Technical Publication

SAM Advanced
for series 1600 (ECU 8)

Application: Genset

Functional Description
Operating Instructions
Workshop Manual
Installation and Initial Operation

Temporary!

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1 Technical Data

1.1 SAM – Technical data

Use

- Installation in enclosed control cabinets.
- Suitable for installation on mounting rails or screw-mounting on cabinet rear wall (fixed installation).
- Suitable for connecting wires or litz wires up to AWG16 (US) (1.5 mm^2).

Technical data

Term	Unit	Value
Installation position		As desired, however integral fault display should be legible.
Operating voltage	VDC	24 rated value (-30%; +30%, kurzzeitig -50%)
Power consumption	W	Under 7 (0.25A at 24V) without additional load.
Degree of protection:		IP 40 as per DIN 40 050
Shock: Rail mounting Fixed installation		 10g, 11ms 30g, 11ms
Vibration: Rail mounting Fixed installation	 Hz Hz	 2 - 12.8:Xpp < ± 3mm 12.8 - 1000:a < 1g [rms] 2 - 12.8: Xpp < ± 3mm 12.8 - 100:a < 4g [rms]
Ambient temperature:	°C	-40 - +70 in circulating ambient air.
Storage temperature:	°C	-40 - +100
Relative humidity	%	5 - 97, no condensation.
Color:		Blue (RAL5015)
Material:	%	Polycarbonate reinforced with 10% fiberglass.
Dimensions:	mm	L x W x H (295 x 151 x 75)
Weight:	kg	Approx. 1.6

Note: Values stated above may be restricted when MCS 5 extension modules are used.

EMI/EMC - Electromagnetic interference (general)

The SAM has been tested according to the following standards and meets the relevant limit values:

Standard	Testing
EN 55011	(Conducted Emission) 10 kHz - 30 MHz Class A
EN 55011	(Radiated Emission) 30 MHz - 1 GHz
IEC-60533:1999	(Conducted Emission) 10 kHz - 30 MHz (type test)
EC-60533:1999	(Radiated Emission) 150 kHz - 2 GHz (type test)
EN 61000-4-2	(ESD interference immunity) ±8kV
EN 61000-4-3	(Radiated interference immunity) 80MHz - – 2GHz
EN 61000-4-4	(Burst interference immunity) ±2kV
EN 61000-4-5	(Surge interference immunity) ±1kV/±2kV
EN 50155	(Surge interference immunity) ±1,8kV
EN 61000-4-17	(LF conducted interference) 0.03 – 10 kHz / 3Veff
EN 61000-4-29	(Mains fluctuation / STANAG 1008)
IEC 60092-504	(Dielectric strength) 550VAC / 10mA
EN 50155	(Isolation) 500V / 10MOhm

Requirements for fulfillment of EMI/EMC limit values are as follows:

- The housing of the SAM must be connected to housing ground e.g. by a cable with a minimum cross-section of 2.5 mm2. Cable length shall not exceed 10 cm.
- Twisted-conductor cables only shall be used to connect sensors and actuators. Maximum length of shall not exceed 5 m for unshielded cables and 50 m for shielded cables (providing that cable harness impedance allows).

Electrical requirements

Term	Unit	Value
Operating voltage:	V	24, -30% to +30% (+16.8 - +32) Admissible residual ripple less than 5% as per STANAG 1008. Note: The processor is automatically reset if the voltage falls below 7 V.
Power supply:	W	Below 7 W. Without activated loads at SAM outputs Additional output current on positive or negative conductor shall not exceed 10 A DC in total.
Current terminals:	mm	5.08 terminals (spring-cage terminals) • Wire diameter AWG14 (US) or 2.5 mm^2 recommended.
Electrical isolation:	V	• Supply ground is common reference potential (Common Ground) for all SAM electronics. This applies to the entire I/O range with the exception of certain electrically isolated channels. • SAM electronics ground is not connected to housing ground. • Signal cable shields must be connected to housing ground if applicable. • Maximum direct current isolating voltage is 500 unless otherwise stated.

Mechanical design

Term	Unit	Value
Installation position:		• Horizontal (to facilitate legibility of fault display and inscriptions on SAM housing). • Note that space is required to connect cabling at the top and bottom when installing the SAM in control cabinets. • The device heats up as a result of power loss. Heat from the SAM dissipates through the back wall. Ensure that heat can be conducted away from the back wall of the SAM to the mounting frame. Do not allow neighboring devices to additionally heat up the SAM.

Signal connections

The SAM module is easily replaced. The input and output signal cables are equipped with modular connectors. Common function channels are combined in groups.
The wires are connected using spring-cage terminal technology.
Two wires may be connected to one terminal when the wires are crimped in a double-wire ferrule. For example, a Phoenix AL-TWIN 2* 0.75-10 may be used.
Connector modules are plugged together. The connector modules are equipped with coding pins to preclude polarity reversal.

Terminals

Term	Unit	Value
Terminal strip modules:		WAGO spring-cage terminals
Current-carrying capacity (at 70 °C):	A	10 per contact
Measuring voltage:	V	250
Measuring surge voltage:	V	2500
Wire cross-sections:	mm^2	Up to 1.5 or AWG15
Clamping range:	mm^2	0.08 – 1.5 or AWG15

Other terminals (RM 5,08) are used for power supply and CAN bus connections.

Additional printed circuit boards in slots 1 ... 3

Observe the relevant technical data applicable to the printed circuit boards concerned when additional boards are used in the SAM.

1.2 CCB 2 – Technical Data

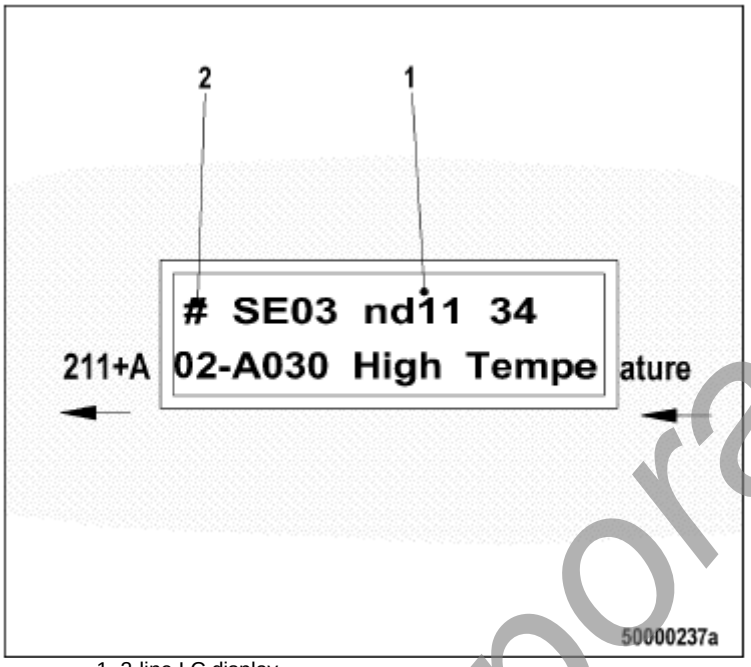
Technical data CCB2

Term	Unit	Value
Input voltage	VDC	+5 (–5 %, +3%) from SAM +24V (±5 %) from SAM
Power consumption	mA	at 5 VDC – less than 600 at 24 VDC – less than 60
Power loss	W	Approx. 4

2 Troubleshooting

2.1 Fault indication on SAM display – Genset applications

SAM fault messages
SAM display



1 2-line LC display
2 Time indicator for alarms

The structure of the display (1) is as follows:

- First line
  - Fault indication
    - # (2) = Alarm is no longer active, does not appear on next power-up,
      - A = Currently active alarms,
      - B = Alarm was active during the last hour,
      - C = Alarm was active during the last four hours,
      - C = Alarm was active during the last four to twelve hours,
      - E = Alarm was active more than twelve hours ago.
    - Fault type (e.g. SE03).
    - Node number at which the fault occurred (e.g. nd05).
- Second line (option)
  - Running text, providing more information about the fault currently displayed

Proceed to the next alarm by pressing key (↓ ↑).

Fault type – fault message text

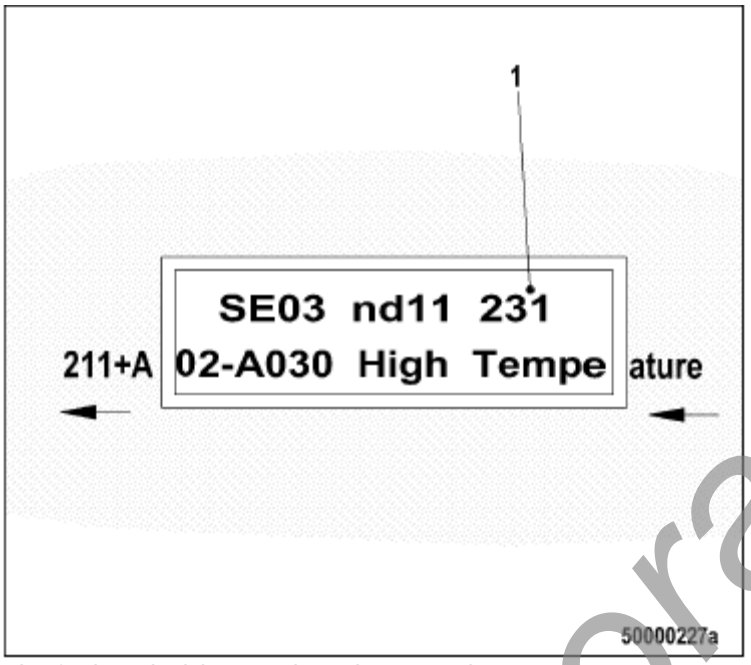
ID	designation	ID	designation
1	SYS_ERR_TEMP_SD	17	SYS_ERR_PAN_1_LOST
2	SYS_ERR_TEMP	18	SYS_ERR_PAN_2_LOST
3	SYS_ERR_SUPPLY_SD	19	SYS_ERR_PAN_3_LOST
4	SYS_ERR_SUPPLY	20	SYS_ERR_PAN_4_LOST
5	SYS_ERR_CAN_A_BUS_OFF	21	SYS_ERR_PAN_5_LOST
6	SYS_ERR_CAN_A_OVERRUN	22	SYS_ERR_PAN_6_LOST
7	SYS_ERR_CAN_B_BUS_OFF	23	SYS_ERR_IO_SLOT_1
8	SYS_ERR_CAN_B_OVERRUN	24	SYS_ERR_IO_SLOT_5
9	TEMP_COMP_ERR	25	SYS_ERR_IO_SLOT_6
10	SYS_ERR_IO_SLOT_2	26	SYS_ERR_IO_SLOT_7
11	SYS_ERR_IO_SLOT_3	27	SYS_ERR_IO_SLOT_8
12	SYS_ERR_IO_SLOT_4	28	SYS_ERR_DWNLD_SERVER
13	SYS_ERR_SER_CONN_LOST	29	SYS_ERR_NOT_PROJ_NODE
14	SYS_ERR_CAN_C_BUS_OFF	30	NOT USED
15	SYS_ERR_CAN_C_OVERRUN	31	Reserved
16	SYS_ERR_SA_CONN_LOST	32	Reserved

Engine governor messages for Series 4000
Recommended action in case of alarm
Yellow alarm:

The engine can still be operated providing that automatic engine shutdown to protect the engine has not been configured or is not tripped. Contact Service immediately/start fault rectification.
Red alarm:
Caution, the engine is running at its limits. Shut down manually without further delay if the engine does not shut itself down immediately after a red alarm is signaled.

Fault and alarm messages

The fault code numbers are generated by the Engine Control Unit and transmitted to the following display.



The fault code (1) comprises three numbers.
Fault messages may also be caused by faulty sensors/actuators. Contact Service to have sensors/actuators checked and replaced as necessary should troubleshooting as prescribed in the table below prove unsuccessful.
IMPORTANT NOTE:
The information provided in the columns “Meaning” and “Action” applies to the standard default state of the genset on delivery. Differing system responses requiring different action may result when settings are changed by the OEM. The OEM is responsible for documenting any changes and defining appropriate counteraction.
The table below lists possible fault codes:

No.	ZKP-No.	Designation	Meaning
3	2.0122.931	HI T-Fuel	Fuel temperature too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
4	2.0122.932	SS T-Fuel	Fuel temperature too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
5	2.0121.931	HI T-Charge Air	Charge air temperature too high (limit 1) ==> Check InterCooler (Alarm Configuration Parameter, for details see PR 2.8008.100)
6	2.0121.932	SS T-Charge Air	Charge air temperature too high (limit 2) ==> Check InterCooler (Alarm Configuration Parameter, for details see PR 2.8008.100)
9	2.0124.931	HI T-Coolant Intercooler	Coolant temperature of InterCooler too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
10	2.0124.932	SS T-Coolant Intercooler	Coolant temperature of InterCooler too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
15	2.0100.921	LO P-Lube Oil	Pressure of lube oil too low (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
16	2.0100.922	SS P-Lube Oil	Pressure of lube oil too low (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
19	2.0126.931	HI T-Exhaust A	Exhaust gas temperature (A-side) too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
20	2.0126.932	SS T-Exhaust A	Exhaust gas temperature (A-side) too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
21	2.0127.931	HI T-Exhaust B	Exhaust gas temperature (B-side) too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
22	2.0127.932	SS T-Exhaust B	Exhaust gas temperature (B-side) too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
23	2.0152.921	LO Coolant Level	Coolant level too low (limit 1) ==> Check coolant level in compensation container (Alarm Configuration Parameter, for details see PR 2.8008.100)
25	2.0154.931	HI P-Diff-Lube Oil	Differential pressure of oilfilter too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
26	2.0154.932	SS P-Diff-Lube Oil	Differential pressure of oilfilter too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
27	2.0151.931	HI Level Leakage Fuel	Level of leakage fuel too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
29	1.8004.206	HI ETC Idle Speed too High	Idle Speed of one of the switcheable chargers too high. (Alarm Configuration Parameter, for details see PR 2.8008.100)

No.	ZKP-No.	Designation	Meaning
30	2.2510.932	SS Engine Over speed	Engine Over speed (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
31	2.3011.931	HI ETC1 Over speed	Speed of basic charger too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
32	2.3012.932	SS ETC1 Over speed	Speed of basic charger too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
33	2.0114.931	HI P-Diff-Fuel	Differential pressure of fuelfilter too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
34	2.0114.932	SS P-Diff-Fuel	Differential pressure of fuelfilter too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
36	2.3013.931	HI ETC2 Over speed	Speed of 1st switcheable charger too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
37	2.3013.912	SS ETC2 Over speed	Speed of 1st switcheable charger too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
38	1.8004.205	AL ETC Speed Deviation	Speed deviation between basic turbo charger and one of the switcheable chargers. (Alarm Configuration Parameter, for details see PR 2.8008.100)
39	1.8004.204	AL ETC2 CutIn Failure	Switching of charger ETC2 failed. (Alarm Configuration Parameter, for details see PR 2.8008.100)
44	2.0153.921	LO Coolant Level Intercooler	Coolant level of intercooler too low (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
51	2.0125.931	HI T-Lube Oil	Lube oil temperature too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
52	2.0125.932	SS T-Lube Oil	Lube oil temperature to high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
57	2.0101.921	LO P-Coolant	Coolant pressure too low (limit 1) ==> check cooling cycle. (Alarm Configuration Parameter, for details see PR 2.8008.100)
58	2.0101.922	SS P-Coolant	Coolant pressure too low (limit 2) ==> Engine stop or limitation of the injection quantity ==> check cooling cycle (Alarm Configuration Parameter, for details see PR 2.8008.100)
59	2.0120.933	SS T-Coolant L3	Coolant temperature too high/ too low (limit 3). (Alarm Configuration Parameter, for details see PR 2.8008.100)
60	2.0120.934	SS T-Coolant L4	Coolant temperature too high/ too low (limit 4). (Alarm Configuration Parameter, for details see PR 2.8008.100)
63	2.0106.931	HI P-Crank Case	Crankcase pressure too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
64	2.0106.932	SS P-Crank Case	Crankcase pressure too high (limit 2). (Alarm Configuration Parameter, for details see PR

No.	ZKP-No.	Designation	Meaning
			2.8008.100)
65	2.0102.921	LO P-Fuel	Fuel supply pressure too low (limit 1) ==> Check filter, fuel on low-pressure side (Alarm Configuration Parameter, for details see PR 2.8008.100)
66	2.0102.922	SS P-Fuel	Fuel supply pressure too low (limit 2) ==> Check filter (low-pressure side) (Alarm Configuration Parameter, for details see PR 2.8008.100)
67	2.0120.931	HI T-Coolant	Coolant temperature too high (limit 1) ==> Check circulation of coolant (Alarm Configuration Parameter, for details see PR 2.8008.100)
68	2.0120.932	SS T-Coolant	Coolant temperature too high (limit 2) ==> Check circulation of coolant (Alarm Configuration Parameter, for details see PR 2.8008.100)
81	1.8004.046	AL Rail Leakage	Rail pressure gradient too low for Start or too high for Stop (==> High-pressure system leaks, air in the system) (Alarm Configuration Parameter, for details see PR 2.8008.100)
82	2.0104.931	HI P-Fuel (Common Rail)	Rail pressure > setpoint value => DBR reduction, shift of start of injection delayed (==> interphase transformer sticks or connections of the interphase transformer) (Alarm Configuration Parameter, for details see PR 2.8008.100)
83	2.0104.921	LO P-Fuel (Common Rail)	Rail pressure < setpoint value => DBR reduction (==> interphase transformer defective or leakage in high-pressure system) (Alarm Configuration Parameter, for details see PR 2.8008.100)
85	2.0128.931	HI T-Umblasen	Umblasen' temperature too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
86	2.0128.932	SS T-Umblasen	Umblasen' temperature too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
89	2.2500.030	SS Engine Speed too Low	Engine is being stalled. The engine speed of the normally operating engine dropped below the limit from parameter 2.2500.027 Limit Engine Speed Low without any stop request. For safety reason the engine is stopped when this event occurs. (Alarm Configuration Parameter, for details see PR 2.8008.100)
90	2.1090.925	SS Idle Speed Not Reached	Idle speed not reached ==> Start abort ==> pay attention to other messages (Alarm Configuration Parameter, for details see PR 2.8008.100)
91	2.1090.924	SS Release Speed Not Reached	Acceleration speed not reached ==> Start abort ==> observe other messages (Alarm Configuration Parameter, for details see PR 2.8008.100)
92	2.1090.923	SS Starter Speed Not Reached	Starter speed not reached ==> Start abort ==> Starter does not turn or turns too slowly

No.	ZKP-No.	Designation	Meaning
			(Alarm Configuration Parameter, for details see PR 2.8008.100)
93	2.1090.922	SS T-Preheat	Preheat temperature too low (limit 2) ==> Coolant temperature for engine start too low ==> Bolting engine start (Alarm Configuration Parameter, for details see PR 2.8008.100)
94	2.1090.921	LO T-Preheat	Preheat temperature too low (limit 1) ==> Coolant temperature for engine start too low (Alarm Configuration Parameter, for details see PR 2.8008.100)
95	2.1090.920	AL Prelubrication Fault	Prelubrication fault. (Alarm Configuration Parameter, for details see PR 2.8008.100)
102	1.8004.624	AL Fuel Cons. Counter Defect	Fuel consumption counter defect. (Alarm Configuration Parameter, for details see PR 2.8008.100)
104	1.8004.623	AL Eng Hours Counter Defect	Engine Hours Counter defect. (Alarm Configuration Parameter, for details see PR 2.8008.100)
118	2.0140.921	LO ECU Power Supply Voltage	Power supply voltage too low (limit 1) ==> Check battery / generator (Alarm Configuration Parameter, for details see PR 2.8008.100)
119	2.0140.922	LOLO ECU Power Supply Voltage	Power supply voltage too low (limit 2) ==> Check battery / generator (Alarm Configuration Parameter, for details see PR 2.8008.100)
120	2.0140.931	HI ECU Power Supply Voltage	Power supply voltage too high (limit 1) ==> Check battery / generator (Alarm Configuration Parameter, for details see PR 2.8008.100)
121	2.0140.932	HIHI ECU Power Supply Voltage	Power supply voltage too high (limit 2) ==> Check battery / generator (Alarm Configuration Parameter, for details see PR 2.8008.100)
122	2.0132.921	HI T-ECU	Temperature of electronic too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
141	1.1088.007	AL Power too high	This alarm is set if the average of the engine power of the last 24 hours exceeded the value specified by PR1.1088.001. (Alarm Configuration Parameter, for details see PR 2.8008.100)
142	1.1088.006	AL MCR exceeded 1 hour	This alarm is set if in the last 12 hours the MCR was exceeded longer than 1 hour. (Alarm Configuration Parameter, for details see PR 2.8008.100)
176	2.4000.004	AL LifeData not available	No (fitting) LifeData-Backup-System is available within a delaytime after ECU-Reset . ==> Backup-system has no LifeData-function or CAN bus interrupted to Backup-system. (Alarm Configuration Parameter, for details see PR 2.8008.100)
177	2.4000.006	AL LifeData restore incomplete	If the ADEC has to restore the LifeData from the backup-system and at least one checksum is wrong after the upload or the upload is incomplete, then this failure is set. (Alarm Configuration Parameter, for details see PR

No.	ZKP-No.	Designation	Meaning
			2.8008.100)
180	2.0500.680	AL CAN1 Node Lost	Connection to a node on CAN bus 1 lost. ==> Check devices connected on CAN (Alarm Configuration Parameter, for details see PR 2.8008.100)
181	2.0500.681	AL CAN2 Node Lost	Connection to a node on CAN bus 2 lost. ==> Check devices connected on CAN (Alarm Configuration Parameter, for details see PR 2.8008.100)
182	2.0500.682	AL CAN Wrong Parameters	Incorrect CAN parameter values have been entered. (Alarm Configuration Parameter, for details see PR 2.8008.100)
183	2.0500.683	AL CAN No PU-Data	A CAN mode is selected which the communication is initialized aided of the PU data module. However, required PU data module is not present or is not valid. ==> Check the devices connected by CAN (Alarm Configuration Parameter, for details see PR 2.8008.100)
184	2.0500.684	AL CAN PU-Data Flash Error	During attempt to copy a received PU data module to Flash module, a program error occurred. ==> Electronic service (Alarm Configuration Parameter, for details see PR 2.8008.100)
186	2.0500.686	AL CAN1 Bus Off	CAN Controller 1 is in "Bus Off" state => Automatic switchover to CAN2 ==>causes e.g. short circuit, massive interference or baud rate incompatibility (Alarm Configuration Parameter, for details see PR 2.8008.100)
187	2.0500.687	AL CAN1 Error Passive	CAN Controller 1 has signaled a warning. ==> causes e.g. lack of associated nodes, slight interference or short-term bus overload. (Alarm Configuration Parameter, for details see PR 2.8008.100)
188	2.0500.688	AL CAN2 Bus Off	CAN-Controller 2 is in "Bus Off" state => Automatic switchover to CAN 1 ==>causes e.g. short circuit, massive interference or baud rate incompatibility. (Alarm Configuration Parameter, for details see PR 2.8008.100)
189	2.0500.689	AL CAN2 Error Passive	CAN Controller 2 has signaled a warning. ==> causes e.g. lack of associated nodes, slight interference or short-term bus overload. (Alarm Configuration Parameter, for details see PR 2.8008.100)
190	2.0500.690	AL EMU Parameter Not Supported	EMU parameters are not supported. ==> Incompatibility (Alarm Configuration Parameter, for details see PR 2.8008.100)
201	1.8004.570	SD T-Coolant	Coolant temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B6), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
202	1.8004.572	SD T-Fuel	Fuel temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B33), if necessary replace it. (Alarm Configuration Parameter, for details see PR

No.	ZKP-No.	Designation	Meaning
			2.8008.100)
203	1.8004.571	SD T-Charge Air	Charge air temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B9), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
204	1.8004.602	SD Level Lube Oil	Level sensor for lube oil defect. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
205	1.8004.574	SD T-Coolant Intercooler	Intercooler coolant temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B26), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
206	1.8004.576	SD T-Exhaust A	Exhaust gas temperature-sensor on A-side defect. ==> short circuit or cable breakage ==> Check sensor and cable (B4.21), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
207	1.8004.577	SD T-Exhaust B	Exhaust gas temperature-sensor on B-side defect. ==> short circuit or cable breakage ==> Check sensor and cable (B4.22), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
208	1.8004.566	SD P-Charge Air	Charge air pressure-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B10), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
211	1.8004.563	SD P-Lube Oil	Lube oil pressure-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B5), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
212	1.8004.564	SD P-Coolant	Collant pressure-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B16), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
213	1.8004.569	SD P-Coolant Intercooler	Intercooler coolant pressure-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B43), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
214	1.8004.568	SD P-CrankCase	Crankcase pressure-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B50), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
215	1.8004.567	SD P-HD	Rail pressure-sensor defect. ==> High-pressure controller emergency operation ==> short circuit or cable breakage ==> Check sensor and cable (B48), if necessary replace it. (Alarm Configuration Parameter, for details see PR

No.	ZKP-No.	Designation	Meaning
			2.8008.100)
216	1.8004.575	SD T-Lube Oil	Lube oil temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B7), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
219	1.8004.573	SD T-Intake Air	Intake air temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B3), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
220	1.8004.584	SD Level Coolant Water	Sensor for coolant level defect. ==> short circuit or cable breakage ==> Check sensor and cable (F33), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
221	1.8004.585	SD P-Diff Lube Oil	Sensor for differential pressure of lube oil defect. ==> short circuit or cable breakage ==> Check sensor and cable (B5), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
222	1.8004.582	SD Level Leakage Fuel	Sensor for leakage level of fuel defect. ==> short circuit or cable breakage ==> Check sensor and cable (F46), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
223	1.8004.583	SD Level Coolant Intercooler	Sensor for coolant level of intercooler defect. ==> short circuit or cable breakage ==> Check sensor and cable (F57), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
227	1.8004.620	SD P-Lube Oil before Filter	Pressure sensor for lube oil before filter defect. ==> short circuit or cable breakage ==> Check sensor and cable (B5.3), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
228	1.8004.595	SD P-Fuel before Filter	Fuel pressure-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B5.3), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
229	1.8004.562	AL Stop Camshaft Sensor Defect	Sensor of Camshaft defect and sensor of crankshaft defect before. ==> Engine stop ==> Check sensor and cable of B1, if necessary replace it. ==> After Engine restart curing of failure. (Alarm Configuration Parameter, for details see PR 2.8008.100)
230	1.8004.498	SD Crankshaft Speed	Sensor defect on crankshaft. ==> short circuit or cable breakage ==> Check sensor and cable (B13), if necessary replace it. After Engine restart follows curing of failure. (Alarm Configuration Parameter, for details see PR 2.8008.100)
231	1.8004.499	SD Camshaft Speed	Sensor defect on camshaft. ==> short circuit or cable breakage ==> Check sensor and cable (B1), if necessary

No.	ZKP-No.	Designation	Meaning
			replace it. After Engine restart follows curing of failure. (Alarm Configuration Parameter, for details see PR 2.8008.100)
232	1.3011.128	SD Charger 1 Speed	Speed-sensor of basic charger defect. ==> short circuit or cable breakage ==> Check sensor and cable (B44.1), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
233	1.3011.129	SD Charger 2 Speed	Speed-sensor of switching charger defect. ==> short circuit or cable breakage ==> Check sensor and cable (B44.2), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
239	1.8004.598	SD P-Diff Fuel	Sensor for differential pressure of lfuel defect. ==> only if SD-Alarme Fuel b. Filter or Fuel after Filter (Alarm Configuration Parameter, for details see PR 2.8008.100)
240	1.8004.565	SD P-Fuel	Fuel pressure-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B34), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
241	1.8004.581	SD T-Umblasen	Temperature-sensor of recirculated charge air defect. ==> short circuit or cable breakage ==> Check sensor and cable (B49), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
242	1.8004.622	SD T-Coolant (R)	Redundant coolant temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
244	1.8004.621	SD P-Lube Oil (R)	Redundant pressure sensor for lube oil defect. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
245	2.8006.589	SD ECU Power Supply Voltage	Internal ECU error. ==> electronic defect (Alarm Configuration Parameter, for details see PR 2.8008.100)
266	2.8006.586	SD Speed Demand	Analog speed demand defect. ==> short circuit or cable breakage ==> Check setpoint tacho-generator and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
268	2.8006.591	SD Spinning Value	Analog spinning value defect. ==> short circuit or cable breakage (Alarm Configuration Parameter, for details see PR 2.8008.100)
269	2.8006.588	SD Loadp.Analog filt	Filtered analog load pulse signal not available. ==> short circuit or cable breakage ==> Check cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)

No.	ZKP-No.	Designation	Meaning
270	2.8006.590	SD Frequency Input	Frequency input defect ==> short circuit or cable breakage (Alarm Configuration Parameter, for details see PR 2.8008.100)
301	1.8004.500	AL Timing Cylinder A1	Error in timing of injector cylinder A1: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
302	1.8004.501	AL Timing Cylinder A2	Error in timing of injector cylinder A2: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
303	1.8004.502	AL Timing Cylinder A3	Error in timing of injector cylinder A3: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
304	1.8004.503	AL Timing Cylinder A4	Error in timing of injector cylinder A4: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
305	1.8004.504	AL Timing Cylinder A5	Error in timing of injector cylinder A5: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
306	1.8004.505	AL Timing Cylinder A6	Error in timing of injector cylinder A6: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
307	1.8004.506	AL Timing Cylinder A7	Error in timing of injector cylinder A7: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
308	1.8004.507	AL Timing Cylinder A8	Error in timing of injector cylinder A8: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
309	1.8004.508	AL Timing Cylinder A9	Error in timing of injector cylinder A9: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
310	1.8004.509	AL Timing Cylinder A10	Error in timing of injector cylinder A10: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
311	1.8004.510	AL Timing	Error in timing of injector cylinder B1: timing value too low /

No.	ZKP-No.	Designation	Meaning
		Cylinder B1	high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
312	1.8004.511	AL Timing Cylinder B2	Error in timing of injector cylinder B2: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
313	1.8004.512	AL Timing Cylinder B3	Error in timing of injector cylinder B3: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
314	1.8004.513	AL Timing Cylinder B4	Error in timing of injector cylinder B4: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
315	1.8004.514	AL Timing Cylinder B5	Error in timing of injector cylinder B5: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
316	1.8004.515	AL Timing Cylinder B6	Error in timing of injector cylinder B6: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
317	1.8004.516	AL Timing Cylinder B7	Error in timing of injector cylinder B7: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
318	1.8004.517	AL Timing Cylinder B8	Error in timing of injector cylinder B8: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
319	1.8004.518	AL Timing Cylinder B9	Error in timing of injector cylinder B9: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
320	1.8004.519	AL Timing Cylinder B10	Error in timing of injector cylinder B10: timing value too low / high. ==> if very often replace solenoid (Alarm Configuration Parameter, for details see PR 2.8008.100)
321	1.8004.520	AL Wiring Cylinder A1	Short circuit in injector cable of cylinder A1. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR

No.	ZKP-No.	Designation	Meaning
			2.8008.100)
322	1.8004.521	AL Wiring Cylinder A2	Short circuit in injector cable of cylinder A2. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
323	1.8004.522	AL Wiring Cylinder A3	Short circuit in injector cable of cylinder A3. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
324	1.8004.523	AL Wiring Cylinder A4	Short circuit in injector cable of cylinder A4. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
325	1.8004.524	AL Wiring Cylinder A5	Short circuit in injector cable of cylinder A5. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
326	1.8004.525	AL Wiring Cylinder A6	Short circuit in injector cable of cylinder A6. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
327	1.8004.526	AL Wiring Cylinder A7	Short circuit in injector cable of cylinder A7. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
328	1.8004.527	AL Wiring Cylinder A8	Short circuit in injector cable of cylinder A8. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
329	1.8004.528	AL Wiring Cylinder A9	Short circuit in injector cable of cylinder A9. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure

No.	ZKP-No.	Designation	Meaning
			(Alarm Configuration Parameter, for details see PR 2.8008.100)
330	1.8004.529	AL Wiring Cylinder A10	Short circuit in injector cable of cylinder A10. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
331	1.8004.530	AL Wiring Cylinder B1	Short circuit in injector cable of cylinder B1. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
332	1.8004.531	AL Wiring Cylinder B2	Short circuit in injector cable of cylinder B2. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
333	1.8004.532	AL Wiring Cylinder B3	Short circuit in injector cable of cylinder B3. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
334	1.8004.533	AL Wiring Cylinder B4	Short circuit in injector cable of cylinder B4. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
335	1.8004.534	AL Wiring Cylinder B5	Short circuit in injector cable of cylinder B5. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
336	1.8004.535	AL Wiring Cylinder B6	Short circuit in injector cable of cylinder B6. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
337	1.8004.536	AL Wiring Cylinder B7	Short circuit in injector cable of cylinder B7. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector)

No.	ZKP-No.	Designation	Meaning
			==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
338	1.8004.537	AL Wiring Cylinder B8	Short circuit in injector cable of cylinder B8. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
339	1.8004.538	AL Wiring Cylinder B9	Short circuit in injector cable of cylinder B9. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
340	1.8004.539	AL Wiring Cylinder B10	Short circuit in injector cable of cylinder B10. ==> interrupted ignition ==> Remove short circuit of solenoid (plus to ground) (e.g. replace injector) ==> after engine restart curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
341	1.8004.540	AL Open Load Cylinder A1	Open load in injector cable of cylinder A1 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
342	1.8004.541	AL Open Load Cylinder A2	Open load in injector cable of cylinder A2 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
343	1.8004.542	AL Open Load Cylinder A3	Open load in injector cable of cylinder A3 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
344	1.8004.543	AL Open Load Cylinder A4	Open load in injector cable of cylinder A4 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
345	1.8004.544	AL Open Load Cylinder A5	Open load in injector cable of cylinder A5 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
346	1.8004.545	AL Open Load Cylinder A6	Open load in injector cable of cylinder A6 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
347	1.8004.546	AL Open Load	Open load in injector cable of cylinder A7 ==> Interrupted

No.	ZKP-No.	Designation	Meaning
		Cylinder A7	ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
348	1.8004.547	AL Open Load Cylinder A8	Open load in injector cable of cylinder A8 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
349	1.8004.548	AL Open Load Cylinder A9	Open load in injector cable of cylinder A9 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
350	1.8004.549	AL Open Load Cylinder A10	Open load in injector cable of cylinder A10 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
351	1.8004.550	AL Open Load Cylinder B1	Open load in injector cable of cylinder B1 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
352	1.8004.551	AL Open Load Cylinder B2	Open load in injector cable of cylinder B2 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
353	1.8004.552	AL Open Load Cylinder B3	Open load in injector cable of cylinder B3 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
354	1.8004.553	AL Open Load Cylinder B4	Open load in injector cable of cylinder B4 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
355	1.8004.554	AL Open Load Cylinder B5	Open load in injector cable of cylinder B5 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
356	1.8004.555	AL Open Load Cylinder B6	Open load in injector cable of cylinder B6 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
357	1.8004.556	AL Open Load Cylinder B7	Open load in injector cable of cylinder B7 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
358	1.8004.557	AL Open Load	Open load in injector cable of cylinder B8 ==> Interrupted

No.	ZKP-No.	Designation	Meaning
		Cylinder B8	ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
359	1.8004.558	AL Open Load Cylinder B9	Open load in injector cable of cylinder B9 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
360	1.8004.559	AL Open Load Cylinder B10	Open load in injector cable of cylinder B10 ==> Interrupted ignition ==> Check cable and solenoid if open load (e.g. replace injector) ==> after cycle curing of failure (Alarm Configuration Parameter, for details see PR 2.8008.100)
361	1.8004.496	AL Power Stage Low	Internal error of electronic (electronic defect possible) ==> Start ITS ==> if electronic o.k. continue to pay attention to messages. If bit "1.1020.021" (Power Stage Failure: Stop Engine) set ==> Engine stop. (Alarm Configuration Parameter, for details see PR 2.8008.100)
362	1.8004.497	AL Power Stage High	Internal error of electronic (electronic defect possible) ==> Start ITS ==> if electronic o.k. continue to pay attention to messages. If bit "1.1020.021" (Power Stage Failure: Stop Engine) set ==> Engine stop. (Alarm Configuration Parameter, for details see PR 2.8008.100)
363	1.8004.560	AL Stop Power Stage	Internal error of electronic (electronic defect possible) ==> Start ITS ==> if electronic o.k. continue to pay attention to messages. If bit "1.1020.021" (Power Stage Failure: Stop Engine) set ==> Engine stop. (Alarm Configuration Parameter, for details see PR 2.8008.100)
365	1.8004.561	AL Stop MV-Wiring Ground	Cable line error ==> If bit "1.1020.021" (Power Stage Failure: Stop Engine) set ==> Engine stop ==> possible causes: 1. short circuit of injector line-plus to ground. 2. short circuit of injector line-minus to ground. ==> Check cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
371	1.8004.634	AL Wiring TO 1	Short circuit or open load on transistor output 1 (TO 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
372	1.8004.635	AL Wiring TO 2	Short circuit or open load on transistor output 2 (TO 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
373	1.8004.636	AL Wiring TO 3	Short circuit or open load on transistor output 3 (TO 3). (Alarm Configuration Parameter, for details see PR 2.8008.100)
374	1.8004.637	AL Wiring TO 4	Short circuit or open load on transistor output 4 (TO 4). (Alarm Configuration Parameter, for details see PR 2.8008.100)

No.	ZKP-No.	Designation	Meaning
381	2.8006.638	AL Wiring TOP 1	Short circuit or open load on transistor output plant 1 (TOP 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
382	2.8006.639	AL Wiring TOP 2	Short circuit or open load on transistor output plant 2 (TOP 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
383	2.8006.640	AL Wiring TOP 3	Short circuit or open load on transistor output plant 3 (TOP 3). (Alarm Configuration Parameter, for details see PR 2.8008.100)
384	2.8006.641	AL Wiring TOP 4	Short circuit or open load on transistor output plant 4 (TOP 4). (Alarm Configuration Parameter, for details see PR 2.8008.100)
390	1.1085.009	AL MCR exceeded	DBR/MCR Function: MCR (Maximum Continuous Rating) is exceeded. (Alarm Configuration Parameter, for details see PR 2.8008.100)
392	2.0480.197	HI T-Coolant Red	Redundant coolant temperature too high (limit 1) ==> Check circulation of coolant (Alarm Configuration Parameter, for details see PR 2.8008.100)
393	2.0480.199	SS T-Coolant Red	Redundant coolant temperature too high (limit 2) ==> Check circulation of coolant (Alarm Configuration Parameter, for details see PR 2.8008.100)
394	2.0480.297	LO P-Lube Oil Red	Redundant pressure of lube oil too low (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
395	2.0480.299	SS P-Lube Oil Red	Redundant pressure of lube oil too low (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
396	1.0480.193	TD T-Coolant Sensor Deviation	Maximum deviation of T-Coolant sensors
397	1.0480.293	TD P-Oil Sensor Deviation	Maximum deviation of P-Oil sensors
400	2.8006.625	AL Open Load Digital Input 1	Open Load on digitil input 1. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
401	2.8006.626	AL Open Load Digital Input 2	Open Load on digitil input 2. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
402	2.8006.627	AL Open Load Digital Input 3	Open Load on digitil input 3. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
403	2.8006.628	AL Open Load Digital Input 4	Open Load on digitil input 4. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
404	2.8006.629	AL Open Load Digital Input 5	Open Load on digitil input 5. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
405	2.8006.630	AL Open Load	Open Load on digitil input 6. ==> cable breakage or no

No.	ZKP-No.	Designation	Meaning
		Digital Input 6	resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
406	2.8006.631	AL Open Load Digital Input 7	Open Load on digitil input 7. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
407	2.8006.632	AL Open Load Digital Input 8	Open Load on digitil input 8. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
408	2.8006.633	AL Open Load Emerg. Stop Input ESI	Open Load on input for emergency stop. ==> cable breakage or no resistance above switch (Alarm Configuration Parameter, for details see PR 2.8008.100)
410	2.0141.921	LO U-PDU	Power driver voltage (injectors) too low (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
411	2.0141.922	LOLO U-PDU	Power driver voltage (injectors) too low (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
412	2.0141.931	HI U-PDU	Power driver voltage (injectors) too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
413	2.0141.932	HIHI U-PDU	Power driver voltage (injectors) too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
414	2.0156.931	HI Level Water Fuel Prefilter	Water level of fuel prefilter too high (limit 1) ==> empty fuel prefilter (Alarm Configuration Parameter, for details see PR 2.8008.100)
415	2.0107.921	LO P-Coolant InterCooler	Coolant pressure of InterCooler too low (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
416	2.0107.922	SS P-Coolant InterCooler	Coolant pressure of InterCooler too low (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
417	1.8004.594	SD Level Water Fuel Prefilter	Water level-sensor of fuel prefilter defect. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
419	1.8004.604	SD T-Coolant b.Engine	Coolant In temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable (B3), if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
420	2.0160.921	AL L1 Aux 1	Input of Aux 1 injured limit 1. (Alarm Configuration Parameter, for details see PR 2.8008.100)
421	2.0160.922	AL L2 Aux1	Input of Aux 1 injured limit 2. (Alarm Configuration Parameter, for details see PR 2.8008.100)
428	2.0130.921	AL L1 T-Aux 1	Temperature input of Aux 1 injured limit 1. (Alarm Configuration Parameter, for details see PR

No.	ZKP-No.	Designation	Meaning
			2.8008.100)
430	2.0168.921	LO P-Coolant before Engine	Coolant pressure too low (limit 1) ==> check cooling cycle. (Alarm Configuration Parameter, for details see PR 2.8008.100)
431	2.0168.922	SS P-Coolant before Engine	Coolant pressure too low (limit 2) ==> check cooling cycle. (Alarm Configuration Parameter, for details see PR 2.8008.100)
434	2.0173.931	HI T-Coolant before Engine	Coolant temperature too high (limit 1) ==> Check circulation of coolant (Alarm Configuration Parameter, for details see PR 2.8008.100)
435	2.0173.932	SS T-Coolant before Engine	Coolant temperature too high (limit 2) ==> Check circulation of coolant (Alarm Configuration Parameter, for details see PR 2.8008.100)
440	2.0110.921	AL L1 P-Aux 1	Pressure input of Aux 1 injured limit 1. (Alarm Configuration Parameter, for details see PR 2.8008.100)
442	2.0110.931	AL L2 P-Aux1	Pressure input of Aux 1 injured limit 2. (Alarm Configuration Parameter, for details see PR 2.8008.100)
444	1.8004.578	SD U-PDU	Sensor defect of Injector Power driver unit. ==> Internal error of ECU7. Change ECU7. (Alarm Configuration Parameter, for details see PR 2.8008.100)
445	1.8004.580	SD P-Ambient Air	Ambient air pressure-sensor defect. (Alarm Configuration Parameter, for details see PR 2.8008.100)
448	2.0103.931	HI P-Charge Air	Pressure of charge air too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
449	2.0103.932	SS P-Charge Air	Pressure of charge air too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
450	2.8006.592	SD Idle/End-Torque Input [%]	Input of Idle/End-Torque defect. ==> short circuit or cable breakage ==> Check transmitter and cable, if necessary replace it. After Engine restart follows curing of failure. (Alarm Configuration Parameter, for details see PR 2.8008.100)
454	2.7000.011	SS Power Reduction Active	Power Reduction is activated. (Alarm Configuration Parameter, for details see PR 2.8008.100)
455	2.8006.650	AL L1 Aux1 Plant	Input of Aux 1 (plant) injured limit 1. (Alarm Configuration Parameter, for details see PR 2.8008.100)
456	2.8006.651	AL L2 Aux1 Plant	Input of Aux 1 (plant) injured limit 2. (Alarm Configuration Parameter, for details see PR 2.8008.100)
460	2.8006.652	HI T-Exhaust EMU	Exhaust gas temperature of EMU too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
461	2.8006.653	LO T-Exhaust EMU	Exhaust gas temperature of EMU too low (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)

No.	ZKP-No.	Designation	Meaning
462	2.8006.654	HI T-Coolant EMU	Coolant temperature of EMU injured limit 1. (Alarm Configuration Parameter, for details see PR 2.8008.100)
464	1.8004.589	SD P-AUX 1	Analog input for pressure Aux 1 defect. ==> short circuit or cable breakage ==> Check transmitter of pressure and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
467	2.0130.922	AL L2 T-Aux1	Temperature input of Aux 1 injured limit 2. (Alarm Configuration Parameter, for details see PR 2.8008.100)
468	1.8004.579	SD T-AUX 1	Analog input for Temperature Aux 1 defect. (Alarm Configuration Parameter, for details see PR 2.8008.100)
469	1.8004.590	SD AUX 1	Analog input for Aux 1 defect. ==> short circuit or cable breakage ==> Check transmitter and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
470	1.8004.587	SD T-ECU	ECU temperature-sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
471	1.8004.592	SD Coil Current	Coil Current sensor defect. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
472	2.8006.593	AL Stop SD	Engine stop, because critical channel has sensor defect. (Alarm Configuration Parameter, for details see PR 2.8008.100)
473	1.8004.593	AL Wiring PWM_CM2	Open load or short circuit on channel PWM_CM2. (Alarm Configuration Parameter, for details see PR 2.8008.100)
474	2.8006.655	AL Wiring FO	Open load or short circuit on frequency output (FO) channel. (Alarm Configuration Parameter, for details see PR 2.8008.100)
475	1.8010.009	AL CR Trigger Engine Stop	Released in case of an engine stop in order to trigger the crash recorder. (Alarm Configuration Parameter, for details see PR 2.8008.100)
476	1.8010.007	AL Crash Rec. Init. Error	Initial error of crash recorder. (Alarm Configuration Parameter, for details see PR 2.8008.100)
478	2.8006.001	AL Comb. Alarm Yel (Plant)	Combined Alarm YELLOW (Plant). (Alarm Configuration Parameter, for details see PR 2.8008.100)
479	2.8006.002	AL Comb. Alarm Red (Plant)	Combined Alarm RED (Plant). (Alarm Configuration Parameter, for details see PR 2.8008.100)
480	2.0291.921	AL Ext. Engine Protection	External Engine Protection function active. (Alarm Configuration Parameter, for details see PR 2.8008.100)
482	1.8004.596	SD T-Exhaust C	Exhaust gas temperature-sensor on A-side defect. ==> short

No.	ZKP-No.	Designation	Meaning
			circuit or cable breakage ==> Check sensor and cable (B4.23), if necessary replace it. After Engine restart follows curing of failure. (Alarm Configuration Parameter, for details see PR 2.8008.100)
483	1.8004.597	SD T-Exhaust D	Exhaust gas temperature-sensor on A-side defect. ==> short circuit or cable breakage ==> Check sensor and cable (B4.24), if necessary replace it. After Engine restart follows curing of failure. (Alarm Configuration Parameter, for details see PR 2.8008.100)
484	2.0133.931	HI T-Exhaust C	Exhaust gas temperature (C-side) too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
485	2.0133.932	SS T-Exhaust C	Exhaust gas temperature (C-side) too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
486	2.0134.931	HI T-Exhaust D	Exhaust gas temperature (D-side) too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
487	2.0134.932	SS T-Exhaust D	Exhaust gas temperature (D-side) too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
488	2.3014.931	HI ETC3 Over speed	Speed of 2nd switcheable charger too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
489	2.3014.932	SS ETC3 Over speed	Speed of 2nd switcheable charger too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
490	2.3015.931	HI ETC4 Over speed	Speed of 3rd switcheable charger too high (limit 1). (Alarm Configuration Parameter, for details see PR 2.8008.100)
491	2.3015.932	SS ETC4 Over speed	Speed of 3rd switcheable charger too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
492	1.8004.202	AL ETC4 CutIn Failure	Switching of charger ETC4 failed. (Alarm Configuration Parameter, for details see PR 2.8008.100)
493	1.8004.203	AL ETC3 CutIn Failure	Switching of charger ETC3 failed. (Alarm Configuration Parameter, for details see PR 2.8008.100)
500	1.4500.900	AL Wiring POM Starter 1	A wiring fault has been detected in the connection of starter 1 of CPM. This could be an open load, cable break or short circuit. ==> Check connection between POM and starter. (Alarm Configuration Parameter, for details see PR 2.8008.100)
501	1.4500.901	AL Wiring POM Starter 2	A wiring fault has been detected in the connection of starter 2 of CPM. This could be an open load, cable break or short circuit. ==> Check connection between POM and starter. (Alarm Configuration Parameter, for details see PR 2.8008.100)
502	1.4500.902	AL Open Load POM Alternator	An open load on POM's alternator output has been detected. ==> Check connection between POM and alternator.

No.	ZKP-No.	Designation	Meaning
			(Alarm Configuration Parameter, for details see PR 2.8008.100)
503	1.4500.903	AL Battery Not Charging	Battery is not being charged by alternator. ==> Check alternator and connection. (Alarm Configuration Parameter, for details see PR 2.8008.100)
504	1.4500.904	AL CAN POM Node Lost	POM is missing on CAN bus. ==> Check connection and POM. (Alarm Configuration Parameter, for details see PR 2.8008.100)
506	1.4500.906	AL Low Starter Voltage	Battery voltage is too low for starting. ==> Check starter battery and cabling. (Alarm Configuration Parameter, for details see PR 2.8008.100)
507	1.4500.907	AL POM Error	A general POM error has been detected. ==> Replace POM. (Alarm Configuration Parameter, for details see PR 2.8008.100)
508	1.4500.908	AL Wrong POM-ID	POM sends a different identification number (ID) than expected. ==> Check POM harness. (Alarm Configuration Parameter, for details see PR 2.8008.100)
510	2.7002.010	AL Override applied	Override applied. (Alarm Configuration Parameter, for details see PR 2.8008.100)
515	2.1090.926	AL Starter Not Engaged	Starter of CPM / POM could not be engaged. => New starting attempt. If the number of automatic starting attempts from PR 1.1090.134 Number of Starting Attempts has been executed, starting procedure is aborted. Check CPM, starter and cabling. (Alarm Configuration Parameter, for details see PR 2.8008.100)
519	1.0158.921	Oillevel Calibration Error	Calibration value could not write to flash or SD-Oilniveau (Alarm Configuration Parameter, for details see PR 2.8008.100)
521	2.0480.289	SS P-Lube Oil Mid Val	P-Oil Middle Value out of 3 Sources, pressure too low (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
523	2.0480.189	SS T-Coolant Red Mid Val	T-Coolant Middle Value out of 3 Sources, temperature too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
524	2.0480.089	SS Engine Over speed Mid Val	Engine Over speedt Middle Value out of 3 Sources, Engine Speed too high (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
525	1.8004.638	SD P-Lube Oil (R2)	Redundant pressure sensor for lube oil defect. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
526	1.8004.639	SD T-Coolant (R2)	Redundant coolant temperature-sensor defect. ==> short circuit or cable breakage

No.	ZKP-No.	Designation	Meaning
			==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
527	1.0480.093	TD EngineSpd. Sensor Deviation	Maximum deviation of engine speed sensors (Alarm Configuration Parameter, for details see PR 2.8008.100)
528	1.2500.102	SD Engine Speed 3rd Sensor	Redundater Sensor defect on crankshaft. ==> short circuit or cable breakage ==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100)
529	2.0480.195	SS T-Coolant Red2	Second redundant coolant temperature too high (limit 2) ==> Check circulation of coolant (Alarm Configuration Parameter, for details see PR 2.8008.100)
530	2.0480.295	SS P-Lube Oil Red2	Second redundant pressure of lube oil too low (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
543	2.0555.005	AL Multiple FDH Slaves	There is more than one device which is configured as Backup for FDH-Functionality. (Alarm Configuration Parameter, for details see PR 2.8008.100)
544	2.0555.003	AL Configuration Changed	Gets active in case of changing system configuration e. g. by changing ECU- or SAM-Device. Remains until undo procedure or data is transfered by a valid maintenance case. Is cancelled automatically. (Alarm Configuration Parameter, for details see PR 2.8008.100)
549	2.7001.952	AL Power Cut-Off detected	This is the alarm from the function Emergency Stop Counter. ECU power was disconnected while the engine was still running. This could lead to a possible overpressure in the high pressure system which might damage the engine. (Alarm Configuration Parameter, for details see PR 2.8008.100)
550	2.0480.095	SS Engine Over speed Red2	Engine Over speed Redundant (limit 2).
551	2.2510.933	SS Engine Over speed Camshaft	Engine Over speed Camshaft (limit 2). (Alarm Configuration Parameter, for details see PR 2.8008.100)
555	2.0555.001	AL Call MTU Field Service	Gets active in case of completing a maintenance-case which manipulates Engine-Parameters. Remains also after switching on-off ECU until a valid release code is entered via Display- and Button-Control of SAM-Device. Release Code is available via Internet by a special procedure. (Alarm Configuration Parameter, for details see PR 2.8008.100)
576	1.1075.083	AL ESCM Override	Exceeding of the corrected current MCR- odr DBR/MCR value. Engine Overload! (Alarm- Configurations- Parameter, for details see PR 2.8008.100)
577	1.0137.900	SD T-Lube Oil Pan	T-Lube Oil Pan sensor defect. ==> short circuit or cable breakage

No.	ZKP-No.	Designation	Meaning
			==> Check sensor and cable, if necessary replace it. (Alarm Configuration Parameter, for details see PR 2.8008.100) (Alarm Configuration Parameter, for details see PR 2.8008.100)
578	2.0137.921	AL L1 T-Lube Oil Pan	T-Lube Oil Pan temperature too high/ too low (Alarm Configuration Parameter, for details see PR 2.8008.100) /c
579	2.1063.511	AL MD CAN Request Idle Speed	MD CAN Request Idle Speed => Node Lost (Node 3,4 or 5) (Alarm Configuration Parameter, for details see PR 2.8008.100)
580	2.1063.513	AL MD CAN Speed Limitation	MD CAN Speed Limitation => Node Lost (Node 3,4 or 5) (Alarm Configuration Parameter, for details see PR 2.8008.100) /c
581	2.1063.515	AL MD CAN Stop	MD CAN Stop => Node Lost (Node 3,4 or 5) (Alarm Configuration Parameter, for details see PR 2.8008.100)

3 Tasks

3.1 SAM – Self-test

DANGER	Electrical voltage. **Risk of serious injury - danger to life!** • Make certain that the power supply to the engine is switched off before starting to work. Ensure that the power supply cannot be switched on unintentionally!
DANGER	Electrical voltage. **Risk of serious injury - danger to life!** • Make certain that the power supply to the engine is switched off before starting to work. Ensure that the power supply cannot be switched on unintentionally!

Self-testing

1. De-energize the plant.
2. Disconnect all connectors on the SAM except for X13.
   2.1. Undo screws.
   2.2. Disconnect connectors.
3. Switch on supply voltage
   Result:
   - SAM is in order when the diagnostic lamp assumes a “steady lit” state within 30 seconds of switching on.
   - Replace SAM if the diagnostic lamp (1) flashes when 30 seconds have passed.
   - Check the power supply if the diagnostic lamp remains dark.
4. Switch off supply voltage.
5. Connect all connectors to SAM.
   5.1. Plug in connectors.
   5.2. Tighten the screws.

4 Repair Work

4.1 SAM – Replacement

Preconditions

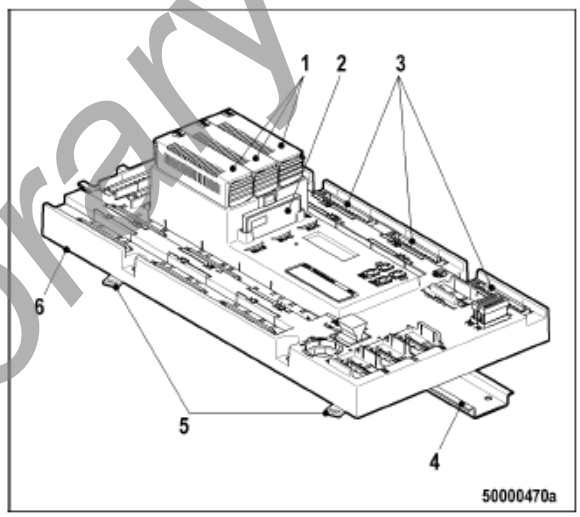
- Engine is stopped and starting disabled.
- Operating voltage is not applied.

Spare parts

Designation / Use	Part No.	Qty.
SAM		

Removing SAM

1. Disconnect all connectors (3) on SAM (6).
2. Slide the two levers (5) to the side in the direction indicated by the arrow to release the lock.
3. Remove SAM from the top-hat rail (4).
4. Remove the CF board (2) from the SAM.
5. As necessary. Remove cassettes with printed circuit boards (1) from SAM (note installation positions).



Installing a new SAM

1. Place the new SAM on the top-hat rail (4).
2. Slide the two levers (5) to the side to engage the lock (position shown in fig.).
3. Connect all cables to SAM (6).
4. Insert CF board (2).
5. If applicable, insert cassettes with printed circuit boards (1) in new SAM.

4.2 SAM fuse – Replacement

Preconditions

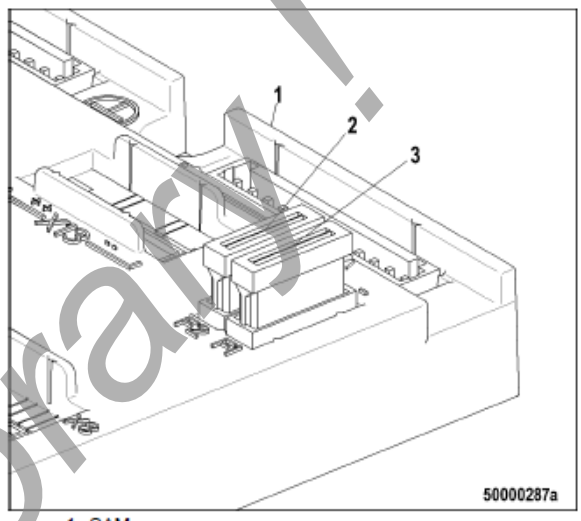
- Engine is shut down.
- Operating voltage is not applied.

Spare parts

Designation / Use	Part No.	Qty.
Fuse 15 A		

Locating a fuse

1. Pinpoint the appropriate fuse.
2. Grasp the faulty fuse between finger and thumb and pull it out.



1 SAM
2 F2 for SAM supply —
3 F1 for SAM supply +

Inserting a new fuse

1. Place the new fuse carefully on the socket.
2. Press the fuse into the socket with one finger as far as it will go.

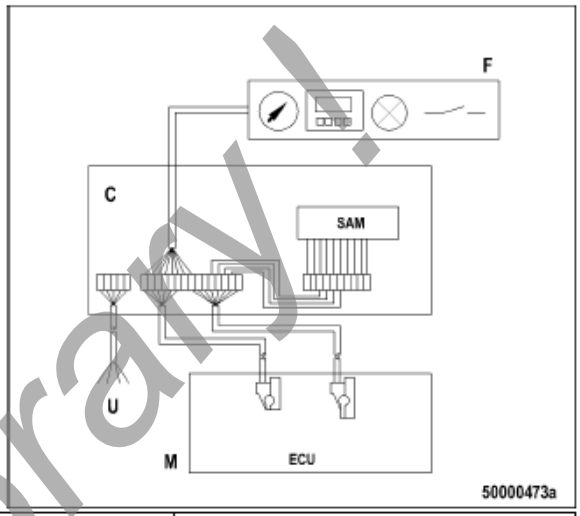
5 Mechanical Installation

5.1 Routing cables between the installation locations

Preconditions

- Cable openings exist.
- Devices are not yet installed.

Cables between installation locations



Designation	Description	Comments
M	Engine	Installation location for engine governor.
C	Switchgear cabinet (OEM)	Installation location for terminal blocks (OEM and SAM).
F	Operator console, possibly also third-party system with controller	Installation location for all control units, controls and indicators.
SAM	Module	
U	Power supply	Cable is shipyard's supply.

1. Route both cables between engine governor (engine-mounted) and terminal block in switchgear cabinet (OEM).
2. Route cables (alarm lamps, instruments, controls, display, if applicable) between terminal block in switchgear cabinet (OEM) and user interface.
3. Route cables between terminal blocks and power supply.
4. If applicable, route further plant-specific cables between SAM and corresponding devices/assemblies (depending on application) in accordance with diagram.
5. If necessary (application-specific), route CAN bus cables between terminal block in switchgear cabinet (OEM) and third-party system.

5.2 SAM – Installation

Preconditions

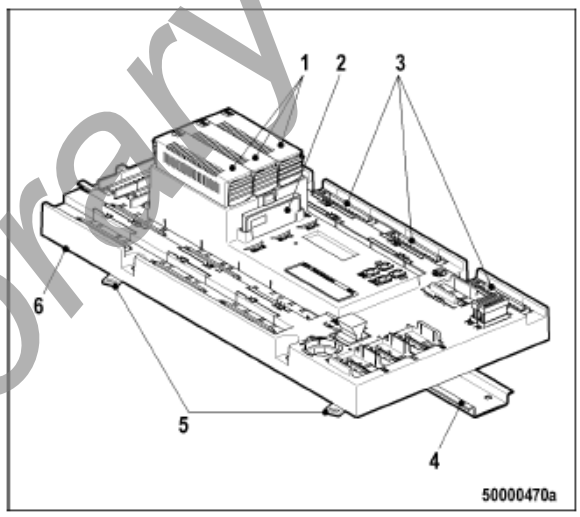
- Operating voltage is not applied.
- Switchgear cabinet with grounded horizontal top-hat rail available.

Selecting the installation location

1. Install in a switchgear cabinet (OEM) with horizontal top-hat rails. Maintain adequate distance to neighboring top-hat rails. Furthermore, the terminal blocks to which the signal cables are connected should be in the immediate vicinity.
2. Check that draw-out clearances are observed at the front.
3. Check that the covers/doors of the switchgear cabinet can also still be closed once SAM has been installed. There must be sufficient space between the door/flap of the switchgear cabinet and the cassettes (1) of the SAM (6). Ensure that cables or assemblies installed in the flap/door do not exert pressure on the various assemblies of the SAM (CF board (2), plug connectors (3)).

Installing SAM

1. Slide the two lugs (5) on SAM (6) to the left stop.
   Result: The lock is released.
2. Clip SAM (6) onto the top-hat rail (4) from top to bottom (inscription legible).
3. Slide the two lugs to the right stop.
   Result: The lock is engaged and grounding is established via the top-hat rail.



6 Electrical Installation

6.1 Electrical installation

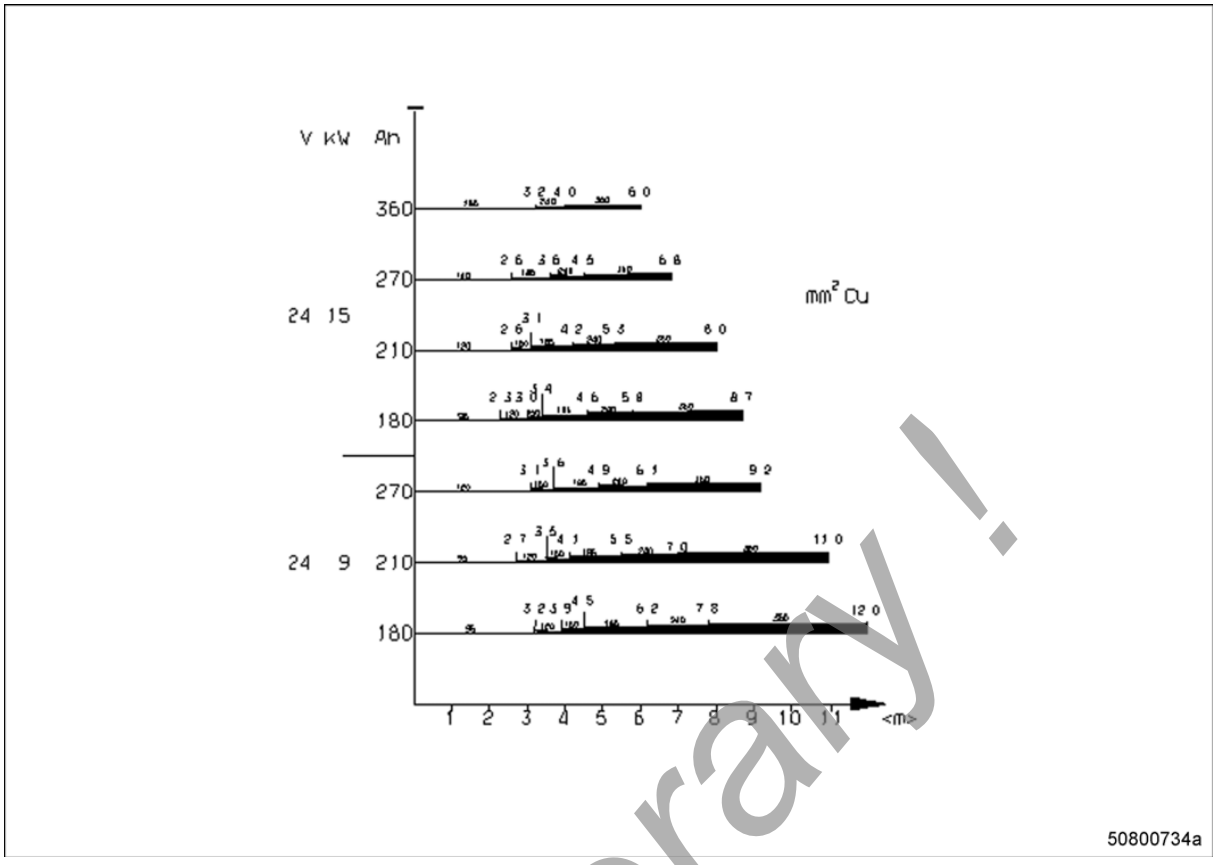
Information about electrical installation of the plant

General information
The information and proposals for power cables, supply lines and control lines listed below cannot claim
completeness, rather they are intended as a guide to facilitate the estimation of cabling and control line requirements.
Order-specific circuit and cabling diagrams shall apply.
Cabling of a diesel-driven three-phase generator can be divided into two groups:

- Lines supplying consumers.
- Control section for starter, auxiliary drives, genset operational and fault messages.

In particular VDE specifications 0298, 0100, 0101, 0271 and 250 shall to power cable selection.
Generally PVC-isolated NYY/H07RNF-O cables shall be used for low-voltage generators and NYSY-2XSY cables for high-voltage generators.
Ölflex cables shall be used for gensets on double resilient mountings.
The tables below show admissible continuous loading for synthetically-isolated single and multiple-core cables depending on ambient temperature as per VDE 0298 and 0100, suggested cables depending on genset power, cross-sections for starting cables and a selection of possible control lines for one or more gensets.
When choosing cables ensure that extremely flexible ones are used in order to absorb vibration from the genset.
Never use magnetic cable sealing ends. Covers should be made of nonmagnetic metal or plastic.
Never route control lines directly next to power cables.
Cable clamps must be used for strain relief in the cable ducts under the switchgear.
Never route extra-low voltage and low voltage in the same cable.
Install an emergency torch and an emergency stop button in the room, preferably next to the emergency exit, when designing the plant as per VDE 0108.

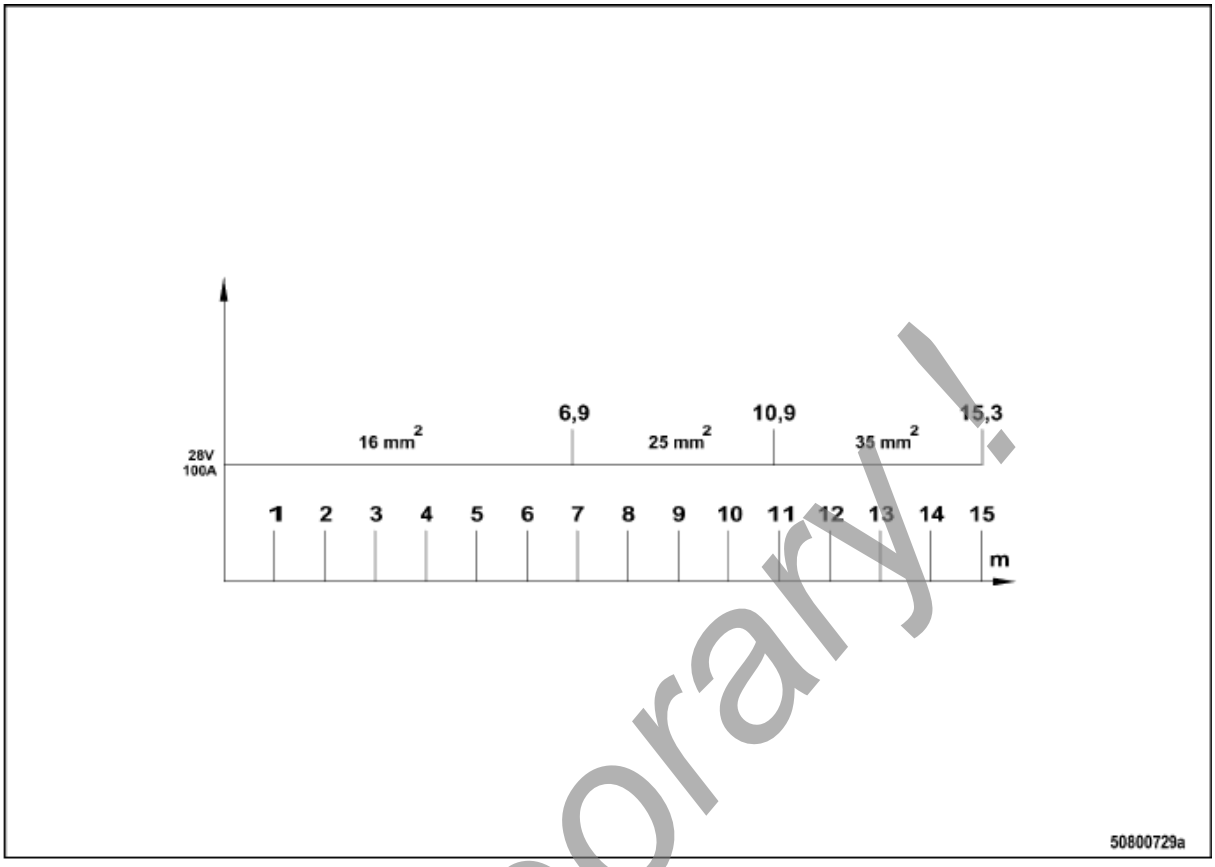
Cable cross-sections for connections between starter batteries and starter
The length of the return line must not exceed that of the supply line (same cross-section).
The required cross-section may have to be realized by means of parallel cabling for satisfactory connection at the starter and the battery (size of terminal rings).
The cross-section of the starter line must be such that voltage drop does not exceed 8 % of the rated battery voltage.



Distance applies to one line (supply or return line)

Cable cross-sections between battery-charging generator and battery (option)

Battery-charging generator



The cable cross-section depends on the rated voltage (V) and the maximum current (A) of the battery-charging generator and the cable length (L) of supply and return line. Maximum admissible voltage drop (UVE) = 0.8 Volt

A= p l L max/UVE = ...mm2; p for CU = 0.0183 Ohm mm2/m

Proposals for type NYY genset power cables as a function of genset power for U = 400 V, ambient temperature up to 30 degrees excluding routing factors.

Routing: Distance from walls, floor or ceiling at least 2 cm, horizontal distance between neighboring cables at least 1x cable diameter. A distance of 2x cable bundle diameter must be observed when routing triangular bundled single-core cables. Protect from radiated heat.

kVA	I_{Rated} in Ampere	Number of cables multiple-core cable	Transmittable current in A	Number of cables single-core cable	Transmittable current in A
400	577	2x(3x150/70)	648	2x(3x1x120)+1x120	628
500	721	3x(3x120/70)	846	2x(3x1x185)+1x185	824
600	866	3x(3x150/70)	972	3x(3x1x120)+1x95 4x(3x1x95)+2x95	942 1084
700	1010	4x(3x120/70)	1128	4x(3x1x95)+2x95 3x(3x1x150)+2x120	1084 1083
800	1154	4x(3x150/70) 3x(3x240/120)	1296 1308	3x(3x1x185)+2x150 4x(3x1x150)+2x150	1236 1444
900	1299	4x(3x185/95)	1484	3x(3x1x240)+2x185 4x(3x1x185)+2x185	1452 1648
1000	1443	4x(3x185/95) 5x(3x150/70)	1484 1620	3x(3x1x240)+2x185 4x(3x1x185)+2x185	1452 1648
1100	1587	5x(3x150/70) 4x(3x240/120)	1620 1744	4x(3x1x240)+2x240 6x(3x1x120)+3x120	1936 1884
1200	1732	5x(3x185/95)	1855	4x(3x1x240)+2x240 5x(3x1x185)+3x150	1936
1300	1876	6x(3x150/70) 5x(3x240/120)	1944 2180	5x(3x1x185)+3x150	2060
1400	2020	5x(3x240/120) 6x(3x185/95)	2180 2226	7x(3x1x120)+4x120 6x(3x1x150)+3x150	2198 2166
1500	2165	6x(3x185/95) 7x(3x150/70)	2226 2268	7x(3x1x120)+4x120 6x(3x1x185)+3x185	2198 2472
1600	2309	8x(3x150/70)	2592	7x(3x1x150)+3x185 8x(3x1x120)+4x120	2527 2512
1800	2598	10x(3x120/90) 8x(3x185/95)	2820 2968	7x(3x1x195)+4x185 8x(3x1x150)+4x150 6x(3x1x240)+3x240	2884 2888 2904
2000	2886	8x(3x185/95) 7x(3x240/120) 10x(3x150/70)	2968 3052 3240	8x(3x1x185)+4x185 9x(3x1x150)+5x150 8x(3x1x150)+4x150 6x(3x1x240)+3x240	3296 3249 2888 2904

Note: Neutral conductor cross-sections specified apply to three-phase current loading only without harmonic loading by frequency rectifiers etc. The cross-section must be increased appropriately as required.

Listed cables are noncommittal proposals intended as an aid to application engineering. Execution is governed by DIN VDE 0298-4.

Conversion factors for increased numbers of multiple-conductor cables or lines in trays and racks. Excerpt from DIN VDE 0298-4 table 22:

1		2	3	4	5	6	7	8
Routing arrangement		Number of trays or racks	Number of multiple-conductor cables or lines					
			1	2	3	4	6	9
			Conversion factors					
Unperforated cable trays	With contact	1	0.97	0.84	0.78	0.75	0.71	0.68
		2	0.97	0.83	0.76	0.72	0.68	0.63
		3	0.97	0.82	0.75	0.71	0.66	0.61
		6	0.97	0.81	0.73	0.69	0.63	0.58

Conversion factors for increased numbers of single-conductor cables or lines in trays and racks. Excerpt from DIN VDE 0298-4 table 23:

1		2	3	4	5	6
Routing arrangement		Number of trays or racks	Number of three-pole current circuits with single-conductor cables or lines			To be used as a multiplier for the rated value of:
			1	2	3	
			Conversion factors			
Perforated cable trays	With contact	1	0.98	0.91	0.87	Three cables or lines in horizontal level arrangement
		2	0.96	0.87	0.81	
		3	0.95	0.85	0.78	
	With contact	1	0.96	0.86	—	Three cables or lines in vertical level arrangement
		2	0.95	0.84	—	

Ambient temperatures must also be taken into consideration when defining cables and lines. Refer to DIN VDE 0298-4, tables 16 to 20 for reduction factors.

Minimum cross-section and number of cores for connections between genset/ genset components and the switchgear.

Connection		**Minimum number of cores**	**Min. cross-section (depending on cable length)**	**Comments**
From	**To**			
Starter battery	Starter	2	See table p. 6	Electric start only
Starter battery	Switchgear	2	See fig. p. 7	Starter battery charger
Genset terminal box	Switchgear	2	2.5 mm^2	Coolant preheating
Genset terminal box	Switchgear	2	2.5 mm^2	Preheating thermostat
Genset terminal box	Switchgear	4	2.5 mm^2	Heating preheating

Connection		Minimum number of cores	Min. cross-section (depending on cable length)	Comments
From	To			
Genset terminal box	Switchgear	4	1.5 mm²	Circulating pump preheating
Engine governor connector X3	Switchgear	System cable 8x2.5+2x0.75 mm²		Engine management power supply MTU supply 10 m (optionally 15 m or 25 m)
Engine governor connector X1	Switchgear	System cable 21x2x0.5mm²		Engine management interface cable MTU supply 10 m (optionally 15 m or 25 m)
Fuel cooler	Switchgear	4	1.5 mm²	BR 4000 only
Generator cabling				
Generator terminal block	Switchgear	2	2.5 mm²	Exciter boosting
Generator terminal block	Switchgear	4	2.5 mm²	Rapid de-excitation
Generator terminal block	Switchgear	2	2.5 mm²	Static on/off
Generator terminal block	Switchgear	3+shield	1.5 mm²	Voltage setpoint adjuster
Generator terminal block	Switchgear	3	1.5 mm²	Anti-condensation heating
Generator terminal block	Switchgear	4	2.5 mm²	Per current transformer core
Generator terminal block	Switchgear	4	1.5 mm²	Per winding temperature monitor
For heat exchanger cooling				
Coolant pump	Switchgear	4	2.5 mm² - 10 mm²	Depending on pump power
Expansion Tank	Switchgear	2	1.5 mm²	Low coolant
Heat exchanger	Switchgear	4	2.5 mm² - 10 mm²	Depending on distance and fan motor power
For air start				
Genset terminal box	Switchgear	2	2.5 mm²	Starting-air valve
Compressor	Switchgear	2	1.5 mm²	Pressure monitor (on/off)
Compressor	Switchgear	2	1.5 mm²	Pressure monitor (alarm)

Connection		Minimum number of cores	Min. cross-section (depending on cable length)	Comments
From	To			
Compressor	Switchgear	4	2.5 mm² - 10 mm²	Compressor power supply, depending on power
Compressor	Switchgear	3	1.5 mm²	Drain valve
For fan cooler with electric motor				
Fan cooler	Switchgear	4	Depending on power and number of motors	
Expansion tank	Switchgear	3	1.0 mm²	MTU supply 15 m (optionally 25 m)
Air intake louvers	Switchgear	3	1.5 mm²	Per louver
Air outlet louvers	Switchgear	3	1.5 mm²	Per louver

Minimum cross-section and number of cores for connections between genset and the switchgear.

Connection		Minimum number of cores	Min. cross-section (depending on cable length)	Comments
From	To			
Fuel supply				
Day tank	Switchgear	4	1.5 mm²	Pump on/off; low
Day tank	Switchgear	5	1.5 mm²	For leakage monitoring only
Fuel pump	Switchgear	4	1.5 mm²	Pump power supply
Monitor	Switchgear	5	1.5 mm²	For Flexwell monitoring
Switchgear power section for auxiliary drives				
LV distribution	Switchgear	4	1.5 mm²	
LV distribution	Switchgear	4	1.5 mm²	MTU supply 15 m (optionally 25 m)
LV distribution	Switchgear	8	1.5 mm²	Per louver
LV distribution	Switchgear	4	10 mm² - 50 mm²	Per louver
Miscellaneous				
Emergency stop button	Switchgear	2	1.5 mm²	If necessary in room
Leakage monitoring	Switchgear	5	1.5 mm²	Per oil/water warning device

Special characteristics as per DIN VDE 0108

Observe the following aspects when executing a plant as per DIN VDE 0108:

- Cables described on page 5 may be used for cabling within one fire section. Only use special plugs and (metal) mounting clamps installed as per manufacturers' instructions to fulfill the required fire rating.

- Observe the following aspects when routing cables from on fire section to another: Cables and lines must be protected from fire to ensure that functionality is maintained when the emergency power genset supplies mandatory safety equipment prescribed by the building supervisory authority.
- Functionality must be maintained for
  - 30 minutes for
    - Fire alarm systems
    - Alarm signaling and information systems for visitors and employees
    - Safety lighting and other auxiliary lighting excepting branch circuits
    - Elevator systems with evacuation circuits
  - 90 minutes for
    - Water pressure booster systems for firefighting water supply (sprinkler systems)
    - Ventilation systems for emergency stairwells, enclosed stairwells
    - Smoke and heat extractor systems
    - Fire department elevators and the associated wells and machinery rooms
- When installing use only certified safety cables with the appropriate supporting appliances and fixing materials.

6.2 SAM signals

General information

This part of the document provides the following information about connection and configuration of the inputs and outputs of adapter module SAM:

- Channel specification
- Channel circuitry
- Parameters which are set with the dialog unit
- Interrelationships of functions in block circuit diagrams

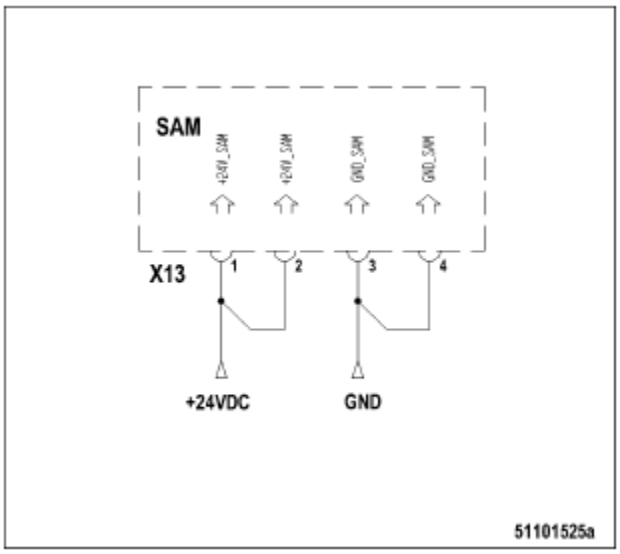
It is assumed that the signals are applied to one or more terminal strips in an OEM switchgear cabinet.

Channel assignment overview

Channel	Signal type:	analog/ binary	function	DiaSys Record
A_IN1	PT100 Mess- Input	A	AIN T-Exhaust A	PV006010
A_IN2	PT100 Mess- Input	A	AIN T-Exhaust B	PV006020
A_IN3	PT100 Mess- Input	A	AIN Temp. Bearing Generator DE	PV006030
A_IN4	PT100 Mess- Input	A	AIN Temp. Bearing Generator NDE	PV006050
A_IN5	PT100 Mess- Input	A	AIN T-Winding 1	PV006070
A_IN6	PT100 Mess- Input	A	AIN T-Winding 2	PV006080
A_IN7	PT100 Mess- Input	A	AIN T-Winding 3	PV006090
A_IN8	PT100 Mess- Input	A	AIN T-Ambient	PV006100
A_IN_ISO1	Input 0-10V isolated	A	Level Day-Tank Volt	PV005355
A_IN_ISO3	Input 0-20mA isolated	A	Level Day-Tank mA	PV005350
A_IN_ISO2	Input 0-10V isolated	A	Level Storage-Tank Volt	PV005365
A_IN_ISO4	Input 0-20mA isolated	A	Level Storage-Tank mA	PV005360
B_IN1	Input pot.-free	B	Disable Cylinder Cut Out 1	PV005001
B_IN2	Input pot.-free	B	Binary Output Test	PV005020
B_IN3	Input pot.-free	B	Test Over speed	PV005040
B_IN4	Input pot.-free	B	Intermittent Oil Priming	PV005060
B_IN5	Input pot.-free	B	Mode Switch 50/60Hz (optional)	PV005065
B_IN6	Input pot.-free	B	Mode Switch	PV005085
B_IN7	Input pot.-free	B	Water In Fuel Prefilter 1	PV006110
B_IN8	Input pot.-free	B	Water In Fuel Prefilter 2	PV006120
B_IN9	Input pot.-free	B	Alarm reset	PV005026
B_IN10	Input pot.-free	B	FAN Control Manual On	PV005030
B_IN11	Input pot.-free	B	Gov. Para. Set Selection	PV005050
B_IN12	Input pot.-free	B	Droop 2	PV005052
B_IN19	Input pot.-free	B	Rating Switch 1	PV005070
B_IN20	Input pot.-free	B	Rating Switch 2	PV005080
P_IN4	Input comm.- gnd	B	Fuel Pump enabled via Input	PV005312
P_IN7	Input comm.- gnd	B	Manual Turning	PV005090

BT_OUT1	Transistor Output HI	B	Over speed Alarm	PV005100
BT_OUT2	Transistor Output HI	B	T-Coolant Warning	PV005110
BT_OUT3	Transistor Output HI	B	T-Coolant Stop	PV005120
BT_OUT4	Transistor Output HI	B	T-Charge Air Warning	PV005130
BT_OUT5	Transistor Output HI	B	T-Charge Air Stop	PV005140
BT_OUT6	Transistor Output HI	B	Level CW Intercooler Stop	PV005150
BT_OUT7	Transistor Output HI	B	Level Coolant Water Stop	PV005160
BT_OUT8	Transistor Output HI	B	FAN 2 on	PV005170
BT_OUT9	Transistor Output HI	B	T-Preheat Not Reached	PV005180
BT_OUT10	Transistor Output HI	B	P-Lube Oil Warning	PV005190
BT_OUT11	Transistor Output HI	B	Engine Running	PV005200
BT_OUT12	Transistor Output HI	B	Fuel Pressure Alarm	PV005210
BT_OUT13	Transistor Output HI	B	Load Assumption Ready	PV005220
BT_OUT14	Transistor Output HI	B	P-Priming Not Reached	PV005230
BT_OUT15	Transistor Output HI	B	T-Generator Warning	PV005240
BT_OUT16	Transistor Output HI	B	Subsidiary Excitation On	PV005250
BT_OUT17	Transistor Output HI	B	Generator Voltage	PV005260
BT_OUT18	Transistor Output HI	B	Circulating Pump On	PV005270
BT_OUT19	Transistor Output HI	B	Downtime Heating On	PV005280
BT_OUT20	Transistor Output HI	B	Day-Tank Level LO	PV005290
REL1	Relays Output	B	Priming Pump On	PV005300
REL2	Relays Output	B	Fuel Pump On	PV005310
REL3	Relays Output	B	Fan 1 On	PV005320
REL4	Relays Output	B	Shutter Open Output	PV005330
PWM Out 1	PWM Output		Fan Control Fan 3 OUT	PV005340
A_OUT1	0-10V Output	A	Instrument 1 Engine Speed	PV007010
A_OUT2	0-10V Output	A	Instrument 2 T- Coolant	PV007020
A_OUT3	0-10V Output	A	Instrument 3 P- Lube Oil	PV007030
A_OUT4	0-10V Output	A	Instrument 4 P- Fuel after filter	PV007040
A_OUT5	0-10V Output	A	Instrument 5 P- Charge Air	PV007050
A_OUT6	0-10V Output	A	Instrument 6 T- Charge Air	PV007060
A_OUT7	0-10V Output	A	Instrument 7 T- Fuel	PV007070
A_OUT8	0-10V Output	A	Instrument 8 Fan Control 3	PV007080

Supply voltage



The operating voltage is supplied at X13. See also (→ Page 92).

CAN interfaces 1 ... 3

CAN1 – PCS5 CAN
The hardware of the CAN interface corresponds to the definition in ISO 11998. The controller supports CAN version 2.0B (11/29-bit identifier). All interfaces are electrically isolated from each other and from the SAM electronics. The interface operates on 5 V level.
CAN communication is not disrupted if a connector is unplugged at the SAM. A terminator (121 Ω, see wiring diagram) must be fitted on the cable connector if the SAM is the last assembly on the bus.

- Online selftest: Yes (by bus timeout monitoring application software)
- Offline diagnosis: Yes (by offline test software: Feedback from transmitted messages)

This interface is used for the default bus.

CAN2 – PCS5 CAN
See “CAN1 – PCS5 CAN”. This interface is used for the redundant bus.

CAN3 – N.c.
This interface is not used.

CAN interfaces CANOpen and SAE-J1939 (option)

CANOpen and SAE-J1939
Printed circuit board CCB2 may be inserted in slot 3 as an option. This provides interfaces as per CANOpen standard and SAE-J1939.

Parameters
The interface concerned must be activated (this is possible by minidialog (see (→ Page 186)). It is also necessary to state which signals are to be available on the bus.

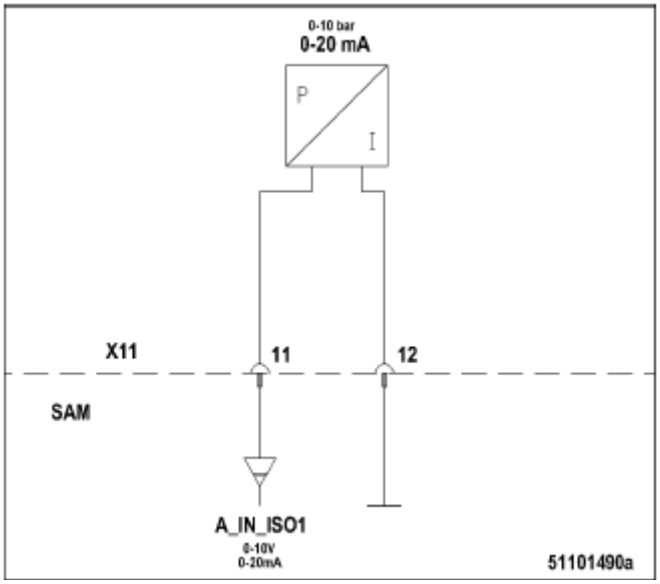
No.	Presetting	Unit	Designation	Settings
PR501	0	Digital	Speed Setting Limit Mode	0 - Default Dataset ADEC 1 - Speed Setting Limit Signal via CAN Active
PR510	0	Digital	Torque Demand Signal Mode	0 - Default Dataset ADEC 1 - Torque Demand via CAN Active
PR511	1	Digital	Rating Switch Mode	0 - Rating Switches not Active 1 - Rating Switches via Binary Input Active 2 - Rating Switches via CAN Active
PR520	0	Digital	Load Signal Mode	0 - Load Signal not Active 1 - Load Signal via CAN Active
PR530	0	Digital	Engine Start Signal Mode	0 - Default Dataset ADEC 1 - Additional Start Signal via CAN Active

No.	Presetting	Unit	Designation	Settings
PR531	0	Digital	Engine Stop Signal Mode	0 - Default Dataset ADEC 1 - Additional Stop Signal via CAN Active
PR532	0	Digital	Alarm Reset Mode	0 - Default Dataset ADEC 1 - Additional Alarm Reset Signal via CAN Active
PR533	1	Digital	Gov. Para. Set Signal Mode	0 - Default Dataset ADEC 1 - Governor Parameter Set Selection via Binary Input Active 2 - Governor Parameter Set Selection via CAN Active 3 - Governor Parameter Set Selection via CAN or Binary Input Active
PR534	0	Digital	Override Signal Mode	0 - Default Dataset ADEC 1 - Additional Override Signal via CAN Active
PR536	0	Digital	Monitored Nodes Signal Mode	0 - Default Dataset ADEC 1 - Demand Monitored Nodes Signal via CAN Active
PR537	0	Digital	Droop 2 Signal Mode	0 - Default Dataset ADEC 1 - Droop 2 Signal via CAN Active
PR538	1	Digital	Mode Switch Mode	0 - Mode Switch not Active 1 - Mode Switch via Binary Input Active
PR540	1	Digital	Disable Cyl. Cut Out Mode	0 - Disable Cylinder Cut Out not Active 1 - Disable Cylinder Cut Out Signal via Binary Input Active 2 - Disable Cylinder Cut Out Signal via CAN Active 3 - Disable Cylinder Cut Out Signal via Binary Input or CAN is Active
PR542	1	Digital	Test Overspeed Signal Mode	0 - Default Dataset ADEC 1 - Test Overspeed Signal via Binary Input Active 2 - Test Overspeed Signal via CAN Active 3 - Test Overspeed Signal via CAN or Binary Input Active
PR543	1	Digital	Manual Fan On Signal Mode	0 - Manual Fan ON not Active 1 - Manual Fan ON Signal via Binary Input Active 2 - Manual Fan ON Signal via CAN Active 3 - Manual Fan ON Signal via CAN or Binary Input Active

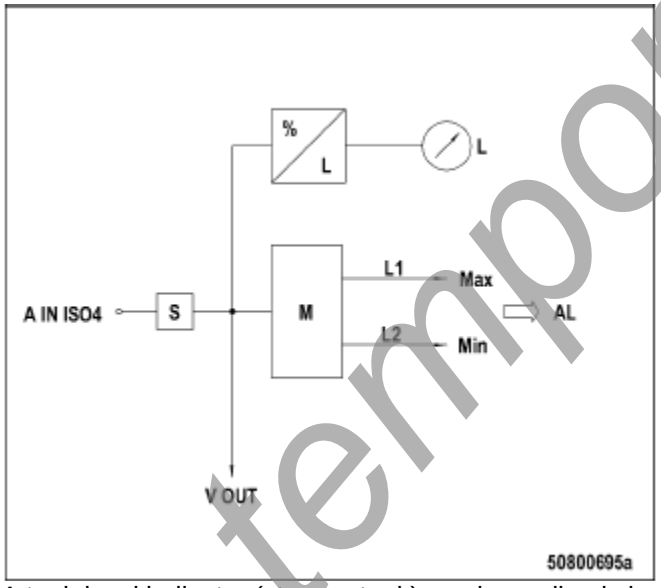
No.	Presetting	Unit	Designation	Settings
PR544	1	Digital	Priming Pump On Signal Mode	0 - Priming Pump ON not Active 1 - Priming Pump ON Signal via Binary Input Active 2 - Priming Pump ON Signal via CAN Active 3 - Priming Pump ON Signal via CAN or Binary Input Active
PR545	1	Digital	Binary Out Test Signal Mode	0 - Output Test not Active 1 - Output Test via Binary Output Active 2 - Output Test via CAN Active 3 - Output Test via Binary Output or CAN Active
PR546	1	Digital	Manual Turning Signal Mode	0 - Manual Turning not Active 1 - Manual Turning via Binary Output Active
PR990	0	Digital	CANopen Error Switch Off	Normal 0. Each Bit corresponds with the related error code. This parameter will be XOR'ed with the error code of the CCB-Gateway
PR991	0	Digital	J1939 Error Switch Off	Normal 0. Each Bit corresponds with the related error code. This parameter will be XOR'ed with the error code of the CCB-Gateway
PR992	0	Digital	CCB Error Switch Off	Normal 0. Each Bit corresponds with the related error code. This parameter will be XOR'ed with the error code of the CCB-Gateway

Analog inputs A_IN ISO 1 ... 4

A_IN_ISO 1 — Storage tank level
Function



The storage tank level is acquired via this input.



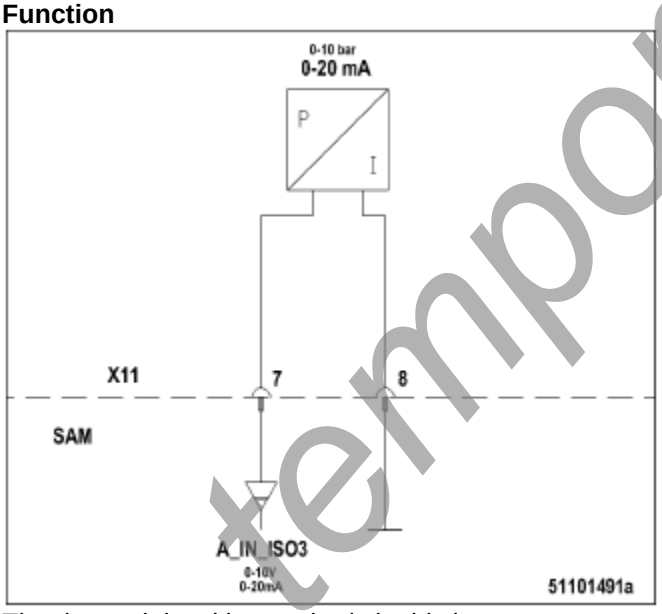
A tank level indicator (storage tank) can be realized via display “L”. The two outputs have the following functions:

- L1: Alarm on overshooting maximum level.
- L2: Alarm on undershooting minimum level.

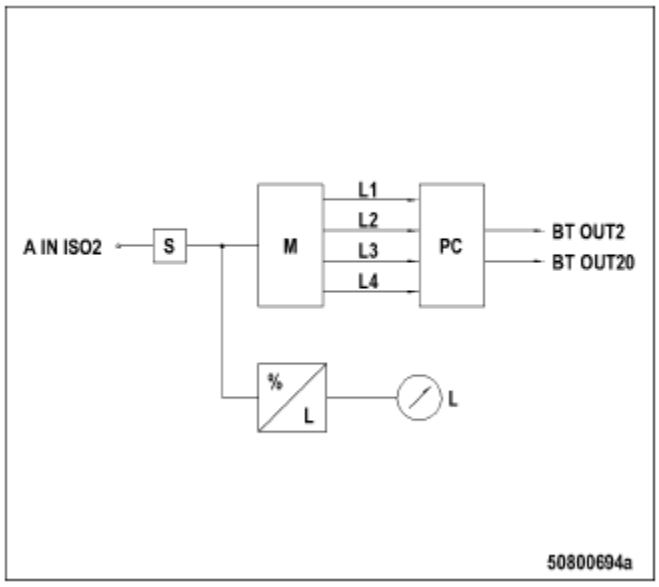
Parameters
Curve and alarm signaling must be set (with limit values and delay times).

No.	Presetting	Unit	Designation	Settings
PR270	4	mA	Curve Holding Tank	Grid Points for Holding Tank Level Calculation
PR271	0	Binary	Holding Tank Control Active	1 - Holding Tank Control is Activated 0 - Holding Tank Control is Deactivated
PR272	95	%	Holding Tank Level HI	Tank Level For Alarm HI
PR273	2	%	Holding Tank Level HI Hyst	Tank Level Hysteresis For Alarm HI Off
PR274	40	%	Holding Tank Level LO	Tank Level For Alarm LO
PR275	2	%	Holding Tank Level LO Hyst	Tank Level Hysteresis For Alarm LO Off
PR278	0	s	Hold-Tank HI Del-Time Risen	Delay Time for Rising Levels at HI Level
PR279	20	s	Hold-Tank HI Del-Time Fall	Delay Time for Falling Levels at HI-Level
PR280	20	s	Hold-Tank LO Del-Time Risen	Delay Time for Rising Levels at LO Level
PR281	20	s	Hold-Tank LO Del-Time Fall	Delay Time for Falling Levels LO-Level

A_IN_ISO 3 — Day tank level
Function



The day tank level is acquired via this input.



A tank level indicator (day tank) can be realized via display “L”. The four outputs L1 to L4 have the following functions:

- L1: Alarm on overshooting maximum level.
- L2: Fuel transfer pump deactivation when level overshot
- L3: Fuel transfer pump activation when level undershot
- L4: Alarm on undershooting minimum level.

These four (internal) outputs switch the two outputs BR_OUT 2 (→ Page 158) and BT_OUT20 (→ Page 175).

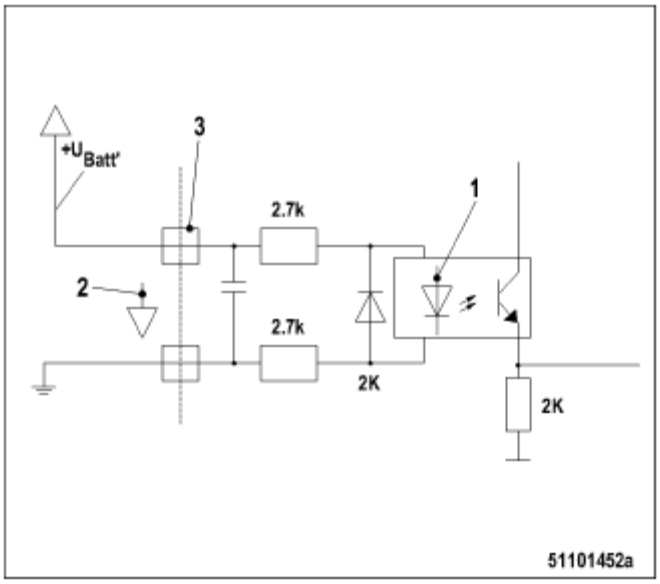
Parameters
Curve and alarm signaling must be set (with limit values and delay times).

No.	Presetting	Unit	Designation	Settings
PR250	4	mA	Curve Day Tank	Grid Points for Day Tank Level Calculation
PR251	0	Binary	Day Tank Control Active	1 - Day Tank Control is Active 0 - Day Tank Control is Deactivated
PR252	95	%	Day Tank Level HIHI	Tank Level For Alarm HI
PR253	2	%	Day Tank Level HIHI Hyst	Tank Level Hysteresis For Alarm HI Off
PR254	90	%	Day Tank Level HI	Tank Level For Fuel Pump OFF
PR255	60	%	Day Tank Level LO	Tank Level For Fuel Pump ON
PR256	40	%	Day Tank Level LOLO	Tank Level For Alarm LOLO
PR257	2	%	Day Tank Level LOLO Hyst	Tank Level Hysteresis For Alarm LOLO Off
PR258	0	s	Day Tank HIHI Del-Time Risen	Delay Time for Rising Levels at HIHI Level
PR259	20	s	Day Tank HIHI Del-Time Fallen	Delay Time for Falling Levels at HIHI-Level
PR260	0	s	Day Tank HI Del-Time Risen	Delay Time for Rising Levels at HI Level
PR261	20	s	Day Tank LO Del-Time Fallen	Delay Time for Falling Levels LO-Level
PR262	20	s	Day Tank LOLO Del-Time Risen	Delay Time for Rising Levels at LOLO Level
PR263	20	s	Day Tank LOLO Del-Time Fallen	Delay Time for Falling Levels at LOLO-Level

Unused A_IN_ISO-inputs
The two inputs A_IN_ISO 2 and A_IN_ISO 4 are not used at present.

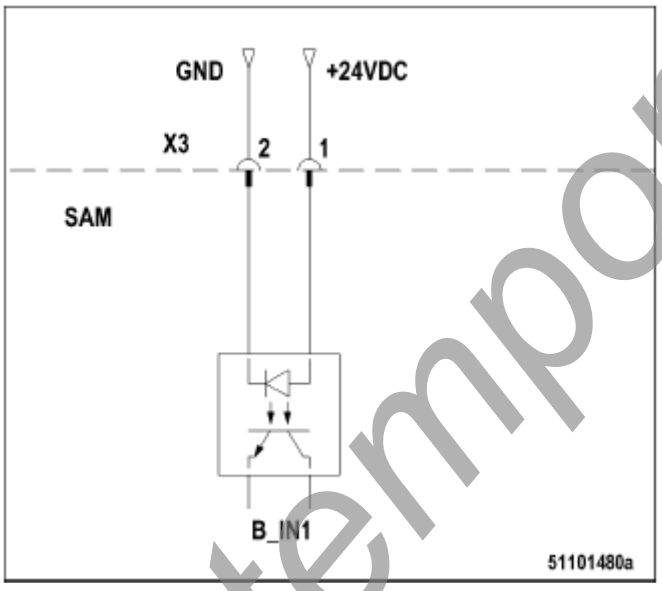
Binary inputs B_IN 1 ... 20

- Control by:
  - External supply
  - 24 V +U_{bat}
- Channel specification:
  - Voltage: +U_{bat_GND} ... +U_{bat}
  - Low detection: U_{in} < 9 V
  - High detection: U_{in} > 12 V
  - Input impedance: Approx. 5.5 kΩ
  - Current: To U_{bat}: 5 mA; to GND: 0 mA
  - DC isolation: Yes, 500 VDC
  - Input filter: Low-pass 500 Hz
- Schematic circuit diagram



1 Optocoupler
2 Input U_{in}
3 Input I_{in}

B_IN 1 – Cylinder cutout off



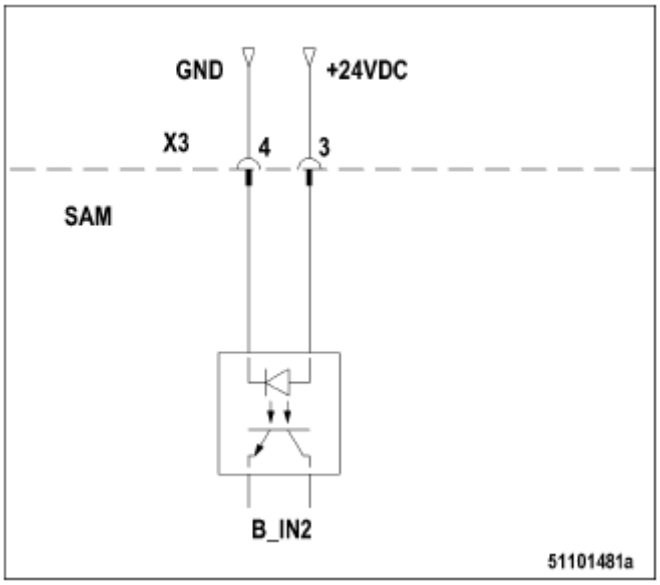
Function

When this input is activated the system suppresses the cylinder cutout request from the engine governor. The engine
runs constantly on all cylinders. This function can also be switched by CANOpen or SAE-J1939 (→ Page 114).

Parameters

No.	Presetting	Unit	Designation	Settings
PR540	1	Digital	Disable Cyl. Cut Out Mode	0 - Disable Cylinder Cut Out not Active 1 - Disable Cylinder Cut Out Signal via Binary Input Active 2 - Disable Cylinder Cut Out Signal via CAN Input Active 3 - Disable Cylinder Cut Out Signal via Binary Input or CAN is Active

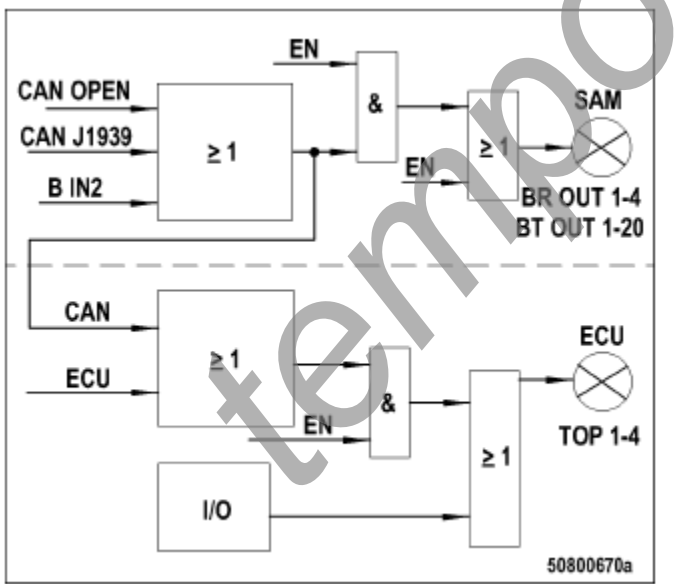
B_IN 2 – Test binary outputs



Function

When this input is activated all (programmed) outputs are activated for testing.

- Transistor outputs BT-OUT 1 ... 20 of SAM
- Relay outputs BR-OUT 1 ... 4 of SAM
- All transistor outputs TOP of the engine governor
- Required settings:
  - Activation of outputs which are activated when this input is activated



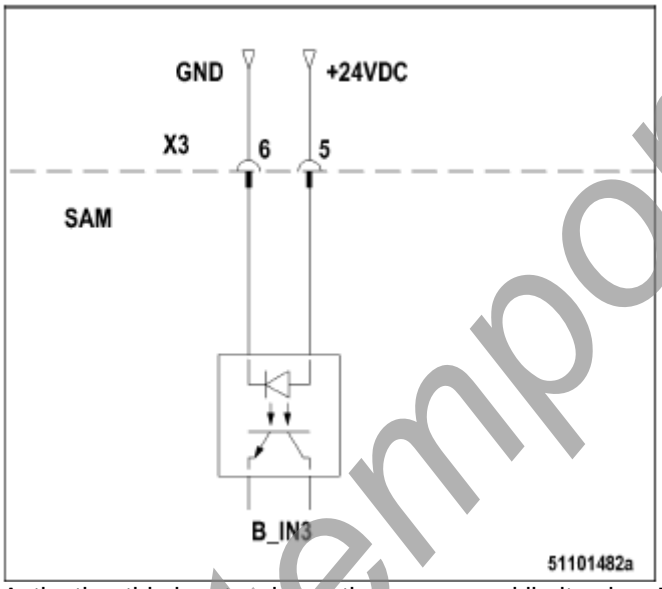
Parameters
In addition to those channels which are to be activated during a test, it is also necessary to specify which source
is to be active to trigger the test. A test can also be initiated via the CAN bus (CANOpen or J1939)

No.	Presetting	Unit	Designation	Settings
PR545	1	Digital	Binary Out Test Signal Mode	0 - Output Test not Active 1 - Output Test via Binary Output Active 2 - Output Test via CAN Active 3 - Output Test via Binary Output or CAN Active
PR050	1	Binary	BIN_OUT_TEST Overspeed Alarm	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR051	1	Binary	BIN_OUT_TEST T-Coolant Warning	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR052	1	Binary	BIN_OUT_TEST T-Coolant Stop	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR053	1	Binary	BIN_OUT_TEST T-Charge Air Warn	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR054	1	Binary	BIN_OUT_TEST T-Charge Air Stop	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR055	1	Binary	BIN_OUT_TEST Level Charge-Air Coolant Alarm	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR056	1	Binary	BIN_OUT_TEST Coolant Lev. Stop	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR057	0	Binary	BIN_OUT_TEST Fan 2 On	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR058	1	Binary	BIN_OUT_TEST T-Preheat N.Reach	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output

No.	Presetting	Unit	Designation	Settings
PR059	1	Binary	BIN_OUT_TEST P-Lube-Oil Warn.	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR060	0	Binary	BIN_OUT_TEST Engine Running	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR061	1	Binary	BIN_OUT_TEST P-Fuel Alarm	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR062	0	Binary	BIN_OUT_TEST Load Assumpt. Rdy	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR063	1	Binary	BIN_OUT_TEST Warn. P-Priming	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR064	1	Binary	BIN_OUT_TEST T-Generator Warn.	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR065	0	Binary	BIN_OUT_TEST Subsidiary Exci.On	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR066	0	Binary	BIN_OUT_TEST Generator Voltage	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR067	0	Binary	BIN_OUT_TEST Circulat. Pump On	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR068	0	Binary	BIN_OUT_TEST Downtime Heat. ON	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR069	1	Binary	BIN_OUT_TEST Day Tank Min Al.	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output

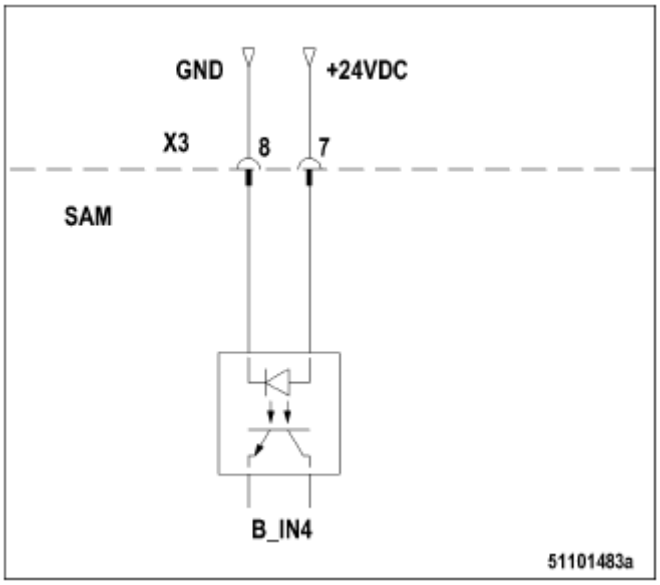
No.	Presetting	Unit	Designation	Settings
PR070	0	Binary	BIN_OUT_TEST Priming Pump ON	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR071	0	Binary	BIN_OUT_TEST Fuel Pump ON	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR072	0	Binary	BIN_OUT_TEST Fan 1 On	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output
PR073	0	Binary	BIN_OUT_TEST Shutter Open	0 - Binary Out Test is Deactivated For This Output 1 - Binary Out Test is Activated For This Output

B_IN 3 – Over speed test



Activating this input reduces the over speed limit value. The engine is stopped by an over speed shutdown if the engine speed reaches this (lower) value or if it is already above this value when this input is switched on. An alarm is signaled simultaneously via the corresponding alarm output and on DIS 10 (if applicable). The alarm is stored in the SAM fault memory.

B_IN 4 — Priming on

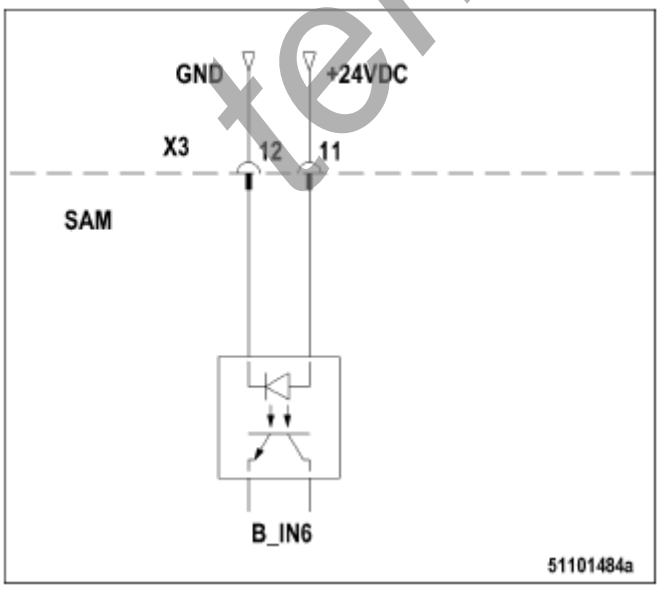


Function
This input switches on the oil priming pump once manually. This function can also be switched by CANOpen or SAE-J1939 (→ Page 114).

Parameters

No.	Presetting	Unit	Designation	Settings
PR544	1	Digital	Priming Pump On Signal Mode	0 - Priming Pump ON not Active 1 - Priming Pump ON Signal via Binary Input Active 2 - Priming Pump ON Signal via CAN Active 3 - Priming Pump ON Signal via CAN or Binary Input Active

B_IN 6 – Parameter switching

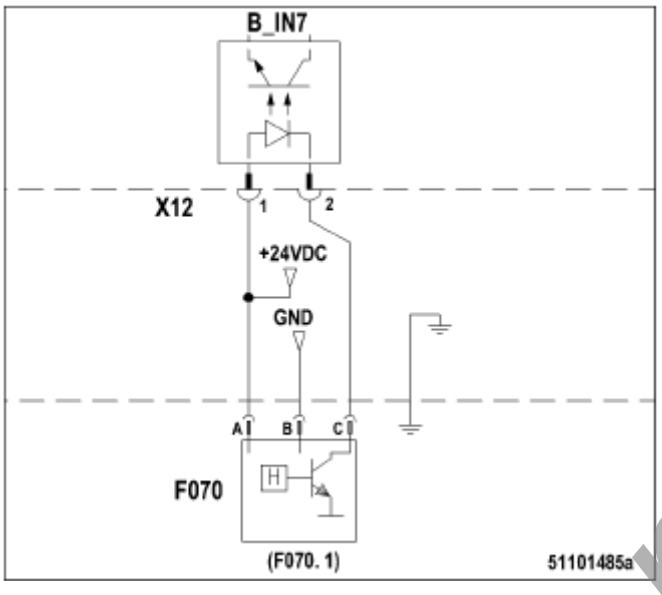


Function
This switch is used to set engine operation in Mode 1 or Mode 2.

Parameters

No.	Presetting	Unit	Designation	Settings
PR538	1	Digital	Mode Switch Mode	0 - Mode Switch not Active 1 - Mode Switch via Binary Input Active

B-IN 7 – Water in fuel prefilter 1



Function

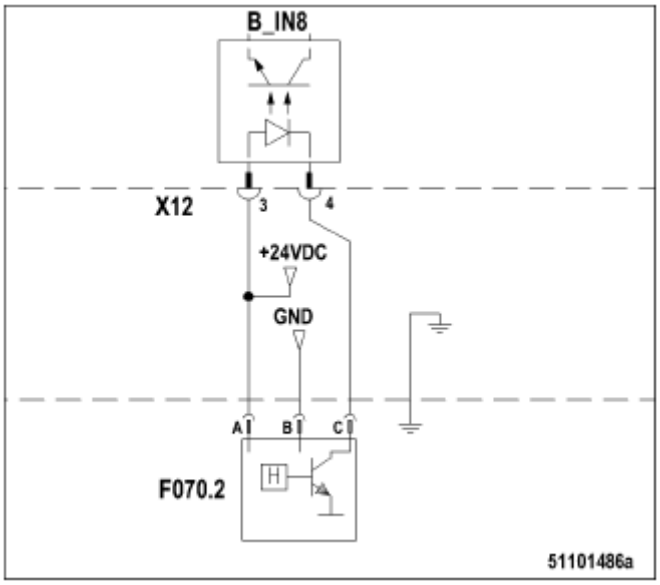
Sensor F070 (or F070.1 if two filters are provided) of fuel prefilter 1 is connected to this input. This detects water in the fuel prefilter.

Parameters

Set whether this signal is to be monitored or not, and, if so, what system response is desired. Furthermore,
the delay time for alarm signaling and cancellation must also be specified.

No.	Presetting	Unit	Designation	Settings
PR380	0	Binary	Water Fuel Filter 1 Monitor ON	1 -Water in Fuel Prefilter Monitoring and Alarm ON 0 - Water in Fuel Prefilter Monitoring and Alarm OFF
PR381	2	Digital	Sel. Alarm Water Fuel Filter 1	0 - No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR384	2	s	Delay Time W. Fuel Filter 1 ON	Delay Time for Alarm ON
PR385	2	s	Delay Time W Fuel Filter 1 OFF	Delay Time for Alarm OFF

B-IN 8 – Water in fuel prefilter 2

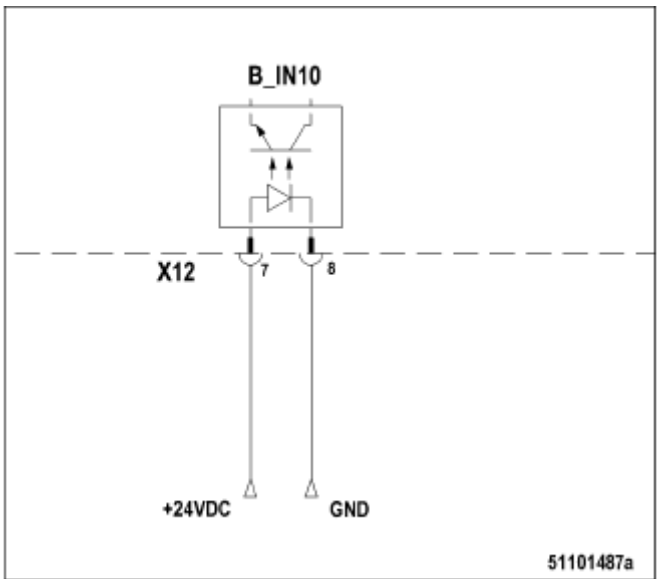


Function
Sensor F070.2 of the second fuel prefilter is connected to this input. This detects water in the fuel prefilter.

Parameters
Set whether this signal is to be monitored or not, and, if so, what system response is desired. Furthermore, the delay time for alarm signaling and cancellation must also be specified.

No.	Presetting	Unit	Designation	Settings
PR390	0	Binary	Water Fuel Filter 1 Monitor ON	1 -Water in Fuel Prefilter Monitoring and Alarm ON 0 - Water in Fuel Prefilter Monitoring and Alarm OFF
PR391	2	Digital	Sel. Alarm Water Fuel Filter 1	0 - No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR394	2	s	Delay Time W. Fuel Filter 1 ON	Delay Time for Alarm ON
PR395	2	s	Delay Time W Fuel Filter 1 OFF	Delay Time for Alarm OFF

B_IN 10 – Fan manual on/louvers open

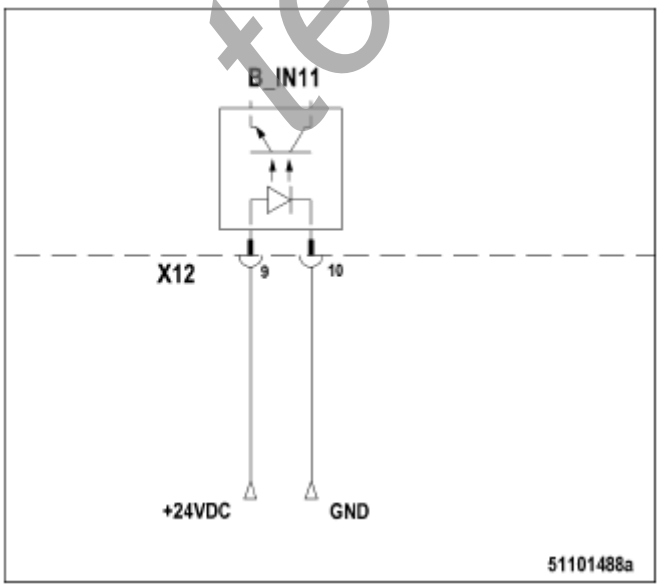


Function
The input switches on the connected fan(s) (up to two possible) manually and opens the associated louvers.

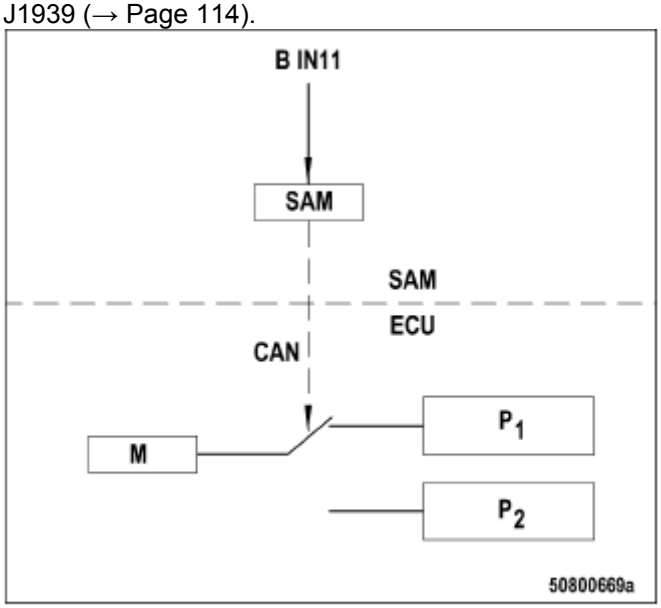
Parameters
The control signal source must be specified. Furthermore, the number of fans must be stipulated (see also parameter PR151 under BR_OUT3, (→ Page 158)).

No.	Presetting	Unit	Designation	Settings
PR543	1	Digital	Manual Fan On Signal Mode	0 - Manual Fan ON not Active 1 - Manual Fan ON Signal via Binary Input Active 2 - Manual Fan ON Signal via CAN Active 3 - Manual Fan ON Signal via CAN or Binary Input Active

B_IN 11 – Parameter switching



Function
The governor incorporates two different parameter records (PID response). This input facilitates switching between these two parameter records. The information about the parameter record to be selected is transmitted on the CAN bus. This function can also be switched by CANOpen or SAE-J1939 (→ Page 114).

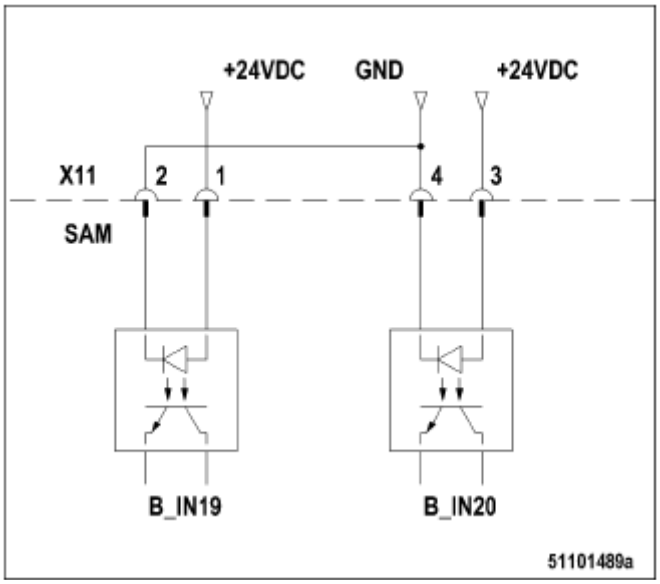


M Engine governor
P_1 Parameter record 1
P_2 Parameter record 2

Parameters
The control signal source must be specified.

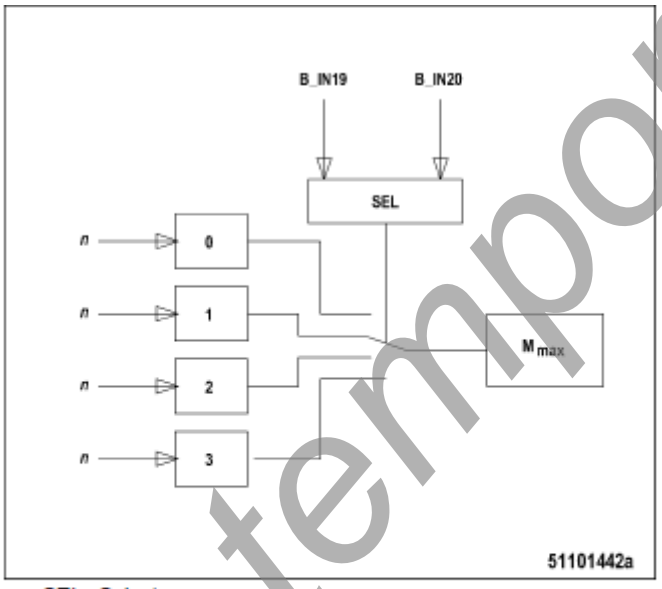
No.	Presetting	Unit	Designation	Settings
PR533	1	Digital	Gov. Para. Set Signal Mode	0 - Default Dataset ADEC 1 - Governor Parameter Set Selection via Binary Input Active 2 - Governor Parameter Set Selection via CAN Active 3 - Governor Parameter Set Selection via CAN or Binary Input Active

B_IN 19 and B_IN 20



Function

These inputs are used to select one of three lower power settings. B_IN 19 is the LSB (Least Significant Bit) for selection, B_IN 20 is the MSB (Most Significant Bit).



SEL Select
n Engine speed
M_{max} Maximum torque
0 Rating 0: No power reduction
1 Rating 1
2 Rating 2
3 Rating 3

Rating selection

Rating	B_IN20	B_IN19
0	0	0
1	0	1
2	1	0
3	1	1

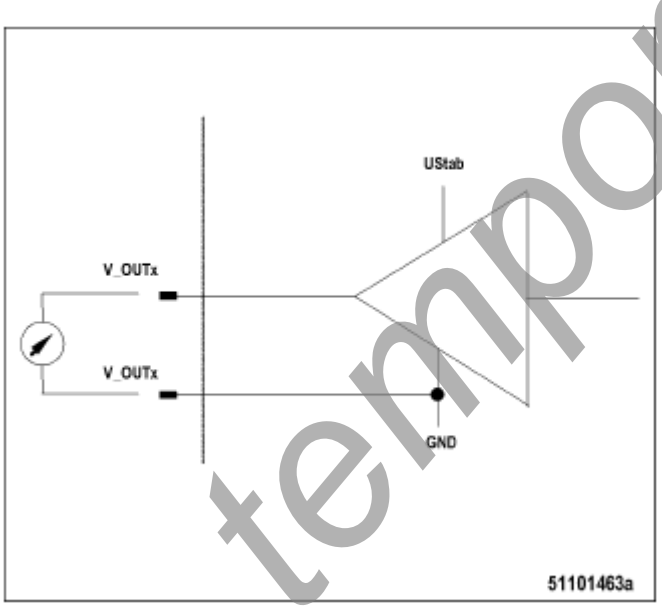
Parameters

No.	Presetting	Unit	Designation	Settings
PR511	1	Digital	Rating Switch Mode	0 - Rating Switches not Active 1 - Rating Switches via Binary Input Active 2 - Rating Switches via CAN Active

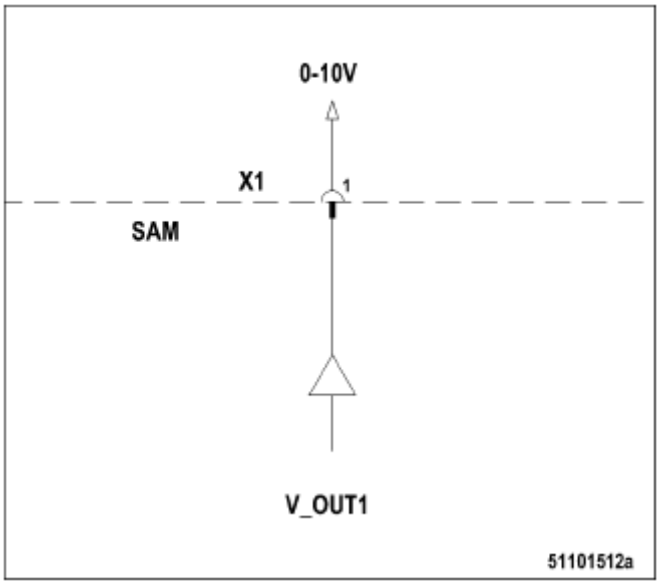
Unused B_IN channels
The following channels are not used:
• B_IN 5
• B_IN 9
• B_IN 12 to B_IN 18

Analog outputs V_OUT 1 ... 8

- Control of:
  - Analog display instruments
  - Analog inputs
- Channel specification:
  - Output voltage: 0 ... 10 V
  - Voltage output current-carrying capacity: I_{max}: 0 ... 8 mA at 10 V
  - Potential: U_{batt_GND}
  - Short-circuit protection: Yes
- Schematic circuit diagram:



V_OUT 1 – engine speed



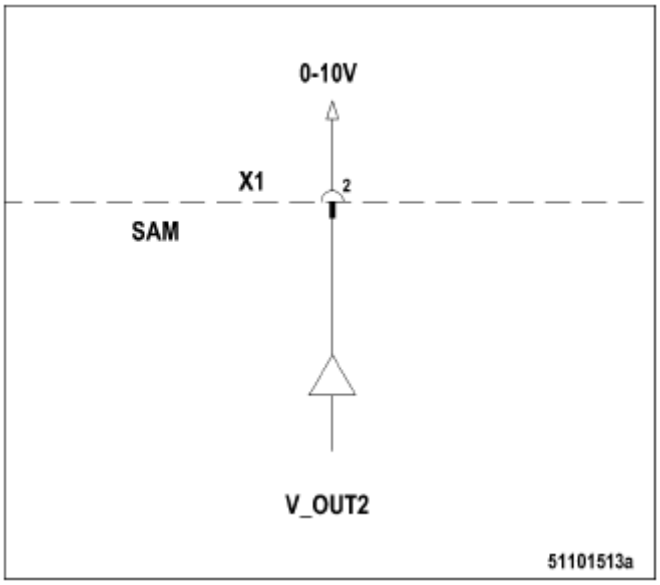
Function
This output provides a voltage which is proportional to engine speed (default setting, other values may be displayed as an alternative, e.g. the speed demand setting).

Parameters
Required settings:

- Source
- Scaling (0 ... n_{max}, standard: 0 ... 10V)
- Displayed value

No.	Presetting	Unit	Designation	Settings
PR101	0	Digital	Selection Instrument 1	0 - Engine Speed 1 - Nominal Speed 2 - Feedback Speed Demand 3 - Feedback Speed Demand Eff. 4 - Engine Speed Crankshaft
PR111	2000	rpm	Scale Instrument Output 1	Grid Point For End of Scale (100%) in RPM

V_OUT 2 – Coolant temperature



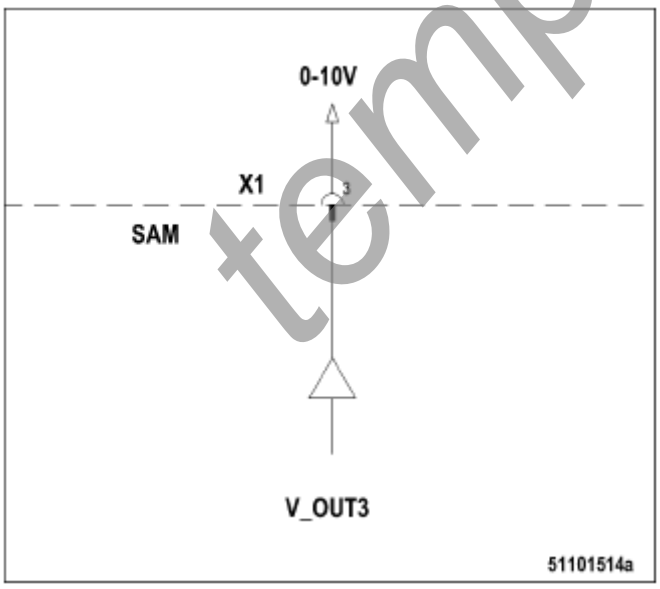
Function
This output provides a voltage which is proportional to coolant temperature.

Parameters
• Scaling (0 ... Umax, standard: 0 ... 10 V equivalent to 0 ... nmax)

No.	Presetting	Unit	Designation	Settings
PR112	120	DegC	Scale Instrument Output 2	Grid Point For End of Scale (100%) In °C

*

V_OUT 3 – Lube oil temperature



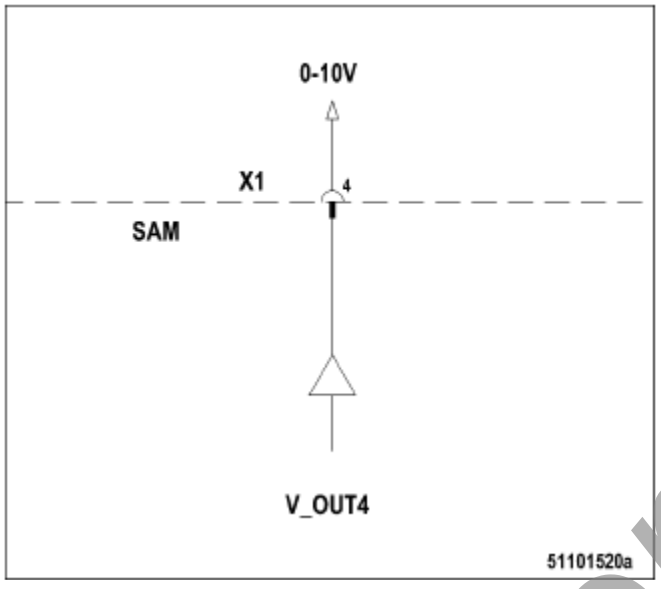
Function
This output provides a voltage which is proportional to lube oil temperature.

Parameters

- Scaling (0 ... t_{max}, standard: 0 ... 120 °C)

No.	Presetting	Unit	Designation	Settings
PR113	120	DegC	Scale Instrument Output 3	Grid Point For End of Scale (100%) In °C

V_OUT 4 – Fuel pressure after filter



Function

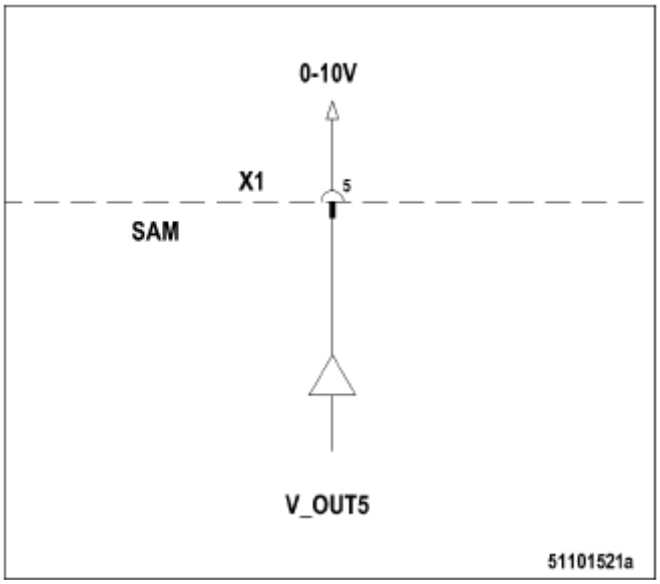
This output provides a voltage which is proportional to the fuel pressure measured after the fuel filter (default; other values may be displayed as an alternative).

Parameters

- Measuring point
- Scaling (0 ... p_{max}, standard: 0 ... 10bar)
- Which pressure value is to be displayed

No.	Presetting	Unit	Designation	Settings
PR104	0	Digital	Selection Instrument 4	0 - Fuel Pressure After Filter 1 - Pressure_1 2 - Pressure_2
PR120	15	bar	Scale P-Fuel After Filter	Grid Point For End of Scale (100%) In BAR

V_OUT 5 – Charge-air pressure 0 to 5 bar



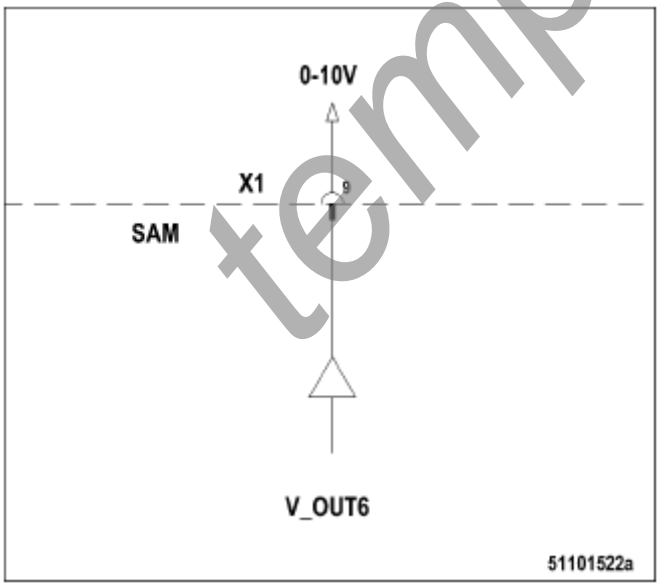
Function
This output provides a voltage which is proportional to the charge-air pressure.

Parameters

- Scaling (0 ... pmax; standard 0 ... 5bar)

No.	Presetting	Unit	Designation	Settings
PR114	5	bar	Scale Instrument Output 5	Grid Point For End of Scale (100%) In BAR

V_OUT 6 – Charge-air temperature/Intercooler coolant temperature



Function
This output provides a voltage which is proportional to the charge-air temperature or intercooler coolant temperature (adjustable).

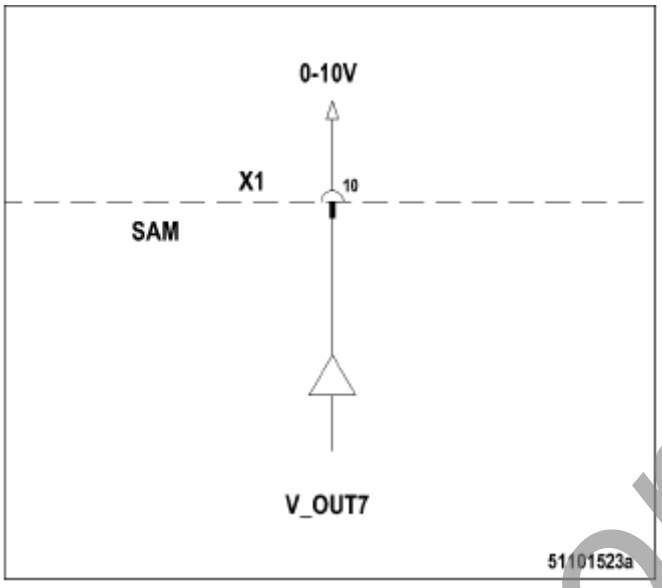
Parameters

- Measuring point charge-air temperature or intercooler coolant temperature

- • Scaling (0 ... tmax; standard 0 ... 120 °C)

No.	Presetting	Unit	Designation	Settings
PR106	0	Digital	Selection Instrument 6	0 - Charge Air Temperature 1 - T-Coolant Intercooler
PR115	120	DegC	Scale Instrument Output 6	Grid Point For End of Scale (100%) In °C

V_OUT 7 – Fuel temperature



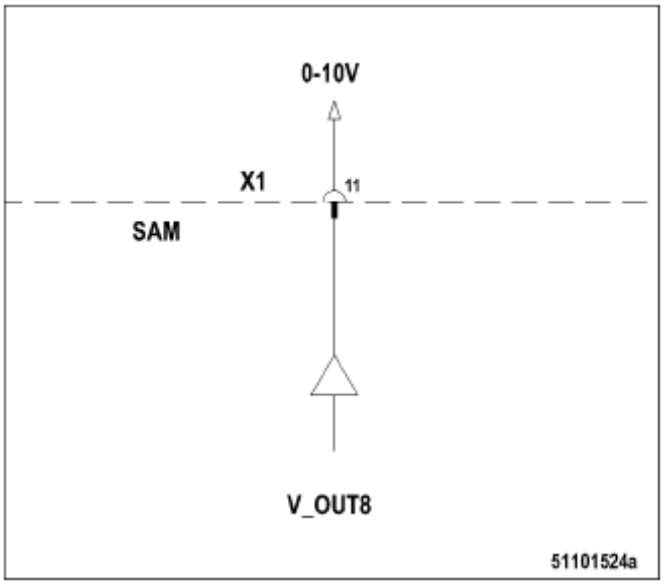
Function
This output provides a voltage which is proportional to fuel temperature.

Parameters

- Scaling (0 ... tmax; standard 0 ... 120 °C)

No.	Presetting	Unit	Designation	Settings
PR116	120	DegC	Scale Instrument Output 7	Grid Point For End of Scale (100%) In °C

V_OUT 8 – Fan speed — Universal



Function
In the default setting, this output provides a voltage which can activate a fan between 0 and full power. Other signals may also be output as an alternative.

Parameters
- Signal source

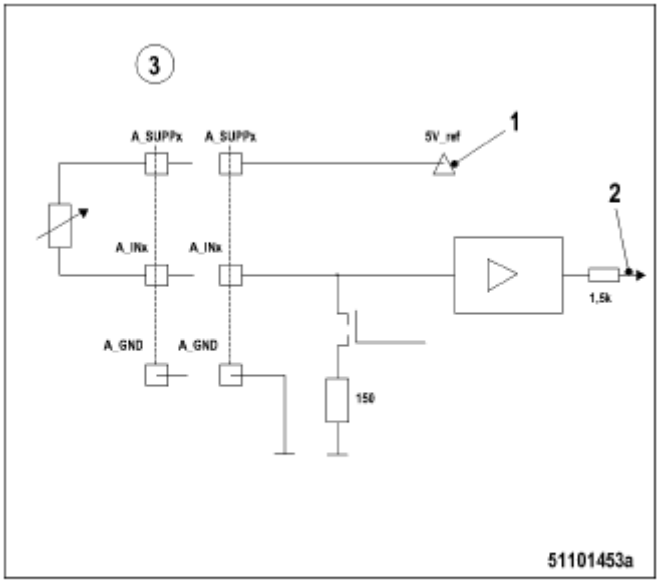
- Scaling (0 ... Umax; standard 0 ... 10V, or 100%)

No.	Presetting	Unit	Designation	Settings
PR108	0	Digital	Selection Instrument 8	0 - Fan Speed 1 - Engine Power Reserve 2 - Injection Quantity Actual DBR 3 - Nominal Power 4 - Level Day Tank 5 - Level Holding Tank 6 - T-Exhaust A 7 - T-Exhaust B 8 - T-Winding_1 9 - T-Winding_2 10 - T-Winding_3
PR130	100	%	Scale Fan Control	Grid Point For End of Scale (100%) In %
PR131	100	%	Scale Engine Power Reserve	Grid Point For End of Scale (100%) In %
PR132	100	%	Scale Inject. Quant. Act.DBR %	Grid Point For End of Scale (100%) In %
PR133	10000	kW	Scale Nominal Power	Grid Point For End of Scale (100%) In kW
PR134	100	%	Scale Level Day Tank	Grid Point For End of Scale (100%) In %
PR135	100	%	Scale Level Holding Tank	Grid Point For End of Scale (100%) In %
PR136	800	DegC	Scale Exhaust Temp. A	Grid Point For End of Scale (100%) In °C
PR137	800	DegC	Scale Exhaust Temp. B	Grid Point For End of Scale (100%) In °C
PR138	200	DegC	Scale Winding Temperature 1	Grid Point For End of Scale (100%) In °C
PR139	200	DegC	Scale Winding Temperature 2	Grid Point For End of Scale (100%) In °C
PR140	200	DegC	Scale Winding Temperature 3	Grid Point For End of Scale (100%) In °C

Analog inputs A_IN 1 ... 8

A_IN 1 – Exhaust gas temperature A

Channel specification

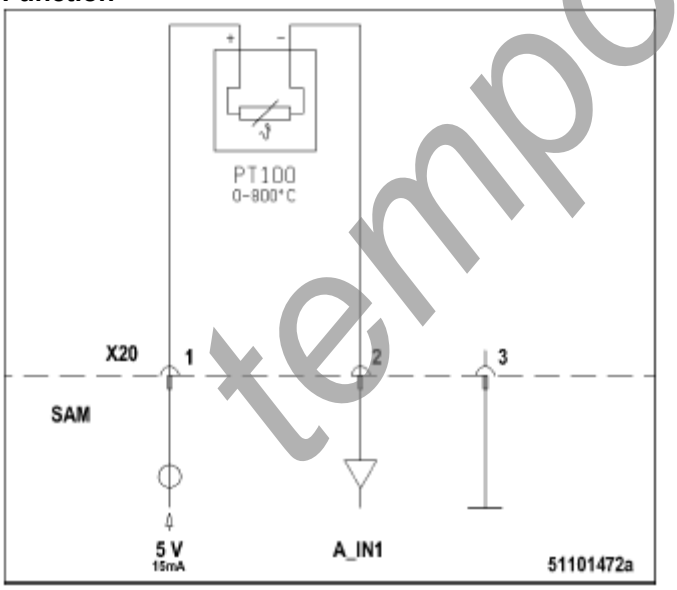


1 U_{ref}
2 A/D channel
3 Pt100 input

Input:

- Temperature measuring current: Pt100 4 mA
- Temperature input impedance: 1 kΩ
- Sensor supply: 5 V, max. 20 Ma

Function



- Acquisition of:
  - Pt100, extended
- Function:
  The channel is used to acquire the combined exhaust gas temperature of engine bank A. The temperature ranges between 0 ... 850 °C. The present temperature is shown on DIS 10 (option, if applicable).
  Programmable system responses:
  - • No alarm
  - Message
  - Yellow alarm
  - Red alarm

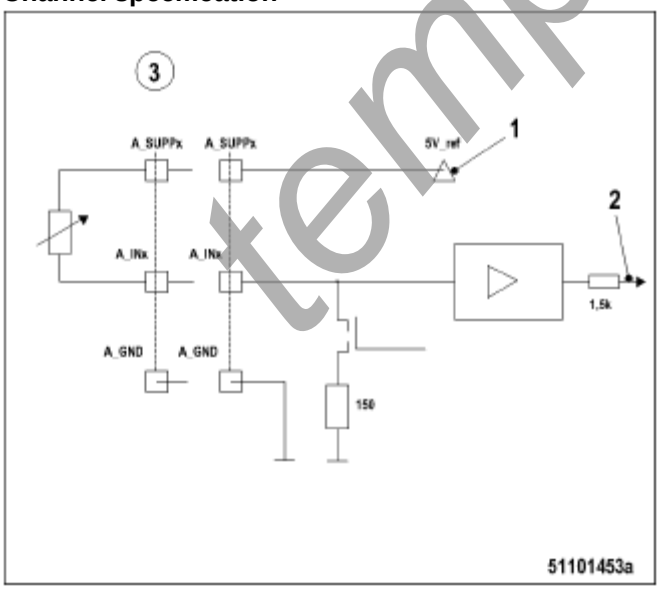
- Red alarm with shutdown
- The alarm is stored in the SAM and displayed on the fault code monitor. It is also displayed on DIS 10 (option, if applicable).

Parameters
Required settings:

- Activation of temperature monitoring
- System response in case of limit value violation
- Limit value
- Hysteresis
- Delay times

No.	Presetting	Unit	Designation	Settings
PR300	0	Binary	T-Exhaust_A Monitoring ON	1 - Exhaust Temp. Monitoring and Alarm ON 0 - Exhaust Temp. Monitoring and Alarm OFF
PR301	2	Digital	Selector Alarm T-Exhaust_A	0 No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR302	700	DegC	Level T-Exhaust_A HI	Protection Level for HI Alarm
PR303	10	DegC	Hysteresis T-Exhaust_A HI	Hysteresis for HI Alarm Protection Level
PR304	2	s	Delay Time T-Exhaust_A HI Rise	Delay Time for crossing the HI Level
PR305	2	s	Delay Time T-Exhaust_A HI Fall	Delay Time for under-run the HI Level

A_IN 2 – Exhaust gas temperature B
Channel specification

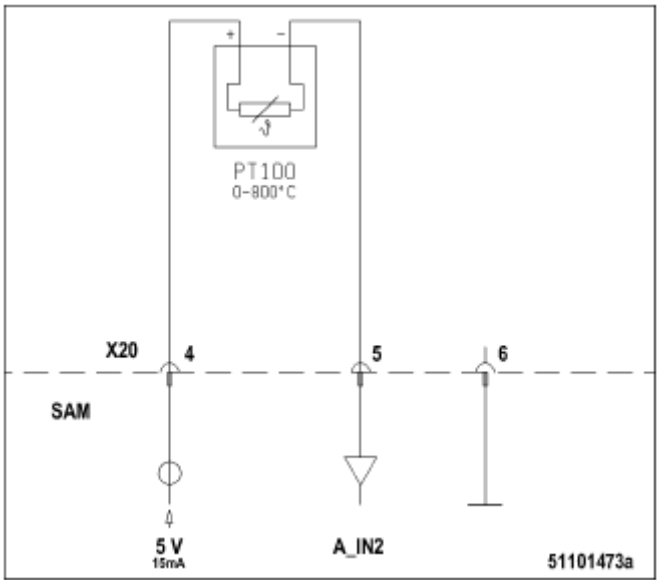


1 U_{ref}
2 A/D channel
3 Pt100 input

Input:

- Temperature measuring current: Pt100 4 mA
- Temperature input impedance: 1 kΩ
- Sensor supply: 5 V, max. 20 mA

Function



- Acquisition of:
  - Pt100, extended
- Function:
  The channel is used to acquire the combined exhaust gas temperature of engine bank B. The temperature ranges between 0 ... 850 °C. The present temperature is shown on DIS 10 (option, if applicable).
  Programmable system responses:
  - No alarm
  - Message
  - Yellow alarm
  - Red alarm
  - Red alarm with shutdown
- The alarm is stored in the SAM and displayed on the fault code monitor. It is also displayed on DIS 10 (option, if applicable).

Parameters

Required settings:

- Activation of temperature monitoring
- System response in case of limit value violation
- Limit value
- Hysteresis

- Delay times

No.	Presetting	Unit	Designation	Settings
PR310	0	Binary	T-Exhaust_B Monitoring ON	1 - Exhaust Temp. Monitoring and Alarm ON 0 - Exhaust Temp. Monitoring and Alarm OFF
PR311	2	Digital	Selector Alarm T-Exhaust_B	0 - No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR312	700	DegC	Level T-Exhaust_B HI	Protection Level for HI Alarm
PR313	10	DegC	Hysteresis T-Exhaust_B HI	Hysteresis for HI Alarm Protection Level
PR314	2	s	Delay Time T-Exhaust_B HI Rise	Delay Time for crossing the HI Level
PR315	2	s	Delay Time T-Exhaust_B HI Fall	Delay Time for under-run the HI Level

A_IN 3 / A_IN 4 – Temperature Bearing Generator DE / NDE
Generator monitorng: temperature bearing DE und NDE
Acquisition of:
Pt100, extended
Function:
The channels are used to acquire the bearing temperature of the generator DE side and NDE side. The temperature ranges between 0 ... 500 °C. The present temperature is shown on DIS 10 (option, if applicable).
The function will be activated via Parameter 320 and 330.
The temperatures for warning, alarms or engine reaction are adjustable:
• message if the temperature exceeded
• alarm if the temperature exceeded
• alarm an engine shut down if the temperature exceeded
The values for the temperatures und warnings are communicated on the external CAN Bus.

Required settings:
•Activation of temperature monitoring
•System response in case of limit value violation
•Limit value
•Hysteresis

inputs

A_IN3	AIN T-Geno DE	PV006010
A_IN4	AIN T-Geno NDE	PV006020

outputs:

SAM V_OUT4	T- Geno DE*
SAM V_OUT8	T- Geno NDE*
SAM BT_OUT15	Common alarm generator
ADEC TOP1	Common alarm yellow
ADEC TOP2	Common alarm red
CANopen	PV006035 T- Bearing Geno DE PV006055 T- Bearing Geno NDE HI T Gen. DE (Binary Signal / Status 2)

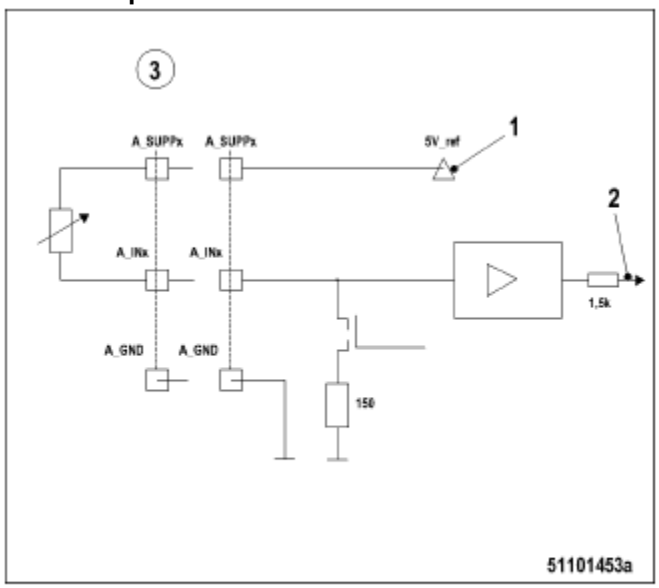
	HI T Gen. NDE (Binary Signal / Status 2)
SAE J1939	SPN1122, PGN 65191 Alternator Bearing 1 Temperature SPN1123, PGN 65191 Alternator Bearing 2 Temperature HI T Gen. DE (PGN 65297 proprietary) HI T Gen. NDE (PGN 65297 proprietary)

* depends parameter settings (see *analog outputs*)

Parameter

No.	**default**	**unit**	**Designation**	**range**
SAM PAR 121	120	°C	Scale Temperature DE	Scale DIS 10 and Instrument (0-10Volt)
SAM PAR 122	120	°C	Scale Temperature NDE	Scale DIS 10 and Instrument (0-10Volt)
SAM PAR 320	0	Binary	function temp. DE Monitoring on	
SAM PAR 321	2	digit	Slector Alarm temperature NDE	0= no reaction, 1=message, 2=yellow, 3 = red, 4=ss
SAM PAR 322	90	°C	Level temperature DE HI	0-500°C
SAM PAR 323	5	°C	Hysteresis temperature 1 HI	0-100 °C
SAM PAR 324	2	Sec	Delay Temperature DE HI Rise	0-30sec
SAM PAR 325	2	Sec	Delay Temperature DE HI Fall	0-30sec
SAM PAR 330	0	Binary	function Temp. NDE Monitoring on	
SAM PAR 331	2		Slector Alarm temperature NDE	0= no reaction, 1=message, 2=yellow, 3 = red, 4=ss
SAM PAR 332	90	°C	Level Temperature NDE HI	0-500 °C
SAM PAR 333	5	°C	Hysteresis temperature 2 HI	0-100 °C
SAM PAR 334	2	sec	Delay Temperature NDE HI Rise	0-30sec
SAM PAR 335	2	sec	Delay Temperature NDE HI Fall	0-30sec

A_IN 5 – Winding temperature 1 generator
Channel specification

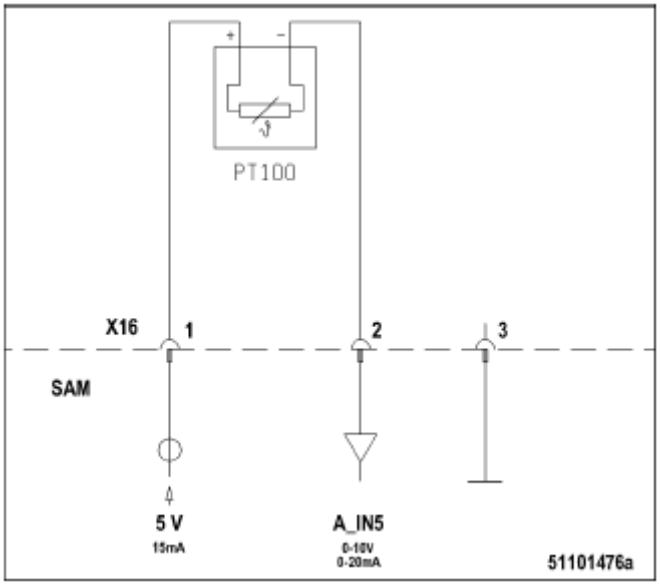


1 U_{ref}
2 A/D channel
3 Pt100 input

Input:

- Temperature measuring current: Pt100 4 mA
- Temperature input impedance: 1 kΩ
- Sensor supply: 5 V, max. 20 mA

Function



- Acquisition of:
  - Pt100 temperature sensor
- Function:
  The channel is used to acquire the winding temperature of generator winding L1.
  Programmable system responses:
  - No alarm
  - Message
  - Yellow alarm
  - Red alarm
  - Red alarm with shutdown
- The alarm is stored in the SAM and displayed on the fault code monitor. It is also displayed on DIS 10 (option, if applicable).

Parameters

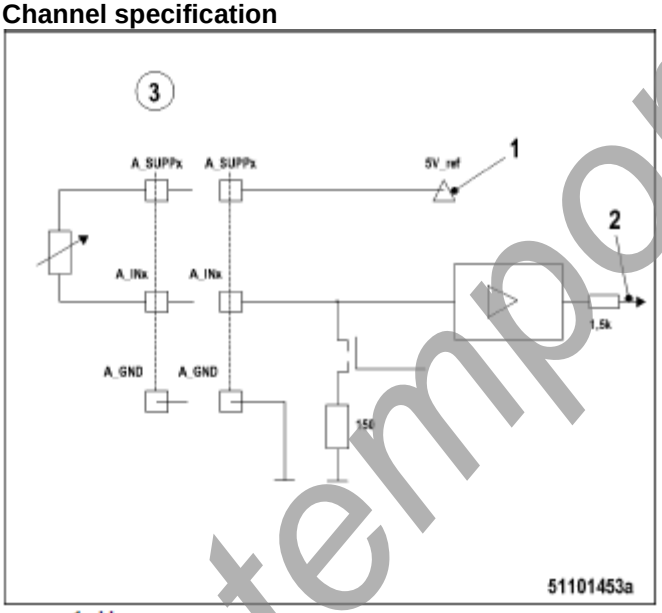
Required settings:

- Activation of temperature monitoring
- System response
- Limit value
- Hysteresis values

- Delay times

No.	Presetting	Unit	Designation	Settings
PR340	0	Binary	Winding Temp. 1 Monitoring ON	1 -Winding Temp. Monitoring and Alarm ON 0 - Winding Temp. Monitoring and Alarm OFF
PR341	2	Digital	Selector Alarm T-Winding 1	0 - No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR342	140	DegC	Level T-Winding 1 HI	Protection Level for HI Alarm
PR343	5	DegC	Hysteresis T-Winding 1 HI	Hysteresis for HI Alarm Protection Level
PR344	2	s	Delay Time T-Winding 1 HI Rise	Delay Time for crossing the HI Level
PR345	2	s	Delay Time T-Winding 1 HI Fall	Delay Time for under-run the HI Level

A_IN 6 – Winding temperature 2 generator
Channel specification

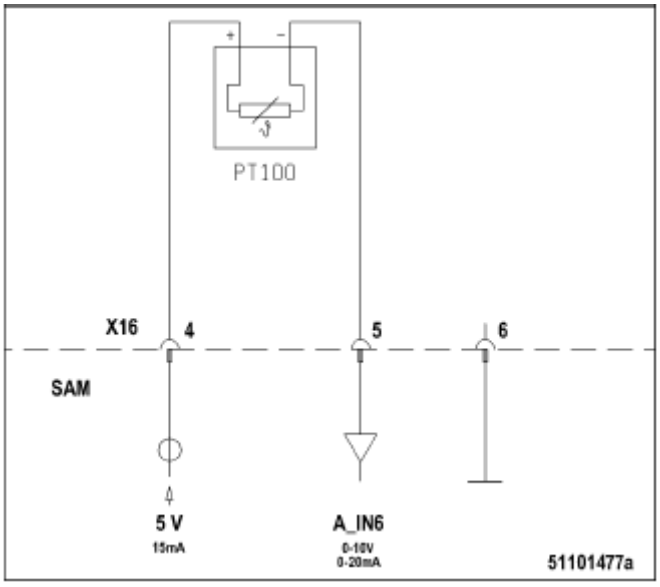


1 U_{ref}
2 A/D channel
3 Pt100 input

Input:

- Temperature measuring current: Pt100 4 mA
- Temperature input impedance: 1 kΩ
- Sensor supply: 5 V, max. 20 mA

Function



- Acquisition of:
  - Pt100 temperature sensor
- Function:
  The channel is used to acquire the winding temperature of generator winding L2.
  Programmable system responses:
  - No alarm
  - Message
  - Yellow alarm
  - Red alarm
  - Red alarm with shutdown
- The alarm is stored in the SAM and displayed on the fault code monitor. It is also displayed on DIS 10 (option, if applicable).

Parameters

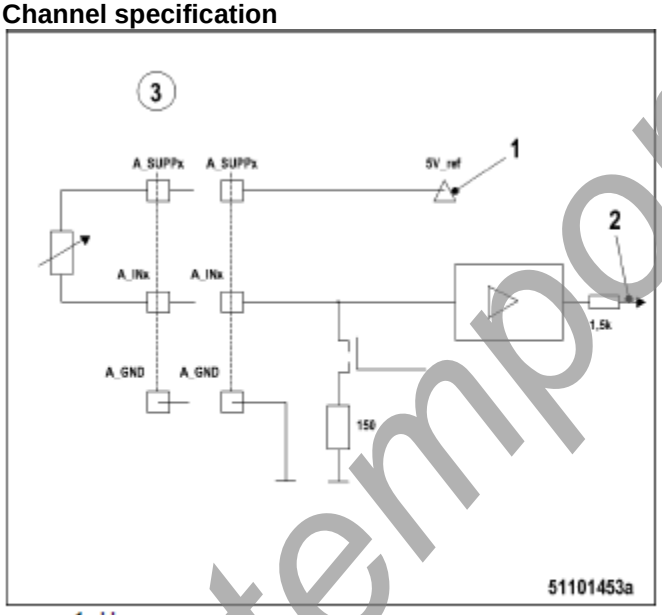
Required settings:

- Activation of temperature monitoring
- System response
- Limit value
- Hysteresis values

- Delay times

No.	Presetting	Unit	Designation	Settings
PR350	0	Binary	Winding Temp. 2 Monitoring ON	1 -Winding Temp. Monitoring and Alarm ON 0 - Winding Temp. Monitoring and Alarm OFF
PR351	2	Digital	Selector Alarm T-Winding 2	0 - No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR352	140	DegC	Level T-Winding 2 HI	Protection Level for HI Alarm
PR353	5	DegC	Hysteresis T-Winding 2 HI	Hysteresis for HI Alarm Protection Level
PR354	2	s	Delay Time T-Winding 2 HI Rise	Delay Time for crossing the HI Level
PR355	2	s	Delay Time T-Winding 2 HI Fall	Delay Time for under-run the HI Level

A_IN 7 – Winding temperature 3 generator
Channel specification

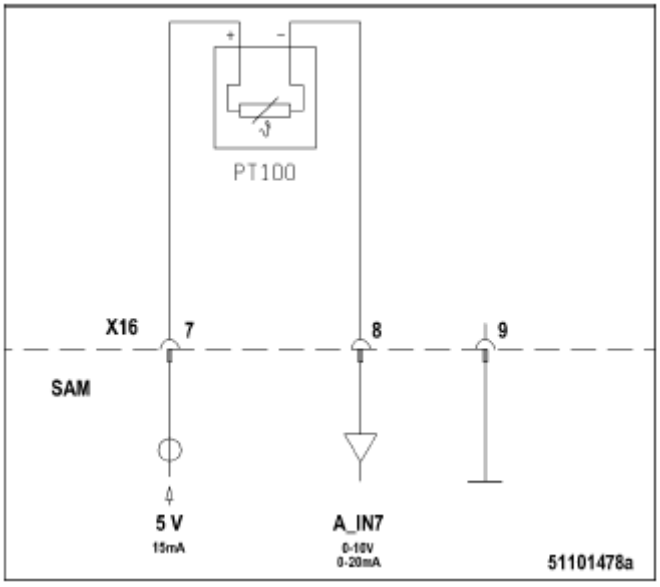


1 U_{ref}
2 A/D channel
3 Pt100 input

Input:

- Temperature measuring current: Pt100 4 mA
- Temperature input impedance: 1 kΩ
- Sensor supply: 5 V, max. 20 mA

Function



- Acquisition of:
  - Pt100 temperature sensor
- Function:
  The channel is used to acquire the winding temperature of generator winding L3.
  Programmable system responses:
  - No alarm
  - Message
  - Yellow alarm
  - Red alarm
  - Red alarm with shutdown
- The alarm is stored in the SAM and displayed on the fault code monitor. It is also displayed on DIS 10 (option, if applicable).

Parameters

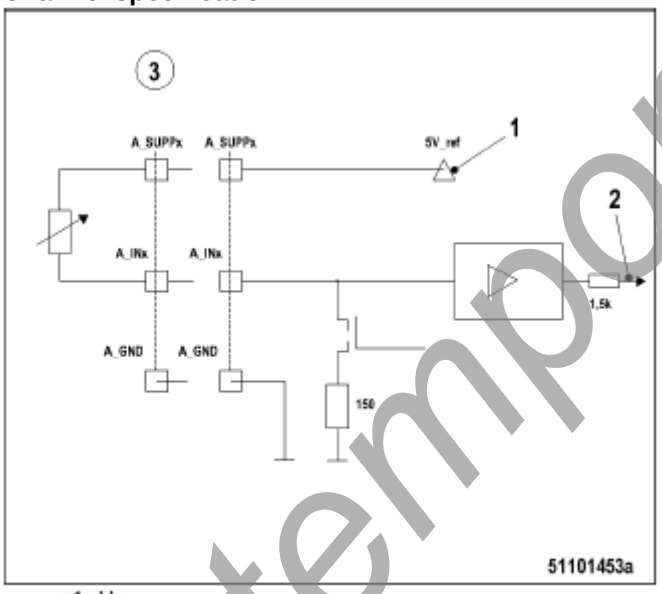
Required settings:

- Activation of temperature monitoring
- System response
- Limit value
- Hysteresis values

- Delay times

No.	Presetting	Unit	Designation	Settings
PR360	0	Binary	Winding Temp. 3 Monitoring ON	1 -Winding Temp. Monitoring and Alarm ON 0 - Winding Temp. Monitoring and Alarm OFF
PR361	2	Digital	Selector Alarm T-Winding 3	0 - No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR362	140	DegC	Level T-Winding 3 HI	Protection Level for HI Alarm
PR363	5	DegC	Hysteresis T-Winding 3 HI	Hysteresis for HI Alarm Protection Level
PR364	2	s	Delay Time T-Winding 3 HI Rise	Delay Time for crossing the HI Level
PR365	2	s	Delay Time T-Winding 3 HI Fall	Delay Time for under-run the HI Level

A_IN 8 – Room temperature
Channel specification

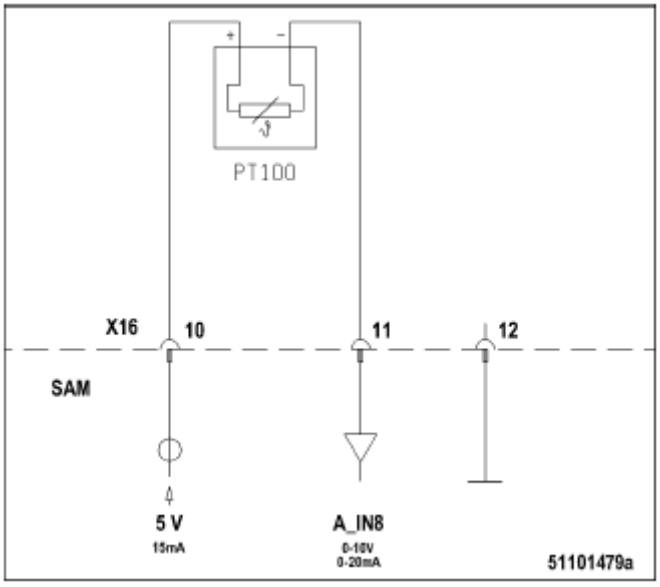


1 U_{ref}
2 A/D channel
3 Pt100 input

Input:

- Temperature measuring current: Pt100 4 mA
- Temperature input impedance: 1 kΩ
- Sensor supply: 5 V, max. 20 mA

Function



- Acquisition of:
  - Pt100 temperature sensor
- Function:
  The channel is used to acquire the room temperature in the generator room.
  Programmable system responses:
  - No alarm
  - Message
  - Yellow alarm
  - Red alarm
  - Red alarm with shutdown
- The alarm is stored in the SAM and displayed on the fault code monitor. It is also displayed on DIS 10 (option, if applicable).

Parameters

Required settings:

- Activation of temperature monitoring
- System response
- Limit value
- Hysteresis values

- Delay times

No.	Presetting	Unit	Designation	Settings
PR370	0	Binary	T-Ambient Monitoring ON	1 -Temperature Monitoring and Alarm ON 0 - Temperature Monitoring and Alarm OFF
PR371	2	Digital	Selector Alarm T-Ambient	0 - No Protection 1 - Message 2 - Yellow Alarm 3 - Red Alarm 4 - Red Alarm with Security Stop
PR372	140	DegC	Level T-Ambient HI	Protection Level for HI Alarm
PR373	5	DegC	Hysteresis T-Ambient HI	Hysteresis for HI Alarm Protection Level
PR374	2	s	Delay Time T-Ambient HI Rise	Delay Time for crossing the HI Level
PR375	2	s	Delay Time T-Ambient HI Fall	Delay Time for under-run the HI Level

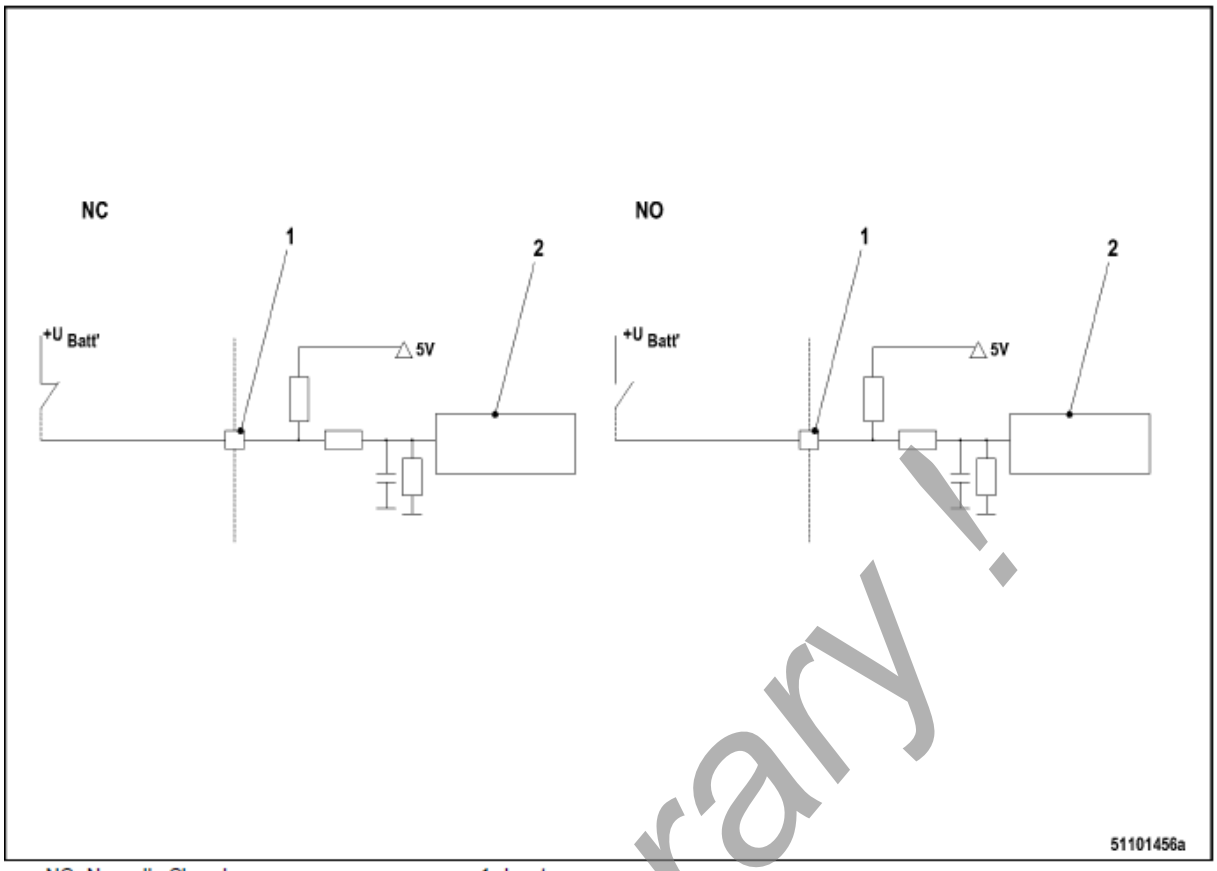
Frequency inputs F_IN 1 ... 2

Frequency inputs are not used:

- F_IN 1
- F_IN 2

Binary inputs with common ground P_IN 1 ... 8

- Control by:
  - Switch to +U_{bat}
- Channel specification:
  - Voltage range: U_{bat_GND} ... +U_{bat}
  - Impedance: Approx. 6.9 kΩ
  - Input current to +U_{bat}: 3.5 mA
  - Input current to U_{bat_GND}: 22 µA
  - Switching to +U_{bat}
    U_{in} > 10 V: Closed (high)
    U_{in} < 9 V: Open (low)
  - Electrical isolation: No
- Required settings:
  - None
- Schematic circuit diagram:



NC Normally Closed
NO Normally Open

1 Input
2 Evaluation

P_IN 7 – Turn engine without starting

Function
Input is NO (normally open):
The starter is activated as soon as the switch is closed (+24 VDC applied), without injecting fuel. This turns the engine without starting.

Parameters
The function must be switched on or off.

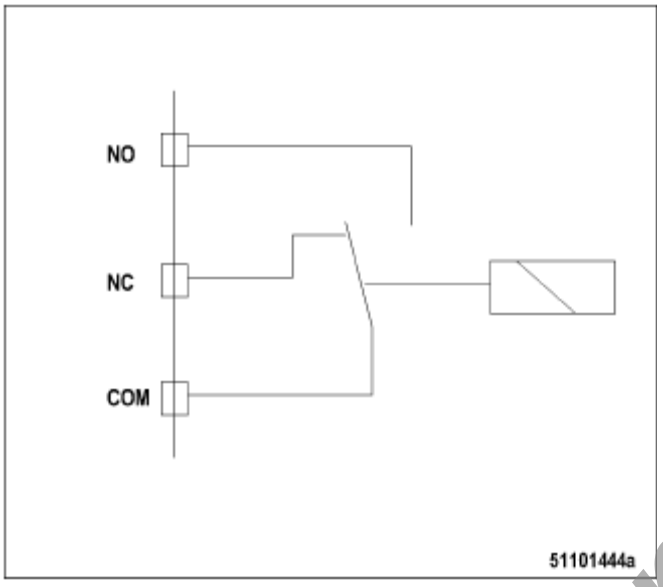
No.	Presetting	Unit	Designation	Settings
PR546	1	Digital	Manual Turning Signal Mode	0 - Manual Turning not Active 1 - Manual Turning via Binary Output Active

Unused P_IN channels
The following channels are not used:
- P_IN 1 to 6
- P_IN 8

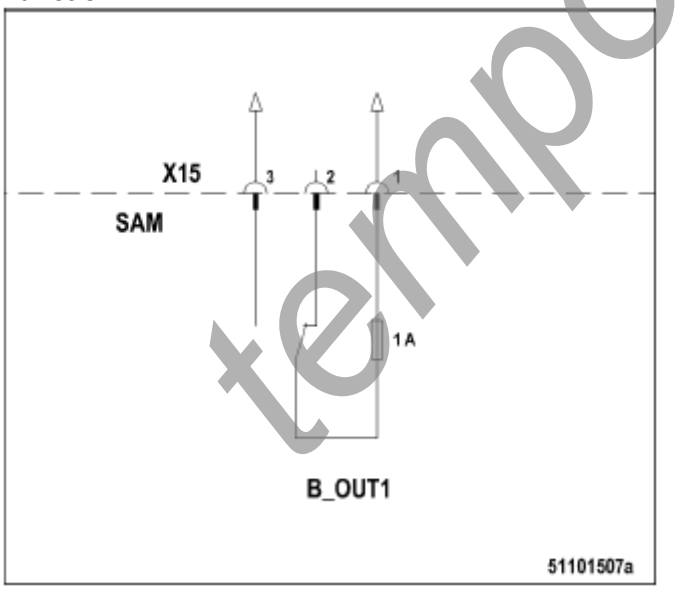
Relay outputs BR_OUT 1 ... 4
- Control of:
  - Load
- Channel specification:

- Voltage range: U < 36 V
- NO — COM — NC (changeover contact)
- Impedance “On”: R < 20 mΩ
- I_{max}: 1 A
- DC isolation: < 300 V

- Required settings:
- Reason for switching



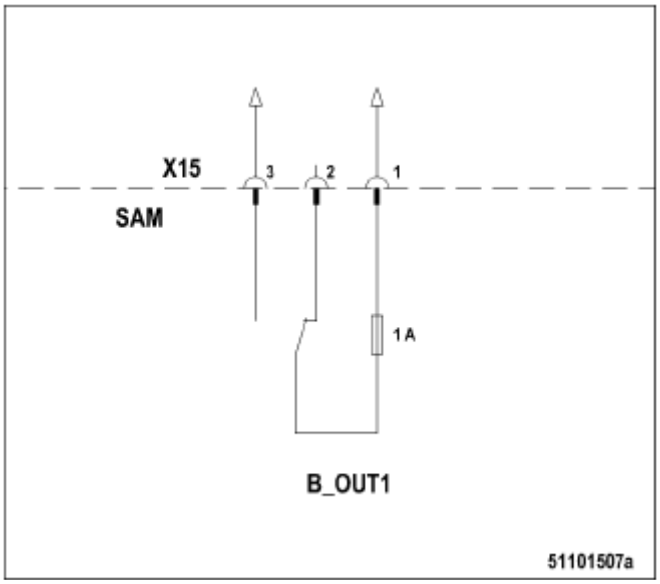
BR_OUT 1 – Oil priming pump on
Function



This output switches on the oil priming pump.

Parameters
None.

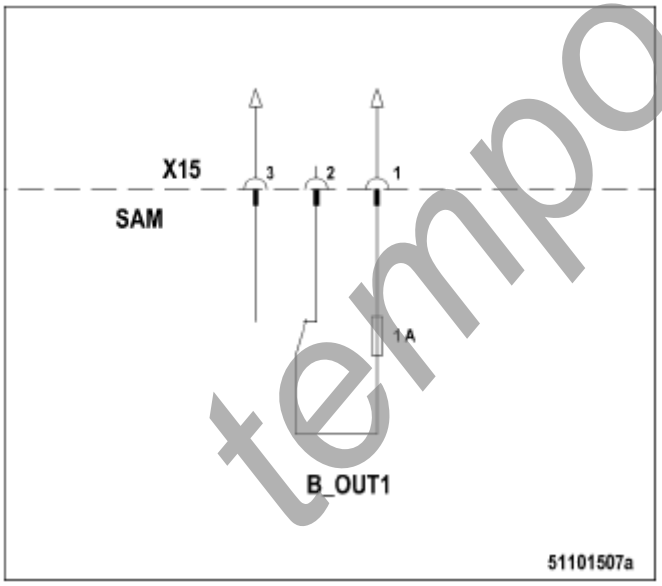
BR_OUT 2 – Fuel pump on
Function



This output switches on the fuel pump. The level at which the pump is switched on/off can be adjusted.

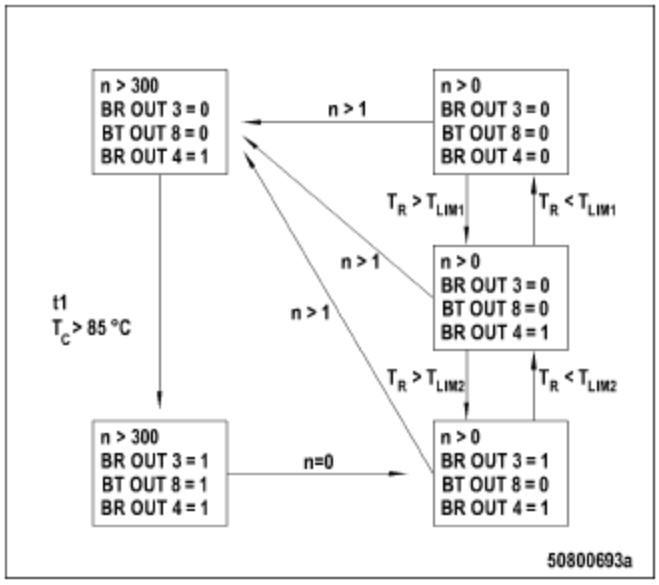
Parameters
The parameters of input A_IN_ISO3 influence the response of output (→ Page 118).

BR_OUT 3 – Fan 1 on
Function



This output switches on fan 1. It is also possible to control the louvers (BR-OUT 4). The schematic illustrates activation of the three outputs associated with fan control. The abbreviations mean:

- BR_OUT 3: Fan 1
- BT_OUT 8: Fan 2
- BR_OUT 4: Louvers
- n > 1: Engine running
- n 0: Engine at a standstill
- n > 300: Engine speed above 300 rpm
- T_C: Coolant temperature
- T_R: Room temperature
- T_{LIM1} and T_{LIM2}: Limit values



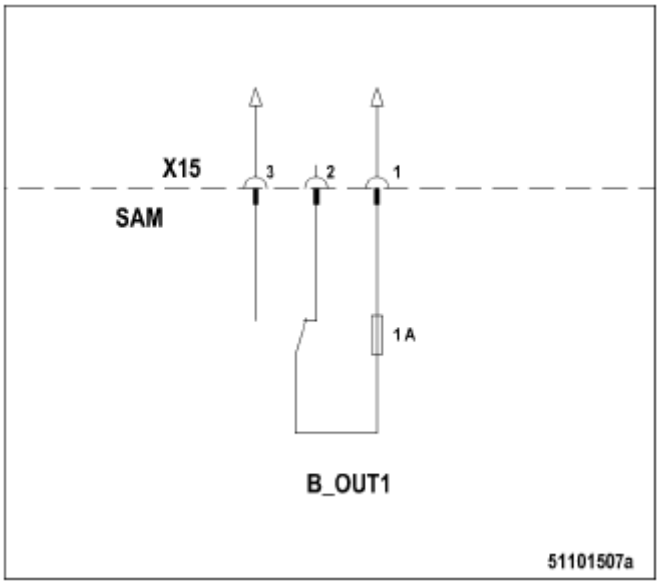
Parameters

Required settings:

- Activation of fan control
- Number of fans
- Louvers
- Hysteresis values
- Delay times
- Coolant temperature tripping value

No.	Presetting	Unit	Designation	Settings
PR150	0	Binary	Fan Control Activation	0 - Fan1 and Shutter are controlled, 1 - Fan Control Enable
PR151	0	Binary	Fan Control Mode Select	1 - Fan1+2 and Shutter are controlled
PR152	120	s	Fan Control Delay Time	Fan Control Delay Time After Engine Start in Seconds
PR154	32	DegC	Fan Control Temperature Level 2	Fan Control Temperature Level for Switch On FAN 1
PR156	3	DegC	Fan Control Temp. Hysteresis 2	Fan Control Temp. Hysteresis for Switch Off FAN 1
PR157	85	DegC	Fan Control T-Coolant Level	T-Coolant Level for Switch Off FAN(s) after Engine Start

BR_OUT 4 – Louvers open/closed
Function



This output controls the louvers. See also .

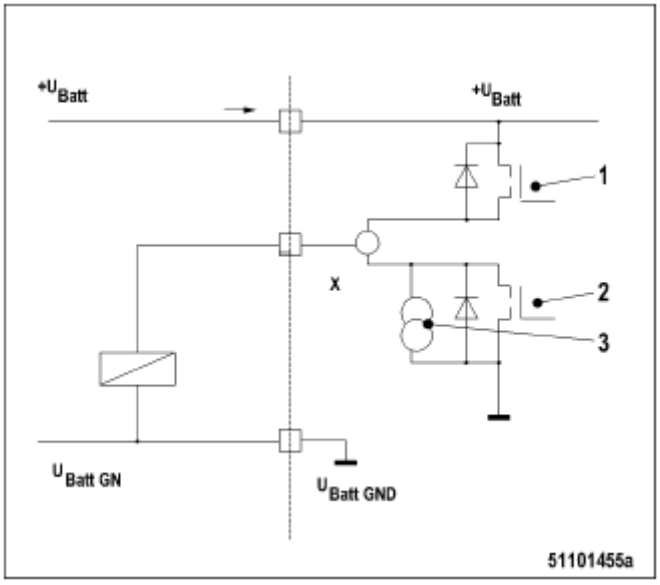
Parameters
Required settings:

- Coolant temperature tripping value
- Hysteresis values

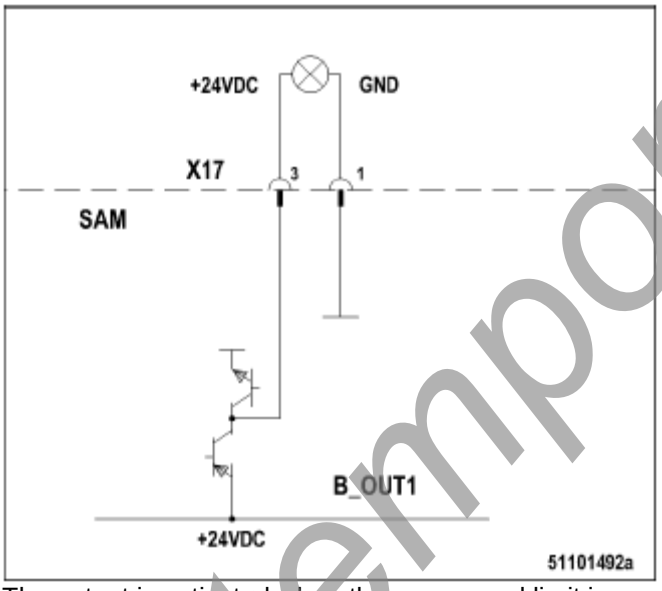
No.	Presetting	Unit	Designation	Settings
PR153	28	DegC	Fan Control Temperature Level 1	Fan Control Temperature Level for Open Shutters
PR155	3	DegC	Fan Control Temp. Hysteresis 1	Fan Control Temp. Hysteresis for Close Shutters

Binary transistor outputs BT_OUT 1 ... 20

- Control of:
  - Loads
- Channel specification:
  - I_{max}: 0.5 A
  - I_{max} when channel switched off: 50 ... 150 µA
  - High active
  - DC isolation: No
  - Short-circuit protection: Yes
- Required settings:
  - System response
- Schematic circuit diagram:



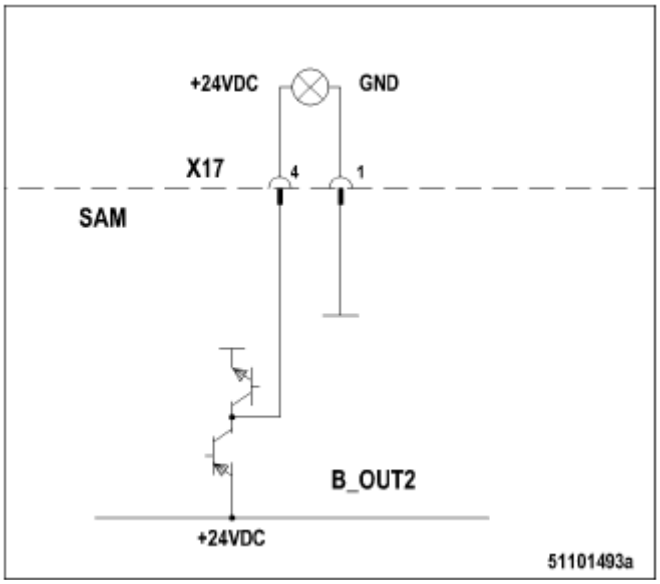
BT_OUT 1 – Over speed
Function



The output is activated when the over speed limit is exceeded.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the
engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

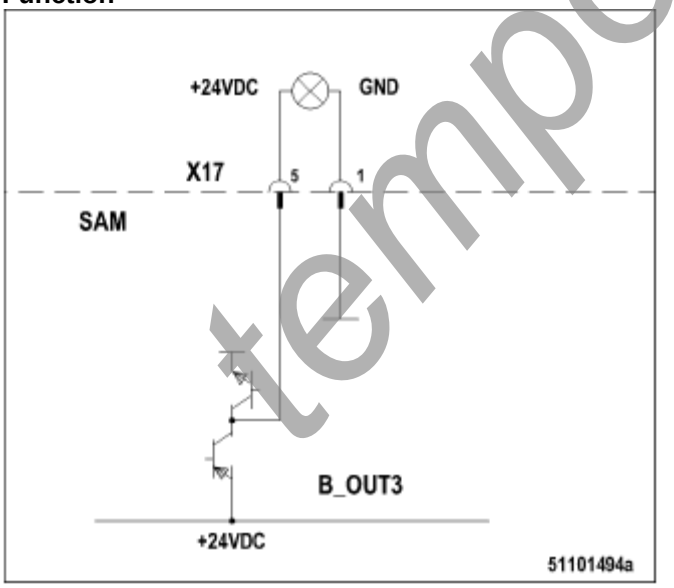
BT_OUT 2 – Coolant temperature too high
Function



The output is activated when the coolant temperature has violated the first limit value.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

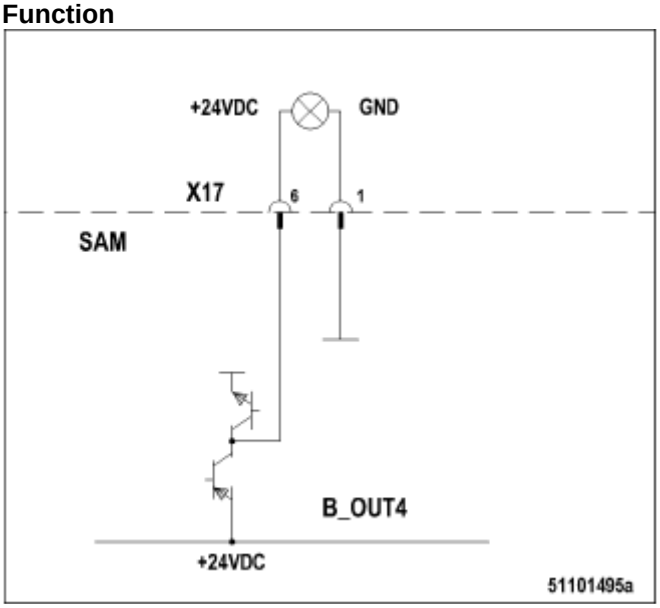
BT_OUT 3 – Coolant temperature too high — Engine stop
Function



The output is activated when the coolant temperature has violated the second limit value thus leading to engine shutdown.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

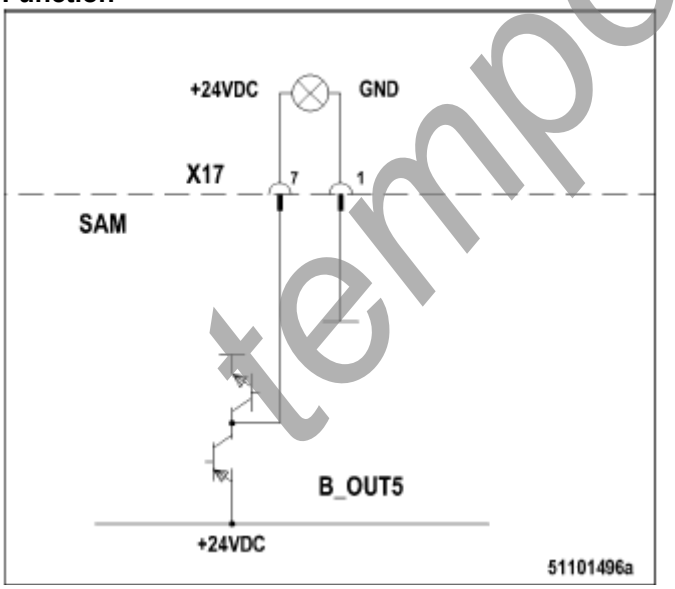
BT_OUT 4 – Charge-air temperature too high
Function



The output is activated when the charge-air temperature has violated the first limit value.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

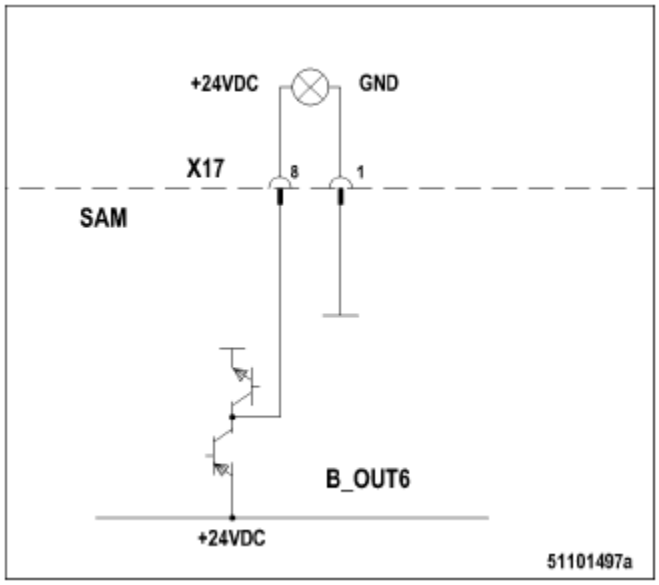
BT_OUT 5 – Charge-air temperature too high
Function



The output is activated when the charge-air temperature has violated the second limit value.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

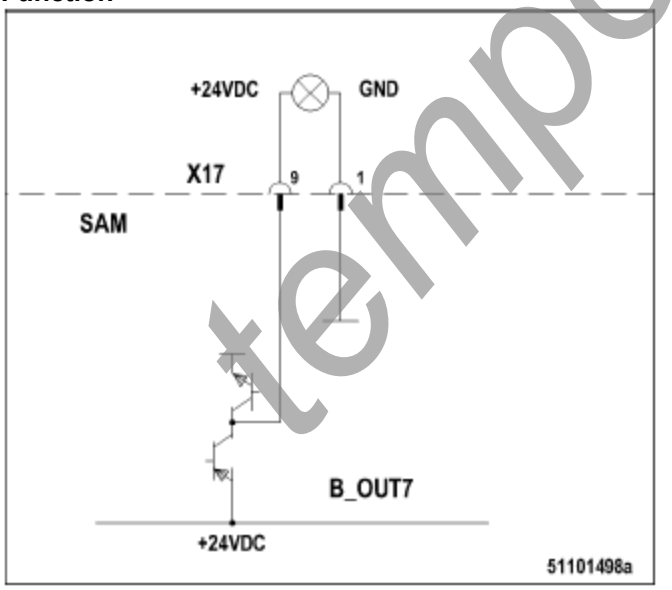
BT_OUT 6 – Charge-air coolant level too low
Function



The output is activated when the charge-air coolant level is too low thus leading to engine shutdown. This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

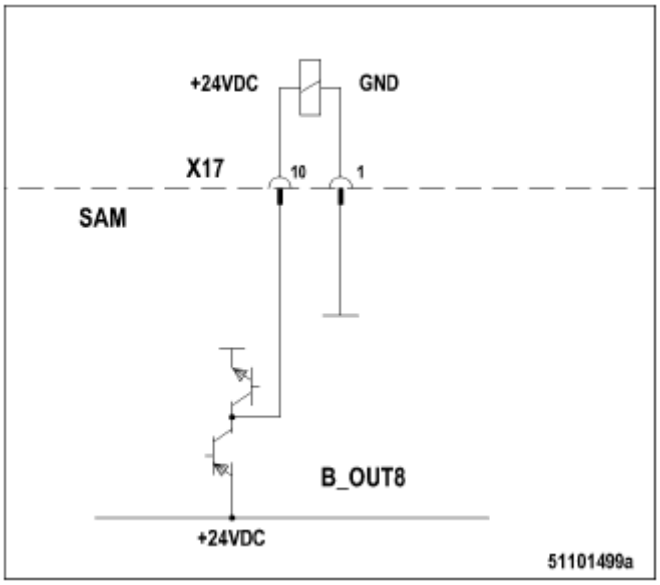
BT_OUT 7 – Coolant level too low
Function



The output is activated when the coolant level is too low thus leading to engine shutdown.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

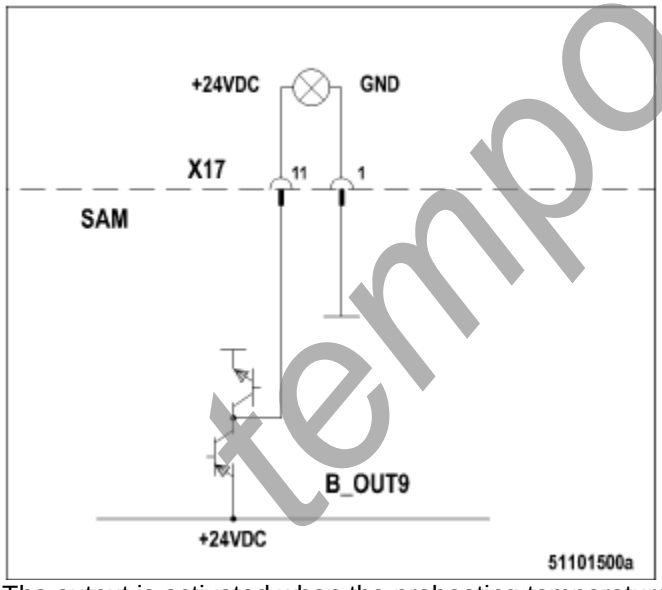
BT_OUT 8 – Fan 2 on
Function



The output is used to control a second fan. See also .

Parameters
This output is influenced by the parameters of output BR_OUT3 (see (→ Page 158)).

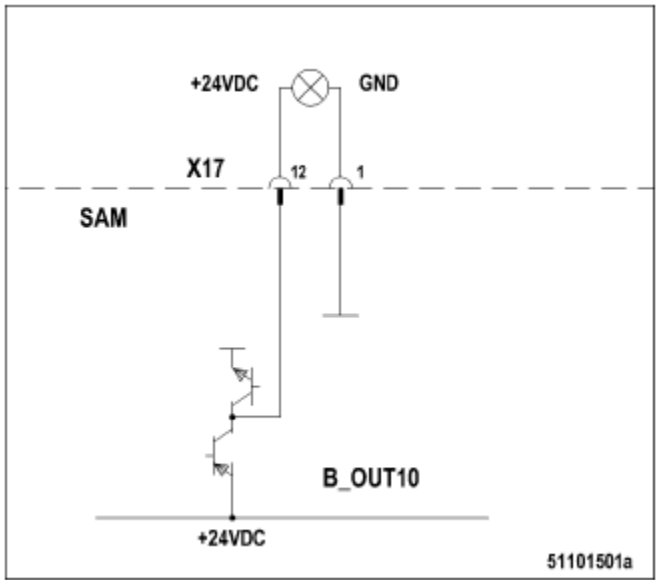
BT_OUT 9 – Preheating temperature not reached
Function



The output is activated when the preheating temperature has not been reached within the specified time.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

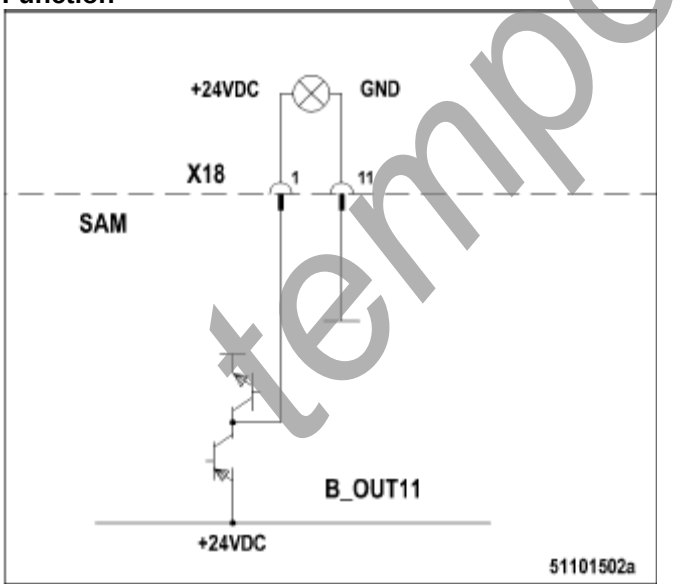
BT_OUT 10 – Lube oil pressure too low
Function



The output is activated when the lube oil pressure has fallen below the first limit value.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

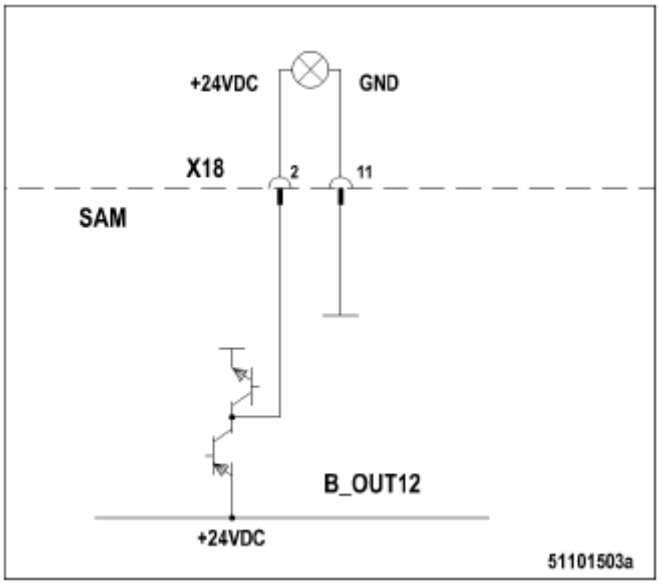
BT_OUT 11 – Engine running
Function



The output is activated when the engine speed is above 300 rpm.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

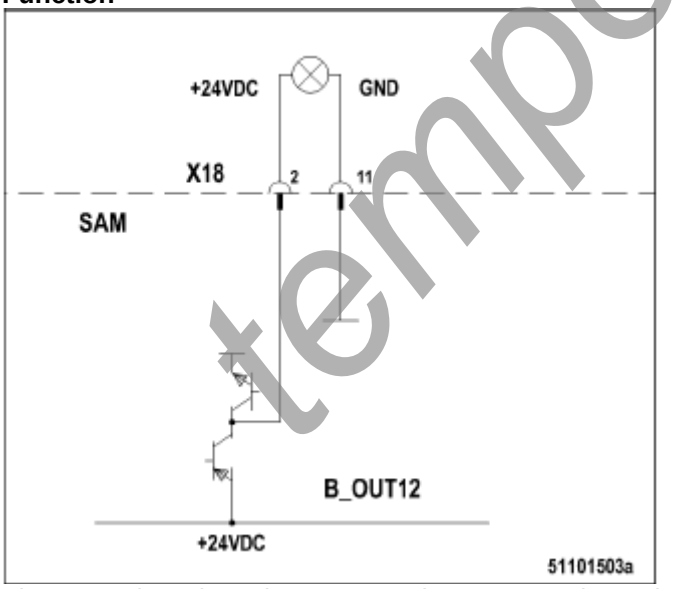
BT_OUT 12 – Fuel pressure too low — Alarm
Function



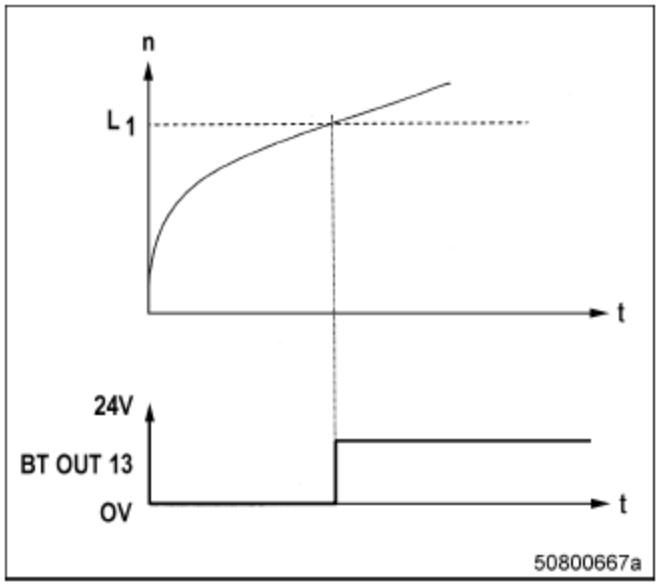
The output is activated if the fuel pressure is below the second limit value.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
None.

BT_OUT 13 – Load acceptance ready
Function

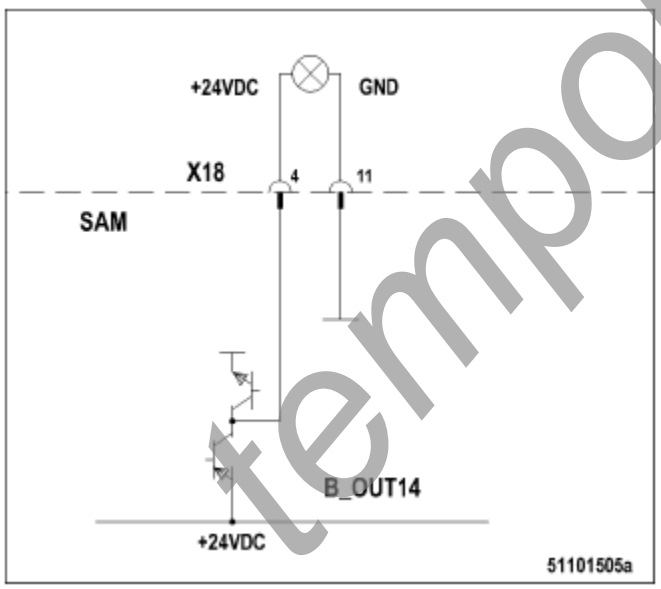


The output is activated as soon as the generator is ready for load (speed limit value exceeded).



Parameters
Limit values for ON and OFF must be specified.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

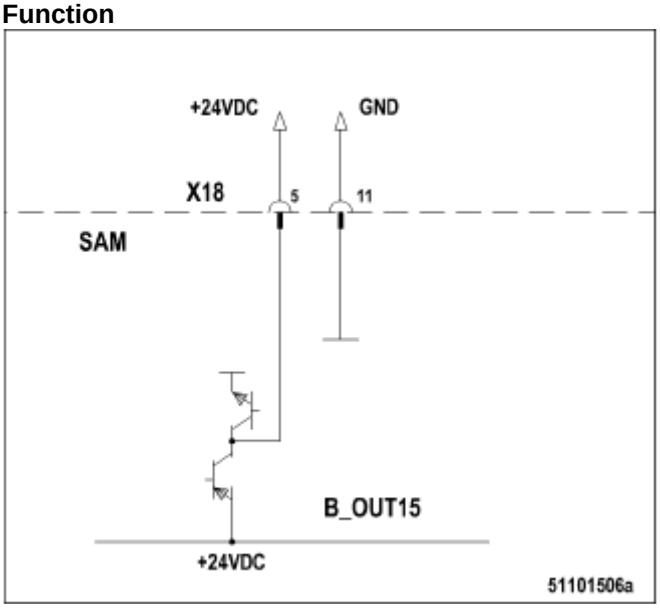
BT_OUT 14 – Priming pressure reached
Function



The output is activated as soon as the priming pressure has been reached.
This function is monitored/controlled by the engine governor. The necessary settings must therefore be made at the engine governor ((→ Page 92)). The SAM output only makes the CAN signal available at a binary output.

Parameters
CAN parameter, must be set in engine governor.

BT_OUT 15 – Generator overtemperature
Function

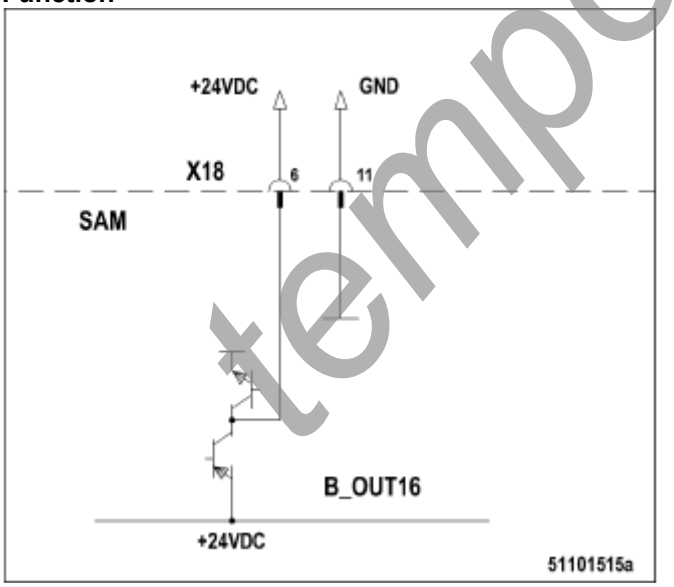


The output is activated when one of the generator windings is too hot.

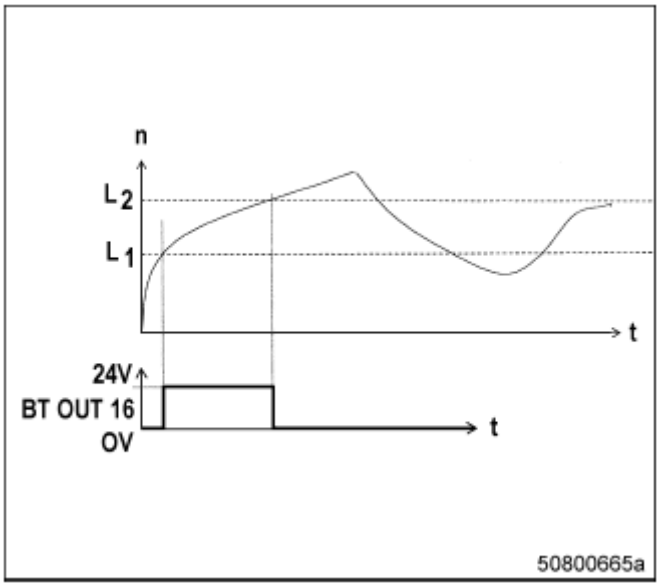
Parameters
None. Limit values and response: See:

- A_IN5: (→ Page 147)
- A_IN6: (→ Page 149)
- A_IN7: (→ Page 151)

BT_OUT 16 – Exciter boosting on
Function



The output is activated to switch on exciter boosting for generator runup (control signal only, a booster must be connected to switch the load). This signal is only output once following engine start when the engine speed is between the two values L1 and L2. Can only be re-triggered after prior detection of the “engine stopped” signal.

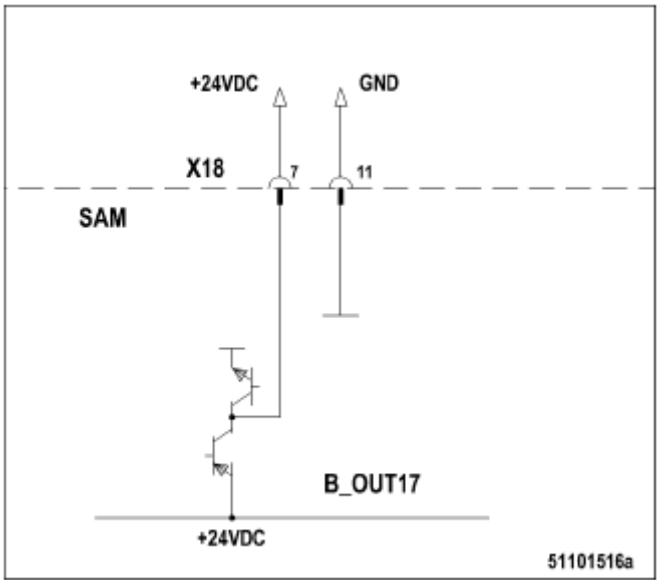


Parameters
Required settings:

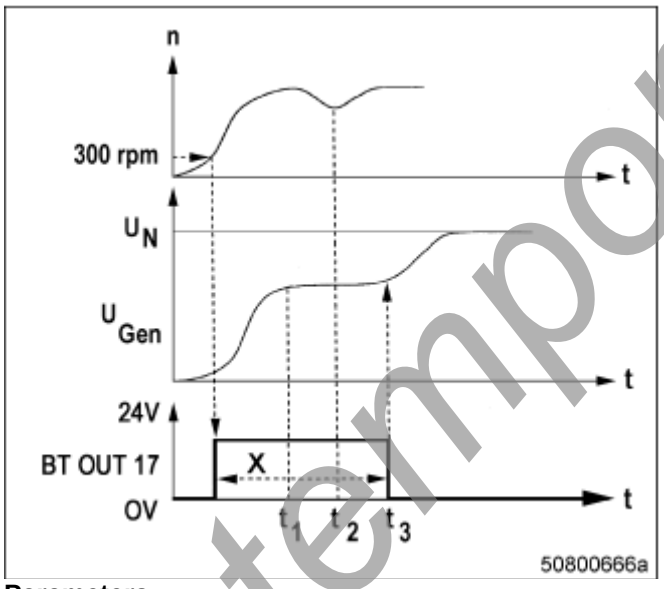
- Activation of the function
- Switching thresholds at which the signal is switched on/off

No.	Presetting	Unit	Designation	Settings
PR201	0	Binary	Subsidiary Excitation Funct. ON	0 - Subsidiary Excitation Function is Deactivated 1 - Subsidiary Excitation Function is Activated
PR202	600	rpm	Subsidiary Excitation Level ON	Engine Speed Level for Switch On Subsidiary Excitation
PR203	1480	rpm	Subsidiary Excitation Level OFF	Engine Speed Level for Switch Off Subsidiary Excitation

BT_OUT 17 – Generator voltage
Function



This signal is only output once following engine start when the engine speed is above a configurable value and the generator voltage has not yet reached the nominal voltage U_N. Can only be re-triggered after prior detection of the “engine stopped” signal.



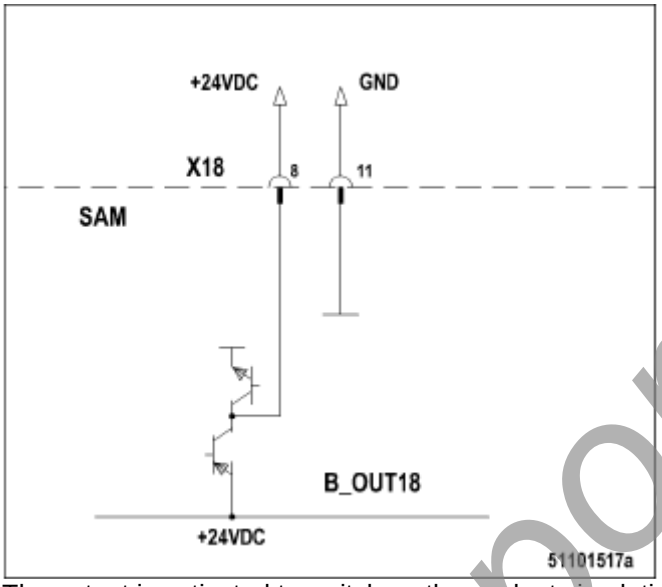
Parameters
Required settings:

- Activate function
- Time X

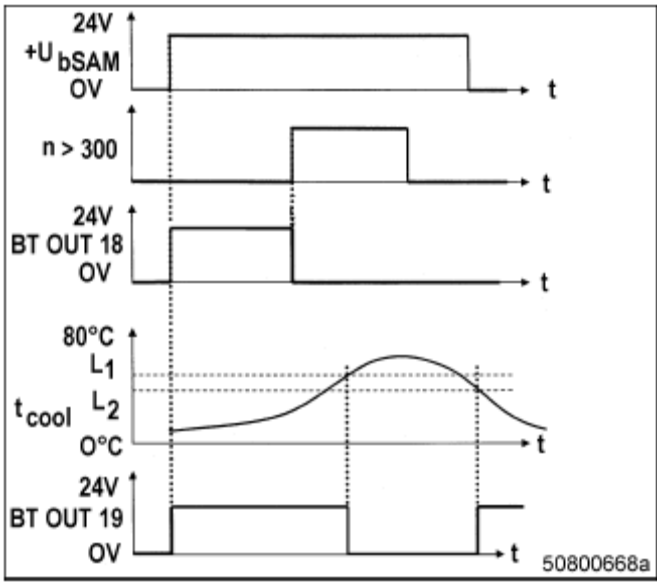
- Speed switching threshold

No.	Presetting	Unit	Designation	Settings
PR205	0	Binary	Generator Voltage Function ON	0 - Generator Voltage Function is Deactivated 1 - Generator Voltage Function is Activated
PR206	20	s	Generator Voltage Time OFF	Time for Switch Off Generator Voltage
PR207	300	rpm	Generator Voltage Level ON	Engine Speed Level for Switch On Generator Voltage

BT_OUT 18 – Circulating pump on
Function



The output is activated to switch on the coolant circulating pump (preheating). This is effected as soon as SAM is connected to operating voltage and the engine is at a standstill.

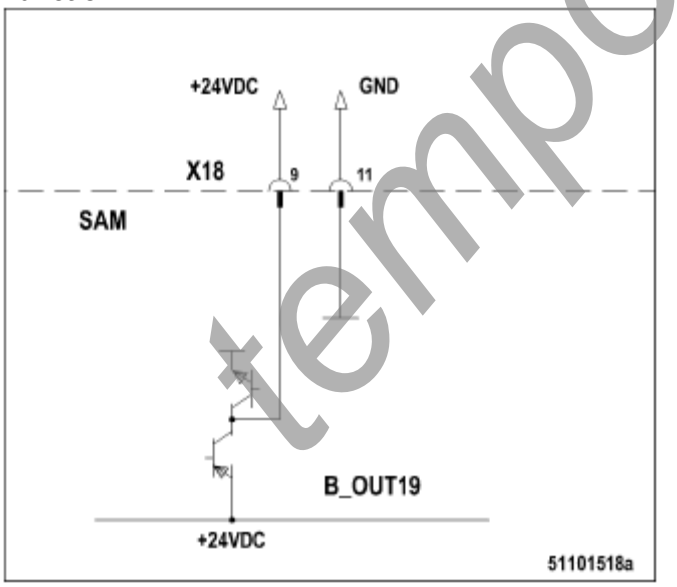


Parameters
Required settings:

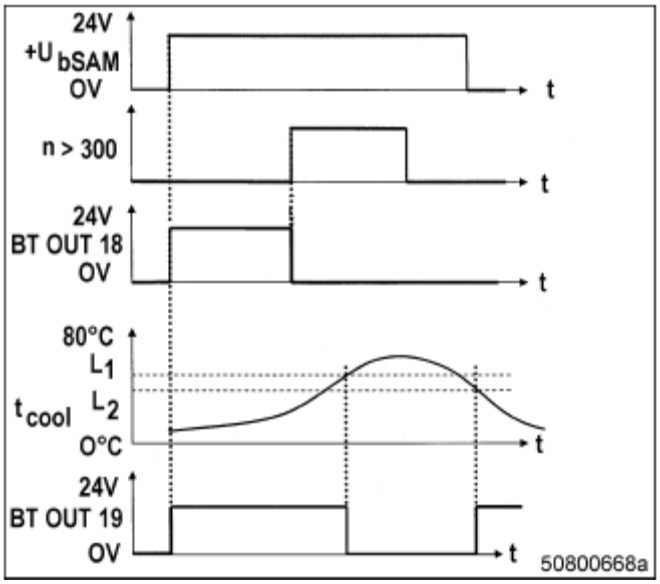
- Activate function

No.	Presetting	Unit	Designation	Settings
PR210	0	Binary	Circulation Pump Function ON	0 - Circulation Pump is Deactivated 1 - Circulation Pump is Activated

BT_OUT 19 – Anti-condensation heating on
Function



The output is activated to switch on the anti-condensation heating. This is effected as soon as the coolant temperature falls below value L2. The anti-condensation heating is switched off when the coolant temperature rises above value L1.



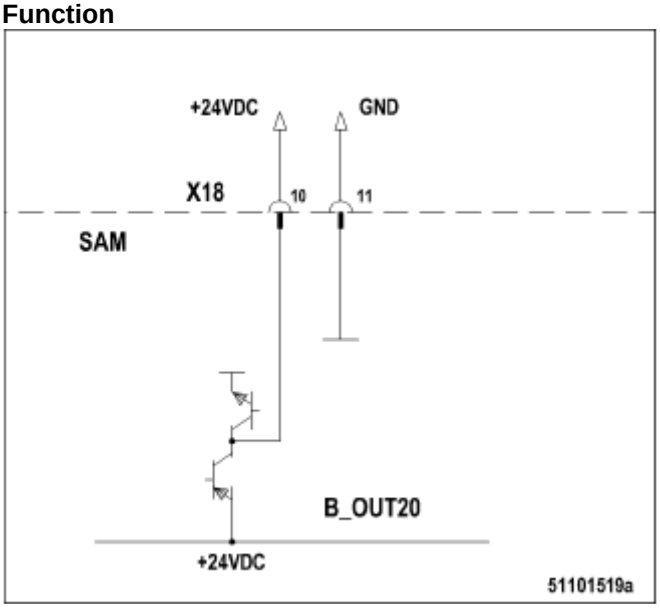
Parameters

Required settings:

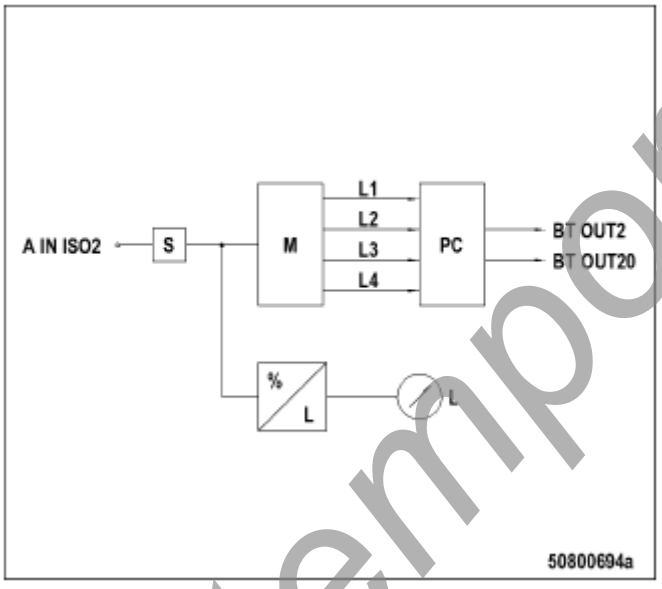
- Activate function
- Switching thresholds L1 and L2

No.	Presetting	Unit	Designation	Settings
PR211	0	Binary	Downtime Heating Function ON	0 - Downtime Heating is Deactivated 1 - Downtime Heating is Activated
PR212	40	DegC	Downtime Heating Temp. ON	Coolant Temperature Level for Switch On Downtime Heating
PR213	45	DegC	Downtime Heating Temp. OFF	Coolant Temperature Level for Switch Off Downtime Heating

BT_OUT 20 – Day tank below minimum — Alarm
Function



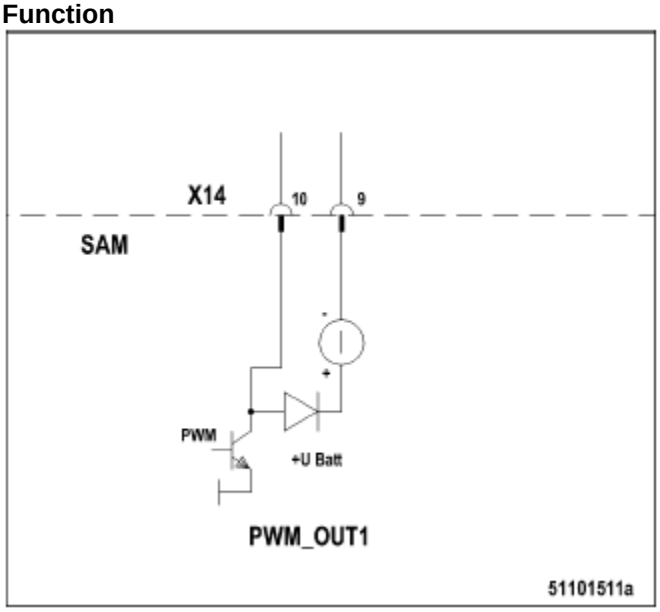
The output is activated when the fuel level in the day tank falls below the limit value.



Parameters
This output is influenced by the parameters of output A_IN_ISO3 (see (→ Page 118)).

Pulse-width-modulated outputs PWM_OUT 1 ... 2

PWM_OUT 1 — Fan control 1
Function



This output is used to control a pulse-width-modulated fan (fan 2).

Parameters
Required settings:

- Activation of the function
- Frequency
- Delay times

- Curves

No.	Presetting	Unit	Designation	Settings
PR040	3	Digital	Config PWM_OUT1	0 - Output is Deactivated 1 - PWM Output 2 - Binary Output 3 - PWM Current Output
PR041	250	Hz	Frequency PWM_OUT1	Frequency PWM_OUT1 in Hz
PR0041	250	Hz	Frequency PWM_OUT1	Frequency PWM_OUT1
PR160	0	%	Curve Fan Control Fan 3	Conversion of Rockford Fan Control Signal - IN: 0-100%
PR161	10	s	T-Delay WB Fan Control Fan 3	Delay Time for Wire Break Detection Fan 3.
PR162	0	Binary	PWM Output FAN 3 ON	0 - PWM Output FAN 3 is Deactivated 1 - PWM Output FAN 3 is Activated
PR163	0	%	WB Fan Detection Limit	Current difference in % for WB detection in reference to the actual current demand.

Unused PWM_OUT outputs
Output PWM_OUT 2 is not used.

Serial interfaces

RS232/RS422
This interface is not used at present.

Ethernet
This interface is used to connect a PC to use the Web function to display the ADEC Web page. In future applications this will make it possible to connect a modem for remote diagnosis.

7 Initial operation

7.1 SAM power supply – Check

Preconditions

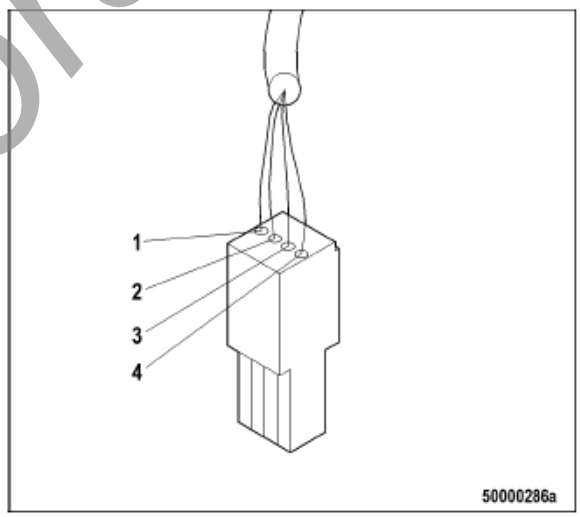
• Supply voltage is available.

Special tools

Designation / Use	Part No.	Qty.
Multimeter	0005362539	1
Test prod, red	0005385230	2
Test prod, black	0005385130	2
Test prod, red	0005385430	2
Test prod, black	0005385330	2
Assembly tool	0005385530	3
Assembly tool	0005385630	3
Cable set	0025314380	1
Insulating bushing	0005316682	2
Insulating bushing	0005316782	2

Checking plant supply voltage

1. Switch off plant supply voltage.
2. Disconnect connector X13 from SAM.
3. Prepare the multimeter for voltage measuring:
   3.1. Plug the leads into the appropriate jacks
   3.2. Set the voltage measuring range to min. 30 V
4. Switch on plant supply voltage.
5. Measure voltage between positive pins (1 and 2) and negative pins (3 and 4) of connector X13. Specified value: Voltage must be between 19.5 V and 30 V.
   5.1. If the measured value deviates from the specification, check plant power supply.
   5.2. If no voltage is present, check wiring.
   5.3. Correct wiring if polarity is reversed, see wiring diagram.
6. Plug connector into socket X13 on SAM.



8 Settings

8.1 CAN node – Configuration

Devices with CAN connection

The following devices are equipped with a CAN interface and are therefore defined by a CAN node:

- Engine governor
- SAM
- DIS 10 (if applicable)

Node numbers

Each node number can only be allocated once on a given bus.

Device	Node number
Engine governor	2
SAM	5
DIS 10 (option)	4

Transmitting new parameters to the device

Note: The parameters are written into different types of memory depending on the device concerned. The following applies:

- Active: Parameters are written into the device RAM. This means that these parameters are only used in currently running operations, the original values are restored when the device is switched off.
- Start value: The data is written into the read-only memory and loaded on switching off and back on again.
- Backup: Some devices have a second read-only memory for redundant parameter storage. Data in the second read-only memory (backup memory) may vary from the data in the first read-only memory in this case. Data must therefore be saved separately.

1. For engine governor: Send data to engine governor.
   Result: All parameters are updated.
2. For SAM:
   2.1. Send data SAM.
   Result: All parameters goe to the device.
   2.2. Accept data as: “Active”
   Result: All parameters are written into the RAM.
   2.3. Accept data as: “Start value”.
   Result: All parameters are written into the read-only memory.
   2.4. Accept data as: “Backup”.
   Result: All parameters are written into the second read-only memory (backup memory).

8.2 SAM MINIDIALOG settings

Preconditions

• Operating voltage is available.

Enter password (contact Service)

Setting the engine type

1. Press key ↑ or ↓ on SAM 2 repeatedly until “Select Parameter page” appears on the display.
2. Press the ENTER key.
   Result: The engine model is displayed in the second line.
3. Press key ↑ or ↓ on printed circuit board SAB 2 repeatedly until the desired engine model is displayed.
   Possible values:

No	Designation
1	New: Eng. Type not defined
2	12 V 2000 G 25
3	12 V 2000 G 45
4	12 V 2000 G 65
5	12 V 2000 G 85
6	16 V 2000 G 25
7	16 V 2000 G 45
8	16 V 2000 G 65
9	16 V 2000 G 85
10	18 V 2000 G 65
11	18 V 2000 G 85
12	12 V 4000 G 23
13	12 V 4000 G 43
14	12 V 4000 G 63
15	12 V 4000 G 83
16	16 V 4000 G 23
17	16 V 4000 G 43
18	16 V 4000 G 63
19	16 V 4000 G 83
20	20 V 4000 G 23
21	20 V 4000 G 43
22	20 V 4000 G 63
23	20 V 4000 G 63 L
24	20 V 4000 G 83
25	20 V 4000 G 83 L

4. Press the ENTER key.
   Result: The engine model selected is displayed, e.g.: 20 V 4000 G 24 is display
5. Press the ENTER key until “Save Changes? Exit-Yes” is displayed, confirm with Yes (Enter).

Setting the display start page

1. Press key ↑ or ↓ on SAM 2 repeatedly until “Select Parameter page” appears on the display.
2. Press the ENTER key.
   Result: The engine model is displayed in the second line.
3. Press key ↑ or ↓ on SAM 2 repeatedly until “Display Start Page” appears on the display. The page presently set is displayed in the second line.
4. Press the ENTER key.
   Result: The page presently set is displayed in the second line.
5. Set the desired page with keys ↑ or ↓ on SAM 2 as follows:
   - ECU Overview
   - ECU Pressure
   - ECUTemp.
   - AUX Page
6. Press the ENTER key.

Note: After completing all settings, proceed with step 7.

7. Press the ENTER key until “Save Changes? Exit-Yes” is displayed, confirm with Yes (Enter).

Setting the interface

1. Press key ↑ or ↓ on SAM 2 repeatedly until “Select Parameter page” appears on the display.
2. Press the ENTER key.
   Result: The engine model is displayed in the second line.
3. Press key ↑ or ↓ on SAM 2 repeatedly until “Interface Configuration” appears on the display.
4. Press the ENTER key.
   Result: The value presently set is displayed in the second line.
5. Use key ↑ or ↓ on the printed circuit board SAB 2 to set the configuration. Possible values:
   - •No
   - SAE-J1939
   - CANOpen

8.3 Additional SAM parameters and options

SAM parameters – General
The following parameters are required to make basic settings in the SAM.

No.	Presetting	Unit	Designation	Settings
PR0001	1	Digital	Conf. SAM Alarm Page Line1	Bit-coded Value: Bit 0: 1, no 2. Line in Initial Page Bit 1: 1, no 2. Line in Service Page Bit 2: 1, no ECU Error Code Text in Initial Page Bit 3: 1, no ECU Error Code in Service Page Bit 4: 1, no AI Prio in Initial Page Bit 5: 1, no AI Prio Service
PR0002	1	Digital	Conf. SAM Alarm Page Line2	Bit-coded Value: Bit 0: 1, no 2. Line in Initial Page, Bit 1: 1, no 2. Line in Service Page Bit 2: 1, no ECU Error Code Text in Initial Page Bit 3: 1, no ECU Error Code in Service Page Bit 4: 1, no AI Prio in Initial Page Bit 5: 1, no AI Prio Service
PR0003	1	Digital	Select Initial Page	1, Alarm Page 2, Error Page
PR0004	2	Digital	Select Change to Service Page	1, Press ESC 2, Press ESC & ENTER (5s)
PR0005	300	s	Time Back to Initial Page	Time Back to Initial Page in Seconds
PR0006	300	s	Time Back to Alarm Auto Disp	Time Back to Alarm Auto Disp in Seconds
PR0007	3	s	Time Next Alarm	Time Next Alarm in Seconds
PR0008	1	s	Time Next Alarm After Scroll	Time Next Alarm After Scroll in Seconds
PR0009	2	Digital	Clear Alarm Page	Bit-coded Value: Bit 0: 1 Page "Clear Alarm Page" existing Bit 1: 1 "Clear Alarm Page" in restricted Area

SAM parameters – System extension
Additional parameters must be set depending on which SAM channels are assigned and whether extension slots are assigned:

No.	Presetting	Unit	Designation	Settings
PR0020	0	Digital	Channel Deactivation C1-16	Bit-coded Value which deactivates SAM Channels 1..16 . Setting the Bit inverts present Channel Deactivation.
PR0021	0	Digital	Channel Deactivation C17-32	Bit-coded Value which deactivates SAM Channels 17..32 . Setting the Bit inverts present Channel Deactivation.
PR0022	0	Digital	Channel Deactivation C33-48	Bit-coded Value which deactivates SAM Channels 33..48 . Setting the Bit inverts present Channel Deactivation.
PR0023	0	Digital	Channel Deactivation C49-64	Bit-coded Value which deactivates SAM Channels 49..64 . Setting the Bit inverts present Channel Deactivation.
PR0024	0	Digital	Channel Deactivation C65-80	Bit-coded Value which deactivates SAM Channels 65..80 . Setting the Bit inverts present Channel Deactivation.
PR0025	0	Digital	Channel Deactivation C81-96	Bit-coded Value which deactivates SAM Channels 81..96 . Setting the Bit inverts present Channel Deactivation.
PR0026	0	Digital	Channel Deactivation C97-112	Bit-coded Value which deactivates SAM Channels 97..112 . Setting the Bit inverts present Channel Deactivation.
PR0027	0	Digital	Channel Deactivation C113-116	Bit-coded Value which deactivates SAM Channels 113..116 . Setting the Bit inverts present Channel Deactivation.
PR0028	0	Digital	Slot 1 Channel Deactivation	Bit-coded Value which deactivates Channels 1..16 of Slot 1. Setting the Bit inverts present Channel Deactivation.
PR0029	0	Digital	Slot 2 Channel Deactivation	Bit-coded Value which deactivates Channels 1..16 of Slot 2. Setting the Bit inverts present Channel Deactivation.
PR0030	0	Digital	Slot 3 Channel Deactivation	Bit-coded Value which deactivates Channels 1..16 of Slot 3. Setting the Bit inverts present Channel Deactivation.

Parameters for monitoring

The following parameters must be set for node monitoring and suppressing system faults:

No.	Presetting	Unit	Designation	Settings
PR031	2	Digital	NMT Switch Off N1-N16	Bit 0 - Node is guarded Bit 1 Node is non guarded
PR032	0	Digital	NMT Switch Off N17-N32	Bit 0 - Node is guarded Bit 1 Node is non guarded
PR033	0	Digital	ECU monitored CAN node	Bit 0 - Node is guarded Bit 1 Node is non guarded
PR035	8192	Digital	SE-Fault Suppression	Bit 0 - Failure is deactivated Bit 1 Failure is activated

Display

The following parameters are required when a display is connected:

No.	Presetting	Unit	Designation	Settings
PR080	0	Digital	Display Acknowl.Configuration	0: All Alarms are Acknowledged 1: Individual Alarms are Acknowledged
PR081	36	Digital	Display Node Number	Display Node Configuration
PR900	0	l/h	Scale End Value for Fuel Consumption Barcharts	Scale End Value for Fuel Consumption Barcharts on the Display. Used when <> 0

Miscellaneous

No.	Presetting	Unit	Designation	Settings
PR042	8	Digital	Trolling Gov Para 1 PWM_OUT1	Trolling Parameter
PR043	8	Digital	Trolling Gov Para 2 PWM_OUT1	Trolling Parameter
PR044	100000	Digital	Trolling Gov Para 3 PWM_OUT1	Trolling Parameter
PR045	100000	Digital	Config BT_OUT7	=0 - Output is Deactivated
				=1 - PWM Output
				=2 - No Function
				=3 - No Function
				=4 Transistor Low Side
				=5 Transistor High Side
PR046	100000	Digital	Config BT_OUT8	=0 - Output is Deactivated
				=1 - PWM Output
				=2 - No Function
				=3 - No Function

No.	Presetting	Unit	Designation	Settings
				=4 Transistor Low Side
				=5 Transistor High Side
PR090	0	s	Delay SAM Ready for Start	Delay Time for SAM Startup
PR501	0	Digital	Speed Setting Limit Mode	=0- Default Dataset ECU
				= 1 - Speed Setting Limit Signal via CANopen Active
PR510	0	Digital	Torque Demand Signal Mode	=0- Default Dataset ECU
				= 1 - Torque Demand via CANopen Active
PR520	0	Digital	Load Signal Mode	= 0 - Load Signal not Active
				= 1 - Load Signal via CANopen Active
PR530	0	Digital	Engine Start Signal Mode	=0- Default Dataset ECU
				= 1 - Additional Start Signal via CANopen Active
PR531	0	Digital	Engine Stop Signal Mode	= 0 - Default Dataset ECU
				= 1 - Additional Stop Signal via CANopen Active
PR532	0	Digital	Alarm Reset Mode	= 0 - Default Dataset ECU
				= 1 - Additional Alarm Reset Signal via CANopen Active
PR534	0	Digital	Override Signal Mode	= 0 - Default Dataset ECU
				= 1- Additional Override Signal via CANopen Active
PR535	0	Digital	Switch 50/60Hz Mode	= 0 - Switch 50/60Hz not Active
				= 1- Switch 50/60Hz via Binary Input Active
				= 2- Switch 50/60Hz via CANopen Active
PR536	0	Digital	Monitored Nodes Signal Mode	= 0 - Default Dataset ECU
				= 1- Demand Monitored Nodes Signal via CANopen Active
PR537	0	Digital	Droop 2 Signal Mode	= 0 - Default Dataset ECU
				= 1- Droop 2 Signal via CANopen Active
PR542	1	Digital	Test Over speed Signal Mode	= 0 - Default Dataset ECU
				= 1 - Test Over speed Signal via Binary Input Active
				= 2 - Test Over speed Signal via CANopen Active
				= 3 - Test Over speed Signal via CANopen or Binary Input Active