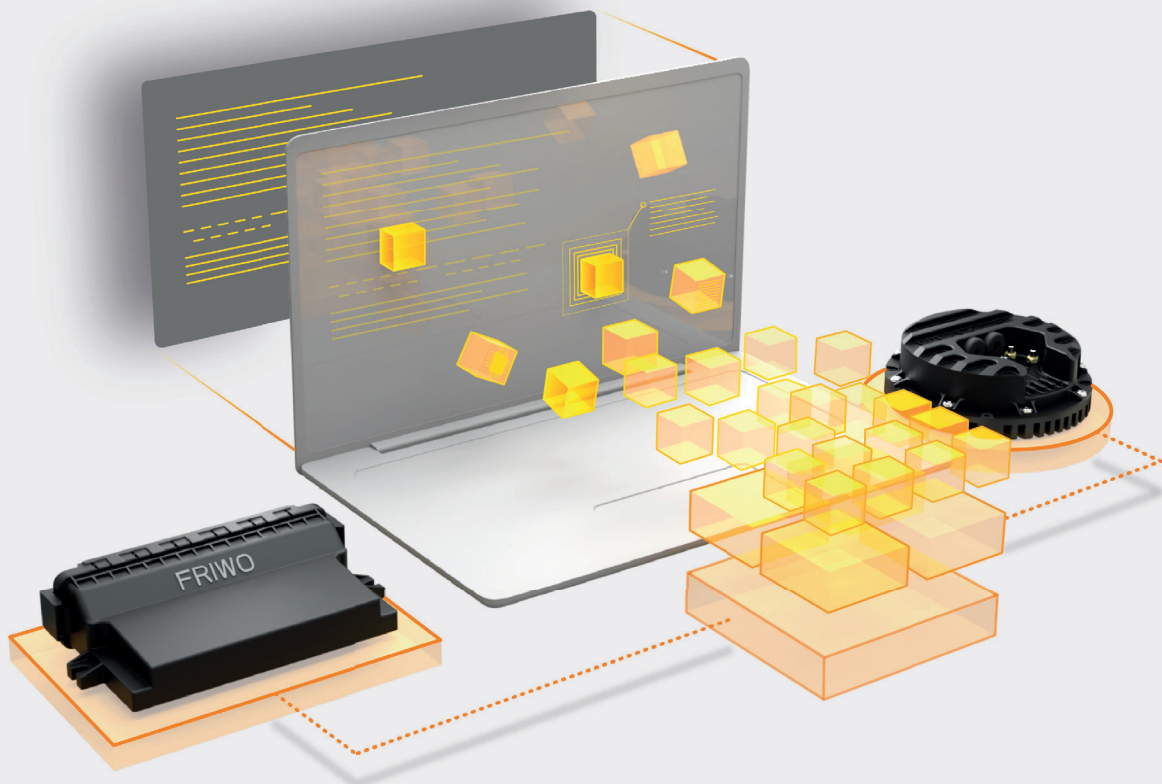**SOFTWARE DEVELOPMENT KIT**

End-to-end Development Environment Setup Solution

VARIABLE DESCRIPTION

DESCRIPTION

This document lists all signals accessible within the FRIWO SDK. The column "API" denotes, through which API the specific signal can be read or written. In the description column, you can find the defined values for each signal. For a detailed instruction on how to access a signal via API, please refer to the corresponding module description that you want to customize.

Signal	API	Datatype	Min	Max	Unit	Description
APP_Throttle_Signal_Channel	trqdesApi_Get	Float32	0	5	-	Selection of input channel which will be used as throttle input: 0 = not selected / off 1 = AIN1 2 = AIN2 3 = PWM@DIN2 4 = CAN-Bus 5 = USB (default)
APP_Brake_Signal_Channel	trqdesApi_Get	Float32	0	7	-	Selection of input channel which will be used as brake input: 0 = not selected / off 1 = AIN1 2 = AIN2 3 = PWM@DIN2 4 = CAN-Bus 5 = USB (default) 6 = DIN1 7 = DIN2
APP_Reverse_Gear_Signal_Channel	trqdesApi_Get	Float32	0	4	-	Selection of input channel which will be used as reverse gear input: 0 = not selected / off 1 = DIN1 2 = DIN2 3 = CAN-Bus 4 = USB (default)
APP_Disp_Ride_Mode	trqdesApi_Get canApi_Get	Float32	0	3	-	Selected ride-mode
APP_Boost_Info	canApi_Get	UInt32	0	$2^{32}-1$	-	Bitcoded configuration of Boost feature: 1 = Boost function generally enabled 2 = Ready to use 4 = Fully charged 8 = Ext. boost limits active 16 = Canceled 32 = Cool down 64 = Collecting 128 = Depleting 256 = Depleted
APP_Boost_Avail_Rel	canApi_Get	Float32	0	100	%	Available boost relative to the maximum collectable amount
APP_Boost_Avail_As	canApi_Get	Float32	0	65535	As	Available boost in ampere-seconds
AIN1_Throttle	trqdesApi_Get	Float32	0	100	%	Mapped relative torque request from Analog Interface 1
AIN2_Throttle	trqdesApi_Get	Float32	0	100	%	Mapped relative torque request from Analog Interface 2
BSW_IO_F_CAN_BSW_BusOff	canApi_Get	Int16	0	1	-	BusOff status flag of CAN peripheral: 0 = BusOn 1 = BusOff
BSW_IO_F_CAN_BSW_Passive	canApi_Get	Int16	0	1	-	BusPassive status flag of CAN peripheral: 0 = BusActive 1 = BusPassive

Signal	API	Datatype	Min	Max	Unit	Description
BSW_IO_F_CAN_BSW_Warning	canApi_Get	Int16	0	1	-	BusWarning status flag of CAN peripheral: 0 = BusReady 1 = BusWarning
CAN_EXT_Reverse_Gear	trqdesApi_Get canApi_Set	Float32	0	1	-	Reverse gear selection from CAN-Bus
CAN_EXT_Torque_Request	trqdesApi_Get canApi_Set	Float32	-100	100	%	Relative torque request from CAN-Bus
CAN_EXT_Alive_Counter	canApi_Set	UInt8	0	255	-	CAN message counter should increase with every message received; Missing messages can be handled by the errorhandler
CAN_EXT_State_Request	canApi_Set	Float32	0	2	-	State request via CAN: 0 = Init/Standby 1 = Request active torque control
CAN_EXT_Ride_Mode	canApi_Set	Float32	0	2	-	Ride-mode selection from CAN-Bus
CAN_EXT_ROC_Start	canApi_Set	Float32	0	1	-	Start the automatic rotor offset calibration
CAN_EXT_Boost_Enable	canApi_Set	Float32	0	1	-	Enable extended boost limits
CAN_EXT_Rotor_Speed_Max	canApi_Set	Float32	0	2400	1/s	Mechanical rotor speed limit for positive and negative speeds throttle
CAN_EXT_Skip_Signal_Checks	canApi_Set	Float32	0	1	-	Skip the signal checks for thorttle and brake for direct initialisation
CAN_Immo_Unlock_Request_Lower	canApi_Set	UInt32	0	$2^{32}-1$	-	Immobilizer key; Used to control the powerstage if the activation mode is setup accordingly
CAN_Immo_Unlock_Request_Higher	canApi_Set	UInt32	0	$2^{32}-1$	-	Immobilizer key; Used to activate the powerstage if the activation mode is setup accordingly
CAN_BMS_Pack_Voltage	canApi_Set	Float32	0	500	V	Actual battery voltage received from BMS
CAN_BMS_Pack_Current	canApi_Set	Float32	-500	500	A (DC)	Battery current; negative values indicate discharge current; positive values indicate charge current

Signal	API	Datatype	Min	Max	Unit	Description
CAN_BMS_Errorcode	canApi_Set	UInt32	0	$2^{32}-1$	-	Errorcode of battery, received via CAN-Bus: 1 = Overtemperature (MOSFET1) 2 = Overtemperature (MOSFET2) 4 = Charge Current 8 = Discharge Current 16 = Overvoltage (Pack) 32 = Overvoltage (dynamic) 64 = Current-sensor offset 128 = Dataset missing/invalid 256 = Cell-monitoring (CRC) 512 = External Enable 1024 = Cell-monitoring (Alert) 2048 = Cell-monitoring (Fault) 4096 = MOSFET-Failure 8192 = Overload during pre charge 16384 = Output voltage too high 32768 = Undervoltage (Pack) 65536 = Discharge Voltage 131072 = Undervoltage (Cell) 262144 = Overvoltage (Cell) 524288 = Dynamic overcurrent 1048576 = Overtemperature in charge-mode 2097152 = Overtemperature in discharge-mode 4194304 = Undertemperature in charge-mode 8388608 = Undertemperature in discharge-mode 16777216 = Current-flow in passive state 33554432 = CAN timeout 67108864 = Cell-connection check failed 134217728 = Selftest required 268435456 = Permanent shutdown 536870912 = external current-sensor monitoring 1073741824 = external voltage-sensor monitoring 2147483648 = Keylock
CAN_BMS_Charge_Plug_Detection	canApi_Set	Float32	0	1	-	Status of chargeplug detection: 0 = chargeplug not detected 1 = chargeplug detected
CAN_BMS_State	canApi_Set	Float32	0	65535	-	BMS State: 0 = Init 1 = Init 2 = Init 3 = Init 4 = Init 5 = Standby-mode 6 = Discharge-mode 7 = Charge-mode 10 = Error 11 = Critical Error 50 = Alarm Mode 98 = Announce Shutdown 99 = Shutdown 100=Off

Signal	API	Datatype	Min	Max	Unit	Description
CAN_BMS_SOC	canApi_Set	Float32	0	100	%	State of charge of the battery calculated by BMS and received via CAN-Bus
CAN_BMS_State_of_Health	canApi_Set	Float32	0	100	%	State of Health of the battery; 0 = 80% of nominal full charge capacity left
CAN_BMS_Remaining_Capacity	canApi_Set	Float32	0	$4*10^9$	mAh	Remaining capacity of the battery
CAN_BMS_Fullcharge_Capacity	canApi_Set	Float32	0	$4*10^9$	mAh	Capacity of fully charged battery
CAN_BMS_TEMP_Powerstage1	canApi_Set	Float32	-50	300	°C	MOSFET temperature of the battery measured at sensor 1
CAN_BMS_TEMP_Powerstage2	canApi_Set	Float32	-50	300	°C	MOSFET temperature of the battery measured at sensor 2
CAN_BMS_TEMP_MCU	canApi_Set	Float32	-50	300	°C	Temperature of the microcontroller of the BMS
CAN_BMS_TEMP_Cell1	canApi_Set	Float32	-50	300	°C	Cell-temperature of the battery measured at sensor 1
CAN_BMS_TEMP_Cell2	canApi_Set	Float32	-50	300	°C	Cell-temperature of the battery measured at sensor 2
CAN_BMS_Max_Charge	canApi_Set	Float32	-500	500	A (DC)	Max charge current of the battery
CAN_BMS_Max_Discharge	canApi_Set	Float32	-500	500	A (DC)	Max discharge current of the battery
CAN_BMS_Max_Voltage	canApi_Set	Float32	0	255	V	Upper charge voltage threshold of the battery
CAN_BMS_Min_Voltage	canApi_Set	Float32	0	255	V	Lower discharge voltage threshold of the battery
CAN_BMS_Warning_Status	canApi_Set	Float32	0	1	-	Shows if battery management system encountered a warning: 0 = No warning 1 = Warning active
CAN_BMS_Pending_HV_Shutdown	canApi_Set	Float32	0	1	-	Battery voltage-output shutdown imminent; Sent very shortly before the battery deactives the output voltage
CAN_BMS_Pending_Bordnet_Shutdown	canApi_Set	Float32	0	1	-	Bordnet shutdown pending; Sent shortly before the battery enters deepsleep
CAN_BMS_PushButton_ShortPress_Detected	canApi_Set	Float32	0	1	-	User Push Button was pressed short
CAN_BMS_PushButton_LongPress_Detected	canApi_Set	Float32	0	1	-	User Push Button was pressed long
CAN_BMS_PushButton_SuperLongPress_Detected	canApi_Set	Float32	0	1	-	User Push Button was pressed superlong
CAN_BMS_PushButton_SuperLongPress_Ongoing	canApi_Set	Float32	0	1	-	User Push Button is pressed constantly
CAN_Custom_Timeout_Bit27	canApi_Set	UInt8	0	1	-	Bit 27 of timeout codeword available for individual use

Signal	API	Datatype	Min	Max	Unit	Description
CAN_Custom_Timeout_Bit28	canApi_Set	UInt8	0	1	-	Bit 28 of timeout codeword available for individual use
CAN_Custom_Timeout_Bit29	canApi_Set	UInt8	0	1	-	Bit 29 of timeout codeword available for individual use
CAN_Custom_Timeout_Bit30	canApi_Set	UInt8	0	1	-	Bit 30 of timeout codeword available for individual use
CAN_Custom_Timeout_Bit31	canApi_Set	UInt8	0	1	-	Bit 31 of timeout codeword available for individual use
CAN_Disp_Reset_Trip	canApi_Set	Float32	0	1	-	Trip reset via CAN-display (long button press in trip display): 0 = No action 1 = Reset
CAN_Dyno_Torque	canApi_Set	Float32	-1000	1000	Nm	Measured torque from dynamometer
CAN_Dyno_DC_Current	canApi_Set	Float32	-1000	1000	A (DC)	Battery current from additional external sensor
CAN_Dyno_DC_Voltage	canApi_Set	Float32	-1000	1000	V	Battery voltage from additional external sensor
CAN_Dyno_Elec_Power_Input	canApi_Set	Float32	-1000	1000	kW	Electrical power from additional external sensor
DIN_DIN1_Signal	trqdesApi_Get	Float32	0	1	-	Relative torque request from DIN1
DIN_DIN2_Signal	trqdesApi_Get	Float32	0	1	-	Relative torque request from DIN2
ERR_Errorcode	canApi_Get	UInt32	0	$2^{32}-1$	-	System Errorcode: 1 = Hardware init pending 2 = MOSFET Error 4 = Over current (battery current) 8 = DC-Link voltage too low 16 = DC-Link voltage too high 32 = Overtemperature (MOSFET) 64 = Accelerator-pedal signal range 128 = Motor blocking detection 256 = DC-Link voltage (dynamic over-/undervoltage) 512 = Motor sensor error 1024 = Current-sensor offset 2048 = Motor overspeed 4096 = Current-setpoint monitoring 8192 = Rotor-offset calibration failed 16384 = Dataset missing/is invalid 32768 = CAN-timeout 65536 = BMS-announced shutdown 131072 = Over current (Motor-current) 262144 = Hardware-variant coding 524288 = Flux-angle monitoring 1048576 = Overtemperature micro-controller 2097152 = CAN BZ counter 4194304 = Brake Monitor 8388608 = Motor Phase Connection 16777216 = Internal LV Voltage 33554432 = Overtemperature (Motor) 67108864 = Overtemperature (Aux-input) 134217728 = Immobilizer

Signal	API	Datatype	Min	Max	Unit	Description
ERR_MEM_Trace_0_Errorcode	canApi_Get	UInt32	0	$2^{32}-1$	-	System Errorcode trace 0 stored in Memory: 1 = Hardware init pending 2 = MOSFET Error 4 = Over current (battery current) 8 = DC-Link voltage too low 16 = DC-Link voltage too high 32 = Overtemperature (MOSFET) 64 = Accelerator-pedal signal range 128 = Motor blocking detection 256 = DC-Link voltage (dynamic over-/undervoltage) 512 = Motor sensor error 1024 = Current-sensor offset 2048 = Motor overspeed 4096 = Current-setpoint monitoring 8192 = Rotor-offset calibration failed 16384 = Dataset missing/is invalid 32768 = CAN-timeout 65536 = BMS-announced shutdown 131072 = Over current (Motor-current) 262144 = Hardware-variant coding 524288 = Flux-angle monitoring 1048576 = Overtemperature micro-controller 2097152 = CAN BZ counter 4194304 = Brake Monitor 8388608 = Motor Phase Connection 16777216 = Internal LV Voltage 33554432 = Overtemperature (Motor) 67108864 = Overtemperature (Aux-input) 134217728 = Immobilizer
IHS_Vibration_Detected	trqdesApi_Get	Float32	0	1	-	Vibration detected on hall-sensors; StateList;1=Vibration detected
INFO_ODO_Total_Kilometers	canApi_Get	Float32	0	$4*10^9$	km	Total mileage during the entire controller lifetime
INFO_ODO_Trip_Kilometers	canApi_Get	Float32	0	$4*10^9$	km	Mileage since last trip-reset [km]
INFO_Motor_Current	canApi_Get	Float32	-1000	1000	A (AC)	Motor-current
INFO_Motor_Current_Iq	canApi_Get	Float32	-1000	1000	A (AC)	Current on torque-axis
INFO_Motor_Current_Id	canApi_Get	Float32	-1000	1000	A (AC)	Current on flux-axis
INFO_DC_Current	canApi_Get	Float32	-1000	1000	A (DC)	DC-Link current
INFO_Voltage_DC_Link	canApi_Get	Float32	0	1000	V	DC-Link voltage
INFO_Rotor_Speed	canApi_Get	Float32	-2400	2400	1/s	Actual mechanical rotor speed
INFO_Vehicle_Speed	canApi_Get	Float32	$-4*10^9$	$4*10^9$	km/h	Vehicle speed
INFO_Remaining_Distance	canApi_Get	Float32	0	32767	km	Remaining distance in current ride-mode

Signal	API	Datatype	Min	Max	Unit	Description
INFO_Consumption_Ave_Trip	canApi_Get	Float32	−32767	32767	Wh/km	Average consumption since last trip-reset
INFO_Ah_Pos	canApi_Get	Float32	0	$2*10^9$	Ah	Current-meter for the consumed current during the entire controller lifetime
INFO_Ah_Neg	canApi_Get	Float32	0	$2*10^9$	Ah	Current-meter for the recovered current during the entire controller lifetime
INFO_Rel_Torque_Setpoint	canApi_Get	Float32	0	100	%	Relative torque related to setpoint of the torque controller
INFO_Rel_Torque_Max	canApi_Get	Float32	0	100	%	Relative torque related to the maximum possible value in the actual ride mode
INFO_Rel_Torque_Mapping	canApi_Get	Float32	0	100	%	Relative torque related to the actual value of the motor curve mapping
PWMI_Throttle	trqdesApi_Get	Float32	0	100	%	Relative torque request from PWM-Input
SOC_State_of_Charge	canApi_Get	Float32	0	100	%	State of Charge (SOC) of the battery
SM_OUT_SYS_Trq_Control	trqdesApi_Get canApi_Get	float32	0	1	-	Status of torque-control: 0 = Torque-control deactivated (Powerstage disabled) 1 = Torque-control activated (Powerstage and Current Controller enabled)
SM_PE_Mode_Req_Int	canApi_Get	Float32	0	65535	-	Operational mode of the PE as requested by APP_Activation_Mode: 0 = SET_PS_Mode_Req 1 = CAN_EXT_State_Reqest 2 = CAN_Immo_Unlock_Request 3 = BLE_Secure_Access_State
SM_BMS_Control_State	canApi_Get	Float32	0	1	-	Remote control command to the BMS: 0 = Turn 48V off 1 = Turn 48V on
TEMP_FET_Max	canApi_Get	Float32	−300	300	°C	Temperature of the hottest MOSFET
TEMP_Motor	canApi_Get	Float32	−300	300	°C	Motor temperature
TEMP_MCU	canApi_Get	Float32	−300	300	°C	Temperature of the microcontroller
TEMP_Combined_Max_Rel	canApi_Get	Float32	0	100	%	Combined relative temperature of Motor and MOSFET

Signal	API	Datatype	Min	Max	Unit	Description
TRQ_DES_Driver_Throttle	trqdesApi_Set	Float32	0	100	%	Throttle signal used for desired driver torque calculation after channel selection through SDK_APP_Throttle_Signal_Channel. Cross connections: This signal is compared against the SM_C_TRQ_Enable_Treshold parameter to control initial system start-up as well as system restart when an error occurs. In both cases the following condition must hold to enable system startup/restart: SDK_TRQ_DES_Driver_Throttle <= SM_C_TRQ_Enable_Treshold This signal is also used for Throttle Preactivation Check if SM_C_Check_Throttle_Enable is set to true.
TRQ_DES_Driver_Brake	trqdesApi_Set	Float32	0	100	%	Brake signal used for desired driver torque calculation after channel selection through SDK_APP_Brake_Signal_Channel. Cross connections: This signal is also used for Brake Preactivation Check if SM_C_Check_Brake_Enable is set to true.
TRQ_DES_Driver_Reverse_Gear	trqdesApi_Set canApi_Get	Float32	0	1	–	Signal which shows if reverse gear is selected: 0 = Forward gear selected 1 = Reverse gear selected Cross connections: This signal is also used in the modules Analog Interface AIN1 and Torque Strategy TRQ_STR to select between different throttle/current mappings.
TRQ_DES_Trq_Req_Rel	trqdesApi_Set	Float32	-100	100	%	Final desired driver torque. This signal serves as input for the following torque limitation (TRQ_LIM) module.
TRQ_LIM_Derating_Active	canApi_Get	Float32	0	1	–	Torque setpoint limitation flag: 0 = No limitation 1 = Derating active
TRQ_LIM_Derating_Temp_MCU	canApi_Get	Float32	0	1	–	The accelerating torque-setpoint is limited to keep the microcontroller temperature: 0 = No limitation 1 = Maximum microcontroller temperature reached

Signal	API	Datatype	Min	Max	Unit	Description
TRQ_LIM_Derating_Max_Positive_Current	canApi_Get	Float32	0	1	-	The accelerating torque-setpoint is limited by AC or DC current limit; StateList; 0=-;1=AC or DC current limit
TRQ_LIM_Derating_Max_Negative_Current	canApi_Get	Float32	0	1	-	The regenerative torque-setpoint is limited by AC or DC current limit: 0 = No limitation 1 = AC or DC current limit
TRQ_LIM_Derating_DC_Link_Voltage_Max	canApi_Get	Float32	0	1	-	The regenerative torque-setpoint is limited to stay below the maximum DC-Link-voltage: 0 = No limitation 1 = Upper DC-Link voltage threshold reached
TRQ_LIM_Derating_DC_Link_Voltage_Min	canApi_Get	Float32	0	1	-	The accelerating torque-setpoint is limited to stay above the minimum DC-Link-voltage: 0 = No limitation 1 = Lower DC-Link voltage thres hold reached
TRQ_LIM_Derating_Rotor_Speed	canApi_Get	Float32	0	1	-	The accelerating torque-setpoint is limited to stay below maximum rotor-speed 0 = No limitation 1 = Maximum rotor-speed reached
TRQ_LIM_Derating_Temp_FET	canApi_Get	Float32	0	1	-	The accelerating torque-setpoint is limited to keep the MOSFET temperature 0 = No limitation 1 = Maximum MOSFET temperature reached
TRQ_LIM_Derating_Temp_Motor	canApi_Get	Float32	0	1	-	The accelerating torque-setpoint is limited to keep the motor temperature: 0 = No limitation 1 = Maximum motor temperature reached

Feedback

We are working very hard to improve our products and therefore **feedback** is indispensable! Please send us your valuable feedback as contact form or via Mail to feedback@friwo.com

https://friwo.link/md/feedback