

1 Circuit diagram - general information

◆ ⇒ [n1.1 ames", page 1](#)

◆ ⇒ [1.2 , page 10](#)

◆ ⇒ [c1.3 colours", page 12](#)

1.1 Signal names

◆ ⇒ [n1.1.1 ames, from 2017", page 1](#)

◆ ⇒ [n1.1.2 ames - DIN standard 72552", page 5](#)

◆ ⇒ [n1.1.3 ames - addition", page 9](#)

1.1.1 Signal names, from 2017



Note

These signal names will be used from 2017. You can find the old terminal designations in the chapters ⇒ [n1.1.2 ames - DIN standard 72552", page 5](#) and ⇒ [n1.1.3 ames - addition", page 9](#)

Signal names	Explanation
(S)	Screen for aerial or video lines
A~	AC phase A
AIR	Air pipe
ANT	Aerial line
ANT-	Aerial line negative
ANT+	Aerial line positive
B~	AC phase B
C~	AC phase C
CAN H	CAN bus High
CAN L	CAN bus Low
CRASH	Crash signal
CTRL	Control for actuators
CTRL-	Control negative (for actuators)
CTRL+	Control positive (for actuators)
CTRL1-	Motor control 1 negative

Signal names	Explanation
CTRL1+	Motor control 1 positive
CTRL2-	Motor control 2 negative
CTRL2+	Motor control 2 positive
DATA	Data line
DATA-	Data line negative
DATA+	Data line positive
DIAG	Diagnosis wire
ETH-	Ethernet data line negative
ETH+	Ethernet data line positive
FxR-H	FlexRay bus high
FxR-L	FlexRay bus low
GETH-	Ethernet data line negative (gigabit)
GETH+	Ethernet data line positive (gigabit)
GND	Ground or negative (also virtual ground)
H2O	water
HV-	High voltage negative
HV+	High voltage positive
HV-U~	High voltage phase U
HV-V~	High voltage phase V
HV-W~	High voltage phase W
K-Diag	K-line bidirectional (diagnosis)
KL1	Terminal 1 - ignition coil, ignition interrupter or ignitor
KL15	Terminal 15 - ignition switch output terminal or ignition / glow release
KL15a	Terminal 15a - ignition, fused
KL30	Terminal 30 - Terminal directly from the battery
KL30a	Terminal 30a - battery positive fused
KL32	Terminal 32 - electric motors, terminal for return line
KL33	Terminal 33 - electric motors, terminal for main connection
KL33L	Terminal 33L - electric motors, left-hand rotation
KL33R	Terminal 33R - electric motors, right-hand rotation
KL4	Terminal 4 - Terminal on ignition coil and on ignition distributor (high voltage)
KL40	Terminal 40 - input terminal directly from 48V battery
KL49	Terminal 49 - input terminal flasher (pulse generator)

Signal names	Explanation
KL49a	Terminal 49a - output terminal on the flasher, input terminal on the flasher switch for flashing pulses
KL50	Terminal 50 - start control
KL50a	Terminal 50a - battery changeover relay, output for starter control
KL50b	Terminal 50b - starter control for parallel operation
KL50e	Terminal 50e - start lock relay input
KL50f	Terminal 50f - start inhibitor relay output
KL53	Terminal 53 - wiper motor, input
KL53a	Terminal 53a - wiper, end stop
KL53b	Terminal 53b - wiper, shunt winding
KL53c	Terminal 53c - washer pump
KL53e	Terminal 53e - wiper, brake winding
KL54	Terminal 54 - brake lights on trailer sockets
KL55	Terminal 55 - fog light
KL56	Terminal 56 - headlight
KL56a	Terminal 56a - high beam and high beam control
KL56b	Terminal 56b - low beam
KL58	Terminal 58 - clearance, tail, license plate and instrument lights
KL58d	Terminal 58d - Terminal for adjustable instrument lighting
KL58L	Terminal 58L - clearance, tail, license plate and instrument lights left
KL58R	Terminal 58R - clearance, tail, license plate and instrument lights right
KL59	Terminal 59 - Terminal for AC voltage (generator, light switch or rectifier)
KL71	Terminal 71 - input for tone sequence switching device (horn)
KL71a	Terminal 71a - output (bass)
KL71b	Terminal 71b - output (high-frequency)
KL75	Terminal 75 - radio, cigarette lighter
KL76	Terminal 76 - speaker
KL77	Terminal 77 - terminal for door valve control
KL85	Terminal 85 - switching relay, drive (output; winding end)
KL86	Terminal 86 - switching relay, drive (input; start of winding)
KL87	Terminal 87 - switching relay, input terminal for NC/CO
KL87a	Terminal 87a - switching relay, first output terminal or terminal 87 fused
KL87b	Terminal 87b - switching relay, second output terminal

Signal names	Explanation
L1 ~	Mains phase L1
L2 ~	Mains phase L2
L3 ~	Mains phase L3
L-Diag	L-line unidirectional (diagnosis)
LIN1... x	LIN bus numbered 1, 2, 3 ... etc.
MOST	MOST bus (fiber optic cable)
N	Neutral conductor N
PE	Protective earth
PILOT	Pilot line
SIG	Signal
SIG-	Signal negative
SIG+	Signal positive
SIG+C	Signal positive cosine
SIG+S	Signal positive sine
SIG15	Signal terminal 15 (status signal)
SIG50	Signal terminal 50 (status signal)
SIG54	Signal terminal 54 (status signal)
SIG-C	Signal negative cosine
SIG-H	Signal high
SIG-L	Signal low
SIG-n	Speed signal
SIG-Rx	Receiver line (receiver)
SIG-S	Signal positive sine
SIG-Tx	Transceiver line (transmitter / receiver)
SIG-v	Speed signal
U ~	3-phase alternating current phase U
V~	3-phase alternating current phase V
VS	General supply voltage (without special voltage level)
VS3V	Supply voltage 3 volts
VS5V	Supply voltage 5 volts
W~	3-phase alternating current phase W

[Back to overview](#) ⇒ [page 1](#)

1.1.2 Signal names - DIN standard 72552

- ◆ KL1 - ignition coil, ignition distributor - low voltage
- ◆ KL1a - To the circuit breaker I (ignition distributor with two separate circuits)
- ◆ KL1b - To the circuit breaker II (ignition distributor with two separate circuits)
- ◆ KL4 - ignition coil, ignition distributor - high voltage
- ◆ KL4a - From ignition coil I (ignition distributor with two separate circuits)
- ◆ KL4b - From ignition coil II (ignition distributor with two separate circuits)
- ◆ KL15 - switched positive to the battery (output of the ignition / drive switch)
- ◆ KL15a - output at the series resistor for ignition coil and starter
- ◆ KL17 - glow plug and starter switch - start
- ◆ KL19 - glow plug and starter switch - preheating
- ◆ KL30 - input from positive pole (+) of the battery, series-parallel switchover relay 12/24 V, direct
- ◆ KL30a - input from positive pole (+) of battery II
- ◆ KL31 - negative pole of the battery or ground, direct
- ◆ KL31a - return line to the negative pole of battery II (series-parallel switchover relay 12/24 V)
- ◆ KL31b - return line to the battery negative terminal or ground via switch or relay (switched negative)
- ◆ KL31c - return line to the negative pole of battery I (series-parallel switchover relay 12/24 V)
- ◆ KL50 - starter control (direct)

Electric motors

- ◆ KL32 - return line
- ◆ KL33 - main connection
- ◆ KL33a - limit switching
- ◆ KL33b - shunt field
- ◆ KL33f - For a second, lower speed level
- ◆ KL33g - For third lower speed level

- ◆ KL33h - For the fourth lower speed level
- ◆ KL33L - counterclockwise rotation
- ◆ KL33R - clockwise rotation

Starter

- ◆ KL45 - separate start relay, output; starter, input (main current) two starters - parallel operation C - start relay for engagement current
- ◆ KL45a - output, starter I, input, starter I and II
- ◆ KL45b - output, starter II
- ◆ KL48 - terminal on the starter and start repeat relay for monitoring the starting process

Direction indicator (flasher)

- ◆ KL49 - input
- ◆ KL49a - output
- ◆ KL49b - output, second circuit
- ◆ KL49c - output, third circuit

Starter control

- ◆ KL50 - starter control (direct)
- ◆ KL50a - changeover relay - output for starter control
- ◆ KL50b - start relay for sequential control of the engagement current when two starters are operated in parallel
- ◆ KL50c - input on start relay for starter I
- ◆ KL50d - input on start relay for starter II
- ◆ KL50e - input start lock relay
- ◆ KL50f - output start lock relay
- ◆ KL50g - input start repeat relay
- ◆ KL50h - output start repeat relay

Wiper motors

- ◆ KL53 - wiper motor, input (+)
- ◆ KL53a - wiper (+), limit switching

- ◆ KL53b - wiper (shunt winding)
- ◆ KL53c - electric windscreen washer pump
- ◆ KL53e - wiper (brake winding)
- ◆ KL53l - wiper motor with permanent magnet and third brush (high speed)

Illuminations

- ◆ KL55 - fog lights
- ◆ KL56 - headlights
- ◆ KL56a - high beam and high beam control lamp
- ◆ KL56b - low beam
- ◆ KL56d - headlight flasher
- ◆ KL57a - parking light
- ◆ KL57L - parking light, left
- ◆ KL57R - parking light, right
- ◆ KL58 - clearance lights, license plate lights, instrument lights, tail lights
- ◆ KL58b - brightness regulator
- ◆ KL58d - brightness regulator
- ◆ KL58L - license plate light, left
- ◆ KL58R - license plate light, right

Generators and voltage regulators

- ◆ KL61 - charge control lamp
- ◆ KL B + - battery positive
- ◆ KL B- - battery negative
- ◆ KL D + - Dynamo plus
- ◆ KL D- - Dynamo minus
- ◆ KL DF - Dynamo field, KL DF1 Dynamo field 1
- ◆ KL DF2 - Dynamo field 2

- ◆ KL U, KL V, KL W - three-phase terminals
- ◆ KL75 - radio, cigarette lighter
- ◆ KL76 - speaker

Switch

Normally closed (NC) and changeover contact

- ◆ KL81 - input
- ◆ KL81a - output 1, normally closed side
- ◆ KL81b - output 2, normally closed side

Multi level switch

- ◆ KL83 - input
- ◆ KL83a - output, position 1
- ◆ KL83b - output, position 2
- ◆ KL83L output, left position
- ◆ KL83R output, right position

Relay/ current relay

- ◆ KL84 - input, drive and relay contact
- ◆ KL84a - output, drive
- ◆ KL84b - output, relay contact

Generators and voltage regulators

- ◆ KL85 - output, drive (end of winding negative or ground)
- ◆ KL86 - input, drive (start of winding)
- ◆ KL86a - start of winding or 1st winding
- ◆ KL86b - winding tap or 2nd winding

Relay contact for normally closed (NC) and changeover contacts

- ◆ KL87 - input. Also used for motor power supply
- ◆ KL87a - output 1 (normally closed side)
- ◆ KL87b - output 2 87c output 3

- ◆ KL87z - input 1
- ◆ KL87y - input 2
- ◆ KL87x - input 3

Relay contact for normally open and changeover contacts

- ◆ KL88 - input
- ◆ KL88a - output 1
- ◆ KL88b - output 2
- ◆ KL88c - output 3
- ◆ KL88z - input 1
- ◆ KL88y - input 2
- ◆ KL88x - input 3

Direction indicator (flasher)

- ◆ KL C - control lamp 1
- ◆ KL C2 - control lamp 2
- ◆ KL C0 - main connection for control circuits set by the indicator switch, separate from the indicator.
- ◆ KL C3 - control lamp 3 (e.g. for second trailer)
- ◆ KL L - left indicator lights
- ◆ KL R - right indicator lights

Back to overview ⇒ [page 1](#)

1.1.3 Signal names - addition

Where a suitable DIN standard code is not available, terminal designations are written in English, for example:

- ◆ CAN_H / CAN_L - lines for CAN bus high and low
- ◆ FlexRay + / FlexRay - - FlexRay data bus
- ◆ + V - output supply voltage from the electronic control unit
- ◆ 0V - reference voltage from the electronic control unit (not connected to body ground, KL31)
- ◆ Signal - data line

[Back to overview ⇒ page 1](#)

1.2 Cables

◆ [⇒ c1.2.1 ross-section", page 10](#)

◆ [⇒ c1.2.2 olour", page 10](#)

◆ [⇒ l1.2.3 ine", page 11](#)

1.2.1 Line cross-section



Note

Only for markets in which the AWG (American Wire Gauge) dimension is used

Wire cross-section in mm ²	AWG
0.35	22
0.50	20
0.75	18
1.0	17
1.5	15
2.5	13
4.0	11
6.0	9
16.0	5
25.0	3
35.0	2

[Back to overview ⇒ page 1](#)

1.2.2 Line colour



Note

For circuit diagrams in which the English colour code is used

German abbreviation	English abbreviation	Explanation
bl	U	Blue
br	N	Brown
ge	Y	Yellow
gn	G	Green
ro	R	Red
sw	B	Black
li	P	Purple
ws	W	White
gr	S	Grey
or	O	Orange
rs	K	Pink

Back to overview ⇒ [page 1](#)

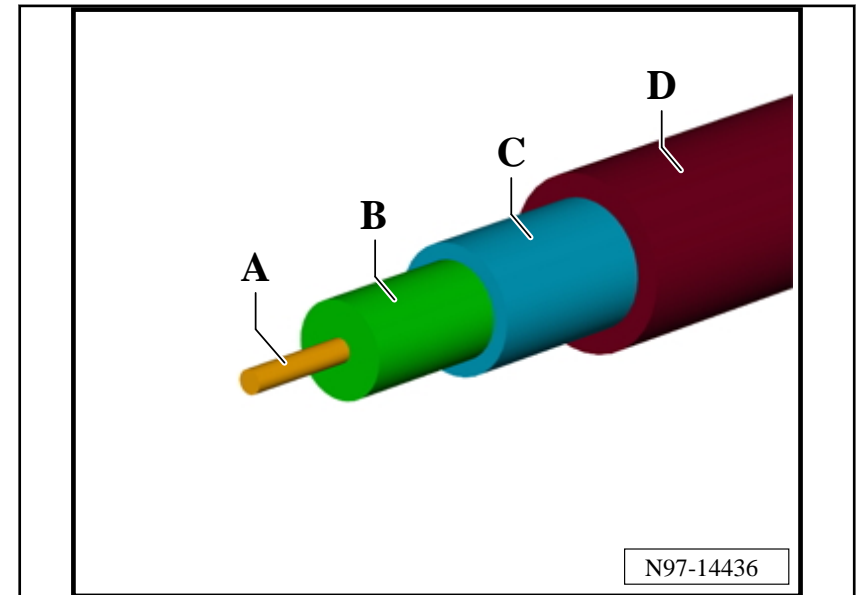
1.2.3 Coaxial line

A - Inner conductor (execution as solid wire or as stranded wire)

B - Dielectric / insulation layer

C - Shielding (solid braid or foil)

D - Coating



N97-14436

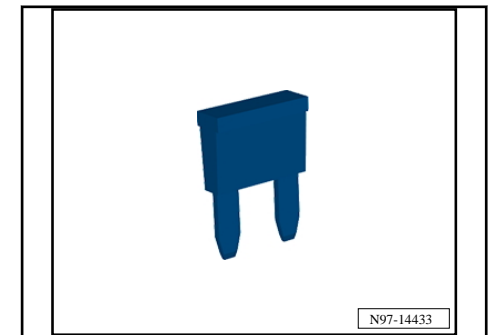
Back to overview ⇒ [page 1](#)

1.3 Fuse colours

- ◆ ⇒ [c1.3.1 colours for type Mini", page 12](#)
- ◆ ⇒ [c1.3.2 colours for type ATO", page 13](#)
- ◆ ⇒ [c1.3.3 colours for type MAXI", page 13](#)
- ◆ ⇒ [c1.3.4 colours for type JCase", page 14](#)
- ◆ ⇒ [c1.3.5 colours for type LP JCase", page 15](#)

1.3.1 Fuse colours for type Mini

fuse type Mini

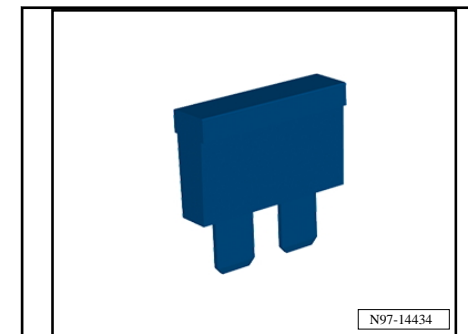


Nominal value	Fuse colour
1 A	black
2 A	Grey
3 A	Purple
4 A	Pink
5 A	Light brown
7.5 A	brown
10 A	red
15 A	Light blue
20 A	yellow

[Back to overview ⇒ page 1](#)

1.3.2 Fuse colours for type ATO

fuse type ATO

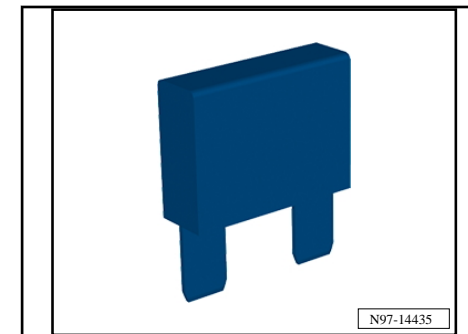


Nominal value	Fuse colour
1 A	black
2 A	Grey
3 A	Purple
4 A	Pink
5 A	Light brown
7.5 A	brown
10 A	red
15 A	Light blue
20 A	yellow
25 A	white
30 A	Light green
35 A	Blue green
40 A	orange

[Back to overview ⇒ page 1](#)

1.3.3 Fuse colours for type MAXI

Fuse type MAXI

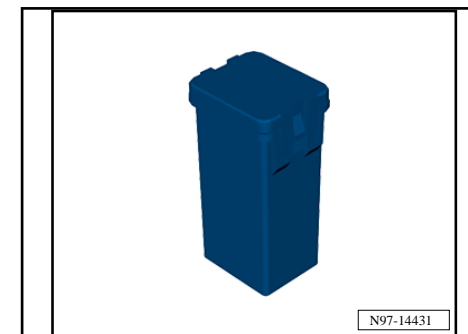


Nominal value	Fuse colour
20 A	yellow
30 A	Light green
40 A	orange
50 A	red
60 A	Light blue
80 A	White

[Back to overview ⇒ page 1](#)

1.3.4 Fuse colours for type JCase

Fuse type JCase



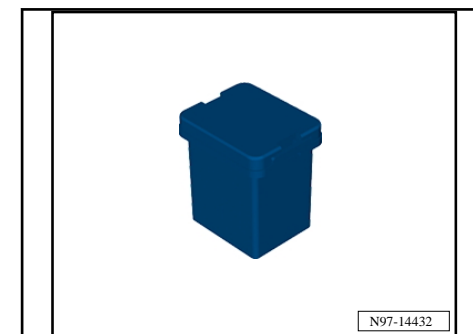
Nominal value	Fuse colour
20 A	blue

Nominal value	Fuse colour
25 A	white
30 A	Pink
40 A	green
50 A	red
60 A	yellow

[Back to overview ⇒ page 1](#)

1.3.5 Fuse colours for type LP JCase

Fuse type LP JCase



Nominal value	Fuse colour
20 A	blue
25 A	white
30 A	Pink
40 A	green
50 A	red
60 A	yellow

[Back to overview ⇒ page 1](#)