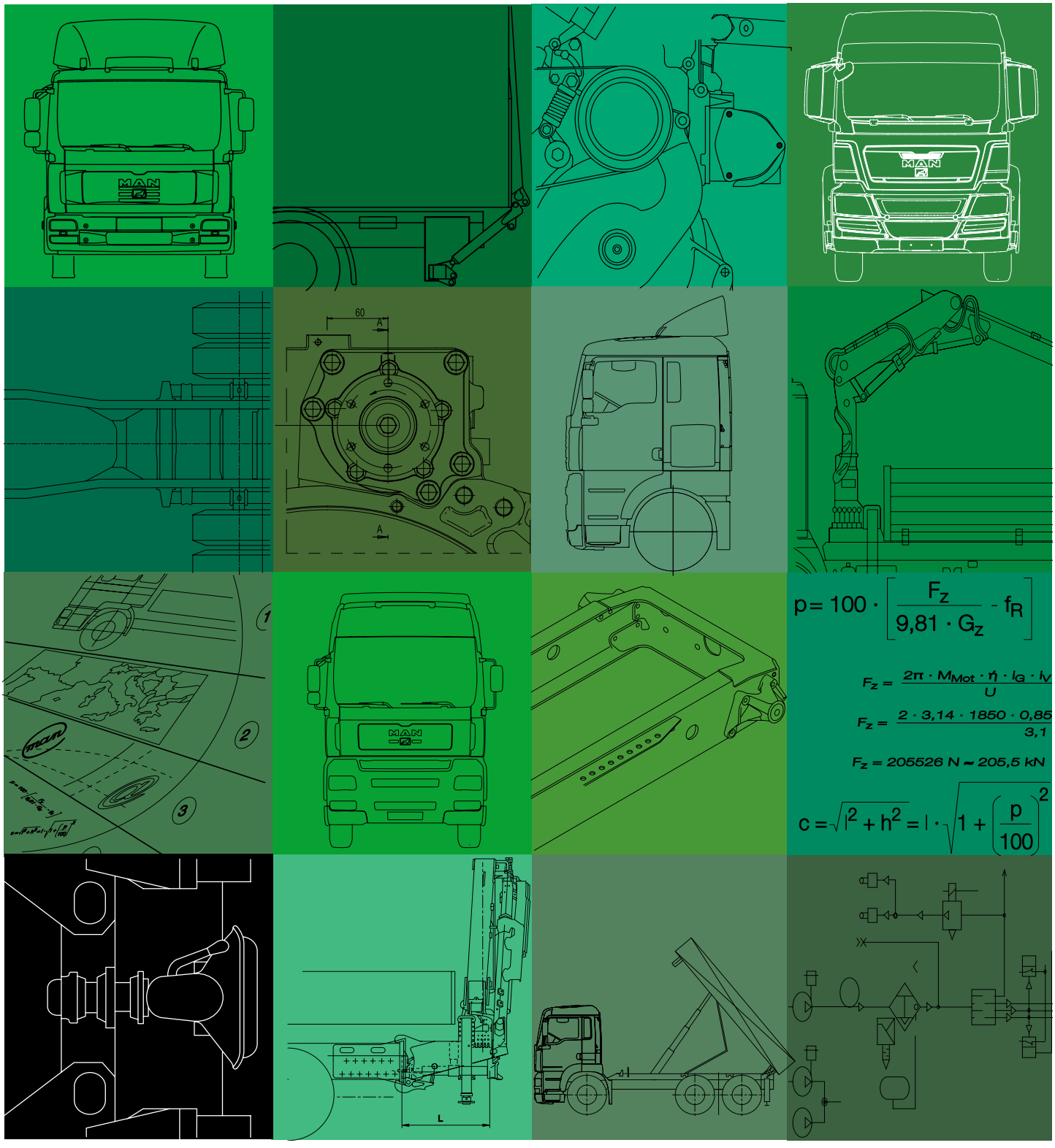
COUPLING DEVICES TG



P U B L I S H E R

MAN Nutzfahrzeuge AG
ESC Department
Engineering Services
Consultation (formerly TDB)

Dachauer Str. 667
D - 80995 Munich

E-Mail:
esc@man.eu

Fax:
+ 49 (0) 89 1580 4264

Coupling devices TG

1. General

If the truck is intended to pull loads, the equipment required to do this must be fitted and approved. Compliance with the minimum engine power required by legislation and/or the installation of the correct trailer coupling does not provide any guarantee that the truck is suitable for pulling loads.
The following is required for retrofitting trailer couplings:

- The required end cross member (see tables 1/2) and trailer coupling
- A dual-line brake coupling
- Electric system for trailer operation, including an ABS socket
- The installation of a trailer control module (TCM) and/or its activation through re-parameterisation.

Only trailer couplings that are approved in accordance with EC Directive 94/20/EC may be used. Contact must not occur between the truck and the trailer during manoeuvring. Adequate drawbar lengths should therefore be selected. The required clearances must also be taken into consideration (in Germany, these are defined in DIN 74058 or EC Directive 94/20/EC). The bodybuilder is obliged to ensure that the body is designed and constructed such that the coupling process can be performed and monitored unhindered and without incurring any risks. The freedom of movement of the trailer drawbar must be guaranteed. If coupling heads and sockets are installed offset to one side (e.g. on the driver's side rear light holder) the trailer manufacturer and vehicle operator must ensure that the cables/pipes are long enough for cornering.

Fig. 1: Clearances for trailer couplings in accordance with 94/20/EC ESC-006

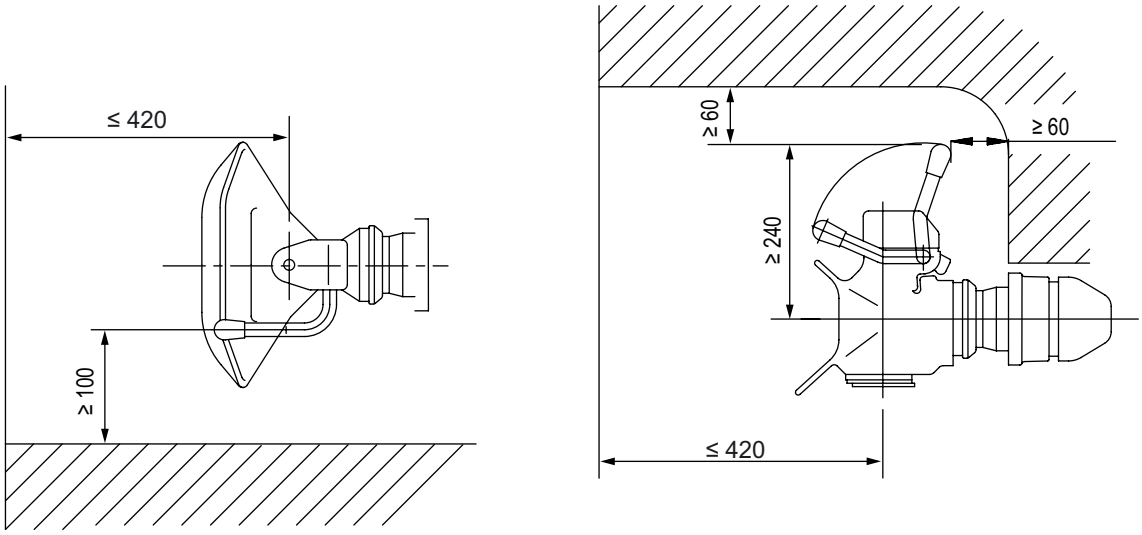
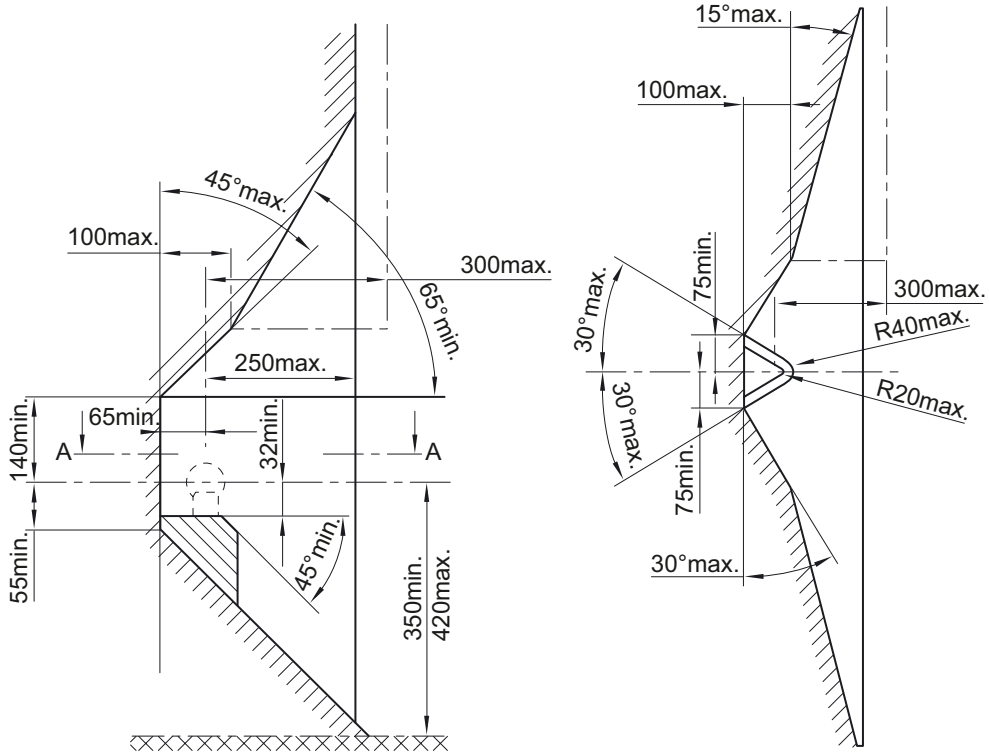


Fig. 2: Clearances for ball-type couplings in accordance with DIN 74058 ESC-152



Only original MAN end cross members and their associated reinforcement plates may be used when fitting trailer couplings. End cross members have a hole pattern that matches that of the associated trailer coupling. This hole pattern may under no circumstances be modified to suit a different trailer coupling. The guidelines provided in the coupling manufacturers' installation instructions must be observed (e.g. tightening torques and their checking). Lowering the trailer coupling without also lowering the end cross member is not permitted! Some examples of how the coupling may be lowered are shown in Figs. 3 and 4. These examples are purposely represented only schematically – they do not constitute a design instruction.
Design responsibility rests with the respective bodybuilder/converter.

Fig. 3: Lowered trailer coupling ESC-515

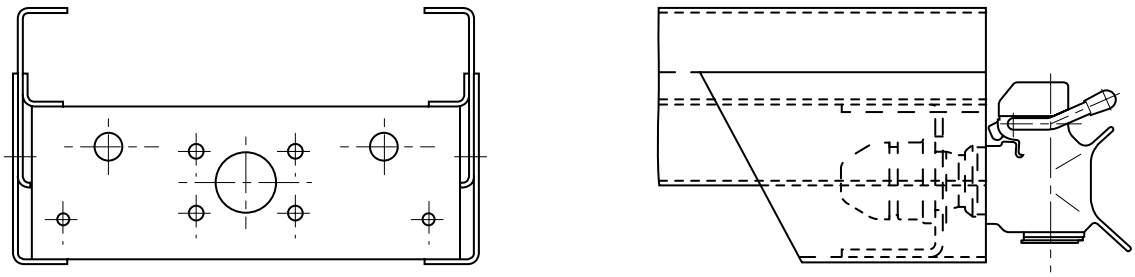
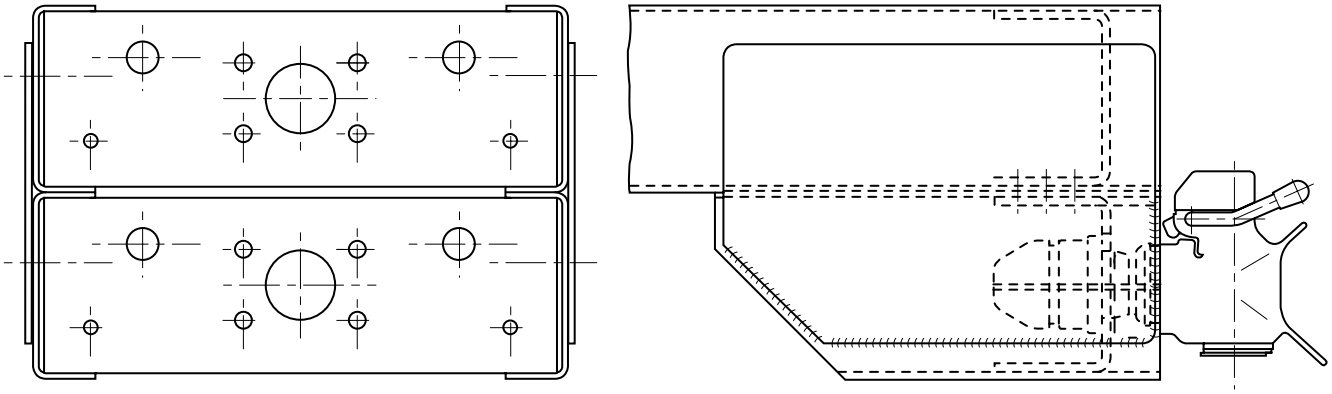


Fig. 4: Trailer coupling fitted below the frame ESC-542



2. Trailer coupling, D value

The required size of trailer coupling is determined by the D value. The trailer coupling manufacturer fits a model plate to the trailer coupling which states the maximum permissible D value. The D value is expressed in kilonewtons [kN].
The formula for the D value is as follows:

Formula 1: D value

$$D = \frac{9{,}81 \cdot T \cdot R}{T + R}$$

If the trailer coupling D value and the permissible gross weight of the trailer are known, then the maximum permissible gross weight of the towing vehicle can be calculated using the following formula:

Formula 2: D value formula for permissible gross weight

$$T = \frac{R \cdot D}{(9{,}81 \cdot R) - D}$$

If the D value and the permissible gross weight of the towing vehicle are known, then the maximum permissible gross weight of the trailer is calculated as follows:

Formula 3: D value formula for permissible trailer weight

$$R = \frac{T \cdot D}{(9{,}81 \cdot T) - D}$$

Where:

D	=	D value, in [kN]
T	=	Permissible gross weight of the towing vehicle, in [t]
R	=	Permissible gross weight of the trailer, in [t]

Examples of these calculations can be found in the “Guide to Fitting Bodies TGL-TGM” booklet, under the „Calculations“ chapter 9.

3. Rigid drawbar trailers, centre-axle trailers, D_c value, V value

The following definitions apply:

- **Rigid drawbar trailer:** Vehicle/trailer combination with one axle or axle group where:
  - the hinged connection to the towing vehicle is achieved by means of a towing device (drawbar),
  - the drawbar connection to the chassis is fixed such that it can transfer vertical moments and,
  - depending on its design, part of its gross weight is borne by the towing vehicle.

- **Centre-axle trailer:** Towed vehicle equipped with a towing device that does not move vertically in relation to the trailer and in which the axle(s) is (are) positioned close to the centre of gravity of the vehicle (when uniformly loaded) such that only a small static vertical load not exceeding 10% of the mass of the trailer or 1,000kg (whichever is less) is transmitted to the towing vehicle. Centre-axle trailers are therefore a subgroup of rigid drawbar trailers.
- **Trailer nose weight (S):** Vertical load exerted by the drawbar at the coupling point. This is added to the weight of the towing vehicle when a trailer is coupled and must therefore be taken into consideration when designing the vehicle (axle load calculation).

In addition to the D value formula, further conditions apply in the case of rigid drawbar trailers/centre axle trailers: Trailer loads on trailer couplings and end cross members are reduced because the nose weight acting on the trailer coupling and end cross member must be taken into account.
In order to harmonise regulations within the European Union, the terms D_c value and V value were therefore introduced with Directive 94/20/EC.

The following formulae apply:

Formula 4: D_c value formula for rigid drawbar and centre-axle trailers

$$D_C = \frac{9{,}81 \cdot T \cdot C}{T + C}$$

Formula 5: V value formula for centre-axle and rigid drawbar trailers having a permissible trailer nose weight of <10% of the trailer mass and that do not exceed 1,000kg

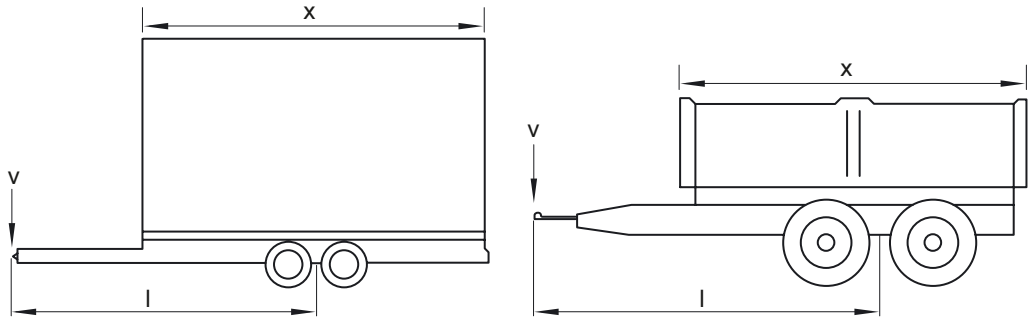
$$V = a \cdot \frac{x^2}{l^2} \cdot c \quad ; \quad \frac{x^2}{l^2} \geq 1$$

If the values for $\frac{x^2}{l^2}$ have been calculated as < 1, a value of 1.0 is to be used.

Where:

D_C	=	Reduced D value when operating with centre-axle trailer, in [kN]
V	=	V value, in [kN]
T	=	Permissible gross weight of the towing vehicle, in [t]
C	=	Sum of the axle loads of the centre-axle trailer carrying maximum permissible load, in [t] not including trailer nose weight
a	=	Equivalent vertical acceleration in the coupling point, in [m/s²]. Use 1,8 m/s² when the towing vehicle is fitted with air suspension or equivalent and 2,4 m/s² for vehicles with other suspension
S	=	Permissible trailer nose weight exerted on the coupling point, in [kg]
x	=	Body length of the trailer, in [m] see Fig. 5
l	=	Theoretical drawbar length, in [m] see Fig. 5

Fig. 5: Body length of trailer and theoretical drawbar length ESC-510



MAN specifies the following for operation with centre-axle trailers/rigid drawbar trailers:

For equipment delivered ex-works, a trailer nose weight that exceeds 10% of the permissible trailer mass and trailers exceeding 1,000kg are not permitted (with the exception of the MAN low coupling system). Other loads are the responsibility of the manufacturer of the respective towing device. MAN cannot make any statements in relation to the permissible loads and calculations (e.g. to 94/20/EC) for these towing devices.

Like all rear loads, trailer nose weights affect axle load distribution. Therefore use an axle load calculation to check whether trailer nose weights are possible. This is particularly important when there are additional rear loads (e.g. tail-lift, rear loading crane).

The trailing axle of vehicles having a lifting trailing axle must not be lifted if centre-axle trailer/rigid drawbar trailer is coupled.
Towing a loaded centre-axle trailer/rigid drawbar trailer with an unloaded towing vehicle is not permitted.
To ensure sufficient steerability, minimum front axle loads for the vehicle must be observed (see booklets on TGA or TGL/TGM).
Table 2 lists possible combinations of trailer loads and nose weights as well as D, D_c and V values. Table 1 assigns them to the different vehicles (listed by model number and type of vehicle).
In some circumstances, it is possible to change the loads listed. Further information can be obtained from the ESC department (For address see “Publisher” above).

4. End cross members and trailer couplings

If the end cross member bearing the MAN item number 81.41250.0133 is fitted (the last four digits are stamped into the end cross member at rear right) then the top and bottom of the mounting plate for the respective trailer coupling must be chamfered as shown in Fig. 6.

Fig. 6: 45° chamfer of the trailer coupling mounting plate if end cross member 81.41250.0133 is fitted

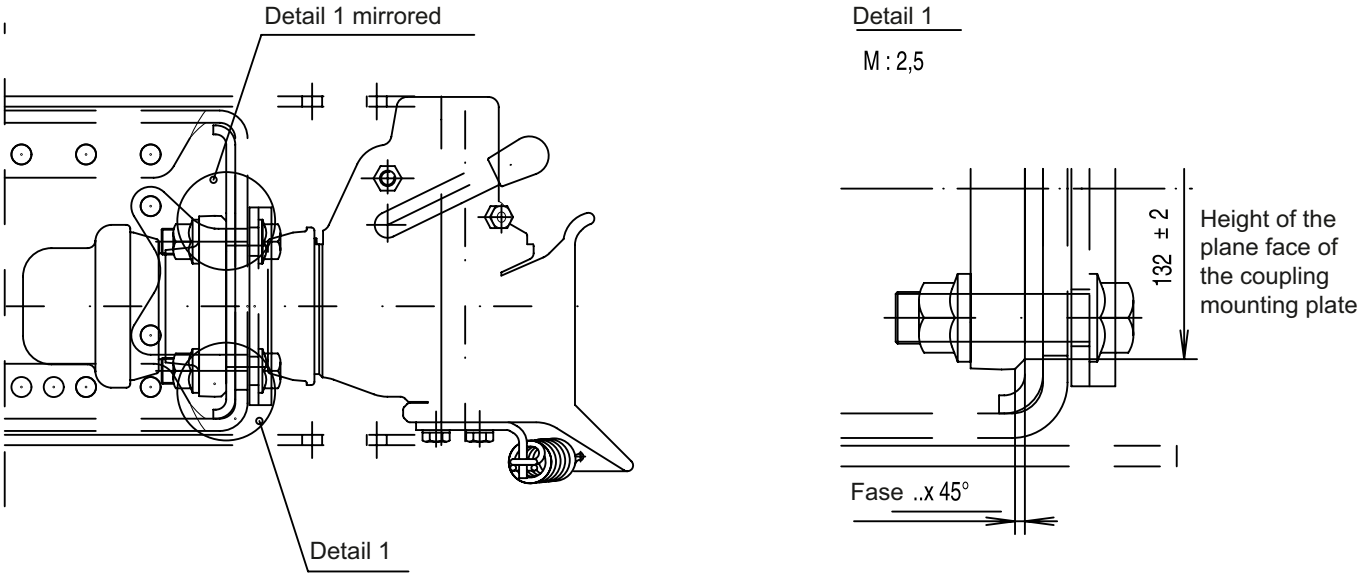


Table 1: Assignment to vehicle, by vehicle range, model number and end cross member

TGL

Model no.	MAN item number	Hole pattern [mm]	Notes
N01, N02 N11, N12	81.41250.0131	None	Not for trailer couplings
	81.41250.5179	140x80	For type G 145 trailer coupling
	81.41660.5189	(3x)83x56	Underride protection and KKK trailer bracket
N03, N04 N05, N13 N14, N15	81.41250.0131	None	Not for trailer couplings
	81.41250.5179	140x80	For type G 145 trailer coupling
	81.41250.5188	120x55	Lowered by 100mm, for fire department, for type G 135 trailer coupling, additional hole pattern 83x56
	81.41660.5189	(3x)83x56	Underride protection and KKK trailer bracket

TGM

Model no.	MAN item number	Hole pattern [mm]	Notes
N08	81.41250.0131	None	Not for trailer couplings
	81.41250.5180	160x100	For type G 150 trailer coupling
	81.41250.5188	120x55	Lowered by 100mm, for fire department, for type G 135 trailer coupling, additional hole pattern 83x56
N16	81.41250.0131	None	Not for trailer couplings
	81.41250.5180	160x100	For type G 150 trailer coupling
	81.41250.5188	120x55	Lowered by 100mm, for fire department, for type G 135 trailer coupling, additional hole pattern 83x56
N18	81.41250.0131	None	Not for trailer couplings
	81.41250.5180	160x100	For type G 150 trailer coupling
	81.41250.5188	120x55	Lowered by 100mm, for fire department, for type G 135 trailer coupling, additional hole pattern 83x56
N26	81.41250.0131	None	Not for trailer couplings
	81.41250.5180	160x100	For type G 150 trailer coupling
N28	81.41250.0131	None	Not for trailer couplings
	81.41250.5180	160x100	For type G 150 trailer coupling
N34	81.41250.5179	140x80	For type G 145 trailer coupling
	81.41250.5188	120x55	Lowered by 100mm, for fire department, for type G 135 trailer coupling, additional hole pattern 83x56
N36	81.41250.5179	140x80	For type G 145 trailer coupling
	81.41250.5188	120x55	Lowered by 100mm, for fire department, for type G 135 trailer coupling, additional hole pattern 83x56
N38	81.41250.5180	160x100	For type G 150 trailer coupling
	81.41250.5188	120x55	Lowered by 100mm, for fire department, for type G 135 trailer coupling, additional hole pattern 83x56
N48	81.41250.0139	160x100	Not approved for trailer loads, only for tow couplings

TGA

Model no.	MAN item number	Hole pattern [mm]	Notes
H01	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, operation with trailer not permitted
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
H02	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .5145 and .0130
	81.41250.5145	160x100	Replaced by .0133
H03	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H04	81.41250.0128	160x100	Tractor
	81.41250.5145	160x100	
H05	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
	81.41250.5145	160x100	Replaced by .0133
H06	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
H07	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
	81.41250.5145	160x100	Replaced by .0133
H08	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, operation with trailer not permitted
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
H09	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
	81.41250.5145	160x100	Replaced by .0133

TGA

Model no.	MAN item number	Hole pattern [mm]	Notes
H10	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
H12	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
H13	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
H14	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H15	81.41250.0133	160x100	
H16	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H17	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H18	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H19	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H20	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H21	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H22	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
H23	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
	81.41250.5145	160x100	Replaced by .0133

TGA

Model no.	MAN item number	Hole pattern [mm]	Notes
H24	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
H25	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, 150mm lower
H26	81.41250.0132	160x100	Tractor,
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, 150mm lower
H27	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H28	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, 150mm lower
H29	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, 150mm lower
H30	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, 150mm lower
H31	81.41250.0133	160x100	
H32	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0129	None	Tractor, not for trailer coupling, replaced by .0135
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0135	None	Tractor, not for trailer coupling, replacement for .0129
H33	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Tipper
	81.41250.5184	160x100	Tipper, 150mm lower
H34	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Tipper
	81.41250.5184	160x100	Tipper, 150mm lower
H35	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	

TGA

Model no.	MAN item number	Hole pattern [mm]	Notes
H36	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H37	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H38	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H39	81.41250.0133	160x100	
H40	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H41	81.41250.0133	160x100	
H42	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
H43	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
H44	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H45	81.41250.0133	160x100	
H46	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H47	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, 150mm lower
H48	81.41250.0133	160x100	
H49	81.41250.0133	160x100	
	81.41250.5187	None	Rear tipper
H51	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm
H52	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm
H54	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm
H55	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm

TGA

Model no.	MAN item number	Hole pattern [mm]	Notes
H56	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm
H57	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Tipper
H58	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Tipper
H70	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, 150mm lower
H71	81.41250.0133	160x100	
H72	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm
H73	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, 150mm lower
H74	81.41250.0133	160x100	
H75	81.41250.0133	160x100	
H76	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
	81.41250.5184	160x100	Tipper, 150mm lower
H80	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Tipper
	81.41250.5184	160x100	Tipper, 150mm lower
H81	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm
H82	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm
H84	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, chassis, lowered by 150mm

TGA

Model no.	MAN item number	Hole pattern [mm]	Notes
H85	81.41250.0133	160x100	
H86	81.41250.0128	160x100	Tractor, replaced by .0132
	81.41250.0132	160x100	Tractor, replacement for .0128
	81.41250.0133	160x100	Replacement for .5145
	81.41250.5145	160x100	Replaced by .0133
H87	81.41250.0133	160x100	
H88	81.41250.0130	160x100	Replaced by .0133
	81.41250.0133	160x100	Replacement for .0130
H89	81.41250.0132	160x100	Tractor
	81.41250.0133	160x100	Chassis
H90	81.41250.0133	160x100	
H91	81.41250.0133	160x100	
H92	81.41250.0133	160x100	
H93	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, 150mm lower
H94	81.41250.0133	160x100	
	82.41250.5092	330x110	10 bolt connection for 100t coupling, normal and lowered, overhang 725mm
	81.41250.5094	330x110	10 bolt connection for 100t coupling, normal, overhang 725mm
H95	81.41250.0133	160x100	
	82.41250.5092	330x110	10 bolt connection for 100t coupling, normal and lowered, overhang 725mm
	81.41250.5094	330x110	10 bolt connection for 100t coupling, normal, overhang 725mm
H96	81.41250.0133	160x100	
	81.41250.5184	160x100	Tipper, 150mm lower

Table 2: TG end cross members and technical data

TGL - table of end cross members

MAN item no. End cross member	Hole pattern [mm]	D [kN]	S [kg]	C [kg]	Rc=C+S [kg]	D_C [kN]	V [kN]	Max. trailer-load [kg]	t [mm]	Weight [kg]	Notes
81.41250.0131	None	0	0	0	0	0	0	0	4	8,2	Not for trailer coupling; minimum end cross member, if no end cross member is installed for fitting a tail-lift or a KKK trailer bracket and/or if the underride protection is omitted.
81.41250.2317	140x80	#	#	#	#	#	#	#	8	26,5	Basic part for 81.41250.5179; # only with internal reinforcement 81.41250.2314.
81.41250.5179	140x80	69	1.000	13.000	14.000	64	35	16.000	8	29	End cross member for TGL 8-ton to 12-ton, models N02/N12/N03/N13/N04/N14/ N05/N15 for type G145 trailer coupling
81.41250.5179	140x80	30	500	4.500	5.000	30	19	4.500	8	29	End cross member for TGL 7-ton, models N01/N11 for type G145 trailer coupling
81.41250.5188	83x56	19	80	2.000	2.080	18	10	2.080	8	31	Lowered by 100mm, for fire department, additional hole pattern 120x55
81.41250.5188	120x55	60	700	6.500	7.200	40	18	12.000	8	31	Lowered by 100mm, for fire department, additional hole pattern 83x56
81.41660.5189	(3x)83x56	26,8	200	3.500	3.700	0	0	3.500	-	30	Underride protection and KKK trailer bracket, only in connection with end cross members 81.41250.0131 or .5179

TGM - table of end cross members

MAN item no.End cross member	Hole pattern [mm]	D [kN]	S [kg]	C [kg]	Rc=C+S [kg]	D_C [kN]	V [kN]	Max. trailer-load [kg]	t [mm]	Weight [kg]	Notes
81.41250.0131	None	0	0	0	0	0	0	0	4	8,2	Not for trailer coupling; minimum end cross member, if no end cross member is installed for fitting a tail-lift and/or if the underride protection is omitted.
81.41250.0139	160x100	0	0	0	0	0	0	0	8,5	23,7	Not approved for trailer loads, only for tow couplings
81.41250.2313	160x100	#	#	#	#	#	#	#	9,3	31	Basic part for 81.41250.5180; # only with internal reinforcement 81.41250.2315.
81.41250.2317	140x80	#	#	#	#	#	#	#	8	26,5	Basic part for 81.41250.5179; # only with internal reinforcement 81.41250.2314.
81.41250.5179	140x80	69	1.000	13.000	14.000	64	35	16.000	8	29	End cross member for 8-ton to 12-ton, models N02/N12/N03/N13/N04/ N14/N05/N15 for type G145 trailer coupling
81.41250.5180	160x100	104	1.000	16.000	17.000	90	50	24.000	9,3	38	End cross member for 15/18-ton for type G150 trailer coupling, only when used with shims81.41290.0164(1)
81.41250.5188	83x56	19	80	2.000	2.080	18	10	2.080	8	31	Fire dept., additional hole pattern 120x55
81.41250.5188	120x55	60	700	6.500	7.200	40	18	12.000	8	31	Additional hole pattern 83x56

(1) **For retrofitting end cross members: Bolt the end cross member to the main frame using 2 shims 81.41290.0164 on the inside of the end cross member.**

TGA-table of end cross members

MAN item no.End cross member	Hole pattern [mm]	D [kN]	S [kg]	C [kg]	R_C=C+S [kg]	D_C [kN]	V [kN]	t [mm]	Weight [kg]	Notes
81.41250.0128	160x100	130	1.000	9.500	10.500	64	35	9,5	25,6	Only tractor with chamfered frame, cannot be changed! Replaced by 81.41250.0132
81.41250.0129	None	0	0	0	0	0	0	5	13,4	Not for trailer coupling, only tractor with chamfered frame, replaced by 81.41250.0135
81.41250.0130	160x100	190	1.000	18.000	19.000	125	65	9,5	31,9	Trailer coupling hole pattern centralised at end cross member height, replaced by 81.41250.0133
81.41250.0132	160x100	130	1.000	9.500	10.500	64	35	9,5	25,6	Only tractor with chamfered frame, replacement for and produced from 81.41250.0128, cannot be changed!
81.41250.0133	160x100	200	1.000	18.000	19.000	130	70	9,5	31,5	Trailer coupling hole pattern 27.5mm lower than 81.41250.0130, replacement for 81.41250.0130 & .5145
81.41250.0135	None	0	0	0	0	0	0	5	12,9	Not for trailer coupling, only tractor with chamfered frame, replacement for 81.41250.0129
81.41250.5145	160x100	200	1.000	18.000	19.000	130	70	11	28,7	Reinforced end cross member, TGA and F2000, replaced by 81.41250.0133
81.41250.5184	160x100	190	1.000	18.000	19.000	130	70	9,5	50,1	150mm lower than series
82.41250.5092	330x110	314	0	0	0	0	0	20	156,6	10 bolt connection for 100t coupling installation – normal and lowered, additional hole pattern 160x100 normal and lowered, only in connection with MAN no. 82.41250.5090 and 82.41250.5091 corner plates. Frame overhang 725mm
82.41250.5092	160x100	200	1.000	18.000	19.000	130	70	20	156,6	Normal and lowered, additional hole pattern for 10 bolt connection for 100t coupling installation – normal and lowered, only in connection with MAN no. 82.41250.5090 and 82.41250.5091 corner plates. Frame overhang 725mm
82.41250.5094	330x110	314	0	0	0	0	0	15	50,6	10 bolt connection for 100t coupling installation – normal, additional hole pattern 160x100 normal, only in connection with MAN no. 82.41250.5090 and 82.41250.5091 corner plates. Frame overhang 725mm
82.41250.5094	160x100	200	1.000	18.000	19.000	130	70	15	50,6	Additional hole pattern for 10 bolt connection for 100t coupling installation – normal, only in connection with MAN no. 82.41250.5090 and 82.41250.5091 corner plates. Frame overhang 725mm
81.42030.5116	160x100	190	1.000	18.000	19.000	150	50		44,5	Only with MAN low coupling system
81.42030.5116	160x100	190	1.000	18.000	19.000	130	75		44,5	Only with MAN low coupling system
81.42030.5116	160x100	190	2.000	18.000	20.000	130	63		44,5	Only with MAN low coupling system

Abbreviations: t = thickness of end cross member material R_C: permissible gross weight of centre-axle trailer

Table 3: Installation drawings for trailer couplings

TGL - allocation of trailer coupling installation drawings to end cross members

MAN item no.End cross member	Hole pattern [mm]	Trailer coupling bolt 40mm	Ball-type coupling	Trailer coupling installation drawing MAN item no.	Notes
81.41250.5179	140x80	G 145	-	81.42000.8154	Observe the permissible values as stated in the TGL end cross member table
81.41250.5188	120x55	G 135	-	81.42000.8200	Observe the permissible values as stated in the TGL end cross member table
81.41250.5188	83x56	TK 226	-	81.42000.8186	Observe the permissible values as stated in the TGL end cross member table
81.41660.5189	(3x)83x56	-	X	81.42000.8166	See also installation of underride protection trailer bracket 81.41660.8186

TGM - allocation of trailer coupling installation drawings to end cross members

MAN item no.End cross member	Hole pattern [mm]	Trailer coupling bolt 40mm	Ball-type coupling	Trailer coupling installation drawing MAN item no.	Notes
81.41250.5179	140x80	G 145	-	81.42000.8154	Observe the permissible values as stated in the TGM end cross member table
81.41250.5180	160x100	G 150	-	81.42000.8164	Observe the permissible values as stated in the TGM end cross member table
81.41250.5188	120x55	G 135	-	81.42000.8200	Observe the permissible values as stated in the TGL end cross member table
81.41250.5188	83x56	TK 226	-	81.42000.8186	Observe the permissible values as stated in the TGL end cross member table

TGA - allocation of trailer coupling installation drawings to end cross members

MAN item no.End cross member	Hole pattern [mm]	Trailer coupling bolt 40mm	Trailer coupling bolt 50mm	100 t trailer coupling bolt 50mm	Trailer coupling installation drawing MAN item no.	Notes
81.41250.0128	160x100	X	X		81.42000.8152_3	Only tractor
81.41250.0130	160x100	X	X		81.42000.8129_3	
81.41250.0132	160x100	X	X		81.42000.8152_3	Only tractor
81.41250.0133	160x100	X	X		81.42000.8152_2	Chamfers required on top and bottom of trailer coupling mounting plate
81.41250.5145	160x100	X	X		81.42000.8129_1	
81.41250.5184	160x100	X	X		81.42000.8152_4	
81.42030.5116	160x100		X		81.42000.8152_1	MAN low coupling system
82.41250.5092	160x100	X	X			Not available at time of going to press
82.41250.5092	330x110			X	82.42000.8021_1	Normal or lowered
82.41250.5094	160x100	X	X			Not available at time of going to press
82.41250.5094	330x110			X	82.42000.8021_1	

5. Ball-type coupling

Like all rear loads even low nose weights affect axle load distribution. Therefore, an axle load calculation must be completed to verify whether the trailer nose weights are permissible. This is particularly important when there are additional rear loads (e.g. tail-lift, rear loading crane).
Other requirements for fitting ball-type couplings are as follows:

- Ball-type coupling must be adequately sized and design-approved (trailer nose weight, trailer load)
- Adequately dimensioned and design-approved trailer bracket
- The trailer bracket must be attached to the vertical webs of the main frame (attachment just to the lower flange of the main frame is not permitted by MAN)
- The test centre (e.g. DEKRA, TÜV) must check for adequate dimensioning and suitable connection to the vehicle frame when the trailer coupling is registered
- Observe the instructions in the installation manual/guidelines provided by the ball-type coupling and trailer bracket manufacturers
- Observe the clearance dimensions, e.g. to DIN 74058 (see Fig. 2)

6. Fifth-wheel coupling

The weight and size of semitrailers and semitrailer tractors must be checked to see if they are suitable for forming an articulated vehicle.

The following must therefore be checked:

- Slew radii
- Fifth-wheel load
- Freedom of movement of all parts
- Legal requirements

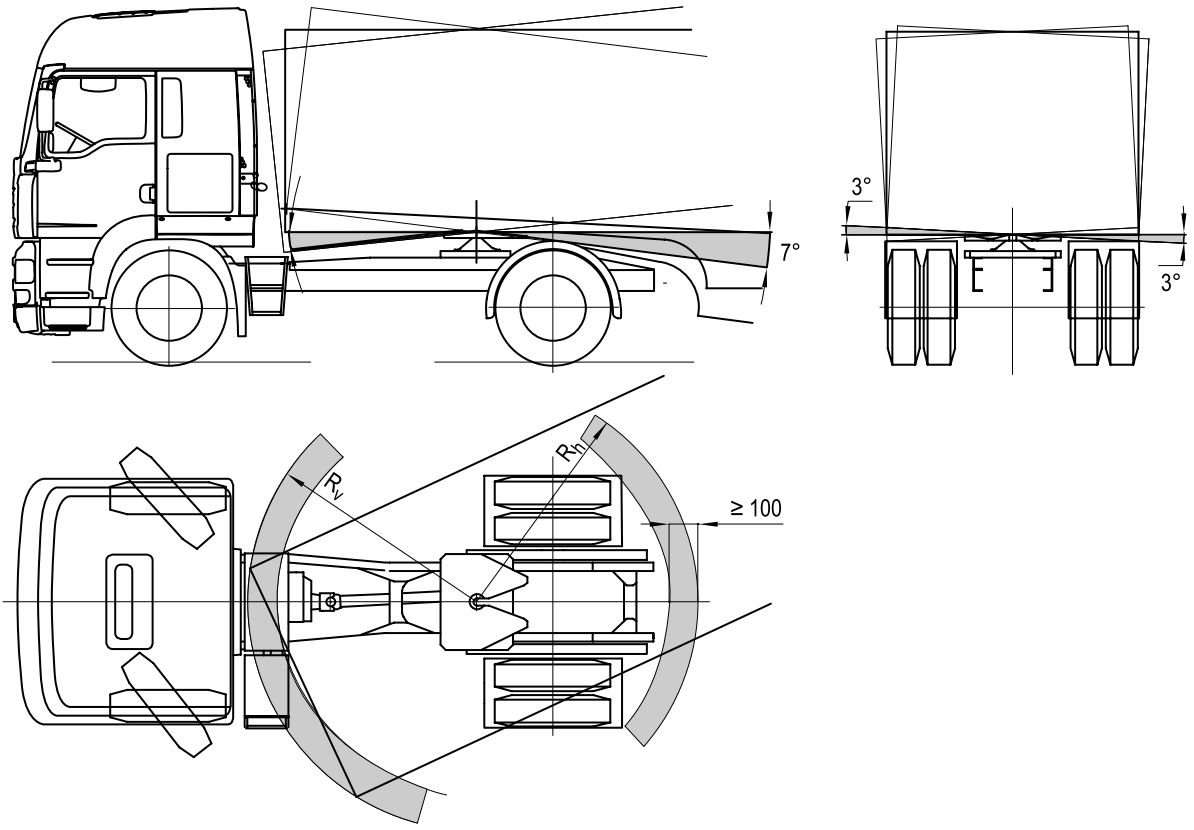
In order to achieve maximum fifth-wheel load the following actions are required before the vehicle goes into operation:

- Weigh the vehicle
- Calculate the axle loads
- Determine the optimum fifth-wheel lead
- Check the front slew radius
- Check the rear slew radius
- Check the front angle of inclination
- Check the rear angle of inclination
- Check the overall length of the articulated vehicle
- Install the fifth-wheel coupling accordingly.

The required angles of inclination are 6° to the front, 7° to the rear and 3° to the side, in accordance with DIN-ISO 1726.
Different tyre sizes, spring ratings or fifth-wheel heights between tractor unit and semitrailer reduce these angles so that they no longer comply with the standard.

In addition to the inclination of the semitrailer to the rear the following must also be taken into account: Body roll when cornering, deflection (axle guide, brake cylinder), antiskid chains, the pendulum movement of the axle unit on vehicles with tandem axles and the slew radii.
The plane of the fifth-wheel pick-up plate on the semitrailer should run parallel with the road at permissible fifth-wheel load.
The height of the fifth-wheel coupling must therefore be designed accordingly.

Fig. 7: Dimensions for semitrailer tractor units ESC-002



The fifth-wheel lead, as stated in the sales documentation or the chassis drawings, is applicable to the standard vehicle only. Under some circumstances, equipment that affects the vehicle's unladen weight or dimensions requires the fifth-wheel lead to be modified. This can also change the payload capacity and the vehicle's length. Only type-approved fifth-wheel couplings and base plates that comply with Directive 94/20/EC may be used. Installing a fifth-wheel coupling without a subframe is not permitted. Under certain circumstances it is possible to fit a fifth-wheel coupling directly. Here, the fifth-wheel coupling is installed on the subframe together with a reinforcing plate (not subject to type approval) and the mounting plate is omitted.

The size of the subframe and the quality of the materia ($\sigma_{0,2}$>350 N/mm^2) must be equivalent to those used on a comparable production vehicle. The fifth-wheel coupling base plate must lie only on the fifth-wheel subframe and not on the frame longitudinal members. The mounting plate must only be attached using bolts approved by MAN or by the fifth-wheel coupling base plate manufacturer. Observe the instructions/guidelines of the fifth-wheel coupling manufacturers. Connecting pipes/cables for air supply, brakes, electrics and ABS must not chafe on the body or snag during cornering. Therefore the bodybuilder must check the freedom of movement of all #cables/pipes when cornering with a semitrailer. When operating without a semitrailer, all pipes/cables must be attached securely in dummy couplings or connectors.

The following fifth-wheel kingpins are available:

- Fifth-wheel kingpin 50 of 2“ diameter
- Fifth-wheel kingpin 90 of 3.5“ diameter.

Which one is to be used depends on various factors. Like on trailer couplings, the deciding factor is the D value. The smaller of the two D values for the kingpin and the fifth-wheel coupling applies for the articulated vehicle as a whole. The D value itself is marked on the model plates.

The following formulae are used to calculate the D value for articulated vehicles:

Formula 6: D value for fifth-wheel coupling

$$D = \frac{0{,}6 \cdot 9{,}81 \cdot T \cdot R}{T + R - U}$$

If the D value is known, the following formula is applied to calculate the permissible gross weight of the semitrailer:

Formula 7: Permissible gross weight of the semitrailer

$$R = \frac{D \cdot (T - U)}{(0{,}6 \cdot 9{,}81 \cdot T) - D}$$

If the permissible gross weight of the semitrailer and the D value of the fifth-wheel coupling are known, the permissible gross weight of the semitrailer tractor unit can be calculated with the following formula:

Formula 8: Permissible gross weight of the tractor unit

$$T = \frac{D \cdot (R - U)}{(0{,}6 \cdot 9{,}81 \cdot R) - D}$$

If the fifth-wheel load is required and all other loads are known, the following formula can be used:

Formula 9: Fifth-wheel load

$$U = T + R - \frac{0{,}6 \cdot 9{,}81 \cdot T \cdot R}{D}$$

Where:

D	=	D value, in [kN]
R	=	Permissible gross weight of the semitrailer, in [t], including the fifth-wheel load
T	=	Permissible gross weight of the semitrailer tractor, in [t], including the fifth-wheel load
U	=	Fifth-wheel load, in [t]

Examples of calculations can be found in the booklet “Guide to fitting bodies TGL-TGM”, chapter „Calculations“.

7. Converting trucks into tractor units or tractor units into trucks

Converting a TGL or TGM truck chassis to a tractor unit is not permitted. Never attempt conversion of a tractor unit to a truck if the vehicle is fitted with ESP (= Electronic Stability Program)!
When converting a tractor unit to a truck or vice-versa, it is necessary to modify the vehicle's EBS (brake) parameterisation. Depending upon the vehicle undergoing conversion this may also involve installing different rear springs or a different level control system on vehicles with air suspension. Conversion of a truck chassis to a tractor unit and vice-versa therefore always requires approval from MAN. The ESC department will provide further information (For address see "Publisher" above).

Parameterisation must be carried out using the MAN-cats® diagnostic system in agreement with the nearest MAN service organisation. Fifth-wheel couplings must be installed on a subframe using a mounting plate or – in the case of direct mounting with a reinforcement plate. The specification of the subframe cross-section and its strength must at least correspond to that of a comparable subframe fitted to a production vehicle.
Air and electrical connections must be relocated so that the semitrailer can be safely coupled and decoupled and the pipes/cables are not damaged by the movement of the semitrailer. If electrical cables have to be modified, wiring harnesses for comparable MAN tractor units must be fitted. These can be obtained from the spare parts department.

If it is not possible to reach the air and electrical connections from the road, a suitable working platform measuring at least 400mm x 500mm, together with access steps, must be provided.