

EM5P1 electromechanical PTO

BICT project

extCAN signals definition ver2.0

extCAN signal definitions

Message received by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF00FE	0x0FF00	EM5P1_BB_requests_1	100	100	6	Cyclic	0	0	00	0xFE		Prop

SPN label	Byte	Bit	Length	State	Resolution	Offset	Operating range Data range	Unit	Note
Pump_max_speed	0	0	12		1.0	0.0	0 - 3800	rpm	Int12
Pump_max_torque	1	4	12		1.0	0.0	0 - 530	Nm*	Int12
Mode_Pressure	3	0	1		1.0	0.0	0 - 1	Dimensionless	Boolean
Inactive				0x00					
Active				0x01					
Mode_Speed	3	1	1		1.0	0.0	0 - 1	Dimensionless	Boolean
Inactive				0x00					
Active				0x01					
Mode_eLoadSensing	3	2	1		1.0	0.0	0-1	Dimensionless	Boolean
Inactive				0x00					
Active				0x01					
Pump_rot_direction	3	3	1		1.0	0.0	0 - 1	Dimensionless	Boolean
Clockwise				0x00				Right Pump rotation*	
Counterclockwise				0x01				Left Pump rotation*	

* “Dimensionless” in the CAN message

** sent via BICT as CAN message to EM5P1

extCAN signal definitions

Message received by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF00FE	0x0FF00	EM5P1_BB_requests_1	100	100	6	Cyclic	0	0	00	0xFE		Prop

CAN messages used by bodywork ECU(s) to setup parameters and control requests via the BICT file to the EM5P1 ECU (IQAN). To be used by bodybuilders that uses *External bodywork CAN bus*!

Pump_max_speed: Max speed which the hydraulic pump can handle OR if the flow in the system needs to be maximized for whatever reason. (3800 rpm is Max available speed)

Pump_max_torque: Max torque (pressure) which the hydraulic pump can handle OR if the flow in the system needs to be maximized for whatever reason. (530Nm is electric motor limit).

Mode_Pressure/Speed/eLS: Which mode that is used for the ePTO system.

Pump_rot_direction: Which rotation direction the pump will spin. Clockwise/counterclockwise is hydraulic pump rotation direction (electric motor will rotate opposite direction!)

Every value in parameter outside of "operating range" will result in an error and electric motor will stop its operation.

* "Dimensionless" in the CAN message

** sent via BICT as CAN message to EM5P1

extCAN signal definitions

Message received by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF01FE	0x0FF01	EM5P1_BB_requests_2	100	100	6	Cyclic	0	0	01	0xFE		Prop

SPN label	Byte	Bit	Length	State	Resolution	Offset	Operating range Data range	Unit	Note
Pump_speed_slope	0	0	12		1.0	0.0	0 – 1000	rpm/100ms*	Int12
Pump_torque_slope	1	4	12		1.0	0.0	0 – 1000	Nm/100ms*	Int12
Pump_size	3	0	20		1.0	0.0	10000 - 250000	mm3*	Int20
Delta_pressure_eLS	5	4	8		1.0	0.0	0 – 100	bar*	Int8
E_mach_spd_governor	6	4	4		1.0	0.0	0-8	Dimensionless	Int4
Parameter_set				0x00					
Slow				0x01					
Medium				0x02					
Fast				0x03					

* “Dimensionless” in the CAN message

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extCAN signal definitions

Message received by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF01FE	0x0FF01	EM5P1_BB_requests_2	100	100	6	Cyclic	0	0	01	0xFE		Prop

CAN messages used by bodywork ECU(s) to setup parameters and control requests via the BICT file to the EM5P1 ECU (IQAN). To be used by bodybuilders that uses *External bodywork CAN bus*!

Pump_speed_slope: Maximal rpm change that the hydraulic pump can handle, in rpm/100ms. 1000 in this parameter means rpm change of 10'000 rpm per second. Hydraulic pump information is needed for this parameter.

Pump_torque_slope: : Maximal torque change that the hydraulic pump can handle, in Nm/100ms. 50 in this parameter means a change of 500 Nm per second on the electric motor. Hydraulic pump information is needed for this parameter.

Pump_size: This parameter is the hydraulic pump size in mm³. A value of 250'000 means a pump size of 250cm³
Delta_pressure_eLS: This is the desired differential pressure in a Load Sensing system (eLS)

Every value in parameter outside of "operating range" will result in an error and electric motor will stop its operation.

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extCAN signal definitions

Message received by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF01FE	0x0FF01	EM5P1_BB_requests_2	100	100	6	Cyclic	0	0	01	0xFE		Prop

E_mach._spd_governor: Electrical machine speed governor that is used by the EM5P1 speed manager to adjust the speed loop when the speed command changes upwards or downwards. This parameter is valid when “Mode_speed” is used. Important! If this parameter varies for different stages of the bodywork control, must only be changed when Oil Request is FALSE.

- **Parameter Set:** In this mode the electrical machine will adjust to target speed according to own preferences. Contact SCANIA for further information
- **Slow:** the electrical machine is adjusting the new target speed at the slowest possible rate. To be used when the speed command change is done without load!
- **Medium:** the electrical machine is adjusting the new target speed at a slower rate. To be used when the speed command change is not inducing any oscillations with the load change! If the electrical machine experience any oscillations set the parameter to Slow if needed.
- **Fast:** the electrical machine is adjusting the new target speed as fast as possible. To be used when the speed command change is not inducing any oscillations with the load change! If the electrical machine experience any oscillations set the parameter to Medium level or even Slow if needed.

Every value in parameter outside of “operating range” will result in an error and electric motor will stop its operation.

extCAN signal definitions

Message received by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF02FE	0x0FF02	EM5P1_BB_req_cmd_1	100	100	6	Cyclic	0	0	02	0xFE		Prop

SPN label	Byte	Bit	Length	State	Resolution	Offset	Operating range Data range	Unit	Note
Speed_cmd	0	0	12		1.0	0.0	0 – 3800	rpm	Int32
Torque_cmd	1	4	12		1.0	0.0	0 - 530	Nm*	Int32
Request_oil	3	0	1		1.0	0.0	0 - 1	On/Off*	Boolean
Off				0x00					
On				0x01					

* “Dimensionless” in the CAN message

** sent via BICT as CAN message to EM5P1

extCAN signal definitions

Message received by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF02FE	0x0FF02	EM5P1_BB_req_cmd_1	100	100	6	Cyclic	0	0	02	0xFE		Prop

CAN messages used by bodywork ECU(s) to setup parameters and control requests via the BICT file to the EM5P1 ECU (IQAN). To be used by bodybuilders that uses *External bodywork CAN bus*!

Speed_cmd: Desired speed of the hydraulic pump when running in "Speed mode". The speed command should NOT be higher than the hydraulic system or hydraulic pump can withstand. Every command outside of "operating range" will result in an error and electric motor will seize of operation.

Torque_cmd: Desired torque (pressure) of the hydraulic pump when running in "Torque mode". The torque (pressure) command should NOT be higher than the hydraulic system or hydraulic pump can withstand. Every command outside of "operating range" will result in an error and electric motor will seize of operation.

Request_oil: When this parameter is active ("1"), the electrical machine will be activated in commanded mode and requested speed/torque or start the eLS function.

extCAN signal definitions

Message sent by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF002E	0x0FF00	EM5P1_signals_1	100	100	6	Cyclic	0	0	00	0x2E		Prop

SPN label	Byte	Bit	Length	State	Resolution	Offset	Operating range Data range	Unit	Note
Actual_speed	0	0	12		1.0	0.0	0 - 3800	rpm	Int12
Actual_torque	1	4	12		1.0	0.0	0 – 530	Nm*	Int32
Mode_Pressure	3	0	1		1.0	0.0	0-1	Dimensionless	Boolean
Inactive				0x00					
Active				0x01					
Mode_Speed	3	1	1		1.0	0.0	0-1	Dimensionless	Boolean
Inactive				0x00					
Active				0x01					
Mode_eLoadSensing	3	2	1		1.0	0.0	0-1	Dimensionless	Boolean
Inactive				0x00					
Active				0x01					

* “Dimensionless” in the CAN message

** sent via BICT as CAN message from EM5P1

extCAN signal definitions

Message sent by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF002E	0x0FF00	EM5P1_signals_1	100	100	6	Cyclic	0	0	00	0x2E		Prop

CAN messages used by bodywork ECU(s) to receive EM5P1 feedback signal via the BICT file from the EM5P1 ECU (IQAN). To be used by bodybuilders that uses *External bodywork CAN bus*!

Actual_speed: Feedback from electric motor of real measured actual speed

Actual_torque: Feedback from electric motor of real measured actual torque on the motor

Mode_Pressure/Speed/ELoadSensing: Status feedback signal that the mode request is acknowledged.

extCAN signal definitions

Message sent by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF012E	0x0FF01	EM5P1_signals_2	100	100	6	Cyclic	0	0	01	0x2E		Prop

SPN label	Byte	Bit	Length	State	Resolution	Offset	Operating range Data range	Unit	Note
Actual_Motor_Temp	0	0	12		1.0	-50	-50 - 210	Deg C	Int12
Actual_Inverter_Temp	1	4	8		1.0	-50	-50 - 130	Deg C	Int8
EM5P1_power_budget	2	4	8		1.0	0	0 – 100	%	Int8
EM5P1_torque_budget	3	4	8		1.0	0	0 – 100	%	Int8

** sent via BICT as CAN message from EM5P1

extCAN signal definitions

Message sent by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF012E	0x0FF01	EM5P1_signals_2	100	100	6	Cyclic	0	0	01	0x2E		Prop

CAN messages used by bodywork ECU(s) to receive EM5P1 feedback signal via the BICT file from the EM5P1 ECU (IQAN). To be used by bodybuilders that uses *External bodywork CAN bus*!

Actual_Motor_Temp: Feedback from electric motor of real measured actual temperatures in the windings.
Max allowed temperature is 150 degrees, derating starts at 140 degrees.

Actual_Inverter_Temp: Feedback from Inverter of real measured actual temperatures on the Heatsink inside the inverter. Max allowed temperature is 85 degrees, derating starts at 65 degrees.

EM5P1_power_budget: Feedback signal calculated by the EM5P1 that shows a dynamic power value based on the total available value minus the used value. The value takes in account the heat temperature degradation!

EM5P1_torque_budget: Feedback signal calculated by the EM5P1 that shows a dynamic torque value based on the total available value minus the used value. The value takes in account the heat temperature degradation!

extCAN signal definitions

Message sent by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF022E	0x0FF02	EM5P1_signals_3	100	100	6	Cyclic	0	0	02	0x2E		Prop

SPN label	Byte	Bit	Length	State	Resolution	Offset	Operating range Data range	Unit	Note
Run_Limitation_Type	0	0	8		1.0	0.0	0-15	Dimensionless	Int8
No limitation				0x00					
Event limitation				0x01					
Motor temperature limitation				0x02					
Low DC voltage limitation				0x03					
High DC voltage limitation				0x04					
Low speed limitation				0x05					
High speed limitation				0x06					
Not used				0x07					
DC power limitation				0x08					
External current limitation				0x09					
External torque limitation				0x0A					
Heatsink temperature limitation				0x0B					
Energy limitation				0x0C					
Max current limitation				0x0D					
Max voltage angle limitation				0x0E					
Switching frequency limitation				0x0F					

** sent via BICT as CAN message from EM5P1

extCAN signal definitions

Message sent by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF022E	0x0FF02	EM5P1_signals_3	100	100	6	Cyclic	0	0	02	0x2E		Prop

Run_Limitation_Type: Feedback from the inverter when there is a reason to limit the current performance/power of the inverter. If no limitation is present this signal is Zero. If other limitations are present, the table will show why any limitation is present. This signal will only be active IF the requested power/speed/torque cannot be delivered.

- 0 = No limitation
- 1 = Event limitation
- 2 = Motor temperature limitation
- 3 = Low DC voltage limitation
- 4 = High DC voltage limitation
- 5 = Low speed limitation
- 6 = High speed limitation
- 8 = DC power limitation
- 9 = External current limitation
- 10 = External torque limitation
- 11 = Heatsink temperature limitation
- 12 = Energy limitation
- 13 = Max current limitation
- 14 = Max voltage angle limitation
- 15 = Switching frequency limitation

extCAN signal definitions

Message sent by BCI (Tx)**

Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF022E	0x0FF02	EM5P1_signals_3	100	100	6	Cyclic	0	0	02	0x2E		Prop

SPN label	Byte	Bit	Length	State	Resolution	Offset	Operating range Data range	Unit	Note
EM5P1_error	1	0	4		1.0	0.0	0-8	Dimensionless	Int4
No_errors				0x00					
CAN comm. error btwn. Inverter and IQAN ECU				0x01					
Pressure sensor error in eLS mode				0x02					
Start up error during start-up of system				0x03					
More than one mode requested from BICT				0x04					
HVIL error in ePTO				0x05					
Coolant pump error				0x06					
Inverter error				0x07					
CAN signal out of range error				0x08					

** sent via BICT as CAN message from EM5P1

extCAN signal definitions

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Identifier	PGN	PGN label	Tmin	Tmax	Default Priority	Message Type	DPext	DP	Group Extension	Source	Destination	Standard/ proprietary
18FF022E	0x0FF02	EM5P1_signals_3	100	100	6	Cyclic	0	0	02	0x2E		Prop

CAN messages used by bodywork ECU(s) to receive EM5P1 feedback signal via the BICT file from the EM5P1 ECU (IQAN). To be used by bodybuilders that uses *External bodywork CAN bus*!

EM5P1_error

These error modes (excl. No_errors) will activate Bodywork Warning message in the instrument cluster

- **0 = No_errors**
- **1 = CAN communication error between Inverter and Parker controller**
- **2 = Pressure sensor error/failure when running in mode eLS**
- **3 = Start up error during start-up of system**
- **4 = More than one mode (Speed/Torque/eLS) requested from BICT at the same time**
- **5 = HVIL error in ePTO**
- **6 = Coolant pump error**
- **8 = Inverter error**
- **9 = CAN signal out of range error**