pass through the corner holes.

b) Fit the button head screws M10×25 (63) and tighten them: 40 N·m.



M10 button head: 40 N·m

Tools:
Hex bit 6 mm
Vacuum lifter or 2 persons

Figure 4-L: Step 11: Hood and rear deck panel

Table 4-K: Parts and materials of step 11

Item	P/N	Name	Qty
10	DTR-12004	Hood (front deck panel)	1
11	DTR-12005	Rear deck panel, tread plate	1
63	ISO 7380-2 M10x25-10.9	Button head screw with collar M10 x 25	13

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 10, 11, 63

Step 11 done	Assembler name	Employee no.	Signature	Date
Step no. 11				

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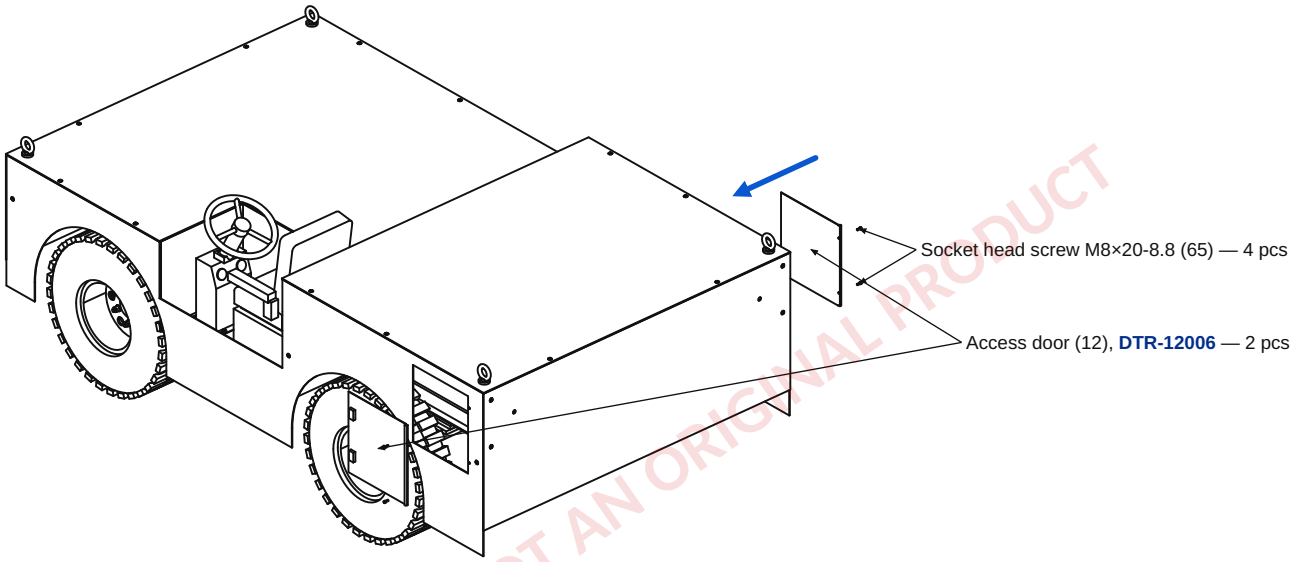
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Step 12 – Access doors

a) Hold an access door (12, **DTR-12006**) in the opening of each side panel at the rear body, hinge to the rear.

b) Put threadlocker on the socket head screws M8×20 (65), 2 per door, and fit them through the hinge leaf: 25 N·m.

c) Close the doors: the 2 latches of each door must catch.



M8 hinge screws: 25 N·m threadlocker

Tools:
Hex bit 6 mm

Figure 4-M: Step 12: Access doors

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Table 4-L: Parts and materials of step 12

Item	P/N	Name	Qty
12	DTR-12006	Access door with piano hinge and two latches	2
65	ISO 4762 M8x20-8.8	Socket head cap screw M8 x 20	4
66	DTR-30001	Threadlocker, medium strength	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 12, 65, 66

Step 12 done	Assembler name	Employee no.	Signature	Date
Step no. 12				

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Step 13 – Bumpers, chevron tape and corner marks

a) Put the front bumper (2, **DTR-11010**) on the front end beam. Put a washer 16 (50) on each of 4 screws M16×130-8.8 (47) and turn them through the bumper into the weld nuts of the end beam. Tighten: 210 N·m. Do the same with the rear bumper.

b) Clean the bumper faces with cleaner **DTR-30004**. Apply the 4 chevron tapes (36), one each side of the hitch, chevrons pointing down to the middle.

c) Apply the 4 yellow corner marks (39) at the top corners of the front and rear panels.

NOTICE

Clean the bumper faces with the surface cleaner and let them dry before you apply the tape. Surface temperature 15 °C or more.

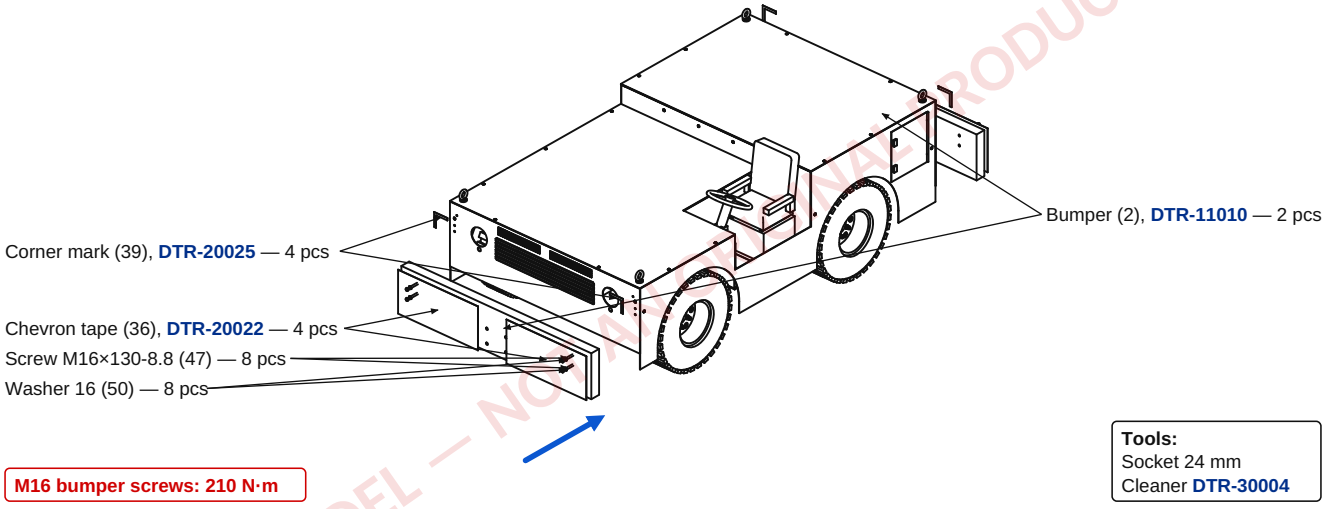


Figure 4-N: Step 13: Bumpers, chevron tape and corner marks

Table 4-M: Parts and materials of step 13

Item	P/N	Name	Qty
2	DTR-11010	Bumper weldment, full width	2
47	ISO 4017 M16x130-8.8	Hexagon head screw M16 x 130	8
50	ISO 7089-16-200HV	Plain washer 16	8
36	DTR-20022	Chevron warning tape black/white, reflective, 440 x 925	4
39	DTR-20025	Corner mark, yellow retro-reflective, L 150 x 150	4
69	DTR-30004	Surface cleaner, solvent based	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 2, 47, 50, 36, 39, 69

Step 13 done	Assembler name	Employee no.	Signature	Date
Step no. 13				

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Step 14 – Tow hitches, hitch pins and tie-down hooks

a) Put the tow hitch (3, **DTR-11020**) on the middle of the front bumper, jaws forward. Fit 4 screws M20×60-10.9 (51) from the front; a washer 20 (54) and a new nut M20 (53) inside the bumper. Tighten crosswise: 580 N·m. Do the same at the rear.

b) Put a hitch pin (4, **DTR-11021**) into each hitch and lock it with a linch pin (43, **DTR-20033**).

c) Put threadlocker on 4 flange bolts M12×30 (59) and fit the 2 tie-down hooks (5, **DTR-11025**) to the front corner posts: 85 N·m.

CAUTION

Hitch screws M20 of class 10.9: use new nuts and washers at every refit, never reuse them.

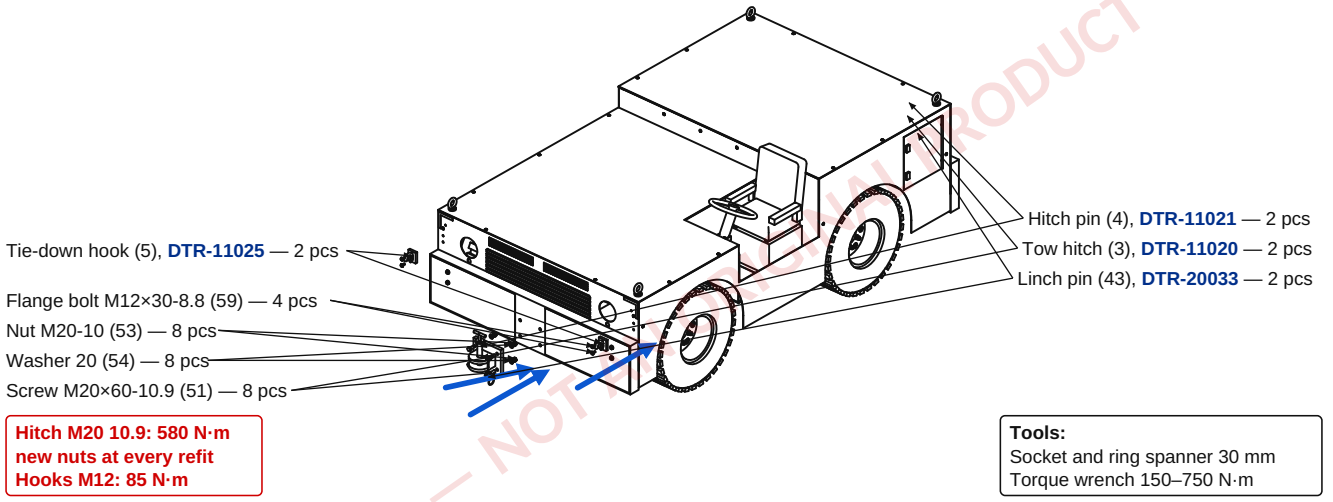


Figure 4-O: Step 14: Tow hitches, hitch pins and tie-down hooks

Table 4-N: Parts and materials of step 14

Item	P/N	Name	Qty
3	DTR-11020	Tow hitch jaw weldment	2
51	ISO 4017 M20x60-10.9	Hexagon head screw M20 x 60	8
54	ISO 7089-20-300HV	Plain washer 20	8
53	ISO 4032 M20-10	Hexagon nut M20	8
4	DTR-11021	Hitch pin d40 with T-handle	2
43	DTR-20033	Linch pin d10 with ring	2
5	DTR-11025	Tie-down hook with base plate	2
59	ISO 4162 M12x30-8.8	Hexagon flange bolt M12 x 30	4
66	DTR-30001	Threadlocker, medium strength	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 3, 51, 54, 53, 4, 43, 5, 59, 66

Step 14 done	Assembler name	Employee no.	Signature	Date
Step no. 14				

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Step 15 – Lamps

a) Push the 2 head lamps (34, **DTR-20020**) into the round openings of the front panel from the front and turn the bezel clips. Fit the 2 position lamps (37, **DTR-20023**) under them and the 2 blue marker lamps (38, **DTR-20024**) at the top corners.
b) Fit the 2 rear combination lamps (35, **DTR-20021**) on the rear panel.
c) Plug each lamp into its connector of the 24 V harness. The harness is part of the power-module supply.

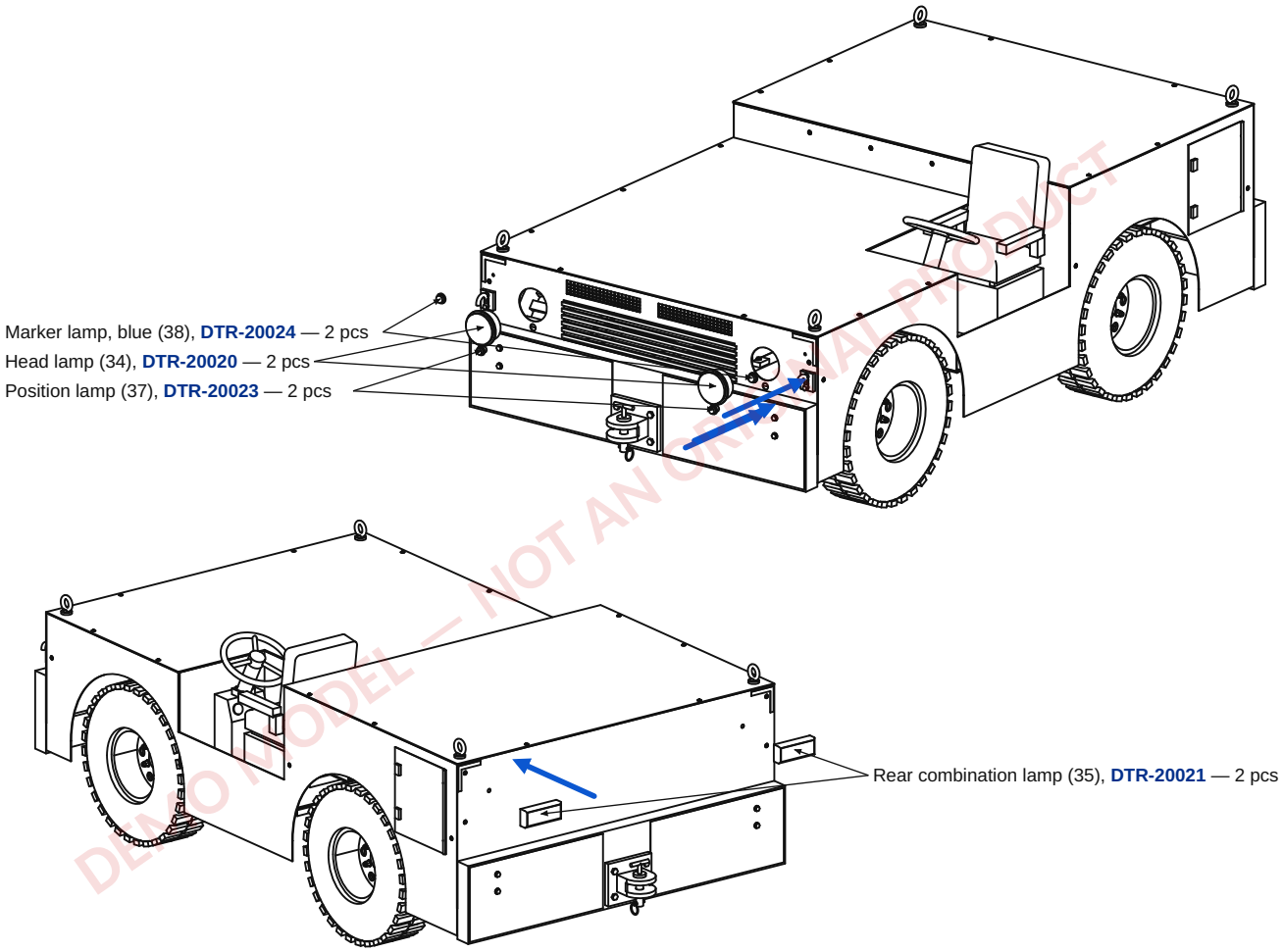


Figure 4-P: Step 15: Lamps

Table 4-O: Parts and materials of step 15

Item	P/N	Name	Qty
34	DTR-20020	Head lamp LED 24 V, round 7 in	2
37	DTR-20023	Position lamp LED 24 V, round 46, clear	2
38	DTR-20024	Marker lamp LED 24 V, round 52, blue	2
35	DTR-20021	Rear combination lamp LED 24 V	2

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 34, 37, 38, 35

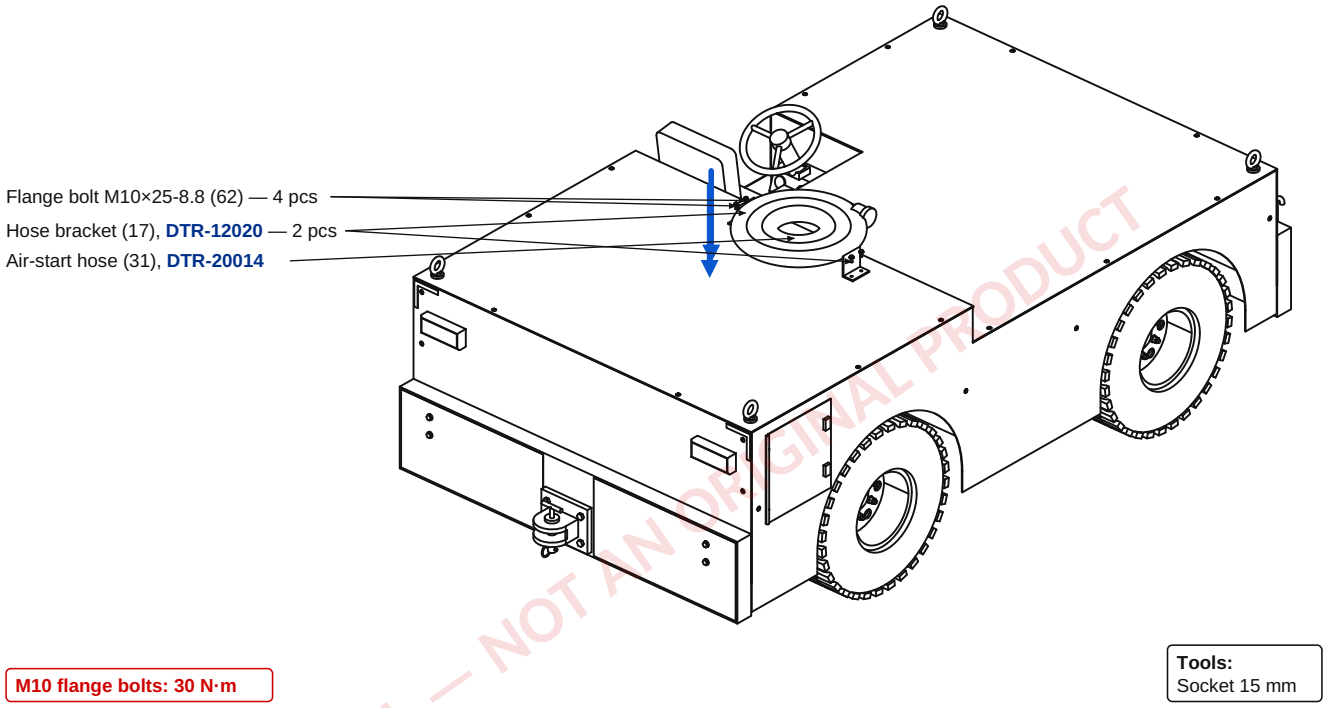
Step 15 done	Assembler name	Employee no.	Signature	Date
Step no. 15				

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Step 16 – Air-start hose and hose brackets

a) Put the 2 hose stowage brackets (17, **DTR-12020**) on the rear deck, lips to the inside. Fit 4 flange bolts M10×25 (62) into the rivet nuts: 30 N·m.

b) Coil the air-start hose (31, **DTR-20014**) flat in three turns between the brackets, coupling to the rear. Connect the other hose end to the outlet of the air-start unit.



M10 flange bolts: 30 N·m

Tools:
Socket 15 mm

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Figure 4-Q: Step 16: Air-start hose and hose brackets

Table 4-P: Parts and materials of step 16

Item	P/N	Name	Qty
17	DTR-12020	Hose stowage bracket	2
62	ISO 4162 M10x25-8.8	Hexagon flange bolt M10 x 25	4
31	DTR-20014	Air-start hose 3 in x 8 m with coupling	1

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 17, 62, 31

Step 16 done	Assembler name	Employee no.	Signature	Date
Step no. 16				

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Step 17 – Tow bar: casters

a) Lay the tow bar weldment (20, **DTR-17000**) on 2 trestles, casters side down.

b) Put a swivel caster (40, **DTR-20030**) under each caster plate. Fit 4 screws M12×40-8.8 (58) from above and new nylon-insert nuts M12 (60) below. Tighten: 85 N·m.

NOTICE

Nylon-insert nuts ISO 7040 are used once. Use new nuts whenever a caster is refitted.

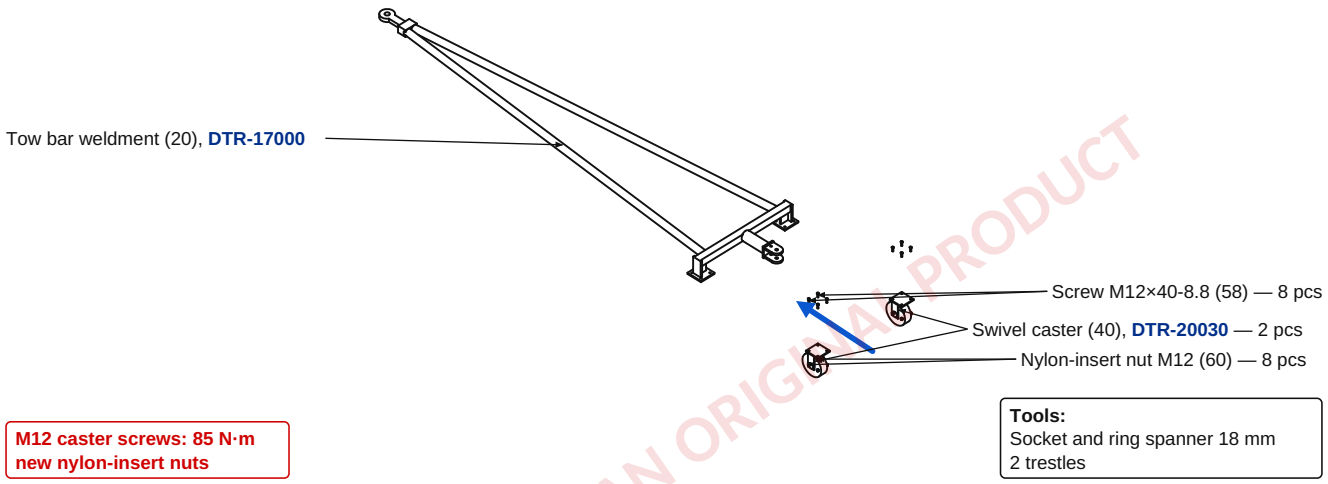


Figure 4-R: Step 17: Tow bar: casters

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Table 4-Q: Parts and materials of step 17

Item	P/N	Name	Qty
20	DTR-17000	Tow bar weldment, A-frame	1
40	DTR-20030	Swivel caster 250 x 80, solid rubber, 600 kg	2
58	ISO 4017 M12x40-8.8	Hexagon head screw M12 x 40	8
60	ISO 7040 M12-8	Prevailing torque nut M12, nylon insert	8

Drawing **DTR-10000 rev B**, sheets 1 to 3; items 20, 40, 58, 60

Step 17 done	Assembler name	Employee no.	Signature	Date
Step no. 17				

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Step 18 – Tow head (option TH)

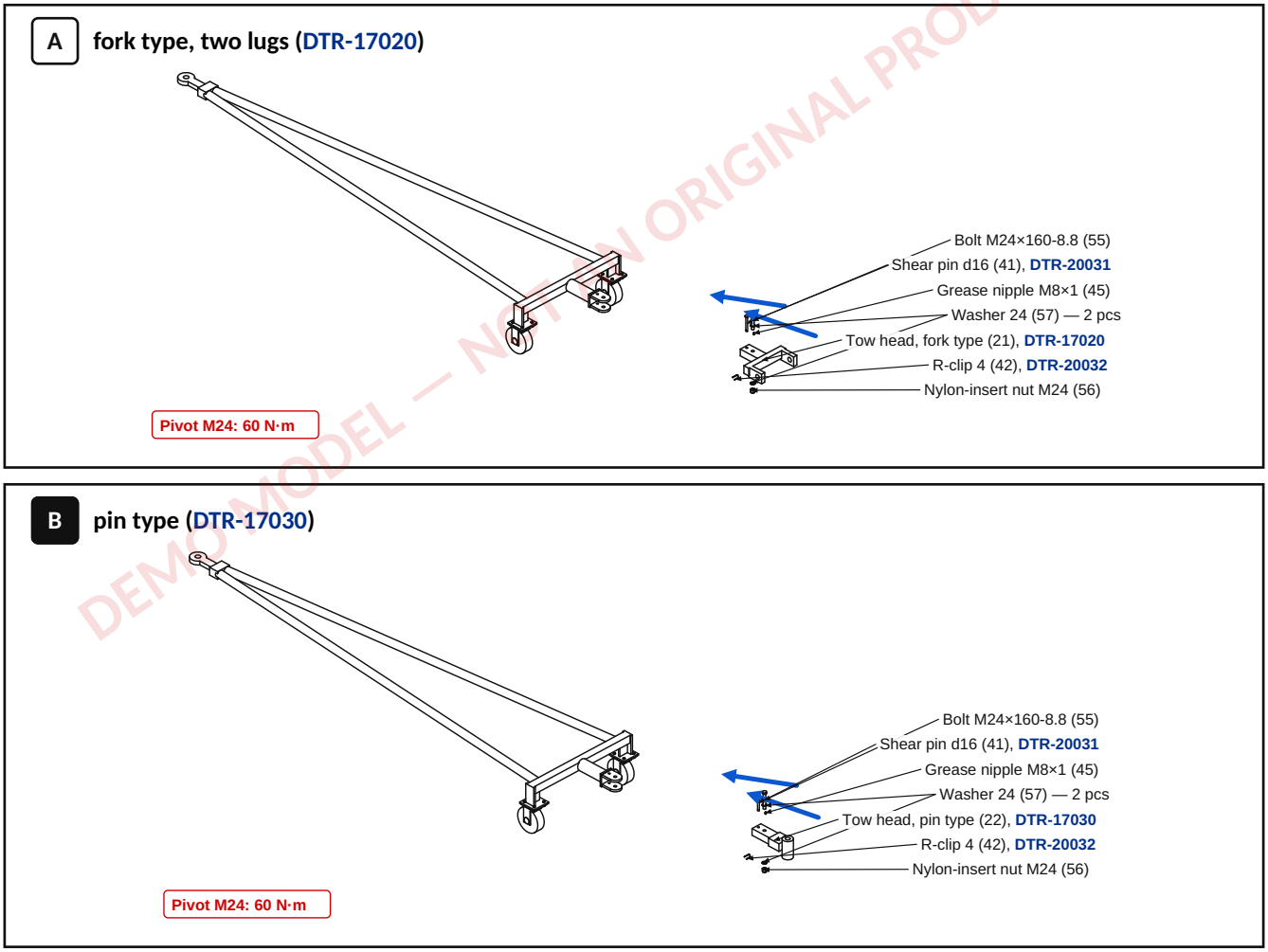
Option A, fork type: put the tongue of the fork-type tow head (21, **DTR-17020**) into the clevis at the aircraft end of the tow bar.

Option B, pin type: put the tongue of the pin-type tow head (22, **DTR-17030**) into the clevis.

Both: put a washer 24 (57) on the bolt M24×160-8.8 (55), put the bolt through the clevis and the tongue from above; a washer 24 and a new nylon-insert nut M24 (56) below. Tighten: 60 N·m; the head must pivot by hand. Put the shear pin d16 (41, **DTR-20031**) through the second hole and lock it with the R-clip (42). Screw in the grease nipple (45) (G3) and grease the pivot.

NOTICE

Choose option TH now. The tow head must pivot freely after tightening; the shear pin is the overload fuse of the tow bar: replace it only with the calibrated shear pin of the parts list.



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Figure 4-S: Step 18: Tow head (option TH) – variants A and B

Table 4-R: Parts and materials of step 18

Item	P/N	Name	Qty
21	DTR-17020	Tow head, fork type *(option TH-A)*	1
22	DTR-17030	Tow head, pin type *(option TH-B)*	1

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55	ISO 4014 M24x160-8.8	Hexagon head bolt M24 x 160	1
57	ISO 7089-24-200HV	Plain washer 24	2
56	ISO 7040 M24-8	Prevailing torque nut M24, nylon insert	1
41	**DTR-20031**	Shear pin d16, calibrated	1
42	**DTR-20032**	R-clip 4	1
45	DIN 71412 AM8x1	Grease nipple M8x1, straight	1
67	**DTR-30002**	Grease, lithium complex EP2	as needed

Drawing **DTR-10000 rev B**, sheets 1 to 3; options table, sheet 2; items 21, 22, 55, 57, 56, 41, 42, 45, 67

Step 18 done	Assembler name	Employee no.	Signature	Date
Step no. 18				

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Step 19 – Couple the tow bar to the rear hitch

a) Chock the wheels of the tractor. Take out the linch pin (43) and the hitch pin (4) of the rear hitch.
b) Two persons lift the lunette end of the tow bar and push the lunette between the jaws of the rear hitch.
c) Put the hitch pin through the jaws and the lunette and lock it with the linch pin. The tow bar rests on its 2 casters.

WARNING

Keep hands and feet away from the lunette and the hitch jaws while the tow bar is moved. Two persons; chock the tractor wheels.

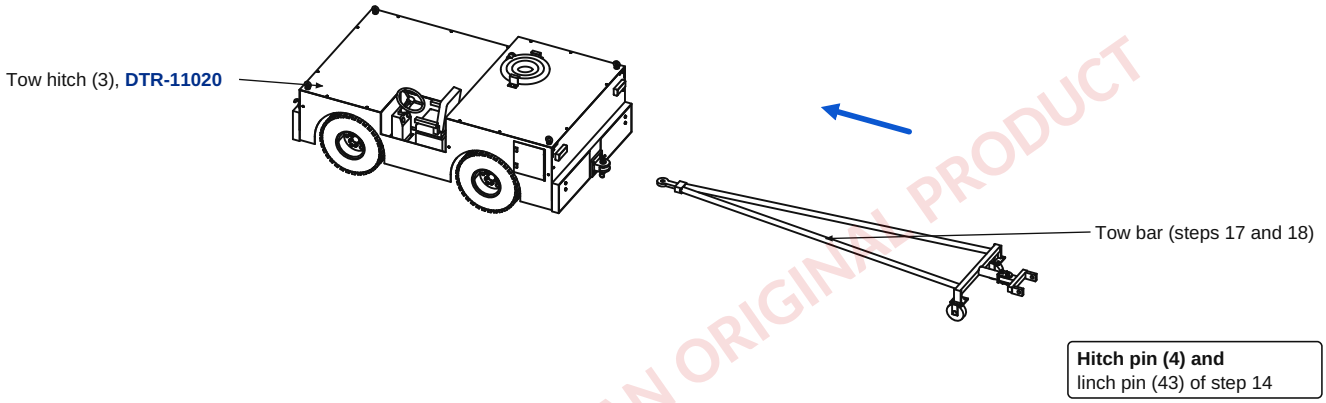


Figure 4-T: Step 19: Couple the tow bar to the rear hitch

Table 4-S: Parts and materials of step 19

Item	P/N	Name	Qty
20	DTR-17000	Tow bar weldment, A-frame	1
4	DTR-11021	Hitch pin d40 with T-handle	1
43	DTR-20033	Linch pin d10 with ring	1

Drawing DTR-10000 rev B, sheets 1 to 3; items 20, 4, 43

Step 19 done	Assembler name	Employee no.	Signature	Date
Step no. 19				

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5. Functional Checks and Assembly Record

(Print this chapter for every assembled tractor)

Assembled item (P/N):	DTR-10000 rev B	Unit serial number:	
Work order:		Supervisor's name:	
Remarks/comments:			

Commissioning

Before the first start: fill the fuel, the engine oil, the coolant and the hydraulic oil, and connect the battery, all per the documents of the power-module supplier. Touch up paint damage with DTR-30003. Then do the functional checks below on a free, level area with the tow bar uncoupled, except for check 7.

Table 5-A: Functional checks – results

Action	Expected Outcome	Result	Notes
1. Torque audit: check 10 % of the joints of every step, every wheel nut and every hitch screw with the torque wrench set to the value of the step	No fastener turns; paint lines unbroken		
2. Tyre pressure, cold, all 4 tyres	8.0 bar ±0.2; LF ____ RF ____ LR ____ RR ____		
3. Steering: turn the wheel lock to lock with the engine running	Smooth, no noise, no contact of the tyres with the wheel arches; no oil leaks		
4. Service brake: drive at walking pace and brake	The tractor stops straight within 1 m		
5. Parking brake on a 10 % ramp	The tractor holds		
6. Lamps: head, position, marker, rear and brake lamps	All work; lenses clean and intact		
7. Hitch pins and tow bar: couple and uncouple at the rear hitch	Pin goes in by hand; linch pin locks; the tow head pivots; shear pin and R-clip fitted		
8. Grease points G1 to G3	Fresh grease at every joint		
9. Air-start unit: run it and connect the hose	Air at the coupling; no leaks at the hose or the outlet		
10. Look at the whole tractor	Tape and corner marks flat; doors latch; no loose parts; option record: BL __ TH __		
RESULT:	☑ PASSED / ☒ FAILED		
Date: _____	Tested By: _____	Signature: _____	

The check values are a proposal of the author for this demonstration product. The process engineer or QC must approve them.

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Table 5-B: Assembly record – steps

Step no.	Operation	Assembler				QC		
		Name	Employee no.	Signature	Date	Name	Signature	Date
1	Frame on stands, lifting eye bolts							
2	Front and rear axles							
3	Wheels, criss-cross tightening							
4	Power module and battery box							
5	Ballast plates (option BL)							
6	Air-start unit sub-frame							
7	Air-start unit module							
8	Operator well: liner, seat base and seat							
9	Steering pedestal and steering column							
10	Body panels							
11	Hood and rear deck panel							
12	Access doors							
13	Bumpers, chevron tape and corner marks							
14	Tow hitches, hitch pins and tie-down hooks							
15	Lamps							
16	Air-start hose and hose brackets							
17	Tow bar: casters							
18	Tow head (option TH)							
19	Couple the tow bar to the rear hitch							
Final	Functional checks (Table 5-A)							

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6. Assembled Tractor

These pictures are renders made from the 3D model (DTR-10000_DT-4800_assembly.step), configuration A, not photographs of a real tractor. The finishes follow the parts list: body, bumpers, wheels and tow bar RAL 9016 white, hitches and hooks RAL 3000 red, frame RAL 7016, hood non-skid, aluminium tread-plate rear deck. The tie-down chains on the rear deck are loose equipment shown for scale; they are not part of the product.



Figure 6-A: Deck Tractor with Tow Bar, front three-quarter view on a flight deck (render from the 3D model)

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Figure 6-B: Left side with the operator seat and the tow bar coupled (render from the 3D model)

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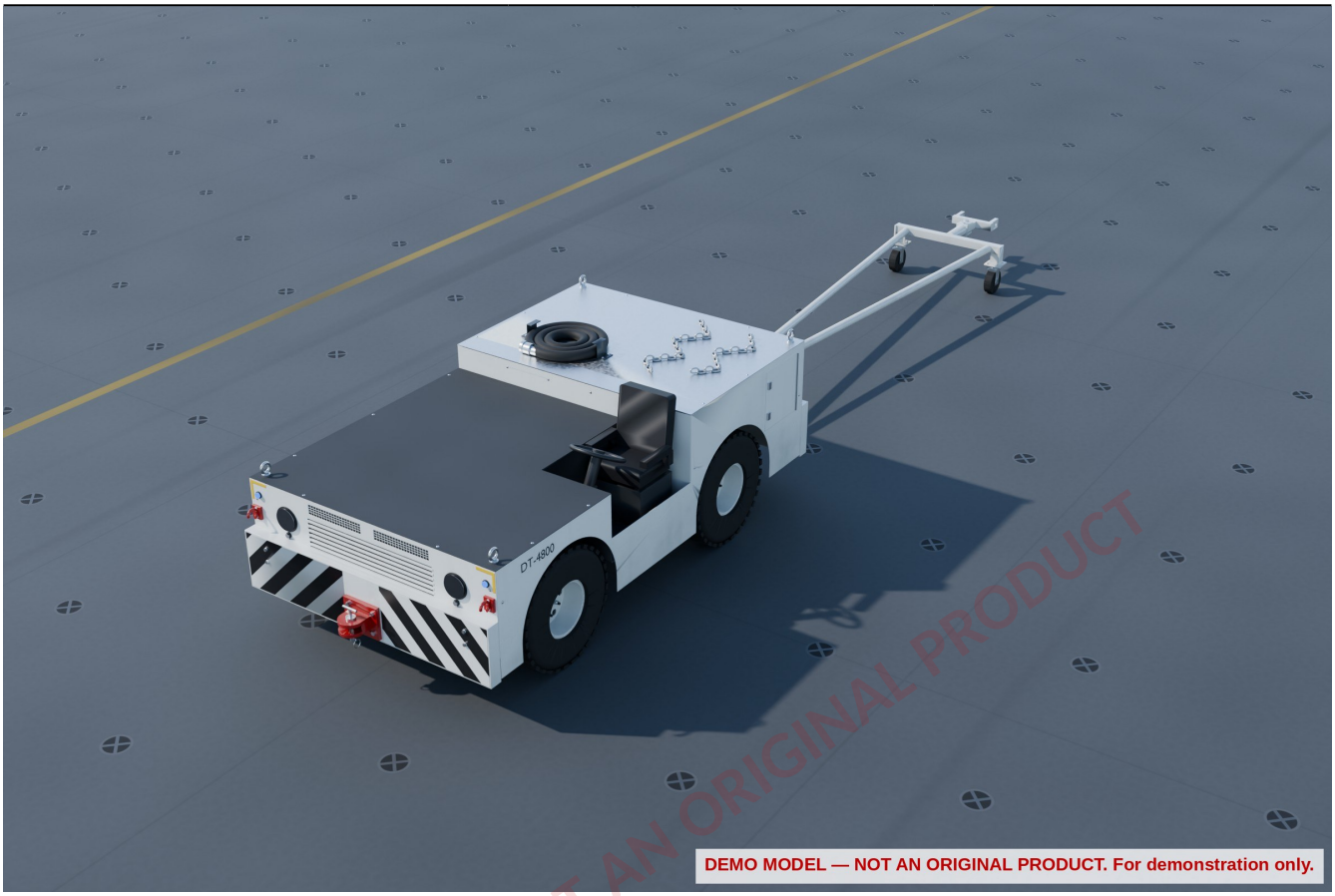


Figure 6-C: Seen from above: hood, operator well, rear deck with the air-start hose (render from the 3D model)

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