QLS+ RC Series

NEW QUALITY & LEVEL SENSOR (QLS+): ALL IN ONE SOLUTION FOR DIESEL EXHAUST FLUID (DEF) / ADBLUE® TANK

- DEF / AdBlue® level
  - Continuous measurement based on Magneto Resistive (MR) Technology
- DEF / AdBlue® temperature
- DEF / AdBlue® quality
  - Urea concentration
  - Detection of unauthorized fluids
- DEF / AdBlue® suction line (with integrated filter)
- DEF / AdBlue® return
- Tank thawing (using engine cooling system)
- Tank vent

Fully integrated sensor and processing electronics provide a solid state sensor for in tank urea quality and level monitoring.

Factory calibrated in compliance with DIN70070 / ISO 22241 standards.

Sensor design compliant to:

- Cummins® AEBs 21.112 and 21.79

Data output compliant to:

- SAE J1939
- CAN 2.0A or CAN 2.0B
- Cummins® AEBs 15.139, 15.140, 15.141 and 15.149

Close-up on the Urea Quality Sensor (concentration, temperature and fluid type)

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DESCRIPTION

The new Measurement Specialties DEF/ AdBlue® Quality & Level Sensor (QLS+) product portfolio is designed to integrate and operate within a broad range of DEF/ AdBlue® tank configurations. In particular, MEAS can customize the QLS+ assembly to match any tank design while providing robust DEF/ AdBlue® heating and accurately performing DEF/ AdBlue® liquid level, temperature and quality measurements.

The high performance DEF/ AdBlue® level measurement relies on our solid state Magneto Resistive (MR) sensor chips which are qualified to automotive performance standards and used for critical component linear position measurements.

The Urea Quality Sensor (UQS), which is highly integrated within the DEF / AdBlue® QLS+ assembly, directly and simultaneously measures the chemical properties of liquids in the DEF / AdBlue® tank to determine the presence and concentration of urea in DEF / AdBlue® or contaminated fluids. Relying on our patented near infrared (NIR) optical sensor technology, the UQS measurement of urea concentration helps ensure that the urea concentration and its quality assist Selective Catalytic Reduction (SCR) system in effectively reducing NOx to regulated emission standards.

The two integrated temperature sensors (one in the UQS and one on the level board) provide a thermal mapping of the suction area.

The QLS+ is a smart system and important tool for meeting regulated OBD compliance to confirm urea presence and concentration and security signal communication.

A universal digital CAN J1939 compliant protocol provides easy to connect interface to main control systems (i.e., ECM, SCR feed control, OBD bus). A simple 4 pins connector allows cost effective mounting options.

FEATURES

High reliability and long term stability

Optimized for OEM specifications

Urea resistant DIN7070/ISO22241

In-tank mounting

Freezing resistant

Range of sizes to suit your application

High reliability Magneto Resistive technology

Urea feed and return in the header

Integrated filter

APPLICATIONS

Diesel Engines

Passenger Vehicles

Buses & Trucks

Commercial On and Off Highway Vehicles

PERFORMANCE SPECIFICATIONS

MAXIMUM RATINGS

Ratings	Symbol	Value	Unit
Supply voltage (peak)	Vcc	36	Vdc
Environment Operating Temperature *	Te	-40 to +105	°C
Fluid Operating Temperature	Tf	-40 to +85	°C
Storage Temperature	Tstg	-40 to +90	°C
Input current @ 12 VDC (in rush)	Ipk	600 (t<200ms)	mA
Vibration (peak)		15	Grms

Peak conditions: less than 10% of the operating time.
* Environment Operating Temperature: Service temperature range at which the sensor and its electronics can operate securely

METROLOGICAL CHARACTERISTICS

Measurement ranges QLS+	Symbol	Min	Typ	Max	Unit
Urea concentration	%urea	0	32.5	62.5	%mass
Response time urea concentration sensing @ 25°C			<20	120	s
Urea concentration accuracy (in the 0-40% range and 0 +60°C range)		-2		+2	%mass
Urea concentration accuracy (out of the previous described range)		-3		+3	%mass
DEF / AdBlue® fluid temperature *	T	-11		70	°C
Other fluid temperature **	T	-40		85	°C
Response time temperature sensing @ 25°C			<20		s
Temperature accuracy	T		+-1		°C
Response time urea level sensing @ 25°C	t		<20		s
DEF / AdBlue® level sensing resolution***		0.2			mm

* DEF / AdBlue® fluids classically freeze at temperature inferior to -11°C and quickly degrade at temperatures superior to 40°C.
** Temperature sensor is capable within the -40 to 125°C range with 1°C accuracy.
*** Accuracy +/-3mm @ 25°C and +/-4mm @ other temperatures

ELECTRICAL CHARACTERISTICS

(@Vcc=12 Vdc, ambient temperature)

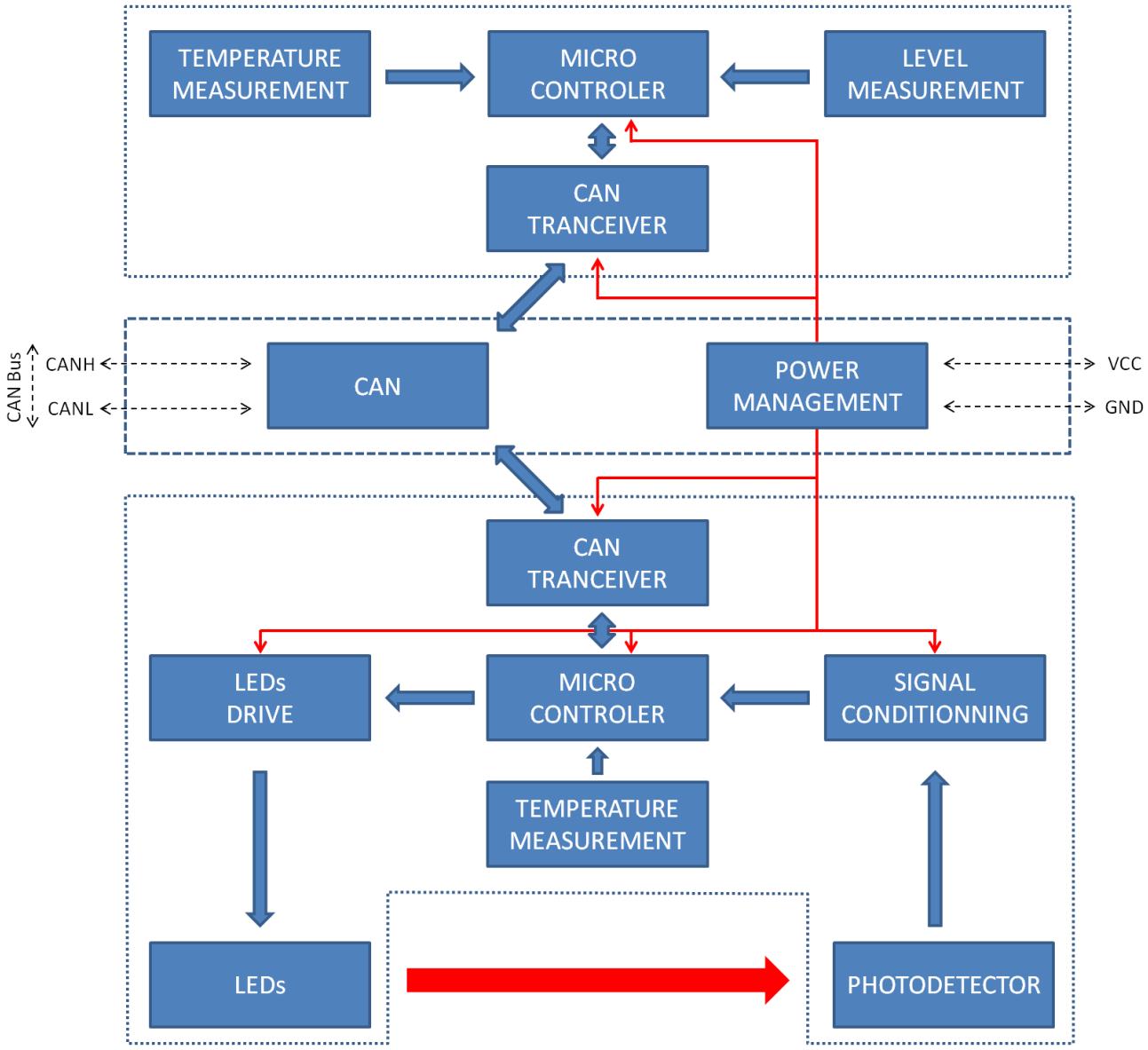
Electrical characteristics	Symbol	Min	Typ 1	Typ 2	Max	Unit
Supply Voltage	VBatt	9	12	24	36	Vdc
Supply Current @ VBatt (steady state)	Iavg	80	70	50	36	mA

CONNECTING & MECHANICAL PACKAGING

LEVEL AND PICK UP UNIT

Mounting	Vertical
Housing Material	Stainless Steel / Rubber
Float Material	Buna N
Fitting	90mm Ø x 33.5mmn with band clamp
Level, heating and pick- up tubes	Stainless Steel 316L
Filter	Gradient depth media
Filter geometry	70 µm (Optional: 40µm)
Sealing Components	Rubber Header
Connection Type	Deutsch DT04-4P or other
IP Rating	IP 67

BLOCK DIAGRAM



TRANSMISSION DATA

CAN FRAME DESCRIPTION – J1939 STANDARDS

Baud rate detection: 250Kbit/s or 500Kbit/s or auto baudrate detection

PGN 64923 is related to catalyst reagent fluid properties:

Aftertreatment DEF Information	PGN	SPN	Byte, bit position	Length	Data range		ENCODING	Rate	Source Address
					Min	Max			
Aftertreatment 1 DEF Temperature 2	64923	3515	1,1	8	-40°C	210°C	1°C/bit, -40°C offset	1s	0xA3
Aftertreatment 1 DEF Concentration	64923	3516	2,1	8	0%	62,5%	0.25%/bit, 0% offset	1s	
Aftertreatment 1 DEF Temperature 2 Preliminary FMI	64923	3519	4,1	5	0	31	Refer to FMI Table	1s	
Aftertreatment 1 DEF Properties Preliminary FMI	64923	3520	5,1	5	0	31	Refer to FMI Table	1s	
Aftertreatment 1 DEF Property	64923	3521	6,1	4	0	15	Refer to Fluid Type Scenarii	1s	

PGN 65110 is related to catalyst reagent fluid level:

Aftertreatment 1 DEF Tank 1 Information	PGN	SPN	Byte, bit position	Length	Data range		ENCODING	Rate	Source Address
					Min	Max			
Aftertreatment 1 DEF Tank Level	65110	1761	1.1	8	0%	100%	0.4%/bit, 0% offset	1s	0xA3
Aftertreatment 1 DEF Tank Temperature	65110	3031	2.1	8	-40°C	210°C	1°C/bit, -40°C offset	1s	
Aftertreatment 1 DEF Tank Level 2	65110	3517	3.1	16	0	Max	0.1mm/bit	1s	
Aftertreatment 1 DEF Tank Level Preliminary FMI	65110	3532	5.1	5	0	31	Refer to FMI Table	1s	
Aftertreatment 1 DEF Tank 1 Temperature Preliminary FMI	65110	4365	6.1	5	0	31	Refer to FMI Table	1s	

PGN 60928 is related to address claim:

- Arbitrary Address Capable = 0
- Industry Group = 0
- Function = 45 (Engine Emission After treatment System)
- Manufacturer Code = 0x0FF (MEAS)
- Identity Number = Serial Number (21 bits)

Following information can be available on request:

- DM 19 Calibration Information (PGN 54016)
- Software Identification (PGN 65242)

FAILURE STATUS AND DIAGNOSTIC & FLUID TYPE SCENARII

Failure status and diagnostic of the UQS are defined by SPN 3519 and 3520:

Failure Mode	SPN 3516 DEF Concentration	SPN 3520 DEF Properties FMI	SPN 3521 DEF Property	SPN 3515 DEF Temp 2	SPN 3519 DEF Temp 2 FMI
Aftertreatment 1 DEF Temperature 2 > 125°C	0xFB	31	0xE	125°C	15
Aftertreatment 1 DEF Temperature 2 < -40°C	0xFB	31	0xE	-40°C	17
Aftertreatment 1 DEF Temperature 2 Short Circuit	0xFB	31	0xF	0xFE	4
Aftertreatment 1 DEF Temperature 2 Open Circuit	0xFB	31	0xF	0xFE	3
Optical Data Incorrect*	0xFE	2	0xE		
Aftertreatment 1 DEF Concentration < 0%	0%	17	0xD		
Aftertreatment 1 DEF Concentration > 62,5%	62,5%	15	0xD		
UQS Not Detected	0xFE	12	0xF	0xFE	12
No Flag		31	0xD		31

Blank: not impacted by sensor's status
*: Optical signal too low or too high

Fluid Type Scenarii:

Fluid Type	SPN 3516 DEF Concentration	SPN 3520 DEF Properties FMI	SPN 3521 DEF Property
Catalyst reagent is diesel	0xFB	31	0x2
Catalyst reagent is proper mixture (DEF / AdBlue®)		31	0x3
Not able to determine catalyst reagent type	X_1	X_2	0xD
Error detected with urea reagent type detection	X_3	X_4	0xE
Not available	0xFB	31	0xF
Ice Detected	0xFB	31	0xF

Blank: not impacted by sensor's status
X_1: 0xFB or not impacted; X_2: 14, 17 or 31; X_3: 0xFB or 0xFE; X_4: 2 or 31

Failure status and diagnostic of the FLS are defined by SPN 3532 and 4365:

Failure Mode	SPN 3031 DEF Tank Temp	SPN 4365 DEF Tank 1 Temp FMI	SPN 1761 DEF Tank Level (%)	SPN 3517 DEF Tank Level 2 (mm)	SPN 3532 DEF Tank Level FMI
Aftertreatment 1 DEF Tank Temperature > 125°C	125°C	15	0xFB	0xFB00	31
Aftertreatment 1 DEF Tank Temperature < -40°C	-40°C	17	0xFB	0xFB00	31
Aftertreatment 1 DEF Tank Temperature Short Circuit	0xFE	4			
Aftertreatment 1 DEF Tank Temperature Open Circuit	0xFE	3			
Aftertreatment 1 DEF Tank Level Open Circuit Faulty MR			X_5	X_5	3
Aftertreatment 1 DEF Tank Level < 0%			0%	0 mm	17
Aftertreatment 1 DEF Tank Level > 100%			100%	Max (mm)	15
Level Data Incorrect**			0xFE	0xFE00	11
Stuck Float					2
No Flag		31			31

Blank: not impacted by sensor's status
X_5: Degraded measurement information
**: Root cause unknown

FMI TABLE

FMI	FMI Description
FMI=2	Data erratic, intermittent or incorrect
FMI=3	Voltage Above Normal, Or Shorted To High Source
FMI=4	Voltage Below Normal, Or Shorted To Low Source
FMI=11	Root Cause Not Known
FMI=12	Bad intelligent device or component
FMI=15	Data Valid But Above Normal Operating Range - Moderately Severe Level
FMI=17	Data Valid But Below Normal Operating Range - Moderately Severe Level
FMI=31	Condition Exists

TECHNICAL CONTACT INFORMATION

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