


FUNCTIONAL DESCRIPTION

MOTVAL02

Positioning Motorized Valve

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1 General

MOTVAL02 is a functional unit designed for the control of position-motorized valves in different processes.

The functional unit is standardized to a high degree to simplify the work of designing presentation, dialog and control logic. MOTVAL02 normally performs its control function without help from other elements.

MOTVAL02 is used in the control of motorized valves from various locations such as:

Operate^{IT} Operator Stations

Control desks

Switch Gear

Local control stations

The valves can also be controlled from a master control function e.g. Group Start or Other higher level control functions.

2 Configuration

MOTVAL02 comprises a function block type for control and logic functions in Control^{IT}, a faceplate and an object display in Operate^{IT} for operator functions and control parameters.

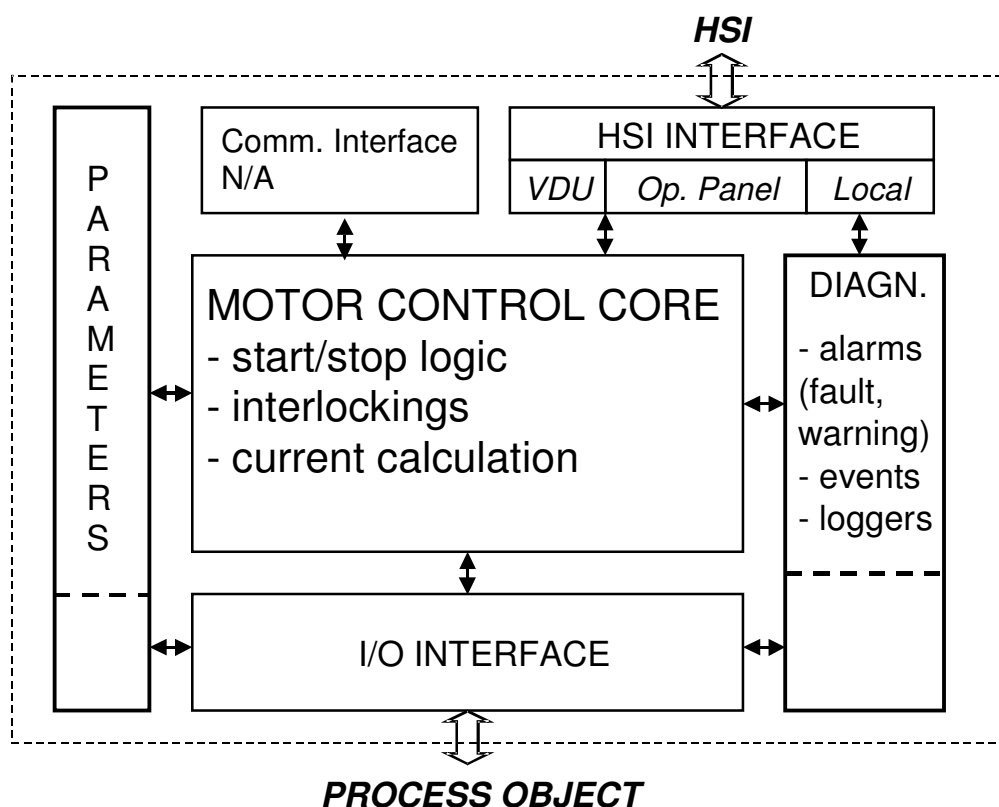


Figure 2-1. The Structure of the Functional Unit

3 Function Block MOTVAL02

FUNCTION OF INPUT TERMINALS	MOTVAL02		FUNCTION OF OUTPUT TERMINALS
Object name	Name	NoInt	No Interlocks
Object description	Description	NoICInt	No Safety Interlocks (IC)
Enable object	Enable	NoIBInt	No Process Interlocks (IB)
Enable control circuit alarm	ME	NoIAInt	No Sequence Interlocks (IA)
Control voltage	M1	Trip	Trip
Overload	M2	Blk	Standby
Motor breaker	M3	RFS	Ready for start
Emergency stop	M4	IPOS	Intermediate position
Short Circuit	M5	OPN	Open order
Safety Interlock 1	IC1	OPNL	Limit switch open is reached
Safety Interlock 2	IC2	CLS	Close order
Safety Interlocks	ICs	CLSL	Limit switch close is reached
Process Interlock 1	IB1	SACk	Start order acknowledgement
Process Interlock 2	IB2	Run	Running
Process Interlock 3	IB3	JogInd	Jog mode
Process Interlock 4	IB4	NoJogInt	No Jog Interlocks
Process Interlocks	IBs	LocalInd	Local mode
Sequence Interlock 1	IA1	ManInd	Man mode
Sequence Interlock 2	IA2	AutoInd	Auto mode
Sequence Interlocks	IAs	E1Ind	E1 mode
Maximum travelling Time	T1	E2Ind	E2 mode
Supervision Time	T2	E3Ind	E3 mode
Start alarm delay Time	T3	AutoSP	Auto setpoint
Torque Limit Switch Open	TorqOpn	WSP	Working setpoint
Function of Open on torque switch (1 = Open on torque open switch)	TorqOpnFunc	Deviation	Deviation
Torque Limit Switch Close	TorqCls	PosError	Position Error
Function of Close on torque switch (1 = Close on torque close switch)	TorqClsFunc	Curr	Actual current (%)
Limit Switch Open	LSOpn	NormCurr	Normal current (%)
Limit Switch Close	LSCls	OutPar	Out Parameter
External reference setpoint in E1 mode	Ext1Ref	Opr	Operator order
External reference setpoint in E2 mode	Ext2Ref		
Open order in E3 mode	E3Opn		
Close order in E3 mode	E3Cls		
Stop order in external mode	Stop		
Selection of MCC run feedback (0 = 2 MCC feedback, 1 = 1 MCC feedback)	Ack1Func		
Main contactor acknowledge open	Ack1		
Main contactor acknowledge close	Ack2		
Motor current	MC		
Actuator position	ActPos		
Position transmitter error	PosErr		
Order mode to Jog	JogEnbl		
Open order in Jog mode	JogOpn		
Close order in Jog mode	JogCls		
Jog start hold function	JogFunc		
Order mode to Local	LEnbl		
Open order in Local mode	LOpn		
Close order in Local mode	LCls		
Local Stop order	LStop		
Order mode to Man	SeqMan		
Order mode to Auto	SeqAuto		
Order mode to E1	SeqE1		
Order mode to E2	SeqE2		
Order mode to E3	SeqE3		
Auto setpoint tracking Ext1 or Ext2	TrackA		
Max Auto setpoint change rate when tranfer from E1 or E2 (unit/s)	SpeedA		

Deviation between setpoint and position transmitter	—	DevDB			
Pulse frequency factor in the CON_PU1	—	PF			
Pulse length factor in the CON_PU1	—	K			
DeadBand in the CON_PU1	—	DeadB			
Block alarm	—	AlcBlk			
Acknowledge alarm	—	AlarmAck			
Actuator position alarm configuration	—	ActPosAlarms			
MC alarm configuration	—	MCAAlarm			
In Parameter	—	InPar			
Event name		EventName			

Figure 3-1. MOTVAL02 Function Block, Complete symbol

Table 3-1 below illustrates the default properties of each terminal of the MOTVAL02 function block.

Name	Data Type	Attributes	Direction	FD Port	Initial value	Description
Name	string	coldretain	in	yes	'Motval02'	Object name
Description	string	coldretain	in	yes	'Descr'	Object description
Enable	bool	coldretain	in	yes	true	Enable object
ME	bool	retain	in	yes	true	Enable control circuit alarm
M1	bool	retain	in	yes	true	Control voltage
M2	bool	retain	in	yes	true	Overload
M3	bool	retain	in	yes	true	Motor breaker
M4	bool	retain	in	yes	true	Emergency stop
M5	bool	retain	in	yes	true	Short Circuit
IC1	bool	retain	in	yes	true	Safety Interlock 1
IC2	bool	retain	in	yes	true	Safety Interlock 2
ICs	ICConn	by_ref	in	yes		Safety Interlocks
IB1	bool	retain	in	yes	true	Process Interlock 1
IB2	bool	retain	in	yes	true	Process Interlock 2
IB3	bool	retain	in	yes	true	Process Interlock 3
IB4	bool	retain	in	yes	true	Process Interlock 4
IBs	IBConn	by_ref	in	yes		Process Interlocks
IA1	bool	retain	in	yes	true	Sequence Interlock 1
IA2	bool	retain	in	yes	true	Sequence Interlock 2
IAs	IACConn	by_ref	in	yes		Sequence Interlocks
T1	time	coldretain	in	yes	60s	Maximum travelling Time
T2	time	coldretain	in	yes	4s	Supervision Time
T3	time	coldretain	in	yes	5s	Start alarm delay Time
TorqOpn	bool	retain	in	yes	true	Torque Limit Switch Open
TorqOpnFunc	bool	coldretain	in	yes	false	Function of Open on torque switch (1 = Open on torque open switch)
TorqCls	bool	retain	in	yes	true	Torque Limit Switch Close
TorqClsFunc	bool	coldretain	in	yes	false	Function of Close on torque switch (1 = Close on torque close switch)
LSOpn	bool	retain	in	yes		Limit Switch Open
LSCls	bool	retain	in	yes		Limit Switch Close
Ext1Ref	real	retain	in	yes		External reference setpoint in E1 mode
Ext2Ref	real	retain	in	yes		External reference setpoint in E2 mode
E3Opn	bool	retain	in	yes		Open order in E3 mode
E3Cls	bool	retain	in	yes		Close order in E3 mode
Stop	bool	retain	in	yes		Stop order in external mode
Ack1Func	bool	coldretain	in	yes	false	Selection of MCC run feedback (0 = 2 MCC feedback, 1 = 1 MCC feedback)
Ack1	bool	retain	in	yes		Main contactor acknowledge open
Ack2	bool	retain	in	yes		Main contactor acknowledge close
MC	real	retain	in	yes		Motor current

Name	Data Type	Attributes	Direction	FD Port	Initial value	Description
ActPos	real	retain	in	yes		Actuator position
PosErr	bool	retain	in	yes		Position transmitter error
JogEnbl	bool	retain	in	yes		Order mode to Jog
JogOpn	bool	retain	in	yes		Open order in Jog mode
JogCls	bool	retain	in	yes		Close order in Jog mode
JogFunc	bool	retain	in	yes		Jog start hold function
LEnbl	bool	retain	in	yes		Order mode to Local
LOpn	bool	retain	in	yes		Open order in Local mode
LCls	bool	retain	in	yes		Close order in Local mode
LStop	bool	retain	in	yes	true	Local Stop order
SeqMan	bool	retain	in	yes		Order mode to Man
SeqAuto	bool	retain	in	yes		Order mode to Auto
SeqE1	bool	retain	in	yes		Order mode to E1
SeqE2	bool	retain	in	yes		Order mode to E2
SeqE3	bool	retain	in	yes		Order mode to E3
TrackA	bool	coldretain	in	yes	true	Auto setpoint tracking Ext1 or Ext2
SpeedA	real	coldretain	in	yes	1.0	Max Auto setpoint change rate when transfer from E1 or E2 (unit/s)
DevDB	real	coldretain	in	yes	5.0	Deviation between setpoint and position transmitter
PF	dint	coldretain	in	yes	1	Pulse frequency factor in the CON_PU1
K	real	coldretain	in	yes	0.5	Pulse length factor in the CON_PU1
DeadB	real	coldretain	in	yes	0.7	DeadBand in the CON_PU1
AlcBlk	bool	retain	in	yes		Block alarm
AlarmAck	bool	retain	in	yes		Acknowledge alarm
ActPosAlarms	Alarm2Limit	by_ref	in	yes		Actuator position alarm configuration
MCAAlarm	AlarmPar	by_ref	in	yes		MC alarm configuration
InPar	Motval02_In Par	by_ref	in	yes		In Parameter
EventName	string	coldretain	in	yes	' Motval02_'	Event name
NoInt	bool	retain	out	yes		No Interlocks
NoICInt	bool	retain	out	yes		No Safety Interlocks (IC)
NoIBInt	bool	retain	out	yes		No Process Interlocks (IB)
NoAIInt	bool	retain	out	yes		No Sequence Interlocks (IA)
Trip	bool	retain	out	yes		Trip
Blk	bool	retain	out	yes		Standby
RFS	bool	retain	out	yes		Ready for start
IPOS	bool	retain	out	yes		Intermediate position
OPN	bool	retain	out	yes		Open order
OPNL	bool	retain	out	yes		Limit switch open is reached
CLS	bool	retain	out	yes		Close order
CLSL	bool	retain	out	yes		Limit switch close is reached
SAck	bool	retain	out	yes		Start order acknowledgement
Run	bool	retain	out	yes		Running
JogInd	bool	retain	out	yes		Jog mode
NoJogInt	bool	retain	out	yes		No Jog Interlocks
LocalInd	bool	retain	out	yes		Local mode
ManInd	bool	retain	out	yes		Man mode
AutoInd	bool	retain	out	yes		Auto mode
E1Ind	bool	retain	out	yes		E1 mode
E2Ind	bool	retain	out	yes		E2 mode
E3Ind	bool	retain	out	yes		E3 mode
AutoSP	real	retain	out	yes		Auto setpoint
WSP	real	retain	out	yes		Working setpoint
Deviation	real	retain	out	yes		Deviation
PosError	bool	retain	out	yes		Position Error
Curr	real	retain	out	yes		Actual current (%)
NormCurr	real	retain	out	yes		Normal current (%)
OutPar	Motval02_O	by_ref	out	yes		Out Parameter

Name	Data Type	Attributes	Direction	FD Port	Initial value	Description
	utPar					
Opr	Motval02_Opr	by_ref	out	yes		Operator order

Table 3-1. Terminal properties.

4 MOTVAL02 Datatypes

4.1 MOTVAL02_InPar

Name	Data Type	Attributes	Initial value	ISP value	Description
Class	dint	coldretain	500		AE class
Severity	dint	coldretain	1000		AE severity
ActPosRange	RangeReal	coldretain			Actuator Range
InitMode	dint	coldretain	5		Init mode (5 = Man ; 6 = Auto ; 7 = E1 ; 8 = E2 ; 9 = E3)
JogBlk	bool	coldretain	false		Block operator order Jog mode
LocalBlk	bool	coldretain	false		Block operator order Local mode
ManBlk	bool	coldretain	false		Block operator order Man mode
AutoBlk	bool	coldretain	false		Block operator order Auto mode
E1Blk	bool	coldretain	false		Block operator order E1 mode
E2Blk	bool	coldretain	false		Block operator order E2 mode
E3Blk	bool	coldretain	false		Block operator order E3 mode
OpenBlk	bool	coldretain	false		Block operator order Open command
CloseBlk	bool	coldretain	false		Block operator order Close command
StopBlk	bool	coldretain	false		Block operator order Stop command
AlcBlkEvBlk	bool	coldretain	true		Block event for AlcBlk
LEnblEvBlk	bool	coldretain	true		Block event for LEnbl
JogEnblEvBlk	bool	coldretain	true		Block event for JogEnbl
SeqManEvBlk	bool	coldretain	true		Block event for SeqMan
SeqAutoEvBlk	bool	coldretain	true		Block event for SeqAuto
SeqE1EvBlk	bool	coldretain	true		Block event for SeqE1
SeqE2EvBlk	bool	coldretain	true		Block event for SeqE2
SeqE3EvBlk	bool	coldretain	true		Block event for SeqE3
LSOpnEvBlk	bool	coldretain	true		Block event for LSOpn
LSClsEvBlk	bool	coldretain	true		Block event for LSCls
ExtOpenEvBlk	bool	coldretain	true		Block event for ExtOpen
ExtCloseEvBlk	bool	coldretain	true		Block event for ExtClose
ExtStopEvBlk	bool	coldretain	true		Block event for ExtStop
IABlockNotExtMode	bool	coldretain	true		IA blocked when not in E1 or E2 mode
IA1	IAnParType2	coldretain			Configuration for IA1
IA2	IAnParType2	coldretain			Configuration for IA2
IAs1	IAnParType2	coldretain			Configuration for IAs.IA1
IAs2	IAnParType2	coldretain			Configuration for IAs.IA2
IB1	IBInParType2	coldretain			Configuration for IB1
IB2	IBInParType2	coldretain			Configuration for IB2
IB3	IBInParType2	coldretain			Configuration for IB3
IB4	IBInParType2	coldretain			Configuration for IB4
IBs1	IBInParType2	coldretain			Configuration for IBs.IB1
IBs2	IBInParType2	coldretain			Configuration for IBs.IB2
IBs3	IBInParType2	coldretain			Configuration for IBs.IB3
IBs4	IBInParType2	coldretain			Configuration for IBs.IB4
IBs5	IBInParType2	coldretain			Configuration for IBs.IB5
IBs6	IBInParType2	coldretain			Configuration for IBs.IB6
IBs7	IBInParType2	coldretain			Configuration for IBs.IB7
IBs8	IBInParType2	coldretain			Configuration for IBs.IB8
IC1	ICInParType2	coldretain			Configuration for IC1
IC2	ICInParType2	coldretain			Configuration for IC2
ICs1	ICInParType2	coldretain			Configuration for ICs.IC1
ICs2	ICInParType2	coldretain			Configuration for ICs.IC2
RatedCurr	real	coldretain	100.0		Rated current (in CurrUnit)
NormalCurr	real	coldretain	50.0		Normal current (in CurrUnit)
CurrUnit	string	coldretain	'A'		Current unit
ShowCurrent	bool	coldretain	false		Show current presentation
AEConfigLSErr	dint	coldretain	1		AE configuration for Limit Sw Exceed
AEConfigM1	dint	coldretain	1		AE configuration for M1
AEConfigM2	dint	coldretain	1		AE configuration for M2

Name	Data Type	Attributes	Initial value	ISP value	Description
AEConfigM3	dint	coldretain	1		AE configuration for M3
AEConfigM4	dint	coldretain	1		AE configuration for M4
AEConfigM5	dint	coldretain	1		AE configuration for M5
AEConfigMCErr	dint	coldretain	1		AE configuration for Main Contactor Error
AEConfigPosErr	dint	coldretain	1		AE configuration for Position Error
AEConfigPosErrC	dint	coldretain	1		AE configuration for Pos Error Close
AEConfigPosErrO	dint	coldretain	1		AE configuration for Pos Error Open
AEConfigTorqCls	dint	coldretain	1		AE configuration for Torque Close
AEConfigTorqOpn	dint	coldretain	1		AE configuration for Torque Open
OUTIncDec	real	coldretain	2.0		Increase/Decrease step of output (in seconds)
SPIncDec	real	coldretain	1.0		Increase/Decrease step of setpoint (In percentage of range)

4.2 MOTVAL02_OutPar

Name	Data Type	Attributes	Initial value	ISP value	Description
AlarmBlk	bool	retain			Alarm blocked
IntlkBlk	bool	retain			Interlock blocked
IntlkBlkActive	bool	retain			Interlock blocked active
EnOverrideAll	bool	retain			Override All button enabled
Mode	dint	retain			Active mode
NormalMode	bool	retain			Normal mode (Active mode = Init mode)
IA1Ind	bool	retain			IA1 interlocked
IA2Ind	bool	retain			IA2 interlocked
IAs1Ind	bool	retain			IAs1 interlocked
IAs2Ind	bool	retain			IAs2 interlocked
IB1Ind	bool	retain			IB1 interlocked
IB2Ind	bool	retain			IB2 interlocked
IB3Ind	bool	retain			IB3 interlocked
IB4Ind	bool	retain			IB4 interlocked
IBs1Ind	bool	retain			IBs1 interlocked
IBs2Ind	bool	retain			IBs2 interlocked
IBs3Ind	bool	retain			IBs3 interlocked
IBs4Ind	bool	retain			IBs4 interlocked
IBs5Ind	bool	retain			IBs5 interlocked
IBs6Ind	bool	retain			IBs6 interlocked
IBs7Ind	bool	retain			IBs7 interlocked
IBs8Ind	bool	retain			IBs8 interlocked
IC1Ind	bool	retain			IC1 interlocked
IC2Ind	bool	retain			IC2 interlocked
ICs1Ind	bool	retain			ICs1 interlocked
ICs2Ind	bool	retain			ICs2 interlocked
ActPosH	AlarmInd	retain			Alarm Indication for ActPosH
ActPosL	AlarmInd	retain			Alarm Indication for ActPosL
HCurr	AlarmInd	retain			Alarm Indication for HCurr
LSErr	AlarmInd	retain			Alarm Indication for LSErr
M1	AlarmInd	retain			Alarm Indication for M1
M2	AlarmInd	retain			Alarm Indication for M2
M3	AlarmInd	retain			Alarm Indication for M3
M4	AlarmInd	retain			Alarm Indication for M4
M5	AlarmInd	retain			Alarm Indication for M5
MCErr	AlarmInd	retain			Alarm Indication for MCErr
PosErr	AlarmInd	retain			Alarm Indication for PosErr
PosErrC	AlarmInd	retain			Alarm Indication for PosErrC
PosErrO	AlarmInd	retain			Alarm Indication for PosErrO
TorqCls	AlarmInd	retain			Alarm Indication for TorqCls
TorqOpn	AlarmInd	retain			Alarm Indication for TorqOpn

4.3 MOTVAL02_Opr

Name	Data Type	Attributes	Initial value	ISP value	Description
BlockAlarm	bool	retain			Operator block alarms
Jog	bool	retain			Operator order Jog mode
Local	bool	retain			Operator order Local mode
Man	bool	retain			Operator order Manual mode
Auto	bool	retain			Operator order Auto mode
E1	bool	retain			Operator order E1 mode
E2	bool	retain			Operator order E2 mode
E3	bool	retain			Operator order E3 mode
Open	bool	retain			Operator order Open command
Close	bool	retain			Operator order Close command
Stop	bool	retain			Operator order Stop command
Incr	real	retain			Operator order Increase SP command
Decr	real	retain			Operator order Decrease SP command
OverrideAll	bool	retain			Operator override all interlocks
IB1Override	bool	retain			Operator override IB1 interlock
IB2Override	bool	retain			Operator override IB2 interlock
IB3Override	bool	retain			Operator override IB3 interlock
IB4Override	bool	retain			Operator override IB4 interlock
IBs1Override	bool	retain			Operator override IBs.IB1 interlock
IBs2Override	bool	retain			Operator override IBs.IB2 interlock
IBs3Override	bool	retain			Operator override IBs.IB3 interlock
IBs4Override	bool	retain			Operator override IBs.IB4 interlock
IBs5Override	bool	retain			Operator override IBs.IB5 interlock
IBs6Override	bool	retain			Operator override IBs.IB6 interlock
IBs7Override	bool	retain			Operator override IBs.IB7 interlock
IBs8Override	bool	retain			Operator override IBs.IB8 interlock
IA1Override	bool	retain			Operator override IA1 interlock
IA2Override	bool	retain			Operator override IA2 interlock
IAs1Override	bool	retain			Operator override IAs.IA1 interlock
IAs2Override	bool	retain			Operator override IAs.IA2 interlock
AutoSP	real	coldretain	0.0		Operator enter auto SP

5 Function

5.1 Basic Properties

The MOTVAL02 functional unit is designed for control of position motorized valves. MOTVAL02 units consist of the following basic functions.

- Supervision of control circuits
- Evaluation of interlocks
- Control of on/off
- Supervision of motor current
- Running of tests from the valve site
- Control from the local operator's panel
- Manual/External running
- Supervision of operations via Operate^{IT} Operator Station

5.2 Control Modes

MOTVAL02 is intended for control from Operate^{IT} Operator Station, i.e. from a central control room. However, it is also possible to select other modes of control and thus control MOTVAL02 from other locations.

All the control modes can be selected from the central operator station. The LOCAL control mode may also be selected from the local control station.

The different modes of control are as follows:

- Jog
- Local
- Manual
- External 1
- External 2


5.3 Ready for Start

Ready for start means that all the interlocks are satisfied, that there are no alarms and that the control mode is not JOG or that the control is DISABLED.

Ready for start is indicated by the MOTVAL02 displays in the Operate^{IT} Operator Station and by the output terminal :RFS (Ready For Start).

5.4 Start-up

An initialization phase begins at start of the system. The result of this becomes:

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The outputs are reset (to zero) except for the ManInd terminal, which is set (to 1).

Manual is the default control mode at system initialization. With an additional circuit it is possible to force the control mode to other modes at system initialization.

5.5 Interlocks

The valve control can be interlocked by signals from the process and also by signals from the control logic. The interlocks are divided into four groups with the following designations and functions.

Safety Interlocks, which interlock the object for safety purposes. The two safety interlocks, IC1Opn and IC2Cls, cannot be blocked. IC1Opn is used to force open the valve when interlock occurs and IC2Cls is used to force close the valve when interlock occurs.

Process Interlocks. There are 4 normal process interlocks, IB1 - IB4. All four interlocks can be configured to accept blocking by the operator. In the same scheme all four can be configured as start interlocks. Start interlock prevents the valve from opening, but does not close an open valve.

External (Sequence) Interlocks. These interlocks (Function block input :IA1Opn and :IA2Cls) are used if the object is to be interlocked against other objects such as a pump motor or a group start or other conditions in an automatic sequence. The interlocks cannot be blocked and the interlocks are not included in the conditions for indication of Ready for start. IA1Opn is used to force open the valve when interlock occurs and IA2Cls is used to force close the valve when interlock occurs.

If *IA blocked when not Ext* is equal to 1

The IA1Opn is effective in E1 mode and IA2Cls is effective in E2 mode.

If *IA blocked when not Ext* is equal to 0

IA1Opne and IA2Cls is effective in all mode except in Jog Mode.

5.6 Control Modes

By selecting control mode, the operator decides from which location the valve is to be controlled. All control modes may be selected through dialog in Operate^{IT} Operator Station. However, the LOCAL control mode may also be selected from the local control station through the Function Block input :LEnbl, provided that the current control mode is neither JOG, nor DISABLE.

For the different control modes, MOTVAL02 is controlled as follows. For a summary of the control modes, see Table 2-1.

5.6.1 Control mode JOG

The control mode JOG is suitable for testing the motor operated valve in the field. The valve is supposed to be controlled from a stop/start station adjacent to the valve. Control from other locations is blocked.

The supervision of interlocks is limited. Only the safety interlocks IC1Opn and IC2Cls as well as faults in the control voltage chain (the inputs :M1 - :M4) prevent starting.

The motor operated valve is opened and closed through the inputs :JogOpn, JogCls and :JogFunc.

- :JogOpn, Open order from field-mounted start/stop station
- :JogCls, Close order from field-mounted start/stop station
- :JogFunc, Stop/Hold function from field-mounted start/stop station

The function of these inputs is set out in tabular form below.

:JogOpn	:JogCls	:JogFunc	
1	0	0	Open order.
0	1	0	Close order
0	0	0	Stop order
1	0	1	Open order.
0	1	1	Close order.
0	0	1	No change (last order obtained)

When :JogFunc=1, the motor operated valve is stopped by breaking the control voltage chain, i.e. signified by any of the :M1 - :M5 inputs going low, or in some cases there is a jog stop push button available at field to stop the order, the jog stop from the field is connected to function block input :Stop.

5.6.2 Control mode LOCAL

The valve is controlled from a local desk or panel. Control from other locations is blocked.

LOCAL control mode, like other points of control, may be selected from Operate^{IT} Operator Station. In addition, LOCAL control mode may be selected from the local control panel through the input :LEnbl as follows:

LEnbl= 1: The control mode is LOCAL, as long as the Operate^{IT} Operator Station operator does not request JOG or STAND BY.

LEnbl -> 0: MOTVAL02 resumes the latest control mode called for from Operate^{IT} Operator Station.

The operator controls the valve through the inputs :LOpn, LCls and :LStop.

:LStop Local stop order (active low)

:LOpn Local Open order

:LCls Local Close order

The function of these inputs is set out in tabular form below.

:Lstop	:LOpn	:LCls	
0	X	X	Stop order. Note In order for the motor to start when LStop has been low, LStop must be set high and LOPN must make a low-to-high transition
1	0	0	No change (Last order obtained)
1	1	0	Open order
1	0	1	Close order

5.6.3 Control mode AUTO

The valve is controlled from Operate^{IT} Operator Station. Control from other locations is blocked. In this mode operator controls the opening of the valve by entering the setpoint value. The valve will open and close automatically until the position reaches the setpoint value.

5.6.4 Control mode MANUAL

The valve is controlled from Operate^{IT} Operator Station. Control from other locations is blocked. This is the default control mode. To open, the operator has to press the key Open. To close, operator has to press the key Close. To stop the valve, the key STOP has to be pressed.

5.6.5 Control mode EXTERNAL 1

The setpoint is set from an external signal, e.g. from a process signal. Control from other locations is blocked. This mode is e.g. used for setting of position for automatic startup and shutdown of valves.

The process controls the position of the valve through the input :Ext1Ref. The operator is able to stop the valve by issuing stop order from Operate^{IT} Operator Station. The control mode then changes to Manual, to prevent that the valve is reopened.

5.6.6 Control mode EXTERNAL 2

The valve is controlled from a superior program , e.g. from a group start, sequence or a process signal. Control from other locations is blocked. This mode is e.g. used for setting of position for automatic startup and shutdown of valves

The process controls the valve through the input :Ext2Ref. The operator is able to stop the valve by issuing stop order from Operate^{IT} Operator Station. The control mode then changes to Manual, to prevent that the valve is reopened.

5.6.7 Control mode EXTERNAL 3

The valve is controlled from an external signal , e.g. from a group start, sequence or a process signal. Control from other locations is blocked. This mode is e.g. used for open/close control of levels and for automatic startup and shutdown of valves

The process controls the valve through the inputs :E3Opn, E3Cls and Stop. The operator is able to stop the valve by issuing stop order from Operate^{IT} Operator Station. The control mode then changes to Manual, to prevent that the valve is reopened.

The inputs used for open, close and stop orders in control mode External 3 are:

:Stop Stop order (active low)

:E3Opn Open order

:E3Cls Close order

The function of these inputs is set out in tabular form below:

:Stop	:E3Opn	:E3Cls	
0	X	X	Stop order
1	0 -> 1	0	Open order
1	0	0 ->1	Close order

:E3Opn and **:E3Cls** are dynamic inputs, i.e. it triggers on the rising edge.

5.6.8 Control mode DISABLED

The valve is closed and all orders to it are blocked.

5.6.9 Operator Order and Order Blocking

The different orders given by the operator can be read at the output terminal :OprOrder.

Blocking of operator order also possible from the control program by setting the corresponding bits in the terminal :OrdBlk.

5.7 Open, Close and Stop

Open, Close and stop commands for MOTVAL02 may originate from dialog with Operate^{IT} Operator Station or from Function Block inputs, depending on the control mode selected (See Section 5.6 Control Modes, and Table 2-1).

When an Open or a Close command is issued to MOTVAL02, it is forwarded to the motor through the Function Block output :OPN (Open order, Forwards/High/Up) and it is reversed the motor through Function Block output :CLS (Close order, Reverse/Low/Down). See Section 5.7.3 Start Order Selection. The open order on the output :OPN and the close order on the output :CLS are continuous outputs.

The main contactor of the motor acknowledges the open order :OPN or close order :CLS by setting the input :ACK1 high for Open and :ACK2 high for Close. The main contactor must acknowledge within the time determined by the input :T2.

There are certain MCC circuits which connect the ACK1 and ACK2 inside the MCC and only send one feedback to DCS system as open and close acknowledges, in this case the ACK1 on the Function Block input :ACK1 to be set to high or 1.

If the main contactor acknowledges the open order :OPN within the time T2, MOTVAL02 sets the open order output :OPN high and keeps it high. The time T3 after the main

contactor having responded, MOTVAL02 starts supervising the motor current. The time T3 is determined by the input :T3

If the main contactor does not acknowledge the start order within the time T2, the start attempt is deemed abortive. Consequently, MOTVAL02 issues an alarm about the contactor failure (Main Contactor Err.) and a new attempt at starting may be made.

The contactor failure alarm indication on the object display of MOTVAL02 disappears when the operator acknowledges the alarm.

MOTVAL02 also issues an alarm about main contactor failure when the contactor acknowledges open or close orders falsely, i.e. when it sets the inputs :ACK1 high without any open order being issued. MOTVAL02 transmits the alarm the time T2 after the input having been set.

5.7.1 Open and Close on Torque

Inputs :TorqOpnFunc and :TorqClsFunc selects opening and/or closing function (Limit sw. or Torque sw.)

:TorqOpnFunc = 0 Opening stops on limit switch :LSOpn.

:TorqOpnFunc = 1 Opening stops on torque switch :TorqOpn.

:TorqClsFunc = 0 Closing stops on limit switch :LSCls.

:TorqClsFunc = 1 Closing stops on torque switch :TorqCls.

If the torque switches are activated before the limit switches, with the torque function selected, an alarm is given. This means that the limit switches of the actuator must be adjusted so that they are made before the torque switches.

5.7.2 Open, Close and Stop Order at Different Control Modes

The table below describes the commands, which can be given at the different control modes of MOTVAL02.

Table 2-1. Relation between commands and control modes

Order	Jog	Auto	Manual	Local	Ext1	Ext2	Ext3
Input JogOpn	Open Stop	-	-	-	-	-	-
Input JogCls	Close Stop	-	-	-	-	-	-
Input Lopn	-	-	-	Open	-	-	-
Input LCls	-	-	-	Close	-	-	-
Input Lstop	-	-	-	Stop	-	-	-
Operator Setpoint	-	0-100%	-	-	-	-	-

Operator Open	-	-	Open	-	-	-	-
Operator Close	-	-	Close	-	-	-	-
Operator stop	Stop	Stop	Stop	Stop*	Stop	Stop	Stop
Input E1Ref	-		-	-	0-100%	-	-
Input E2Ref	-		-	-	-	0-100%	-
Input E2Opn	-		-	-	-	Open	-
Input E2Cls	-		-	-	-	Close	-
Input E3Opn	-		-	-	-	-	Open
Input E3Cls	-		-	-	-	-	Close
Input Stop	Stop	Stop	-	-	Stop	Stop	Stop

* only when local mode is selected from operate ^{IT} keyboard

5.7.3 Start Order Selection

The Function Block MOTVAL02 has one open order and one close order outputs:

- :OPN Open order, Forwards/High/up
- :CLS Close order, Reverse/Low/Down

The activation of the outputs is determined as follows from the different points of control.

Control mode JOG

FB input :JogOpn

FB input :JogCls

Control mode LOCAL

FB input :LOpn

FB input :LCls

Control mode AUTO

The operator set the setpoint from Operate ^{IT} Operator Station.

Control mode MAN

The operator issues a Start order from Operate^{IT} Operator Station.

Control mode Ext 1

FB input :Ext1Ref.

Control mode Ext 2

FB input :Ext2Ref.

Control mode Ext 3

A superior control program sets the input :E3Opn or E3Cls to issue a new open or close order.

See the table below.

:E3Opn	:E3Cls	Stop	Descr
0	0	1	No change.
1	0	1	Open order.
0	1	1	Close order
X	X	0	Stop order

Control mode DISABLE

The valve cannot be opened.

5.8 Fault Evaluation in the Control Circuit

Evaluation is performed in the priority order M1, M2, M5, M3 and M4. This means that if the Input :M1 =0, the inputs :M2 - :M5 are not regarded etc. The signal ME interlocks the complete evaluation. ME=0 is used to prevent incorrect alarms with, for example, a total control voltage failure. The inputs M1 to M5 are to be TRUE when there are no errors. The evaluation presupposes that the control circuit consists of a number of breaking contacts in series.

5.9 Supervision of Motor Current

The input MC is connected to the process signal for motor current. In the FB element MOTVAL02, the value which corresponds to 100 % load (rated current) is given for the variable NomCurr. The motor current is compared with NomCurr and an alarm indication is obtained if the current is greater than Current Alarm Limit. During start up, the comparison is blocked during the time T3. The value presented on the display screen is given as a percentage of the rated current (rated current = 100 %).

5.10 Event Handling

Event are generated for status change on the signals defined in interaction window in chapter 5.11.4 Alarm and Event Blocking

The layout of the event is described in chapter 6.3.2

All Operator Events are reported by Audit Trail Functionality and not included in the FunctionBlock.

The individual text string for each event is stored in the Alarm and Event Translator aspect. This text can be NLS handled.

5.11 Interaction Window

The interaction window is available in the Control^{IT} Control Builder. The interaction window is an engineering aid used to simplify configuration and blocking of signals not available on the faceplates. Changes to values in the Interaction window are only available in 'Online' mode in Control^{IT}.

5.11.1 MOTVAL02 Interaction Window

Interaction window overview. Name and description are shown. The buttons are links to sub-windows.

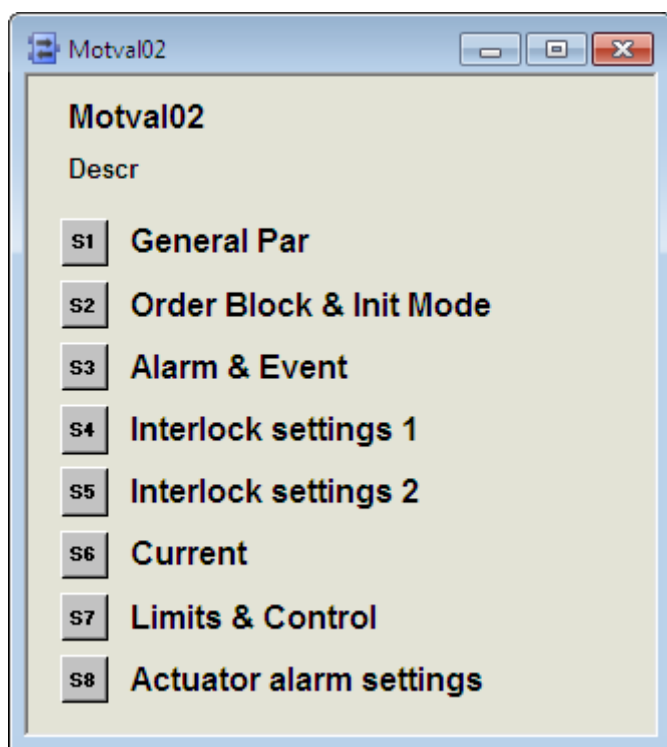


Figure 4-1 Main Interaction Window.

5.11.2 General Parameters

“Class” defines the process section or area in which alarms are grouped. By utilizing class the alarms can be filtered. Valid values are user defined. A suggestion would be to use mill area numbers as class values.

“Severity” defines the alarm priority for general alarms. Valid values are 1 –1000 where 1000 is the highest priority.

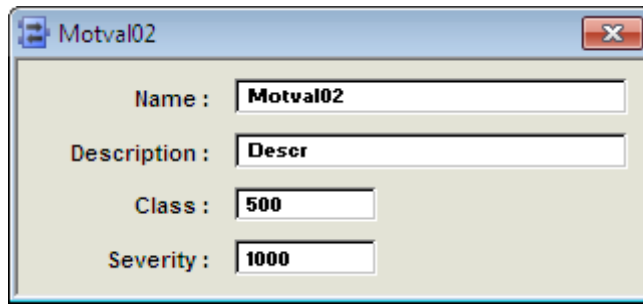


Figure 4-2 General Parameters.

5.11.3 Order Block

Blocking of operator order and event handling of these are entered in this window.

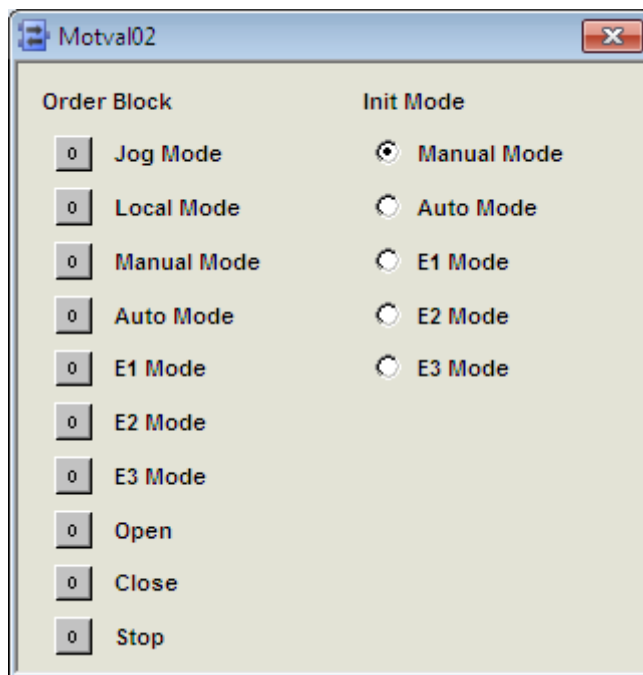


Figure 4-3 Order Block.

5.11.4 Alarm and Event Blocking

Alarm and Events are generated for status change on the signals defined in interaction window.

The layout of the alarm and event is described in chapter 6.3.

All Operator Events are reported by Audit Trail Functionality and not included in the FunctionBlock.

The individual text string for each event is stored in the Alarm and Event Translator aspect. This text can be NLS handled.

For Alarm Configuration the following values are valid

- 0 No Alarm or Event are generated
- 1 Alarm and Event are generated
- 2 Event is generated

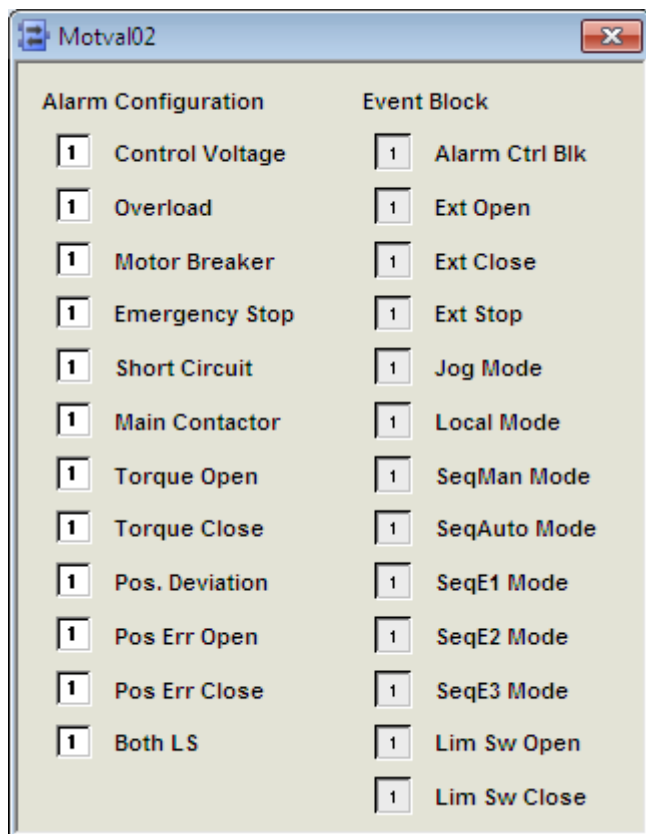


Figure 4-4 Indication Event Block.

5.11.5 Interlock Settings

The different settings for interlocks are entered in this window.

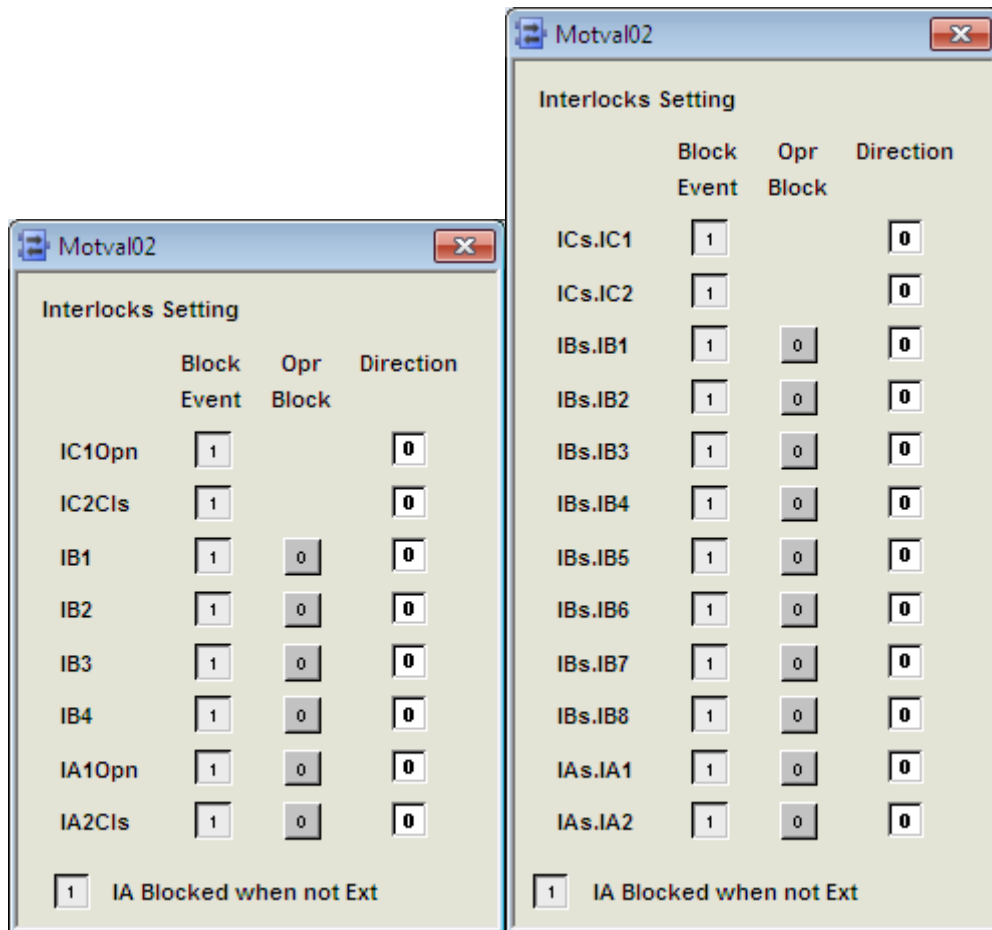


Figure 4-5 Interlock Settings.

5.11.6 Current settings

Motor nominal (rated) current and normal current is entered in this window. The actual current is also indicated.

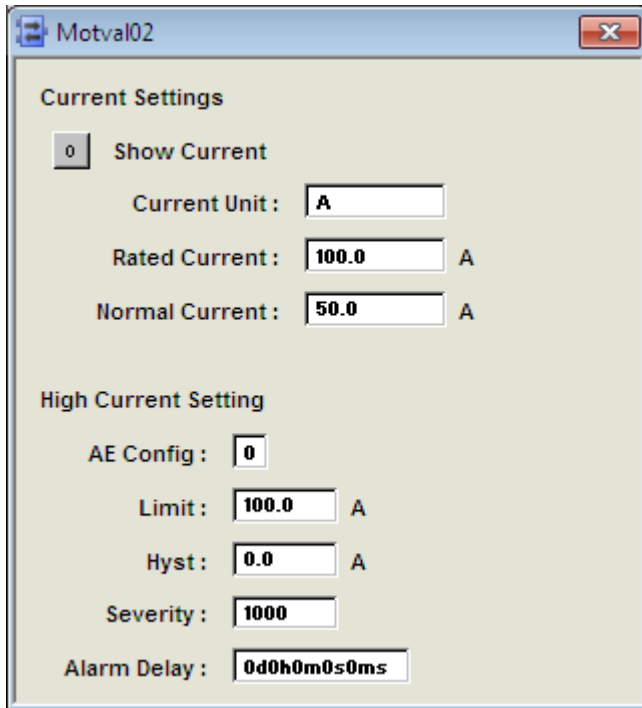


Figure 4-6 Current settings.

5.11.7 Texts

The different interlock and information texts is entered in this window.

Name	Value	Type	Description	Readable?	R/Permission	Writable?	W/Permission	Deploy Scheme
M1Text	Control Voltage	String	M1 Text	Yes		Yes	Configure	Always Repla
M2Text	Overload	String	M2 Text	Yes		Yes	Configure	Always Repla
M3Text	Motor Breaker	String	M3 Text	Yes		Yes	Configure	Always Repla
M4Text	Emergency Stop	String	M4 Text	Yes		Yes	Configure	Always Repla
M5Text	Short Circuit	String	M5 Text	Yes		Yes	Configure	Always Repla
IC1Text		String	IC1 Interlock Text	Yes		Yes	Configure	Always Repla
IC2Text		String	IC2 Interlock Text	Yes		Yes	Configure	Always Repla
ICs								
IC1Text		String	ICs.IC1 Interlock Te	Yes		Yes	Configure	Always Repla
IC2Text		String	ICs.IC2 Interlock Te	Yes		Yes	Configure	Always Repla
IB1Text		String	IB1 Interlock Text	Yes		Yes	Configure	Always Repla
IB2Text		String	IB2 Interlock Text	Yes		Yes	Configure	Always Repla
IB3Text		String	IB3 Interlock Text	Yes		Yes	Configure	Always Repla
IB4Text		String	IB4 Interlock Text	Yes		Yes	Configure	Always Repla
IBs								
IB1Text		String	IBs.IB1 Interlock Te	Yes		Yes	Configure	Always Repla
IB2Text		String	IBs.IB2 Interlock Te	Yes		Yes	Configure	Always Repla
IB3Text		String	IBs.IB3 Interlock Te	Yes		Yes	Configure	Always Repla
IB4Text		String	IBs.IB4 Interlock Te	Yes		Yes	Configure	Always Repla
IB5Text		String	IBs.IB5 Interlock Te	Yes		Yes	Configure	Always Repla
IB6Text		String	IBs.IB6 Interlock Te	Yes		Yes	Configure	Always Repla
IB7Text		String	IBs.IB7 Interlock Te	Yes		Yes	Configure	Always Repla
IB8Text		String	IBs.IB8 Interlock Te	Yes		Yes	Configure	Always Repla
IA1Text		String	IA1 Interlock Text	Yes		Yes	Configure	Always Repla
IA2Text		String	IA2 Interlock Text	Yes		Yes	Configure	Always Repla
IAS		String	RunInt2 Interlock Te	Yes		Yes	Configure	Always Repla
IA1Text		String	IAS.IA1 Interlock Te	Yes		Yes	Configure	Always Repla
IA2Text		String	IAS.IA2 Interlock Te	Yes		Yes	Configure	Always Repla
Info1Text		String	Info 1 Text	Yes		Yes	Configure	Always Repla
Info2Text		String	Info 2 Text	Yes		Yes	Configure	Always Repla

Figure 4-7 Texts.

5.11.8 Alarm settings

Setting of the alarm limits for MV alarms

Motval02

Alarm Settings

	L Limit	H Limit
AE Config :	<input type="text" value="0"/>	<input type="text" value="0"/>
Limit :	<input type="text" value="100.0"/>	<input type="text" value="100.0"/>
Hyst :	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
Severity :	<input type="text" value="1000"/>	<input type="text" value="1000"/>
Alarm Delay :	<input type="text" value="0d0h0m0s0ms"/>	<input type="text" value="0d0h0m0s0ms"/>

5.11.9 Limits & Control

Max, min ranges and units are entered in this window.

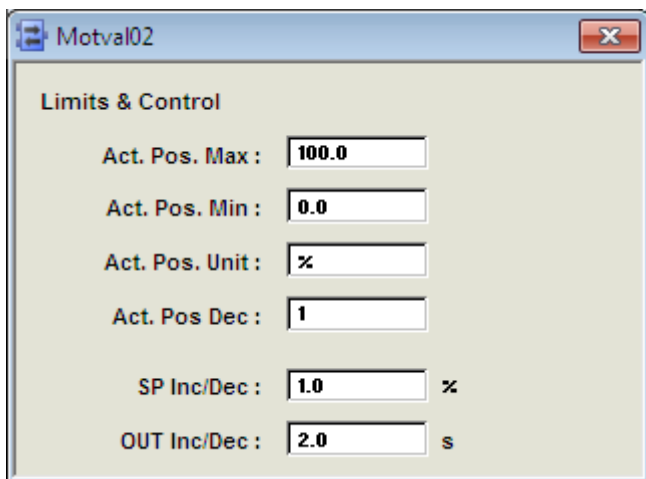


Figure 4-9 Limits & Control.

6 Operator Functions

The Operator functions are divided in principle into 3 parts:

Presentation (Display elements, Time logged properties)

Faceplate (Dialog)

Alarm and Event handling

6.1 Presentation

6.1.1 Display Elements

Display elements, which can be used for different display types, are available for use in the functional unit MOTVAL02.

The display elements show the status and the controls of the process with different degrees of detail and are intended for the following displays:

- Object display
- Process display
- Interlock Display

Examples of different display elements, which could be used, are given in the following sections.

6.1.1.1 Object Display

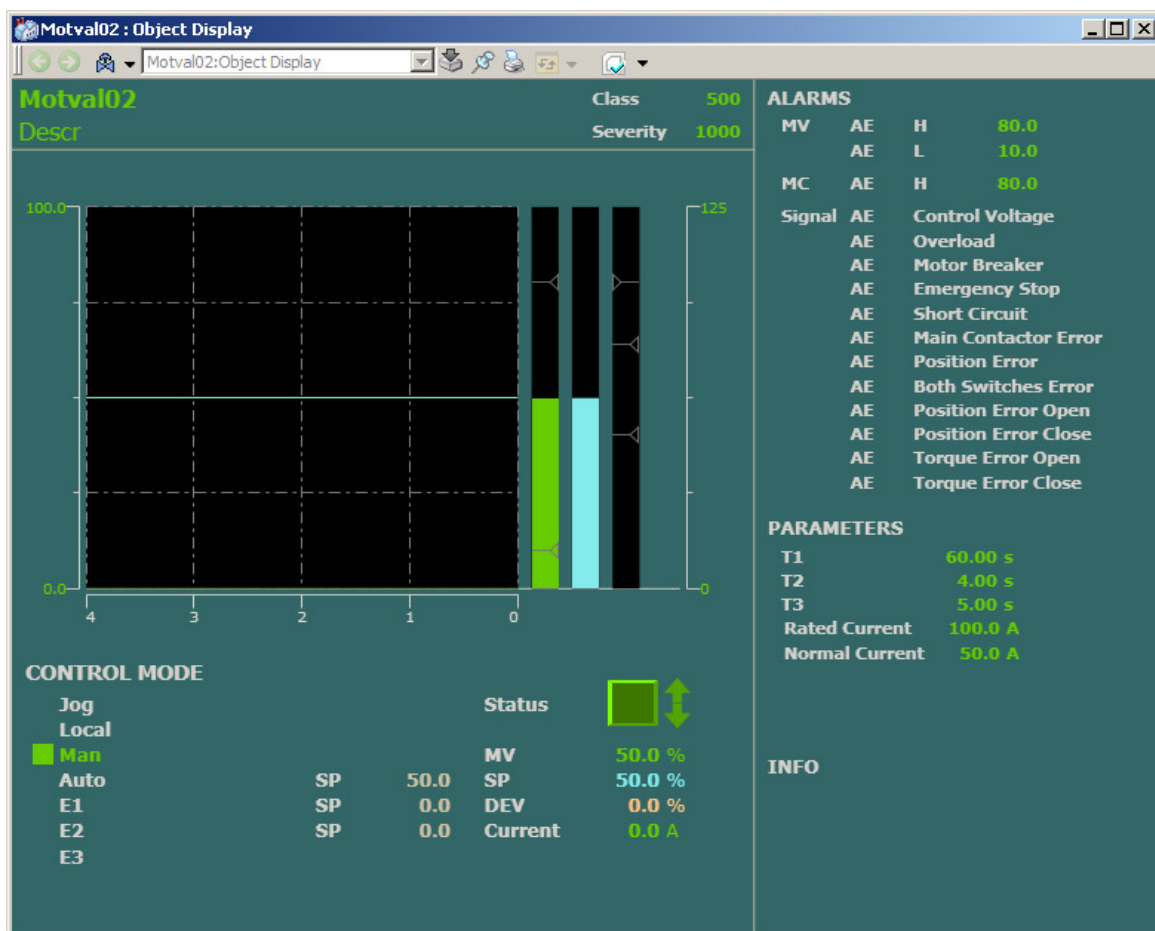


Figure 5-1. Object Display.

6.1.1.2 Process Display

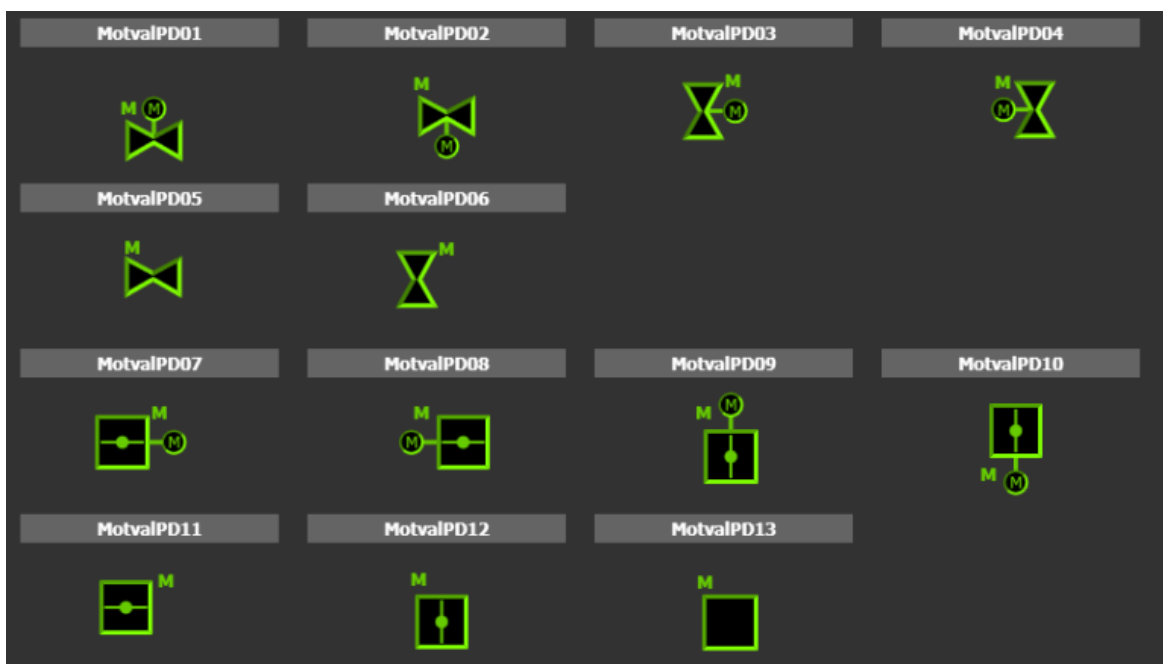




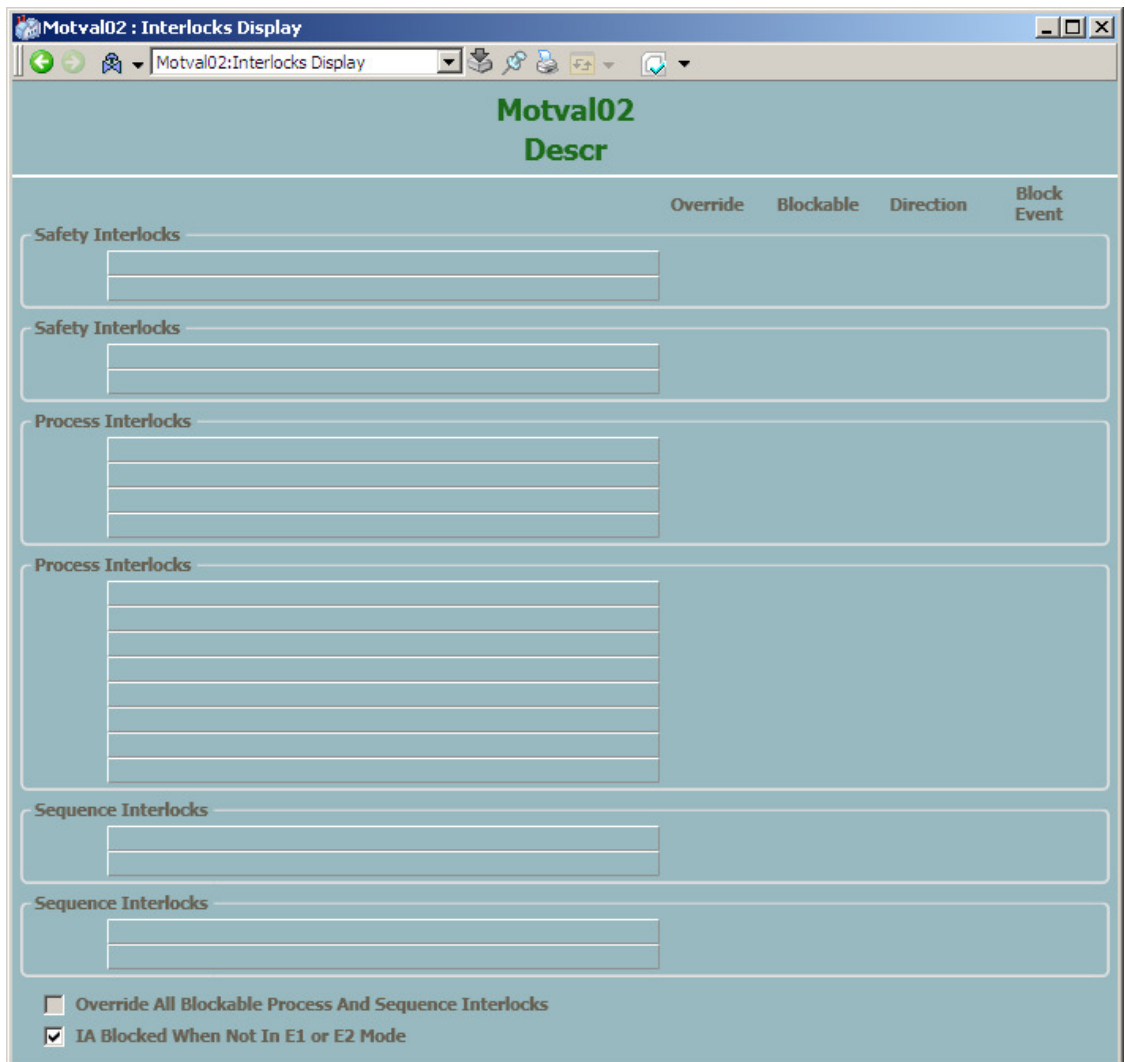
Figure 5-2. MOTVAL02 Graphic elements

6.1.1.3 Interlock Display

This display shows the actual status of all Interlock. The operator can override individual interlocks or all interlock.

Interlocks that can be overridden must be set to Blockable. This can be done from this display if the user has permission Configure or from the Interaction Window see chapter 5.11.4

Start Interlock, Block Event and IA Blocked when no in E1 or E2 mode are parameters that can be set from this display if the user has Permission Configure or from Interaction Window



6.1.2 Time-logged Properties

Measured values stored can be presented graphically in the form of curves on the display screen. Such a display, a **Trend display**, can consist of 1- 4 curves. All properties for the object MOTVAL02 are available to be logged on the trend curves.

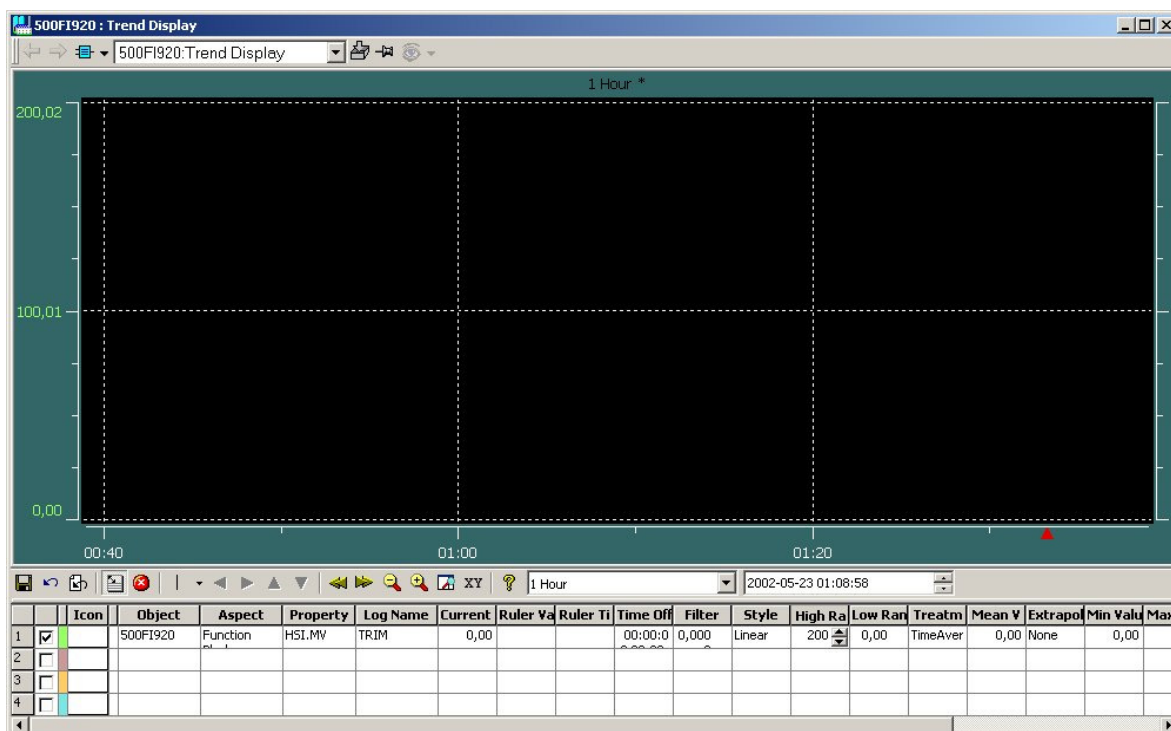


Figure 5-3 Trend Curve

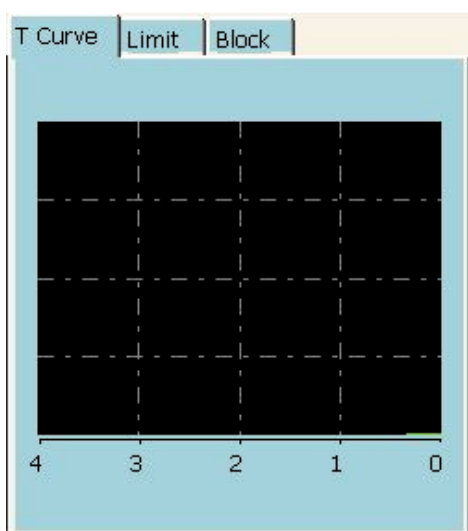


Figure 5-4 Extended Faceplate (T Curve)

6.2 Faceplate(Dialog)

The display screen is supplemented with a mouse and keyboard for operator communication with the functional unit/object.

By using Operate^{IT} Operator Station the operator can view and control the process through faceplates. The dialogue consists of buttons, indicators and graphic presentations

within a Faceplate. A faceplate has three levels of dialogue, which are presented by the following three runtime views:

- Reduced Faceplate, where the size and contents typically have been optimized to cover most of the normal process operator actions. Minimum dialogue. This is the default view.
- Faceplate, which typically covers all normal process operator actions. This view is disabled as default.
- Extended Faceplate, with functions and information intended for the process engineer or the advanced operator. Maximum dialogue.

The figures 5-5 to 5-11 below and overleaf illustrate the various presentations of the faceplate.

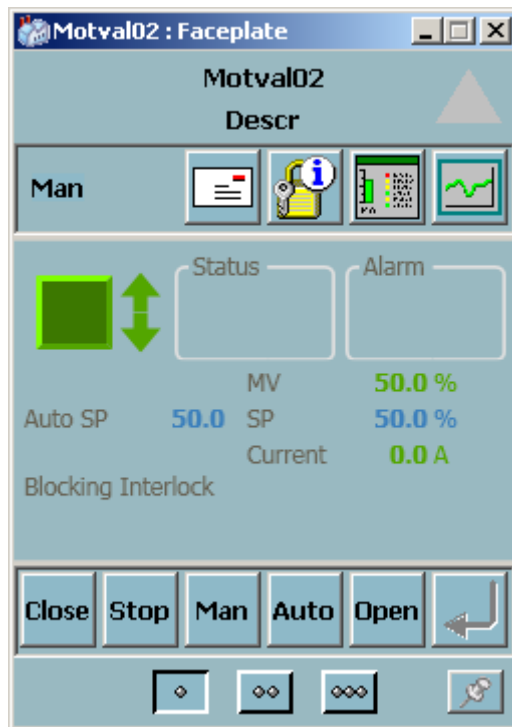


Figure 5-5 Reduced Faceplate.

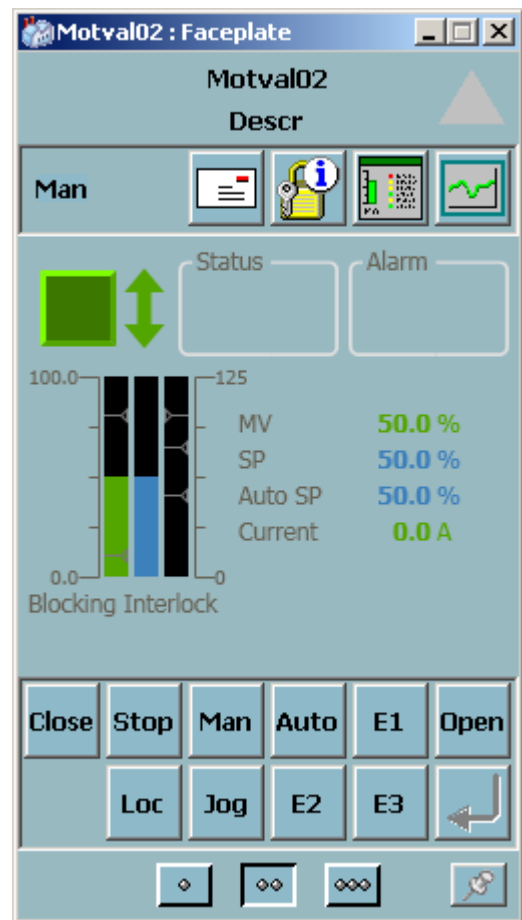


Figure 5-6 Faceplate.

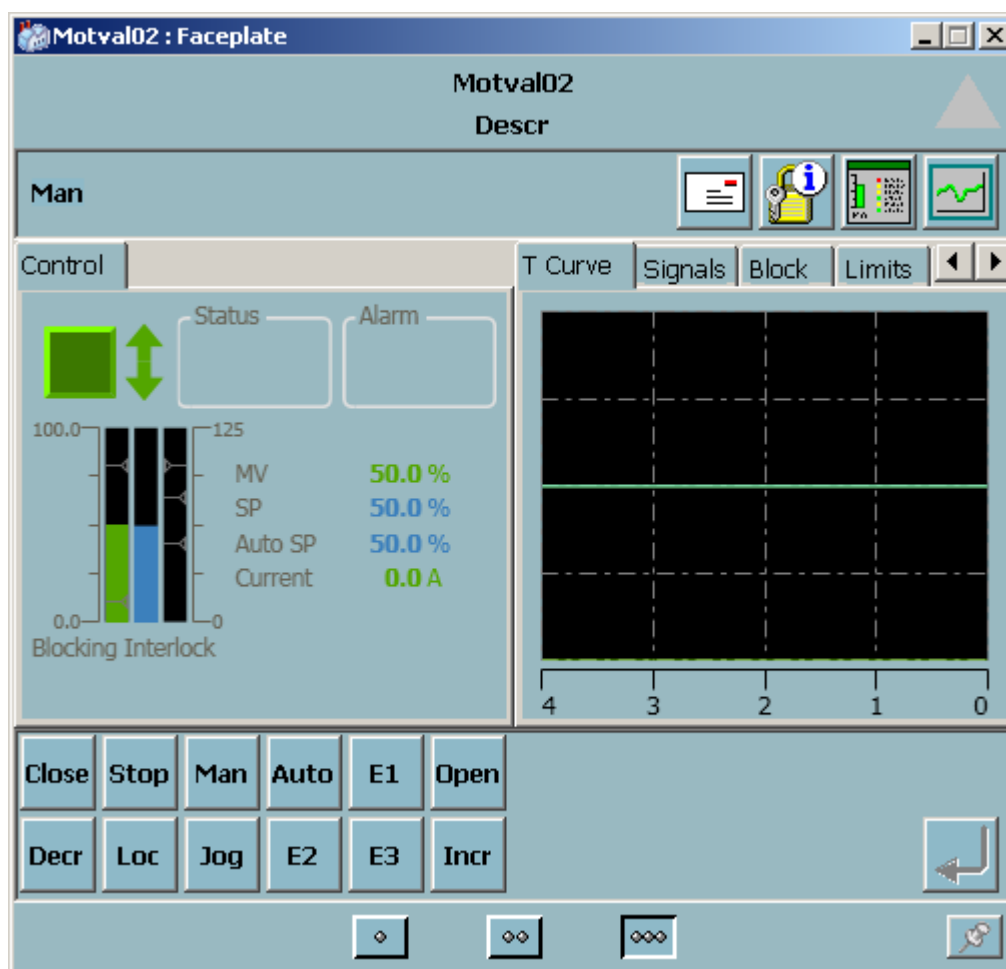


Figure 5-7 Extended Faceplate

6.3 Alarm and Event Handling

6.3.1 General

This section contains a description of all alarms and events in the functional unit MOTVAL02.

When a measured value deviates from the controllers limits or fails an alarm and an event is generated and can be viewed on the Operate^{IT} Operator Station. The alarms are indicated in the faceplate, object display and in the alarm and event list.

The alarm limits for MOTVAL02 can be controlled individually

The time stamping of the alarm is done when the function block is executed.

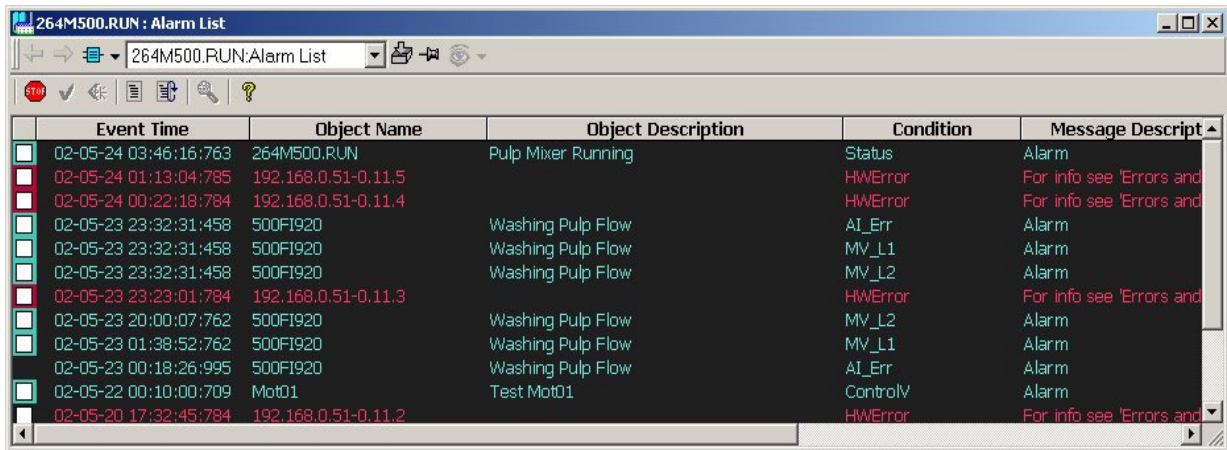


Figure 5-8 Alarm List

6.3.2 Alarm and Event Message

The following alarm texts are generated by the functional unit Motval02. . The “Condition” text are stored in the Alarm and Event Translator aspect and can be NLS handled.

Object Name	Object Description	Condition	Message Description
<Name>	<Description>	ActPos_HiLim	Alarm
<Name>	<Description>	ActPos_LoLim	Alarm
<Name>	<Description>	Control Voltage	Alarm
<Name>	<Description>	Emergency Stop	Alarm
<Name>	<Description>	High Current	Alarm
<Name>	<Description>	LimitSwErr	Alarm
<Name>	<Description>	Main Contactor	Alarm
<Name>	<Description>	Overload	Alarm
<Name>	<Description>	Short Circuit	Alarm
<Name>	<Description>	Motor Breaker	Alarm
<Name>	<Description>	TorqueCls	Alarm
<Name>	<Description>	TorqueOpn	Alarm
<Name>	<Description>	Position Deviation	Alarm
<Name>	<Description>	Pos Err Open	Alarm
<Name>	<Description>	Pos Err Open	Alarm

The following event texts are generated. The “Message Description” text are stored in the Alarm and Event Translator aspect and can be NLS handled.

*) Ext Open/Close is a combination of all Open/Close orders from Application.

SourceName	ObjectDescription	Condition	Message Description
<Name>	<Description>		SeqE1 Mode

<Name>	<Description>		SeqE2 Mode
<Name>	<Description>		SeqMan Mode
<Name>	<Description>		Local Mode
<Name>	<Description>		Ext Open
<Name>	<Description>		Ext Close
<Name>	<Description>		IC1 On
<Name>	<Description>		IC1 Off
<Name>	<Description>		IC2 On
<Name>	<Description>		IC2 Off
<Name>	<Description>		IB1 On
<Name>	<Description>		IB1 Off
<Name>	<Description>		IB2 On
<Name>	<Description>		IB2 Off
<Name>	<Description>		IB3 On
<Name>	<Description>		IB3 Off
<Name>	<Description>		IB4 On
<Name>	<Description>		IB4 Off
<Name>	<Description>		IA1 Opn On
<Name>	<Description>		IA1 Opn Off
<Name>	<Description>		IA2 Cls On
<Name>	<Description>		IA2 Cls Off
<Name>	<Description>		Limit Sw Open
<Name>	<Description>		Limit Sw Close
<Name>	<Description>		Alarm Acknowledge
<Name>	<Description>		Alarm Control Block

6.4 Faceplate tabs

6.4.1 Alarm and Event Blocking

By using the extended faceplate it is possible for the process engineer to block alarms and alarm printouts. When the block alarm and block printout check boxes are active then all alarms are blocked as indicated by the yellow text in the indicator button row and by the limit indicator on the bar graph.

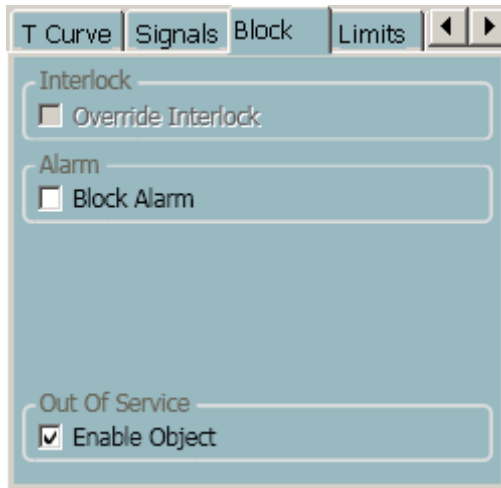


Figure 5-9 Extended Faceplate (Block)

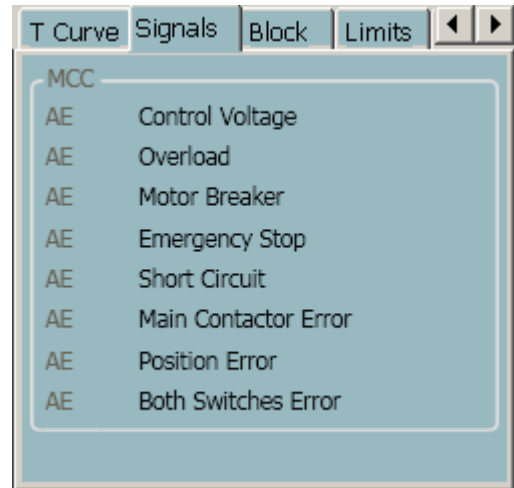
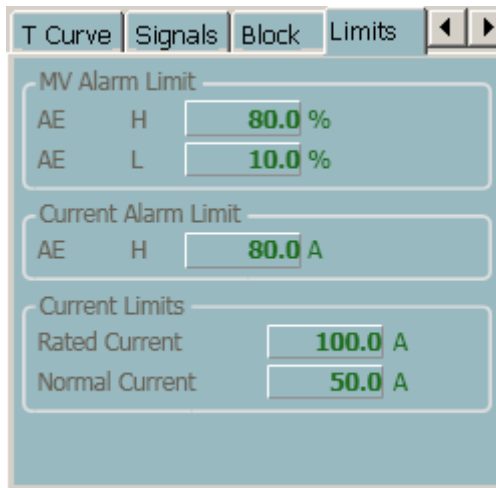
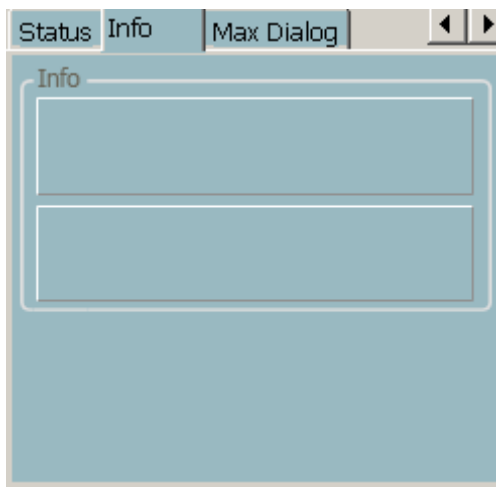


Figure 5-10 Extended Faceplate (Signals)

6.4.2 Limits

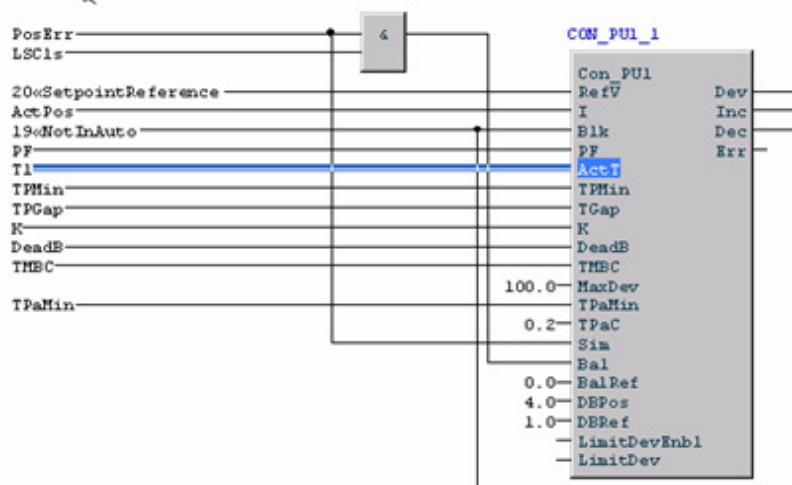


6.4.3 Info text



Appendix:

Configuration of the CON_PU element.



REVISION

Rev.	Page (P) Chapt. (C)	Description	Date Dept./Init.
-		First version	
A		Rev 1.3/0	021106/MP
B		Rev 2.0/0	03-05-26/MP
C	5, 8	Initialization	04-04-14/FM
D	3, 4	Rev 3.1/2	050319/MP
E	4,5	Event Handling is added. Interaction Window's are updated	050330/BP
F	3	Rev 4.0/1	050706/MP
G			
H		Appendix added	061107/BP
I		Rev 5.0-1 Interlock functionality is updated	081203/BP
J		Update Rev 5.1/0	101103/BP