Continental
The Future in Motion

Continental Engineering Services

CES Motorsport – RSX ABS Kit

Technical Outline

Continental Continental Engineering Services

1. Vehicle Description

The following list shows the vehicle environment the RSX ABS Kit should be used in. The persons/entity who is conducting the integration of the RSX ABS into the vehicle is solely responsible for the overall vehicle braking system definition, performance, and durability.

- Race/track car (no public road usage)
- Compatible with rear-wheel drive, front-wheel drive or all-wheel drive vehicles
- Hydraulic brake system:
  - Front/rear hydraulic brake circuit split only
  - Compatible with a tandem master cylinder or two individual master cylinders (front/rear) incorporated into a pedal box assembly with brake balance bar
  - The volume consumption of the hydraulic system (including calipers, hydraulic pipes, flex lines, etc.) must not exceed the values of 34mm³/bar on the front axle and 15mm³/bar on the rear axle
  - The maximum brake pressures to enter ABS control (wheel locking pressures) must not exceed 100 bar
- maximum speed: 320 kph

2. Content of the CES RSX ABS Kit

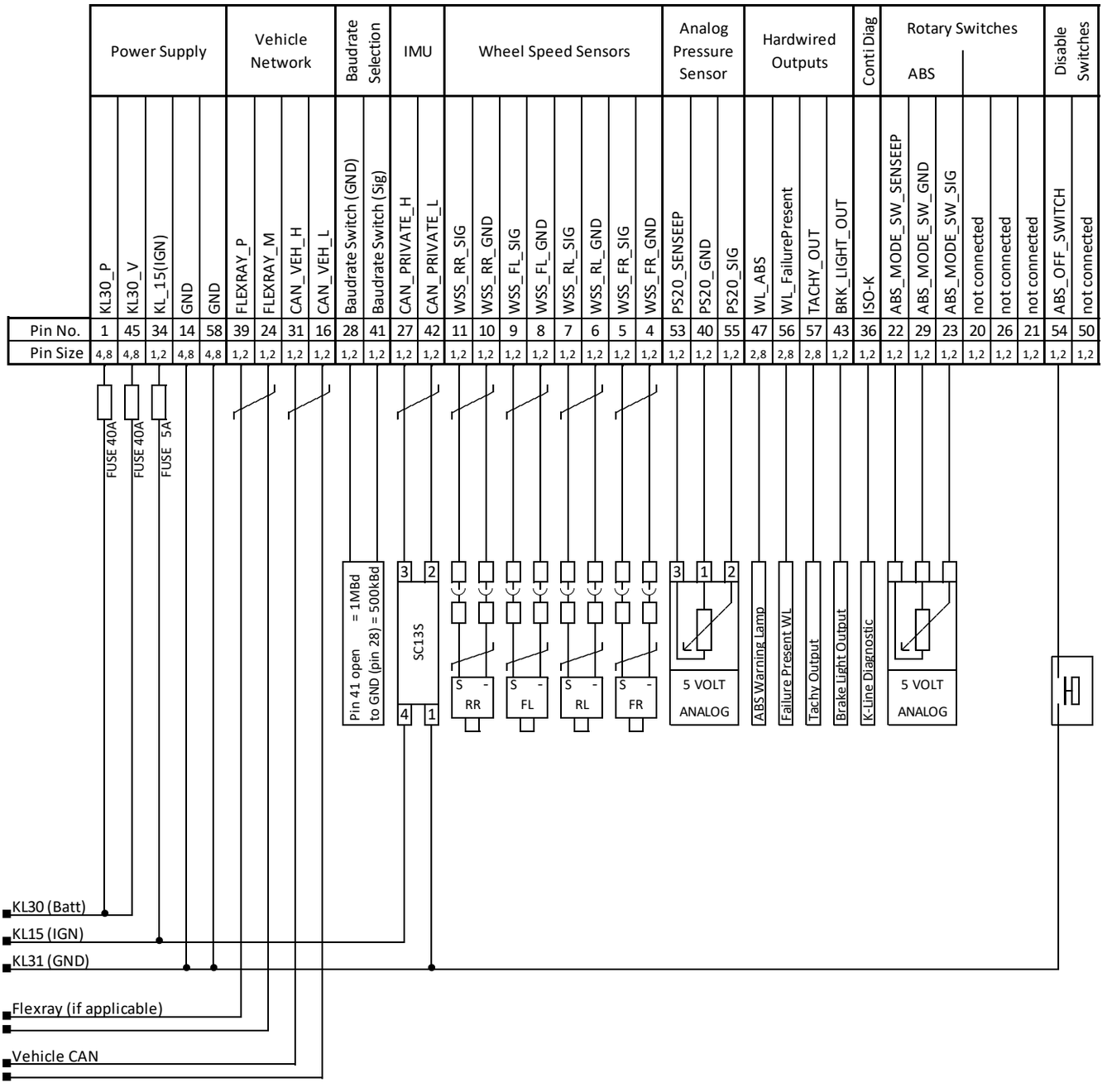
- RSX ABS HECU (see chapter 3)
- IMU – Inertial Measurement Unit (see chapter 4)
- External Pressure sensor (see chapter 5)
- Rotary switches (see chapter 6)
- Connectors (see chapter 7)
- Diagnostic CAN Interface (see chapter 8)

3. Electronic Brake System

3.1. Hardware

- Continental Mk100 HECU
  - Reference no.: 3-75000-013
  - Weight: 1.990g
- HCU (Hydraulic Control Unit)
  - Internal pressure sensor for front axle master cylinder pressure measurement
    - External pressure sensor for rear axle master cylinder pressure measurement
  - Delivered pre-filled
    - No complex fill & bleed procedure necessary
    - Conventional bleeding of the brake system is sufficient
- ECU (Electronic Control Unit)
  - 58-pos TE MCon connector

Electrical diagram (ABS only)



3.2. Software Functions

- RABS – Racing Anti-lock Braking System

Continental Engineering Services' RSX Racing ABS assures maximum performance under racing conditions. The RABS is based on the newest generation of ABS. This new software approach provides the best braking performance in-class, outperforming our competitors, especially on bumpy courses such as the Nürburgring Nordschleife.
Only using eight valves (inlet & outlet) in the hydraulic control unit, it can be used in racing series where the regulation prohibits the usage of side slip control systems and only permits ABS (e.g., GT3). If only ABS is activated, the unit can be provided with an FIA seal that allows application for these kinds of FIA racing series.

- ABS Mode Switch

The RSX ABS offers the possibility to select different ABS modes. They can either be switched by a hardwired switch, or a defined CAN interface.

The RSX ABS provides two times six modes: Six mode-configurations in analog valve control mode and six mode-configurations in digital valve control mode. The analog mode is recommended for gentlemen drivers, whilst the digital mode should be used by drivers braking closed to blocking pressure.

In both, analog and digital valve control mode the ABS control behavior is influenced according. With a changing focus from stability to brake performance the following ABS characteristics occur:

- The entry into ABS control is changed to a later.
- The wheel dynamics are controlled in a way where the pressure modulation provides increased feedback in the brake pedal.

For wet conditions, an earlier ABS entry & more dynamic wheel control is recommended, as these setups focus on stability.

The selection can be done by a hardwired switch or a CAN interface. For the configuration of the interface (hardwired or CAN) use the RSX Tool.

- EBD – Electronic Brake Force Distribution

The brake system layout and changing normal forces on the rear axle might not always lead to an optimal utilization of the friction level. Hence, an overbraked rear axle can be the result, with negative impacts in the vehicle stability.
EBD prevents from under- as well as overbrake of the rear wheels, by adapting the brake force of the rear wheels on those of the front wheels.

For racing purposes, a slightly overbraked rear axle can increase the drivers feeling of the vehicle agility when braking into corners. Therefore, tuning options are provided in the RSX Tool

3.3. Possible Configurations (via RSX Tool*)

- Powertrain
  - FWD or RWD
- Gearbox
  - Automatic (torque converter), DSG or Manual
- Vehicle Geometry
  - Wheelbase, Track Width, Axle Loads, etc.
- Mounting Position of IMU
  - 0° or 180°
- CAN Baudrate
  - 500kBaud or 1MBaud
- Steering Wheel Angle Sensor Information (optional)
  - Custom SWA sensor or Bourns® Automotive SWA sensor, on vehicle CAN or IMU CAN
- Tire circumferences to be received via CAN
  - Applicable or not applicable
- Each wheel speed sensor individually
  - 2-Level or 3-Level (direction sensing)
- mode switch (ABS) and function-off-switch (ABS) individually
  - Hardwired, via CAN or not applicable
- ABS & EBD Tuning
  - adjust the ABS and EBD control functions according to the track conditions and driver preferences
- Diagnostics
  - Read & Clear Failures, see detailed description of the Diagnostic Failure Code

(* the RSX Tool is provided in addition to the RSX ABS Kit)

3.4. Hardwired Interfaces

Some of the hardwired interfaces need not to be used at all or alternative CAN signals can be used instead.

- 4x Wheel speed sensor
  - Active type WSS, 2-Level or 3-Level
  - Sensors are not included
- 1x External pressure sensor
  - For rear axle master cylinder pressure measurement
- Function mode switches (hardwired)
  - Selection of 10 modes (max. stability … max. performance) for ABS
- Function-off-switches independent of selected mode (hardwired)
  - ABS on/off
- Further hardwired outputs
  - Warning Lamps for ABS
  - Tachometer speed
  - Brake light activation (e.g., as information for other ECUs)

3.5. CAN Interfaces

- Private CAN (500kBaud)
  - For communication with external IMU
- Vehicle CAN (Configurable 1MBaud / 500kBaud)
  - Comprehensive information on ABS status and signals
    - Wheel speeds, including direction and wheel ticks (FL, FR, RL, RR)
    - Vehicle reference Speed
    - Brake circuit pressures (Front, Rear)
    - Wheel pressures (FL, FR, RL, RR – calculated values)
    - Accelerations (X, Y, Z; -5g … +5g)
    - Angular rates (X, Y, Z; -156°/s … +156°/s)
    - Status and activation flags
    - ABS activation flags (individually for each wheel)
    - Mode selection states
    - Function disable flags
    - Warning lamps
  - Mode switch & On/Off switch, applicable instead of hardwires switches
  - Tire circumferences for front and rear axle to adjust them easily without changing the configuration
  - Standardized interface for a steering angle sensor
  - Standardized transmission interface for reading information from an auto gearbox
  - Diagnostic interface (UDS)
  - Software update via CAN
- 1x Flexray
  - Available for customer-specific adaptation

4. IMU – Inertial Measurement Unit

The Continental SC13S is a 6DOF (degrees of freedom) inertial measurement unit.

- Weight < 50g
- IP6K9K protection level according to ISO 20653
- 3x acceleration
  - X, Y and Z direction
  - Range from -59m/s² to +59m/s²
- 3x rotation rate
  - Yaw rate, roll rate and pitch rate
  - Range from -300°/s to +300°/s

5. External Pressure Sensor

The Continental PS20 pressure transducer is used to measure the pressure in the rear brake circuit in case a balance bar or similar device is fitted for adjusting brake balance. The measured pressure is used to optimize the pressure modulation on the rear wheels.

- Robust design
- IP6K9K protection level according to ISO 20653

The pressure transducer can be omitted if the front and rear circuit pressures are identical conditioned by the brake system design (e.g., tandem master cylinder).
The RSX ABS Kit includes a M12 to M10 adapter.

6. Rotary Switches

A 12-position rotary switch allows the selection of the most suitable mode for the specific vehicle under current conditions. Two switches are used to select the modes for ABS and TC/RYC independently.
Analog switches are used intentionally because of their reliable function and cost-efficiency.

- Haltech HT-010504

For switching off the control function (ABS) separate push-button switches can be used. This allows to keep the selected mode when switching off the function temporarily.

Instead of using the hardwired switches it is also possible to select the control mode and the off mode by using predefined CAN messages.

7. Connectors

The RSX ABS Kit includes all connectors to build the wiring harness according to the needs of the vehicle.
If requested, CES is also able to design and manufacture custom-designed wiring harnesses.

#	Connector	Description	Wire Size [mm²]	Parts per Kit
1	ABS	RSX HECU connector - housing		1
2	ABS	RSX HECU connector – wire cover		1
3	ABS	Pin - Size 1.2	0.5 - 0.75	35
4	ABS	Blind Plug - Size 1.2		25
5	ABS	Pin - Size 2.8	0.5 - 1.0	5
6	ABS	Wire Seal - Size 2.8		3
7	ABS	Blind Plug - Size 2.8		8
8	ABS	Pin - Size 4.8	2.5 - 4.0	6
9	ABS	Wire Seal - Size 4.8		4
10	IMU	IMU Connector Female 4 Pos		1
11	PS	IMU Connector Female 3 Pos		1
12	IMU & PS	Pin - Size 0.63	0.5 - 0.75	10
13	IMU & PS	Wire Seal - Size 0.63		7

If requested, CES is also able to design and manufacture custom-designed wiring harnesses.

8. Diagnostic CAN Hardware

The connection between the RSX Tool an the RSX ABS is established on the Vehicle CAN. To connect the User-PC with the vehicle CAN, the Diagnostic CAN Hardware is part of the delivery: PEAK – PCAN; p/n: IPEH-002021

9. RSX Vehicle Integration

Please follow the steps in the RSX Manual, that is part of the delivery.

10. Safety Disclaimer

- Based on the to date available information Continental Engineering Services has agreed with the CUSTOMER that the PRODUCT is not safety relevant.
- The CUSTOMER is responsible for a safety concept on operational context level which allows the safe operation of the PRODUCT in conjunction with its environment. This includes the correct integration of the PRODUCT according to the RASI agreement inside the technical offer.
- The CUSTOMER is responsible for the final evaluation of potential hazards and risks arising from use of the PRODUCT in the operational context. In case of modifications of the operational context of the PRODUCT, the CUSTOMER shall analyze the impact on the PRODUCT (impact analysis on item level).
- The CUSTOMER shall communicate any newly identified hazards to Continental Engineering Services.
- Continental Engineering Services reserves the right to submit a new offer factoring in the relevant technical and commercial aspects of changes becoming necessary because of newly identified hazards or because of changes of the superseding technical state of the art.
- All consequences resulting from those changes will be borne by CUSTOMER in particular but without limitation regarding the time schedule, development costs and piece price of the PRODUCT.
- Continental Engineering Services is entitled to withhold delivery of the PRODUCT if Continental Engineering Services becomes aware of any safety risks, e.g. due to insufficient hazard analysis and risk assessment on operational context level, with a lack of safety measures that were required to prevent safety risks caused by interactions between the PRODUCT and its operational context.
- Continental Engineering Services furthermore reserves the right to retract the quotation or cancel the project if the CUSTOMER changes its opinion about safety and as a consequence the PRODUCT either cannot or only with unreasonable effort be developed or manufactured in a way which ensures the safety of the PRODUCT.

11. Design Part List

POS	QUANT.	UT	PART NUMBER	DESIGNATION	NOTE	ND	*
0010	1	ST	3-75000-013	HECU MK100			
0020	1	ST	3-75000-177	INS 13S 6 DOF DemoSample			
0030	1	ST	3-75000-178	brake sensor		ND	
0040	1	ST	3-75000-179	fitting		ND	
0050	1	ST	3-75000-180	rotary switch		ND	
0060	1	ST	3-75000-181	interface PCAN-USB-Adapter		ND	
0070	1	ST	3-75000-176	cable set		ND	

RELEASE					ND = NO DRAWING IN SAP PLM			
MLC	20	CES-21100240	14.01.2022	ALT	DEPARTMENT:A HE	NOTE ISO 16016 PROTECTION NOTICE	DOKUMENT NO. 3-75000-182	
CHANGE						DESIGNATION	DOC-TYP DPM	DOC-PART 000 ND
00	00	C28	CES-21100240	14.01.2022	ALT	HECU MK100 ABS KIT	WEIGHT WEIGHED (G): CALCULATED(G):	SHEET 1 OF 1
RV	DV	REL	NOTICE-NO.	DATE	NAME		SUB. FOR	

Continental Engineering Services
Breitlacherstrasse 94
60489 Frankfurt am Main

RaceABS@conti-engineering.com