XL-PS40044BM-en-DE Rev F

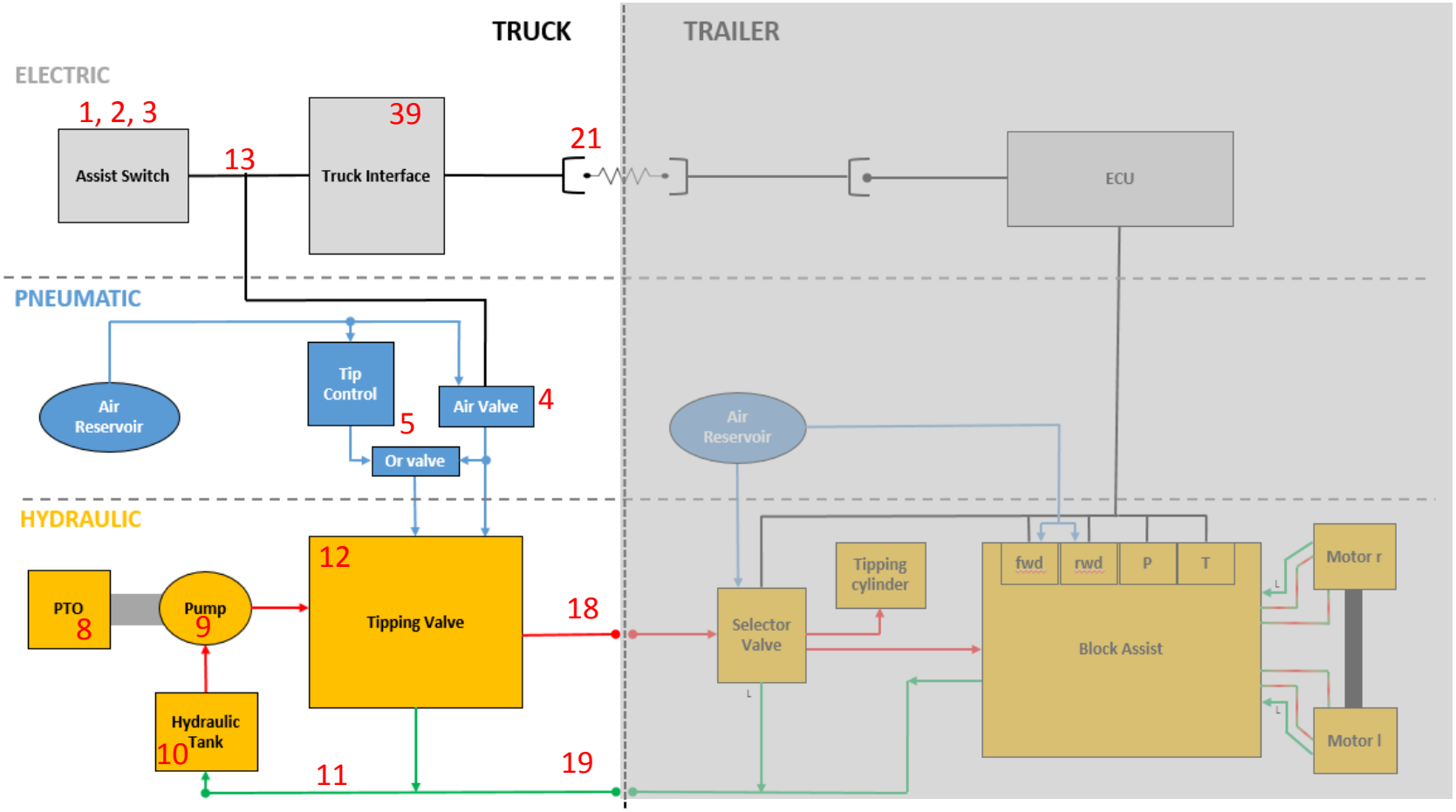
Installation Manual SAF TRAK Truck

Inhalt

Danger:

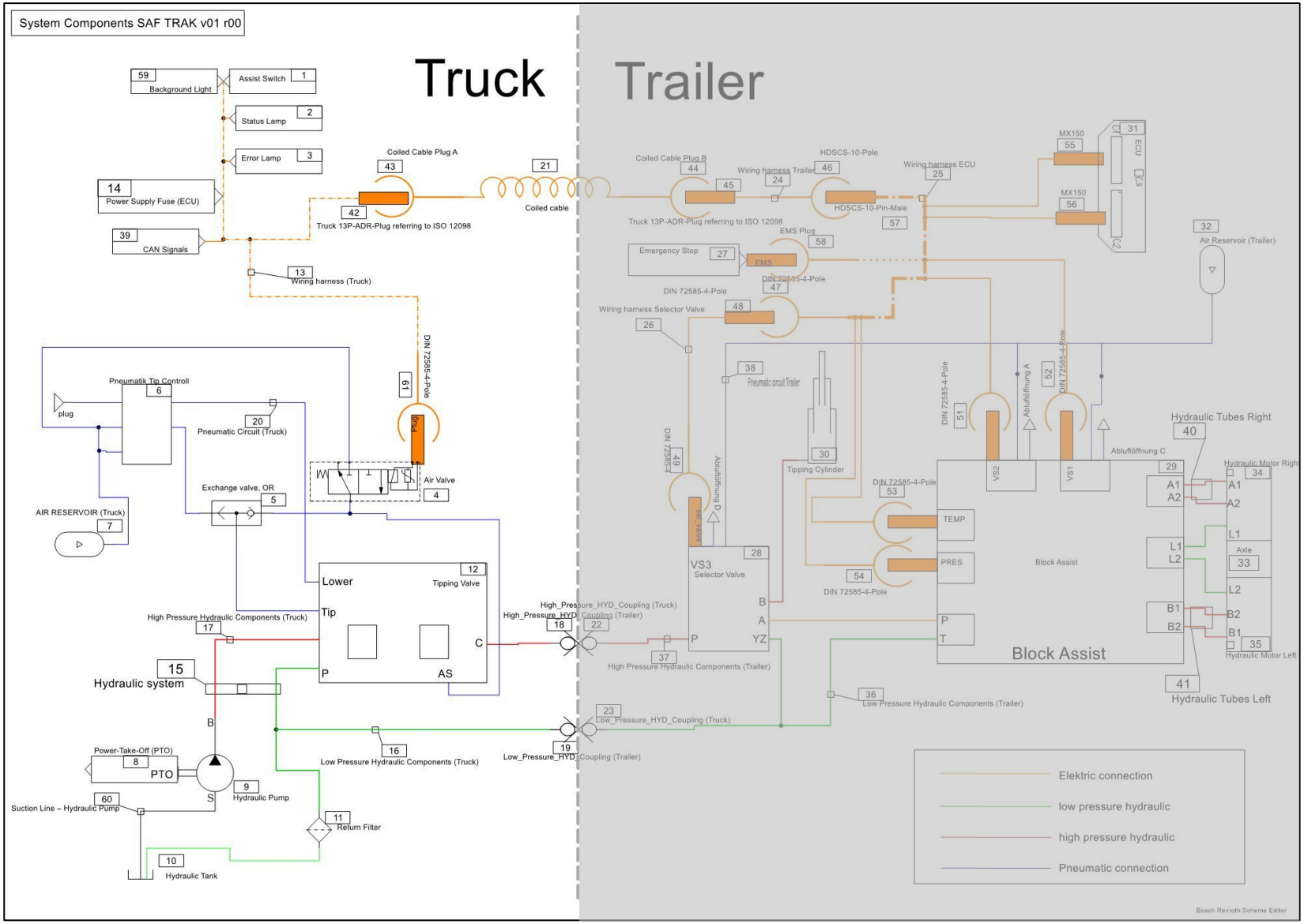
- The hydraulic system of the trailer with SAF TRAK axle must never be put into operation if the return line is not connected to the hydraulic tank.
- If the return line is not connected to the tank, the sealing system of the SAF TRAK axle will be damaged.

1. Overview / block diagram



1	Assist Switch	10	Hydraulic Tank	39	Attached Control Device
2	Status Lamp	11	Return Filter		
3	Error Lamp	12	Tipping Valve		
4	Air Valve	13	Wiring Harness (Truck)		
5	Exchange Valve, OR	18	High_Pressure_HYD_Coupling (Truck)		
8	Power-Take-Off (PTO)	19	Low_Pressure_HYD_Coupling (Truck)		
9	Hydraulic Pump	21	Coiled Cable		

2. Installation plan (Wiring diagram)



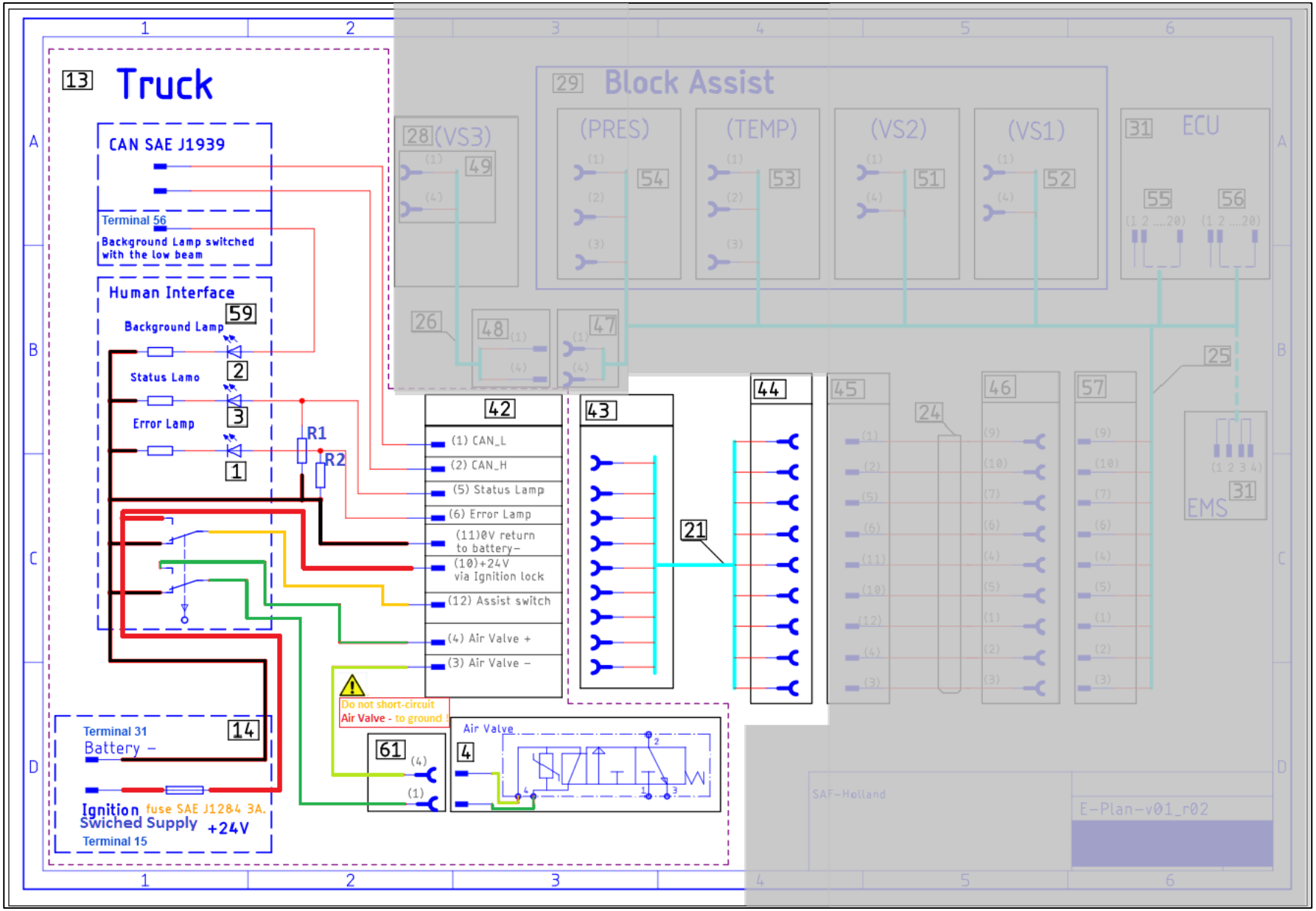
No.	Component	No.	Component
1	Assist Switch	31	ECU
2	Status Lamp	32	Air Reservoir (Trailer)
3	Error Lamp	33	Axle
4	Air Valve	34	Hydraulic Motor Right
5	Exchange Valve, OR	35	Hydraulic Motor Left
6	Pneumatic Tip Control	36	Low Pressure Hydraulic Components (Trailer)
7	Air Reservoir (Truck)	37	High Pressure Hydraulic Components (Trailer)
8	Power-Take-Off (PTO)	38	Pneumatic Circuit (Trailer)
9	Hydraulic Pump	39	CAN Signals
10	Hydraulic Tank	40	Hydraulic Tubes Right
11	Return Filter	41	Hydraulic Tubes Left
12	Tipping Valve	42	Truck 13P-ADR-Plug referring to ISO 12098
13	Wiring Harness (Truck)	43	Coiled Cable Plug A
14	Power Supply Fuse (ECU)	44	Coiled Cable Plug B
15	Hydraulic System	45	Trailer 13P-ADR-Plug
16	Low Pressure Hydraulic Components (Truck)	46	HDSCS-10-Pole
17	High Pressure Hydraulic Components (Truck)	47	DIN 72585-4-Pole
18	High_Pressure_HYD_Coupling (Truck)	48	DIN 72585-4-Pole
19	Low_Pressure_HYD_Coupling (Truck)	49	DIN 72585-4-Pole
20	Pneumatic Circuit (Truck)	50	DIN 72585-4-Pole
21	Coiled Cable	51	DIN 72585-4-Pole
22	High_Pressure_HYD_Coupling (Trailer)	52	DIN 72585-4-Pole
23	Low_Pressure_HYD_Coupling (Trailer)	53	DIN 72585-4-Pole
24	Wiring Harness Trailer	54	DIN 72585-4-Pole
25	Wiring Harness ECU	55	MX150
26	Wiring Harness Selector Valve	56	MX150
27	Emergency Stop	57	HDSCS-10-Pin
28	Selector Valve (Trailer)	58	EMS Plug
29	Block Assist	59	Background Light
30	Tipping Cylinder	60	Suction Line – Hydraulic Pump
		61	DIN 72585-4-Pole

Remark to 21, 42, 43, 44, 45:

- The male 13P-ADR connector (42) AT THE TRUCK has to be marked permanently and irremovably with “SAF TRAK”.
- The male 13P-ADR connector (45) AT THE TRAILER has to be marked permanently and irremovably with “SAF TRAK”.
- Both female 13P-ADR connectors (43; 44) of the coiled cable (21) have to be marked permanently and irremovably with “SAF TRAK”.

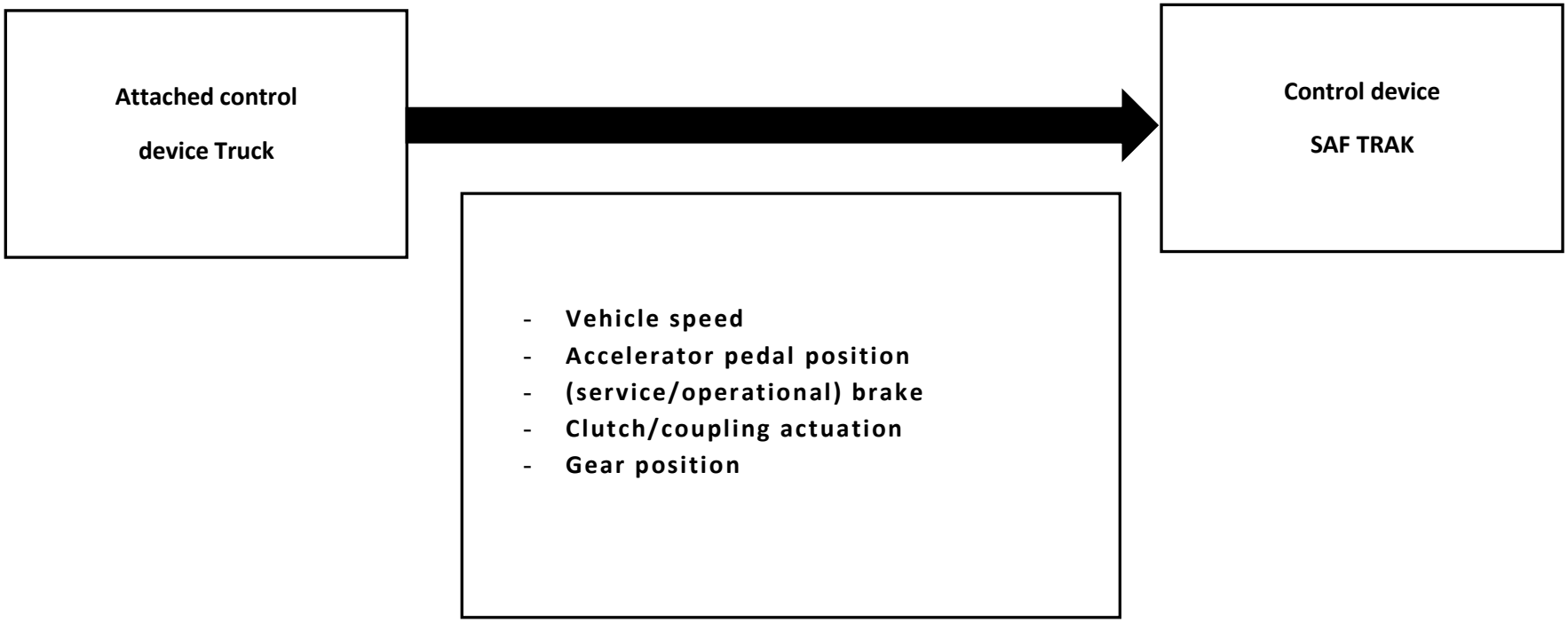
Figure 1: List of components / parts belonging to trailer in grey

3. Elektrical circuit diagram



4. CAN-Signals

The trailer requires an attached control device. This sends –as per norms SAE J1939 or ISO 11992-3 –following CAN-signals regarding:



5. Application layer acc. **SAE J1939**
Physical layer acc. ISO 11898 High-Speed-CAN/5V Base/250 kBaud

Following signals are processed:

Accelerator pedal position		
Norm		**SAE J1939**
CAN-Message		**EEC2**
Identification	**Hex**	**0xF003**
	Decimal	**61443**
Start	**Bit**	**8**
Length	**Bit**	**8**
Max. value	**Hex**	**0xFA**
	Decimal	**250**
Resolution	**%/bit**	**0,4**
Unit		**%**

Vehicle speed		
Norm		**SAE J1939**
CAN-Message		**CCVS1**
Identification	**Hex**	**0xFEF1**
	Decimal	**65265**
Start	**Bit**	**8**
Length	**Bit**	**16**
Max. value	**Hex**	**0xFAFF**
	Decimal	**64255**
Resolution	**km/h/bit**	**1/256**
Unit		**km/h**

Brake pedal position		
Norm		SAE J1939
CAN-Message		CCVS1
Identification	Hex	0xFEF1
	Decimal	65265
Start	Bit	28
Length	Bit	2
unactuated		0
actuated		1
Error		2
unavailable		3

Clutch pedal position		
Norm		SAE J1939
CAN-Message		CCVS1
Identification	Hex	0xFEF1
	Decimal	65265
Start	Bite	30
Length	Bit	2
unactuated		0
actuated		1
Error		2
unavailable		3

Gear selection (automatic gearbox)		
Norm		SAE J1939
CAN-Message		ETC2
Identification	Hex	0xF005
	Decimal	61445
Start	Bit	0
Length	Bit	8
Max. value	Hex	0xFB
	Decimal	251
Offset		125

Reverse gear (manual)		
Norm		SAE J1939
CAN-Message		ETC5
Identification	Hex	0xFEC3
	Decimal	65219
Start	Bit	8
Length	Bit	2
unactuated		0
actuated		1
Error		2
unavailable		3

Neutral gear (manual)		
Norm		**SAE J1939**
CAN-Message		**ETC5**
Identification	**Hex**	**0xFEC3**
	Decimal	**65219**
Start	**Bit**	**10**
Length	**Bit**	**2**
Not in neutral		**0**
in Neutral		**1**
Error		**2**
unavailable		**3**

5.1. Manufacturer specific CAN signals

Neutral gear		SCANIA
Norm		SAE J1939
CAN-Message		BCI1
Identification	Hex	0xFF28
	Decimal	65320
Start	Bit	6
Length	Bit	2
Not in neutral		0
in Neutral		1
Error		2
unavailable		3

Reverse gear		SCANIA
Norm		SAE J1939
CAN-Message		ETC5
Identification	Hex	0xFF28
	Decimal	65320
Start	Bit	22
Length	Bit	2
unactuated		0
actuated		1
Error		2
unavailable		3

Neutral gear		VOLVO
Norm		SAE J1939
CAN-Message		BBM_BBNet_01P
Identification	Hex	0xFF80
	Decimal	65408
Start	Bit	26
Length	Bit	2
Not in neutral		0
in Neutral		1
Error		2
unavailable		3

Gear selection		DAF
Norm		SAE J1939
CAN-Message		TCO01
Identification	Hex	0xE6C0
	Decimal	59072
Start	Bit	30
Length	Bit	2
Forwards		0
Backwards		1
Error		2
unavailable		3

6. Application layer acc. **ISO 11992-3**

Physical layer acc. ISO 11898 High-Speed-CAN/5V Base/250 kBaud

Vehicle speed		**Daimler**
Norm		**ISO11992-3**
CAN-Message		**GPM13**
Identification	**Hex**	**0xFE5F**
	Decimal	**65119**
Start	**Bit**	**48**
Length	**Bit**	**16**
Max. value	**Hex**	**0xFAFF**
	Decimal	**64255**
Resolution	**km/h/bit**	**1/256**
Unit		**km/h**

Gear selection		**Daimler**
Norm		**ISO11992-3**
CAN-Message		**GPM14**
Identification	**Hex**	**0xFE61**
	Decimal	**65121**
Start	**Bit**	**8**
Length	**Bit**	**8**
Max. value	**Hex**	**0xFB**
	Decimal	**251**
Resolution	**Gear/bit**	**1**
Offset		**125**

Accelerator pedal position		Daimler
Norm		ISO11992-3
CAN-Message		GPM14
Identification	Hex	0xFE61
	Decimal	65121
Start	Bit	56
Length	Bit	8
Max. value	Hex	0xFA
	Decimal	250
Resolution	%/bit	0,4
Unit		%

Brake pedal position		Daimler
Norm		ISO11992-3
CAN-Message		GPM1F
Identification	Hex	0xEF80
	Decimal	61312
Start	Bit	2
Length	Bit	2
unactuated		0
actuated		1
Error		2
unavailable		3

7. Components

7.1. Electrics

7.1.1. General wiring regulations

1	(All) Wiring have to fulfil applicable parts of ISO 4141.
2	CAN Bus have to be executed with a drilled wire according to SAE J1939-11 or SAE J1939-15.
3	Wiring of CAN Bus has to be executed matching applicable parts of SAE J1939-11 or SAE J1939-15.
4	The CAN Bus is already terminated with a resistor of 120 Ω (in harness 04 424 2039 00).
5	It is mandatory, that all components are wired according to the electric layout. Deviating wires are prohibited and may cause abnormal behaviour.
6	The air valve has to meet 5.2.1Air Valve (4)'s requirements.
7	Total cable length from feeding point to loading should not exceed 40m.
8	Vehicle-specific norms and instructions have to be complied with.

7.1.2. Assist switch (1)

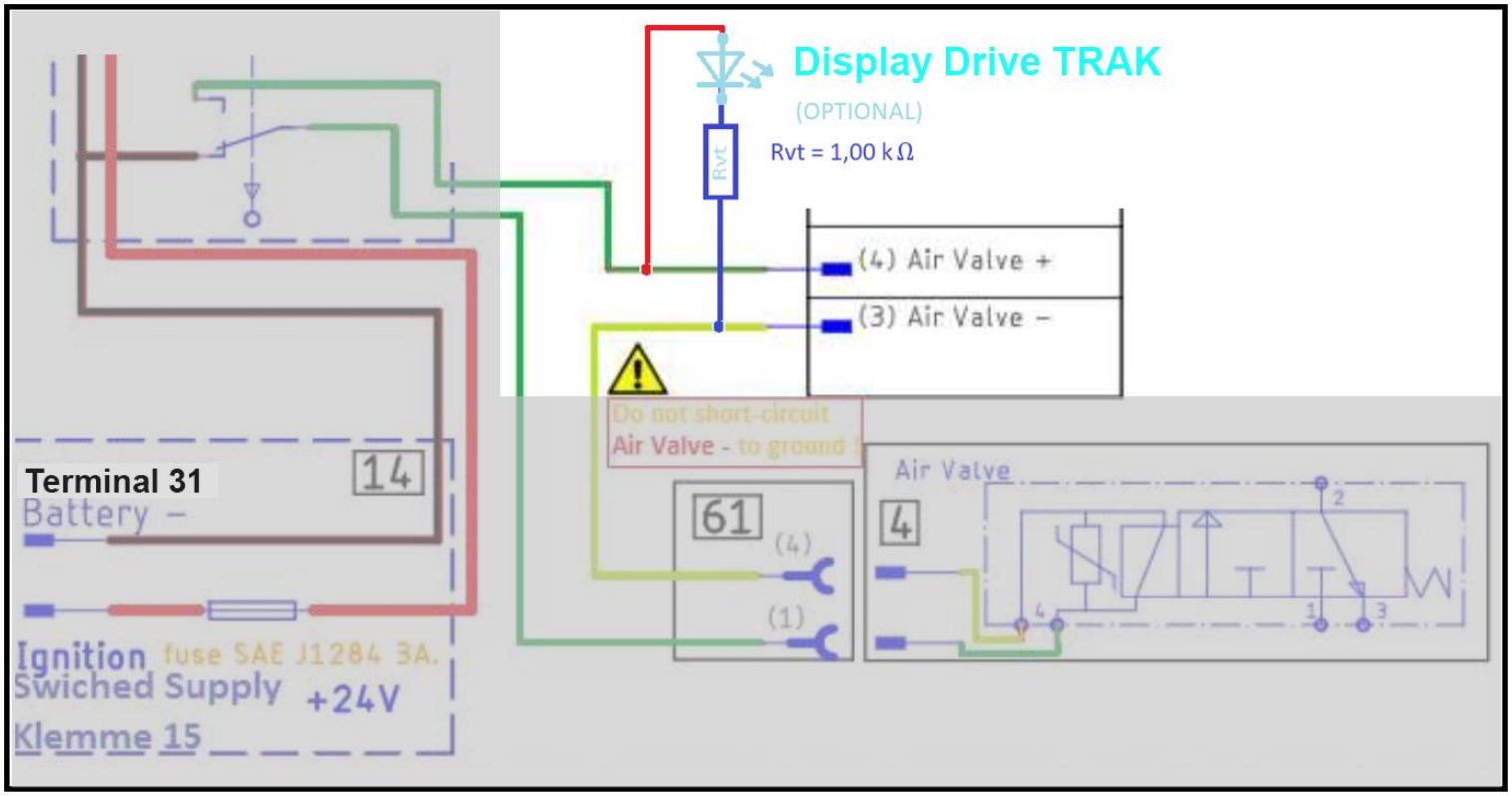
Temperature	-40°C ≤ t ≤ +80°C
Haltbarkeit	≥ 40000 Load changes
Locking	Flip switch with locking in OFF-position
Identification	Needs to be clearly identifiable as SAF TRAK switch
Nominal voltage	24V
Nominal current	≥ 10A
Installation location	Tractor's cab, easy to reach for from driver's seat

7.1.3. Indicator/Control lamps (2, 3)

Colour	Green status lamp Yellow error lamp
Nominal voltage	24V
Max. current drain	400 mA
Identification	Control lamps need to be clearly identifiable as status and error lamp
In general	Applicable parts of ECE R121's latest version have to be fulfilled
Installation location	Control lamps have to be clearly visible from driver's seat
In general	If SAF TRAK's digital exit shall be connected with the digital entrance of a body control device, an additional Pull-down-resistor would be needed to put in parallel. Pull-down resistor: Resistance 1.00 KΩ Power Rating ≥1W Pay attention to adequate cooling.

7.1.4. Display Drive TRAK (optional)

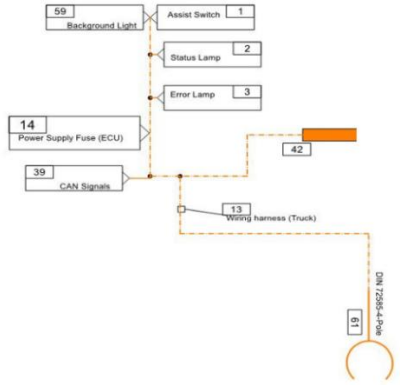
We recommend the installation of a signal lamp (e.g. in blue) to indicate the driver that the SAF TRAK is powered. For this following additional wiring has to be executed:



7.1.5. Troubleshooting

Error-free	Action	Error		Corrective actions
Step 1	Ignition ON			
● 5s ON ⇨ ○ OFF ● 5s ON ⇨ ○ OFF	⇩	● 5s ON ⇨ OFF ● 5s ON ⇨ ON	Error CAN signals Lamps not connected No power supply Trailer not connected	Disconnect body CAN from the mains Check wiring Check fuse Connect trailer ECU at trailer has to shine green
Step 2	Actuating switch ON			
● OFF ⇨ ● ON ○ OFF	⇩	● OFF ○ OFF ⇨ ● ON	Valves not connected Valve defective Oil temperature too high	Connect valves Check valve resistors Check wiring Air valve not connected as per wiring diagram
Step 3	Start engine			
● ON ○ OFF	⇩	● ON ⇨ ○ OFF ○ OFF ⇨ ● ON	See step 1/2	See step 1/2
Step 4	PTO ON			
● ON ○ OFF	⇩	● ON ⇨ ○ OFF ○ OFF ⇨ ● ON	See step 1/2	See step 1/2
Step 5	Engage a gear			
● ON ○ OFF	⇩	● ON ⇨ ○ OFF ○ OFF ⇨ ● ON	See step 1/2	See step 1/2
Step 6	Actuate Acc. pedal			
● ON ○ OFF	⇩ SAF TRAK is active!	● ON ⇨ ○ OFF ○ OFF ⇨ ● ON	SAF TRAK faulty oil pressure	Ignition off and start with step 1 Check pneumatics Don't forget to engage Power-Take-Off (PTO) Check hydraulic supply

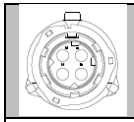
7.1.6. Wiring Harness –Truck (13)



Connections:

- Assist switch (1)
- Status lamp (2)
- Error Lamp (3)
- Background light (59)
- CAN-signals (39)
- Power Supply Fuse (ECU) (14)
- Truck 13P-ADR-Plug referring to ISO 12098 (42) PIN-allocation see chapter 6
- DIN 72585-4-Pole (61) connection for air valve (4)

PIN-allocation plug 61 (air valve)

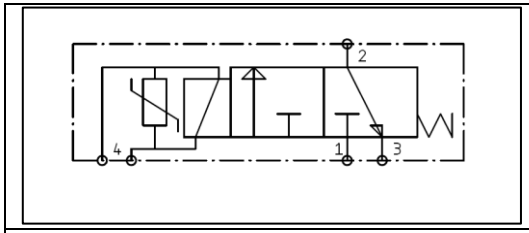
	Plug 61 DIN 72585-4-Pin	Cable cross section [mm²]
Air valve +	1	min 0,75
Not assigned	-	-
Not assigned	-	-
Air valve -	4	min 0,75

7.1.7. Coiled cable (21)

See chapter 6 “Junction to trailer”

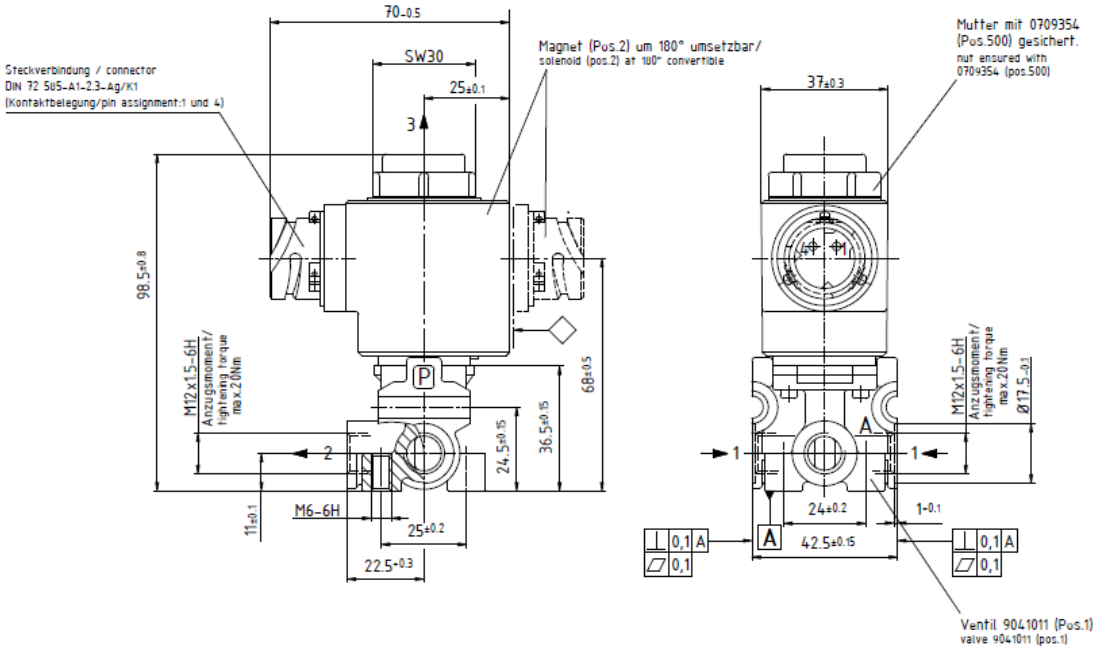
7.2. Pneumatics

7.2.1. Air valve (4)



Connections	Connection to
1	Tipping valve & OR-valve
2	Exhaust air
3	Air tank
4	Assist switch & control device SAF TRAK

Coil	With integrated varistor
Valve type	3/2-way valve
Nominal diameter pneumatics	3mm (in-& outlet)
Operating pressure	As specified by the manufacturer
Operating range temperature	-40°C ≤ T ≤ +90°C
Working fluid	Air
Installation location	No regulations
Nominal voltage	24 V (DC)
Operating range control current	300 mA ≤…≤ 1000 mA
Engagement time	100 % ET (Engagement time)



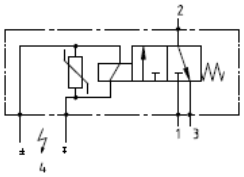
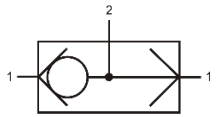
Kunde Customer	freier Verkauf/open market
Kunden-Bestell-Nr. customer-order-no.	
Kunden-Lastenheft-Nr. customer-specification-no.	
Technische Daten / technical data	
Schaltschema diagram	
Ventil valve	3/2-Wegeventil 3/2-way valve
Nennweite pro Ventil nominal diameter per valve	3 mm (Zulauf und Entlüftung) 3 mm (supply and exhaust)
Betriebsdruck operating pressure	Pe ≤ 10 bar
Ventilsitzdichtung valve seat seal	Viton
Betriebsemperaturbereich operating temperature range	-40 °C ... +100 °C
Arbeitsmedium working medium	Druckluft / air
Einbaulage mounting position	beliebig / unrestricted
Nennspannung rated voltage	24^{+6}_{-3} V DC
Stromaufnahme current consumption	410 mA
Einschaltdauer engagement time	100 % ED
Leistungsaufnahme power input	ca. 10 W
Magnet solenoid	mit eingeb. Varistor / with built-in varistor

Figure 2:AirValve Example

7.2.2. OR-valve (Exchange valve) (5)

Pneumatic 	Under pressurisation one of both entries gets passed through to the exit. Under both-sided pressurisation, the upper entry gets passed through. Connections: Pneumatic-hosesØ 8x1 $Ø_{interior}$: NW 4,0 Operating range: 0…10bar

7.3. Hydraulics

7.3.1. Power-Take-Off (PTO) (8)

Gearbox-sided Engine-sided	Manufacturer specifications have to be considered, especially: - permitted rotational frequency [r/min] & drive moment [Nm] - utilisable while driving!

7.3.2. Hydraulic pump (9)

Single-circle-axial-piston-pump with constant displacement volume	Manufacturer specifications have to be considered, especially permitted rotational frequency & drive moment. Additionally: - Ø Suction connection: ≥ 2 ½ “ - Volume flow rate: 120 l/min ≤ Q ≤ 200 l/min (corresponds to a speed of ca. 8…13 km/h of the SAF TRAK axle) - Operating pressure: 200 bar ≤ p ≤ 350 bar (corresponds to a speed of ca. 8.500…15.000 Nm)

Following rules apply:

1. The lower the volume flow rate created by the pump, the lower the speed level.
2. The lower pump’s attainable pressure, the lower SAF TRAK’s drive moment

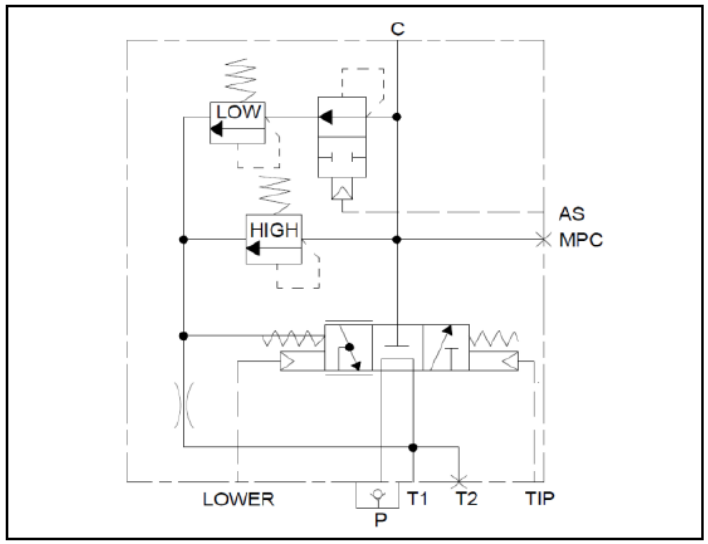
7.3.3. Oil

HLP	As per DIN 51524-2
HLPD	As per DIN 51524-2
HV	As per DIN 51524-3
HVLP	As per DIN 51524-3
HEES	As per ISO 15380
Class 32 or 46	

7.3.4. Hydraulic tank & Return filter (10), (11)

Hydraulics	Manufacturer specifications have to be considered! Additionally: - Ø Suction connection: ≥ 2 ½ “ - Ø Return connection: ≥ 1 ¼ “ - Volume: tipping cylinder’s volume requirements + additional 50 litres - Return filter ß≤25µm

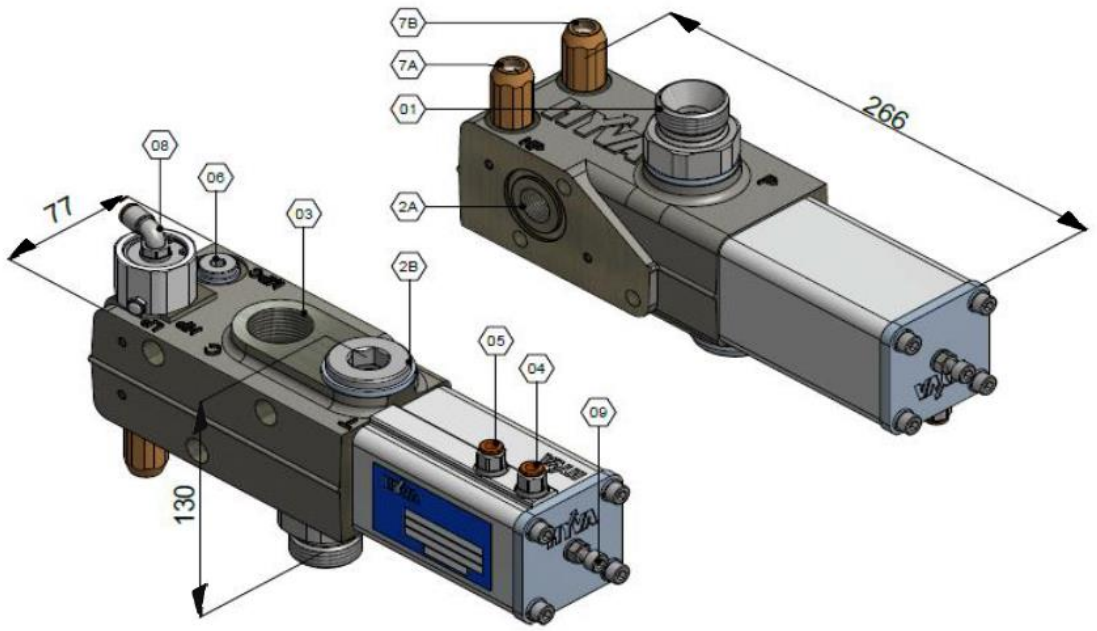
7.3.5. Tipping valve (12)

Two-level valve 	Manufacturer specifications have to be considered! Additionally: - pressure limitation level 1 (Truck pressure limitation for tipper action): depends on tipping cylinder - pressure limitation level 2 (pressure limitation for auxiliary drive while driving SAF TRAK): operational pressure 350 bar

Example from Hyva:

HT-2220-TNK-AS

For direct mounting on
- TNK: Hyva tank mounting plate

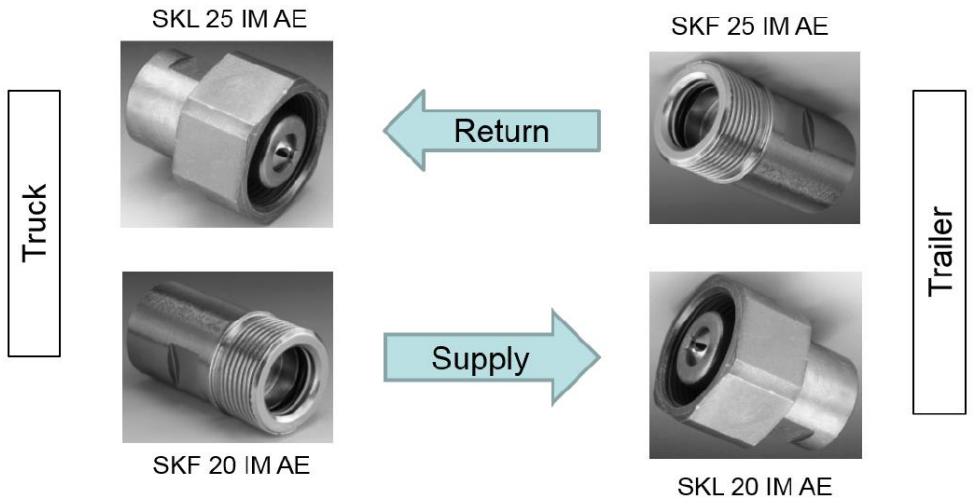


3D model is available on request

1	P	Pump connection
2A	T1	Tank connection
2B	T2	Alternative tank connection
3	C	Cylinder connection
4		Pneumatic connection (Tip) 6 mm
5		Pneumatic connection (Lower) 6 mm
6	MPC	Measure Pressure Cylinder (Pressure gauge point)
7A		High Pressure relief cartridge (HP)
7B		Low Pressure relief cartridge (LP)
8		Air switch (AS) 6 mm (Pneumatic pressure selector)
9		Adjustment screw (int.hex. 5) (To adjust the lowering speed)

7.3.6. High / Low Pressure HYD Coupling (18) / (19)

Securing against interchanging hydraulic connections between tractor and trailer, example



To protect against dust, etc. we recommend the use of a dust protection when disconnected:

SKL ZUBS 20 AE
SKL ZUBS 25 AE

SKF ZUBS 20 AE
SKF ZUBS 25 AE

Flow (=High pressure):
Operational pressure: 350bar
Operational temp.: -40°C ≤ T ≤ 100°C
Min. interior diameter: ≥20mm

Return (=Low pressure):
Operational pressure: 50bar
Operational temp.: -40°C ≤ T ≤ 100°C
Min. interior diameter: ≥25mm

In general:
Flow rate: 200l/min

All hoses and tubes used in flow and return have to match relating min. interior diameter!

8. Junction to trailer

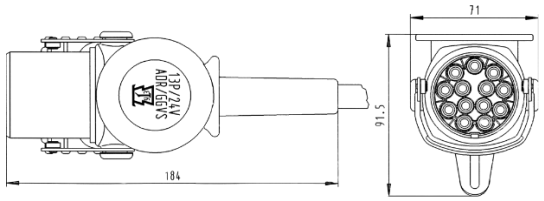
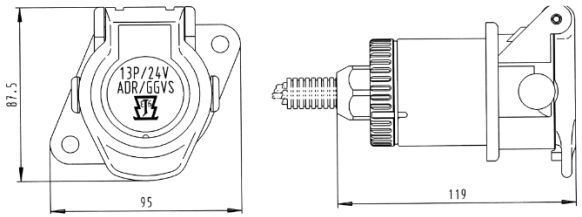
Regarding allocation to wiring diagram see chapter 3 “Electrical circuit diagram”

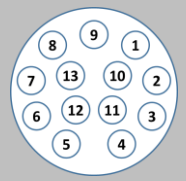
Truck: Socket 42

Coiled cable: Plug 43

Plug 44

Trailer: Socket 45

Plug / Source: Erich Jäger	Socket / Source: Erich Jäger
	

Signal Name	Wire diameter [mm²]	Pin allocation 	Comments
CAN-L	1.0	1	Can-bus has to be wired with greased or non-greased twisted-pair-wires. Can bus has to be wired as per SAE J1939-11 or SAE J1939-15
CAN-H	1.0	2	
Air valve -	1.0	3	
Air valve +	1.0	4	
Status lamp	1.0	5	
Error lamp	1.0	6	
Set aside for future applications	-	7	
Set aside for future applications	-	8	
Set aside for future applications	-	9	
+24V via ignition	1.5	10	Has to be connected via motor-vehicle fuse SAE J1284 3A
0V Battery -	1.5	11	
Assist switch	1.0	12	
Not assigned	1.0	13	

9. Revision history

Document version	Name / date	Chapter	Changes
Rev. 00	Oliver Marschner/ 31.08.2018	All	Initial version Revision 00
Rev. 01	Simon Schäfers / 06.09.2018		Revision 01
Rev. 02	Simon Schäfers / 14.09.2018		Revision 02
Rev. 03	Simon Schäfers / 14.11.2018	3, 5 and 6	Electrical circuit diagram updated CAN messages updated
Rev. 04	Helbring Schültz / 20.05.2019	Page 6	Remark for the 13 pin ADR cable: Components 21, 42, 43, 44, 45. Durably mark the assignmet of the male and female connectors on the truck and trailer side.
Rev. 05	Stegmann / 11.02.2020	7.1.1 General wiring regulations 7.1.4 Display Drive TRAK (optional)	Remark of the terminator in the harness Chapter added
Rev. 06	Helbring Schültz / 05.03.2020	Page 2 inserted	Safety instruction: The return line has to be connected to the tank !