ISAGRAF FUNCTION BLOCKS

This document highlights the User built ISaGRAF function blocks that have been custom developed, on top of the already available ISaGRAF function blocks, to be used in the programming of the Kingfisher RTUs. These custom function blocks have been split into two distinct categories.

User built Function Blocks that are created using pre-existing ISaGRAF only functions and function blocks are part of the “GENERIC LIBRARY” and can be included in any Toolbox PLUS project.

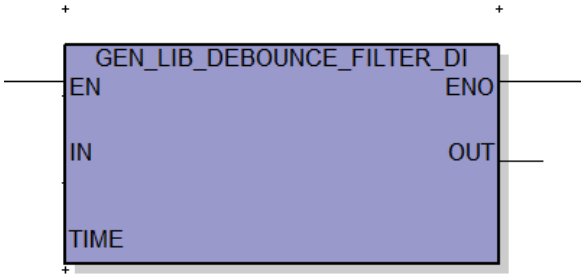
User built Function Blocks that are created using pre-existing ISaGRAF as well as KINGFISHER functions and function blocks are part of the “KINGFISHER_ISAGRAF_LIBRARY” project. These user built function blocks need to be exported from ISaGRAF and then imported back into any Toolbox PLUS project as required.

GENERIC LIBRARY

Name: GEN_LIB_DEBOUNCE_FILTER_DI

Purpose: Takes a Digital value and applies a time based Debounce filter to it, before indicating it’s actual state. This ensures that intermittent changes of state on the digital value is not taken into account.

Input and Output parameters:



GEN_LIB_DEBOUNCE_FILTER_DI

Name	Short n...	Type	Direction	Comment
EnableIn_BOOL	EN	BOOL	Input	Enable Function Block
InputVar_BOOL	IN	BOOL	Input	DigitalInput
DebounceTime_TIME	TIME	TIME	Input	Debounce Filter Time
EnableOut_BOOL	ENO	BOOL	Output	Finished Function Block
OutputVar_BOOL	OUT	BOOL	Output	Mapped Output Variable
ElapsedTime_TIME	ELTM	TIME	Local	ElapsedTime

Description:

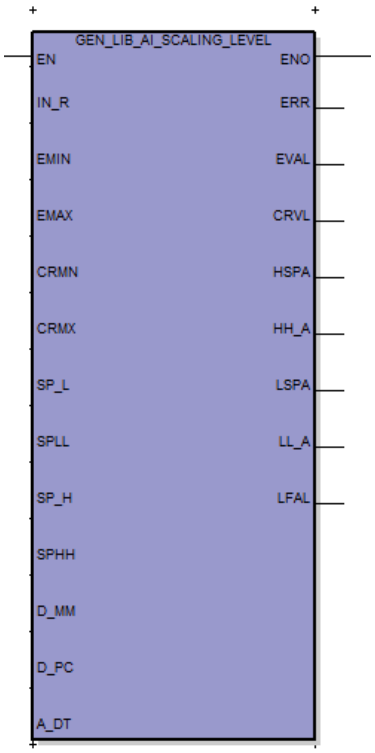
Below is a description of the functionality of this function block

1. Takes the INPUT value and starts an ON_DELAY Timer.
2. When Timer has expired, reflect the INPUT value on the OUTPUT.
3. If INPUT value changes before timer has expired, then ON_DELAY timer is reset.

Name: GEN_LIB_AI_SCALING_LEVEL

Purpose: Being able to convert a RAW input value into an ENGINEERING value and also calculate the relevant alarms (like High Alarm, Low Alarm, Loop Fail Alarm, etc.). Mainly used for scaling Level related values (like Tank Level).

Input and Output parameters:



GEN_LIB_AI_SCALING_LEVEL

Name	Short n...	Type	Direction	Comment
EnableIn_BOOL	EN	BOOL	Input	Enable Function Block
RAWINPUT	IN_R	DINT	Input	Input Variable
EngMinVal_MM	EMIN	REAL	Input	Engineering Minimum Value in MM
EngMaxVal_MM	EMAX	REAL	Input	Engineering Maximum Value in MM
ConvRawMin	CRMN	DINT	Input	Converted Raw Minimum value
ConvRawMax	CRMX	DINT	Input	Converted Raw Maximum Value
EngLowSetpoint	SP_L	REAL	Input	Engineering Low Setpoint
EngLowLowSetpoint	SPLL	REAL	Input	Engineering Low Low Setpoint
EngHighSetpoint	SP_H	REAL	Input	Engineering High Setpoint
EngHighHighSetpoint	SPHH	REAL	Input	Engineering High High Setpoint
AlarmDB_MM	D_MM	REAL	Input	Alarm Deadband in MM
AlarmDB_PRCNT	D_PC	REAL	Input	Alarm Deadband in Percentage
AlarmDebounce_TIME	A_DT	TIME	Input	Alarm Debounce Time
EnableOut_BOOL	ENO	BOOL	Output	Finished Function Block
Error	ERR	BOOL	Output	Error in Function Block
EngValue	EVAL	REAL	Output	Enginnering Converted Value
ConRawValue	CRVL	DINT	Output	Converted Raw Value
HighSP_Alarm	HSPA	BOOL	Output	High Setpoint Alarm
High_High_SP_Alarm	HH_A	BOOL	Output	High High Setpoint Alarm
LowSP_Alarm	LSPA	BOOL	Output	Low Setpoint Alarm
Low_Low_SP_Alarm	LL_A	BOOL	Output	Low Low Setpoint Alarm
LoopFailAlarm	LFAL	BOOL	Output	Loop Fail Alarm

Description:

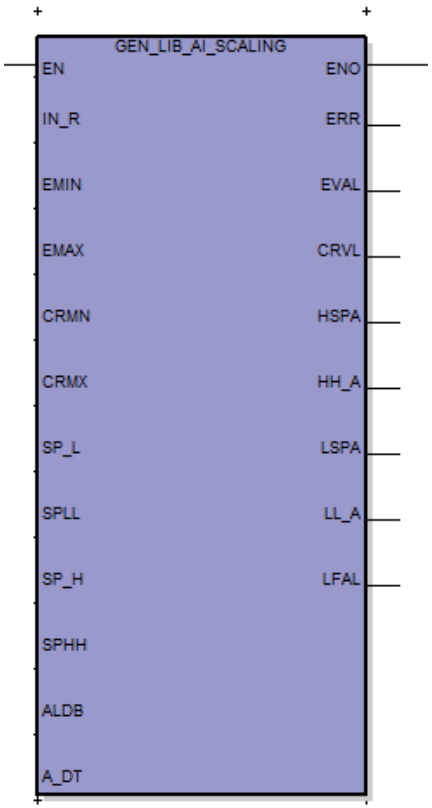
Below is a description of the functionality of this function block

1. Converts the RAW Input value (0-32760) into and ENGINEERING Value (in mm) as well as a RAW value in a different range.
2. If the RAW input value is less than 3.6mA or greater than 20mA, then set Loop Fail Alarm, else clear Alarm
3. If the ENGINEERING Value is above the High Setpoint and below the Low Setpoint, then set the alarms appropriately.
4. Only clear alarms if the ENGINEERING Value if the greater than or lower than the deadband value specified and the debounce timer has expired.
5. The deadband value is fixed at 50m for levels less than 10 metres and is calculated as a percentage for level greater than 10 metres.

Name: GEN_LIB_AI_SCALING

Purpose: Being able to convert a RAW input value into an ENGINEERING value and also calculate the relevant alarms (like High Alarm, Low Alarm, Loop Fail Alarm, etc.). Used for scaling of generic Analog Values.

Input and Output parameters:



GEN_LIB_AI_SCALING

Name	Short n...	Type	Direction	Comment
EnableIn_BOOL	EN	BOOL	Input	Enable Function Block
RAWINPUT	IN_R	DINT	Input	Input Variable
EngMinVal	EMIN	REAL	Input	Engineering Minimum Value
EngMaxVal	EMAX	REAL	Input	Engineering Maximum Value
ConvRawMin	CRMN	DINT	Input	Converted Raw Minimum value
ConvRawMax	CRMX	DINT	Input	Converted Raw Maximum Value
EngLowSetpoint	SP_L	REAL	Input	Engineering Low Setpoint
EngLowLowSetpoint	SPLL	REAL	Input	Engineering Low Low Setpoint
EngHighSetpoint	SP_H	REAL	Input	Engineering High Setpoint
EngHighHighSetpoint	SPHH	REAL	Input	Engineering High High Setpoint
AlarmDB	ALDB	REAL	Input	Alarm Deadband of overall RAW value
AlarmDebounce_TIME	A_DT	TIME	Input	Alarm Debounce Time
EnableOut_BOOL	ENO	BOOL	Output	Finished Function Block
Error	ERR	BOOL	Output	Error in Function Block
EngValue	EVAL	REAL	Output	Enginnering Converted Value
ConRawValue	CRVL	DINT	Output	Converted Raw Value
HighSP_Alarm	HSPA	BOOL	Output	High Setpoint Alarm
High_High_SP_Alarm	HH_A	BOOL	Output	High High Setpoint Alarm
LowSP_Alarm	LSPA	BOOL	Output	Low Setpoint Alarm
Low_Low_SP_Alarm	LL_A	BOOL	Output	Low Low Setpoint Alarm
LoopFailAlarm	LFAL	BOOL	Output	Loop Fail Alarm

Description:

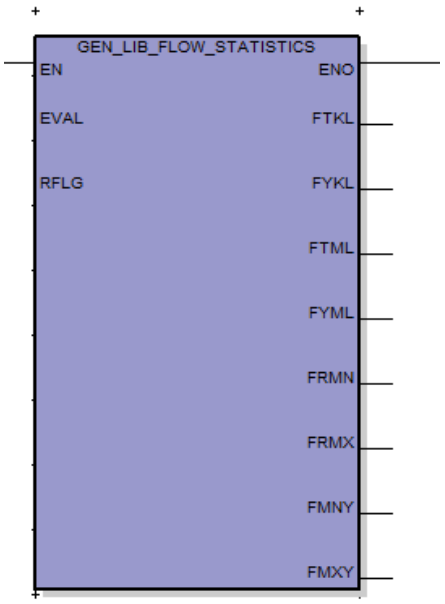
Below is a description of the functionality of this function block

1. Converts the RAW Input value (0-32760) into and ENGINEERING Value as well as a RAW value in a different range.
2. If the RAW input value is less than 3.6mA or greater than 20mA, then set Loop Fail Alarm, else clear Alarm
3. If the ENGINEERING Value is above the High Setpoint and below the Low Setpoint, then set the alarms appropriately.
4. Only clear alarms if the ENGINEERING Value if the greater than or lower than the deadband value specified and the debounce timer has expired.

Name: GEN_LIB_FLOW_STATISTICS

Purpose: Takes an Analog value (Flow) and calculates the Flow Rate as well as the Minimum and Maximum Flow Rate for a day. It can also Rollover today's data to yesterday's data if required.

Input and Output parameters:



GEN_LIB_FLOW_STATISTICS

Name	Short n...	Type	Direction	Comment
EnableIn	EN	BOOL	Input	Enable IN
EngValInput	EVAL	REAL	Input	Engineering Analog Value
RolloverFlag	RFLG	BOOL	Input	Rollover Flag
EnableOut	ENO	BOOL	Output	Enable Out
FlowRateTDY_KL_DINT	FTKL	DINT	Output	Flow Rate Today in KL DINT
FlowRateYDY_KL_DINT	FYKL	DINT	Output	Flow Rate Yesterday in KL DINT
FlowRateTDY_ML_DINT	FTML	DINT	Output	Flow Rate Today in ML DINT
FlowRateYDY_ML_DINT	FYML	DINT	Output	Flow Rate Yesterday in ML DINT
MinFlowRate_DINT	FRMN	DINT	Output	Minimum Flow Rate DINT
MaxFlowRate_DINT	FRMX	DINT	Output	Maximum Flow Rate DINT
MinFlowRate_YDY_DINT	FMNY	DINT	Output	Minimum Flow Rate Yesterday DINT
MaxFlowRate_YDY_DINT	FMXY	DINT	Output	Maximum Flow Rate Yesterday DINT

Description:

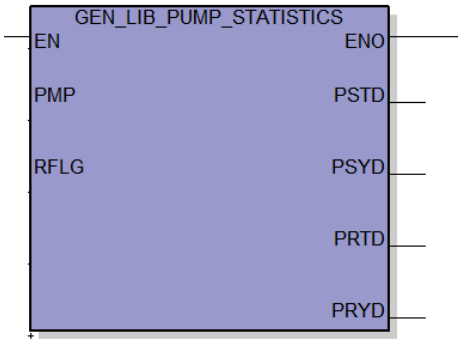
Below is a description of the functionality of this function block

1. Takes the Engineering INPUT value and every second increments the Flow Rate in KL. It also calculates the Flow Rate in ML.
2. If the INPUT value is less than the Minimum Flow Rate for 15 seconds, it updates the Minimum Flow Rate.
3. If the INPUT value is greater than the Maximum Flow Rate, the Maximum Flow Rate is updated.
4. On rising edge of the Rollover Flag, today's flow rates are copied across to yesterday's flow rates and then reset back to 0.
5. On the rising edge of the Rollover Flag, today's minimum and maximum flow rates are copied across to yesterday's flow rates and the current INPUT values is copied across to the minimum and maximum flow rate. They will be updated when the function block is called next.

Name: GEN_LIB_PUMP_STATISTICS

Purpose: Takes a Digital value (Pump Start) and calculates the number of Pump Starts for a Day as well as the total hours the pump has been running. It can also Rollover today's data to yesterday's data if required.

Input and Output parameters:



GEN_LIB_PUMP_STATISTICS

Name	Short n...	Type	Direction	Comment
EnableIn	EN	BOOL	Input	Enable IN
PumpInput	PMP	BOOL	Input	Pump Input
RolloverFlag	RFLG	BOOL	Input	Rollover Flag
EnableOut	ENO	BOOL	Output	Enable Out
PumpStartsTDY	PSTD	DINT	Output	Pump Starts Today
PumpStartsYDY	PSYD	DINT	Output	Pump Starts Yesterday
PumpHrsRunTDY	PRTD	DINT	Output	Pump Hours Run Today
PumpHrsRunYDY	PRYD	DINT	Output	Pump Hours Run Yesterday

Description:

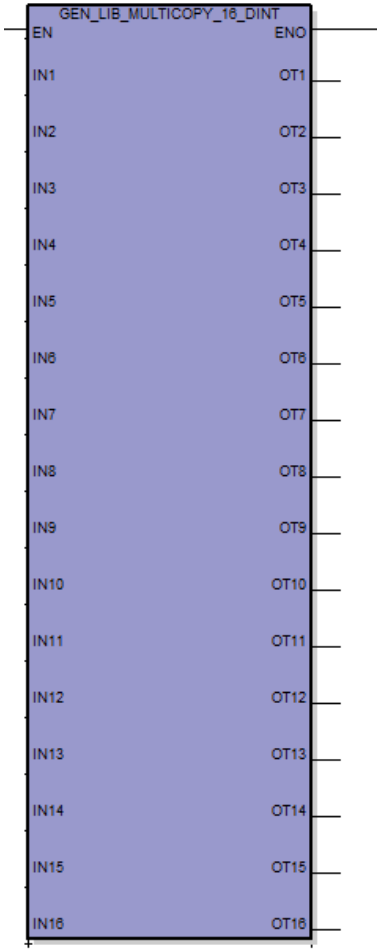
Below is a description of the functionality of this function block

1. On every Rising edge of the INPUT value, it increments the number of pump starts for the day.
2. Every Hour, when INPUT is true, it increments the total hours the pump has run.
3. On rising edge of the Rollover Flag, today's pump starts and hours run are copied across to yesterday's pump starts and hours run and then reset back to 0.

Name: GEN_LIB_MULTICOPY_16_DINT

Purpose: Allows you to map 16 input values of type DINT to 16 output values of type DINT.

Input and Output parameters:



GEN_LIB_MULTICOPY_16_DINT

Name	Short n...	Type	Direction	Comment
EnableIn_BOOL	EN	BOOL	Input	Enable Function Block
Input1	IN1	DINT	Input	Local Register 1
Input2	IN2	DINT	Input	Local Register 2
Input3	IN3	DINT	Input	Local Register 3
Input4	IN4	DINT	Input	Local Register 4
Input5	IN5	DINT	Input	Local Register 5
Input6	IN6	DINT	Input	Local Register 6
Input7	IN7	DINT	Input	Local Register 7
Input8	IN8	DINT	Input	Local Register 8
Input9	IN9	DINT	Input	Local Register 9
Input10	IN10	DINT	Input	Local Register 10
Input11	IN11	DINT	Input	Local Register 11
Input12	IN12	DINT	Input	Local Register 12
Input13	IN13	DINT	Input	Local Register 13
Input14	IN14	DINT	Input	Local Register 14
Input15	IN15	DINT	Input	Local Register 15
Input16	IN16	DINT	Input	Local Register 16
EnableOut_BOOL	ENO	BOOL	Output	Finished Function Block
Output1	OT1	DINT	Output	Mapped Register 1
Output2	OT2	DINT	Output	Mapped Register 2
Output3	OT3	DINT	Output	Mapped Register 3
Output4	OT4	DINT	Output	Mapped Register 4
Output5	OT5	DINT	Output	Mapped Register 5
Output6	OT6	DINT	Output	Mapped Register 6
Output7	OT7	DINT	Output	Mapped Register 7
Output8	OT8	DINT	Output	Mapped Register 8
Output9	OT9	DINT	Output	Mapped Register 9
Output10	OT10	DINT	Output	Mapped Register 10
Output11	OT11	DINT	Output	Mapped Register 11
Output12	OT12	DINT	Output	Mapped Register 12
Output13	OT13	DINT	Output	Mapped Register 13
Output14	OT14	DINT	Output	Mapped Register 14
Output15	OT15	DINT	Output	Mapped Register 15
Output16	OT16	DINT	Output	Mapped Register 16

Description:

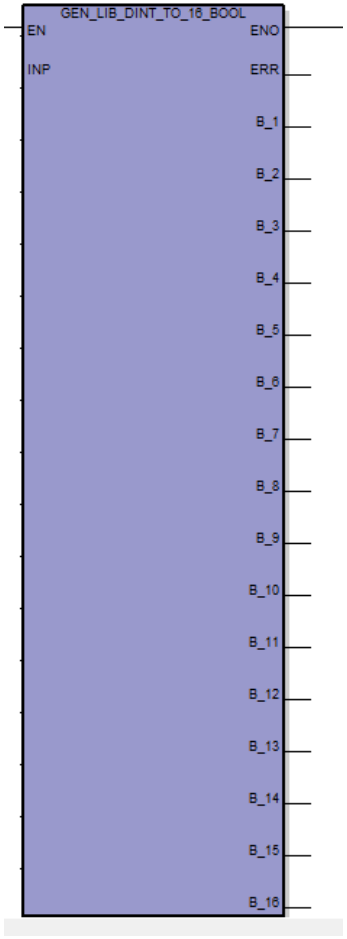
Below is a description of the functionality of this function block

1. Each INPUT (type DINT) is copied across to an OUTPUT (type DINT)
2. For example, INPUT1 is copied to OUTPUT1, INPUT2 is copied to OUTPUT2 and so on.

Name: GEN_LIB_DINT_TO_16_BOOL

Purpose: Allows you to map the lower 16 bits of the INPUT value (of type DINT) to 16 individual OUTPUTS (of type BOOL / BINARY)

Input and Output parameters:



GEN_LIB_DINT_TO_16_BOOL

Name	Short n...	Type	Direction	Comment
EnableIn_BOOL	EN	BOOL	Input	Enable Function Block
Input_DINT	INP	DINT	Input	Input Variable
EnableOut_BOOL	ENO	BOOL	Output	Finished Function Block
Error_BOOL	ERR	BOOL	Output	Error in Function Block
Bit_1_BOOL	B_1	BOOL	Output	Bit 1 of Input Value
Bit_2_BOOL	B_2	BOOL	Output	Bit 2 of Input Value
Bit_3_BOOL	B_3	BOOL	Output	Bit 3 of Input Value
Bit_4_BOOL	B_4	BOOL	Output	Bit 4 of Input Value
Bit_5_BOOL	B_5	BOOL	Output	Bit 5 of Input Value
Bit_6_BOOL	B_6	BOOL	Output	Bit 6 of Input Value
Bit_7_BOOL	B_7	BOOL	Output	Bit 7 of Input Value
Bit_8_BOOL	B_8	BOOL	Output	Bit 8 of Input Value
Bit_9_BOOL	B_9	BOOL	Output	Bit 9 of Input Value
Bit_10_BOOL	B_10	BOOL	Output	Bit 10 of Input Value
Bit_11_BOOL	B_11	BOOL	Output	Bit 11 of Input Value
Bit_12_BOOL	B_12	BOOL	Output	Bit 12 of Input Value
Bit_13_BOOL	B_13	BOOL	Output	Bit 13 of Input Value
Bit_14_BOOL	B_14	BOOL	Output	Bit 14 of Input Value
Bit_15_BOOL	B_15	BOOL	Output	Bit 15 of Input Value
Bit_16_BOOL	B_16	BOOL	Output	Bit 16 of Input Value

Description:

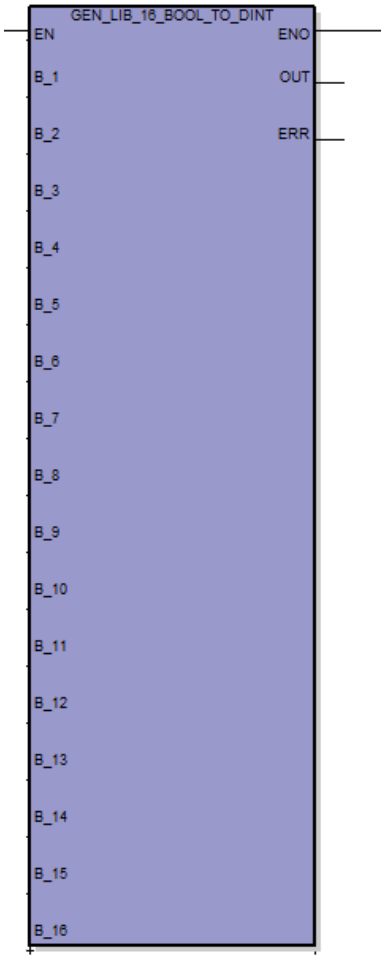
Below is a description of the functionality of this function block

1. The lower 16 bits of the INPUT (type DINT) variable is copied across to 16 individual OUTPUTs (type BOOL)
2. For example, Bit 0 of INPUT is copied to OUTPUT1, Bit 1 of INPUT is copied to OUTPUT2 and so on.

Name: GEN_LIB_16_BOOL_TO_DINT

Purpose: Allows you to map 16 individual INPUT values (of type BOOL) to the lower 16 bits of an OUTPUT value (of type DINT)

Input and Output parameters:



GEN_LIB_16_BOOL_TO_DINT

Name	Short n...	Type	Direction	Comment
EnableIn_BOOL	EN	BOOL	Input	Enable Function Block
Bit_1_BOOL	B_1	BOOL	Input	Bit 1 of Input Value
Bit_2_BOOL	B_2	BOOL	Input	Bit 2 of Input Value
Bit_3_BOOL	B_3	BOOL	Input	Bit 3 of Input Value
Bit_4_BOOL	B_4	BOOL	Input	Bit 4 of Input Value
Bit_5_BOOL	B_5	BOOL	Input	Bit 5 of Input Value
Bit_6_BOOL	B_6	BOOL	Input	Bit 6 of Input Value
Bit_7_BOOL	B_7	BOOL	Input	Bit 7 of Input Value
Bit_8_BOOL	B_8	BOOL	Input	Bit 8 of Input Value
Bit_9_BOOL	B_9	BOOL	Input	Bit 9 of Input Value
Bit_10_BOOL	B_10	BOOL	Input	Bit 10 of Input Value
Bit_11_BOOL	B_11	BOOL	Input	Bit 11 of Input Value
Bit_12_BOOL	B_12	BOOL	Input	Bit 12 of Input Value
Bit_13_BOOL	B_13	BOOL	Input	Bit 13 of Input Value
Bit_14_BOOL	B_14	BOOL	Input	Bit 14 of Input Value
Bit_15_BOOL	B_15	BOOL	Input	Bit 15 of Input Value
Bit_16_BOOL	B_16	BOOL	Input	Bit 16 of Input Value
EnableOut_BOOL	ENO	BOOL	Output	Finished Function Block
Output_DINT	OUT	DINT	Output	Output Variable
Error_BOOL	ERR	BOOL	Output	Error in Function Block

Description:

Below is a description of the functionality of this function block

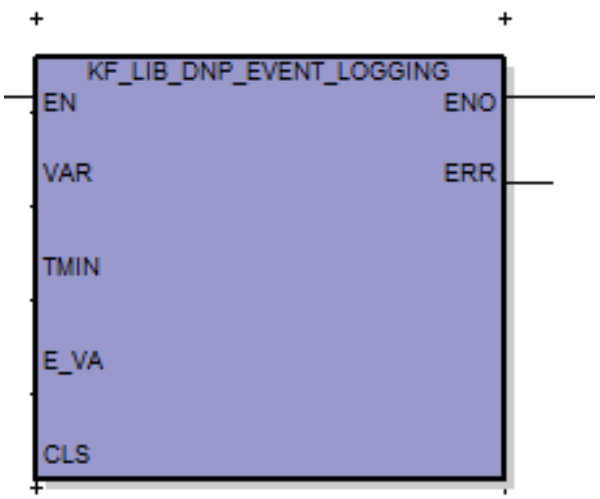
1. The 16 individual INPUTs (type BOOL) are copied across to the lower 16 bits of the OUTPUT (type DINT)
2. For example, INPUT1 is copied across to Bit 0 of OUTPUT, INPUT2 is copied across to Bit 1 of OUTPUT, and so on.

KF Specific Function Blocks

Name: KF_LIB_DNP_EVENT_LOGGING

Purpose: This function block allows you to generate a DNP Event log based on time. If time is 0, then the event log is generated straight away, else it is created based on time specified. You also have to specify the Class (1, 2 or 3) of event.

Input and Output parameters:



KF_LIB_DNP_EVENT_LOGGING

Name	Short n...	Type	Direction	Comment	()
EnableIn	EN	BOOL	Input	Enable IN	
LogVariable	VAR	STRING	Input	EventLogVariable	20
Time_Minutes	TMIN	DINT	Input	Time in Minutes to be used for event logging	
Event_Variation	E_VA	USINT	Input	Event Variation used for USER TYPE	
Class	CLS	USINT	Input	Specify Class of EventLog	
EnableOUT	ENO	BOOL	Output	Enable Out	
Error	ERR	BOOL	Output	Error in Creating Event Log	
⊞ Create_Log		KF_EVENT_LOG	Local	Create Kingfisher Event Log	
StrLength		DINT	Local	String Length	
Time_MS		DINT	Local	Time In Milliseconds	
BlinkTime		TIME	Local		
⊞ Timer_BLINK		BLINK	Local	Actual Blink Timer	
⊞ EdgeTrig		R_TRIG	Local	Rising Edge Trigger	

Description:

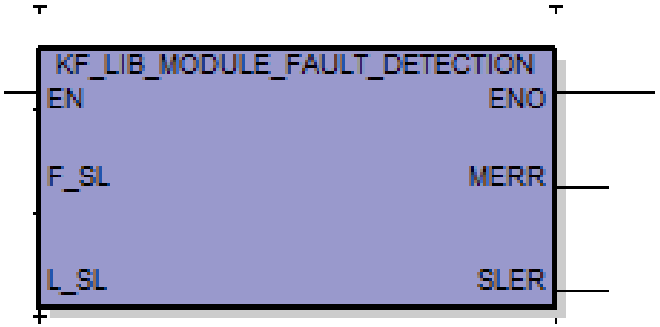
Below is a description of the functionality of this function block

1. Checks to see if all INPUT parameters specified is within the ranges allowed.
2. If time is 0, creates a new DNP Event Log and with the correct Event variation and Class
3. If time is greater than 0, then waits till the timer has expired, and then creates a new DNP Event Log and with the correct Event Variation and Class

Name: KF_LIB_MODULE_FAULT_DETECTION

Purpose: This function block allows you to specify a range of slot numbers that can be checked to see if the physical module present on the backplane matches the module configured in the software. An error indicates a mismatch or missing module.

Input and Output parameters:



KF_LIB_MODULE_FAULT_DETECTION

Name	Short n...	Type	Direction	Comment
EnableIN	EN	BOOL	Input	Enable IN
FirstSlot	F_SL	UINT	Input	Fist Slot to be monitored
LastSlot	L_SL	UINT	Input	Last Slot to be monitored
EnableOut	ENO	BOOL	Output	Enable Out
Error	MERR	BOOL	Output	Module ERROR
Slot	SLER	UINT	Output	Slot where first error was detected
Index		UINT	Local	Index to run through slots
⊞ ModuleOK		KF_GET_MODULE_OK	Local	

Description:

Below is a description of the functionality of this function block

1. Checks to see if all INPUT parameters specified is within the ranges allowed.
2. Based on the First Slot and Last Slot entered, check every slot to see if the module configured matches the actual module in the slot.
3. If it matches, then move to the next slot, else indicate Module Error and also the Slot where error is indicated.

NOTE: The Generic Library as well as “Kingfisher ISaGRAF Library” Toolbox PLUS project are available for download from our website.