Safety automation system solutions

Preventa safety modules types XPS BA, XPS BC, XPS BF

For electrical monitoring of two-hand control stations

Operating principle

Two-hand control stations are designed to provide protection against hand injury. They require machine operators to keep their hands clear of the dangerous movement zone.

The use of two-hand control is an individual protective measure, which can safely protect only one operator. Separate two-hand control stations must be provided for each operator in a multiple-worker environment.

Safety modules XPS BA, BC and BF for two-hand control stations comply with the requirements of European standard EN 574/ISO 13851 for two-hand control systems.

The control stations must be designed and installed such that they cannot be activated involuntarily or easily rendered inoperative. Depending on the application, the requirements of type C standards specific to the machinery involved must be met (additional personal protection methods may have to be considered).

To initiate a dangerous movement, both operators (two-hand control pushbuttons) must be activated within an interval ≤ 0.5 s (synchronous activation). If one of the two pushbuttons is released during a dangerous operation, the control sequence is cancelled. Resumption of the dangerous operation is possible only if both pushbuttons are returned to their initial position and reactivated within the required time interval.

The safety distance between the control units and the hazardous zone must be sufficient to ensure that when only one operator is released, the hazardous zone cannot be reached before the dangerous movement has been completed or stopped.

Safety automation system solutions

Preventa safety modules types XPS BA, XPS BC

For electrical monitoring of two-hand control stations

Characteristics

Module type				XPS BA	XPS BC
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 1 max.	Category 4 max.
Conformity to standards				EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574/ISO 13851 type III A, EN 50082-2	EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574 type III C/ISO 13851, EN 50082-2
Product certifications				UL, CSA	UL, CSA, INRS
Supply	Voltage		**V**	⎓ 24, ∿ 115, ∿ 230	⎓ 24, ∿ 24, ∿ 115, ∿ 230
	Voltage limits			- 20…+ 20% (⎓ 24 V), - 20…+ 10% (∿ 24 V), - 15…+ 15% (∿ 115 V), - 15…+ 10% (∿ 230 V)	- 20…+ 10% (⎓ 24 V), - 15…+ 10% (∿ 24 V), - 15…+ 15% (∿ 115 V), - 15…+ 10% (∿ 230 V)
	Frequency		**Hz**	50/60	
Consumption			**VA**	< 20 (apparent power)	< 6
Module inputs fuse protection				Internal, electronic	
Inputs				S1: 1 N/C + N/O, S2: 1 N/C + N/O	
Two-hand control type Conforming to EN 574/ISO 13851				III A	III C
Synchronisation time			**s**	0.5 maximum	
Control unit voltage	⎓ 24 V version		**V**	24	24
	∿ 24 V, 115 V, 230 V version		**V**	24	48
Minimum voltage and current				**Between terminals T11-T12, T11-T13**	**Between terminals T11-T13, T21-T23**
	U min./I min. - ⎓ 24 V version (20 °C)			18 V/30 mA	18 V/140 mA
	U min./I min. - ∿ 24 V/115 V/230 V version (20 °C)			18 V/30 mA	30 V/50 mA
Calculation of wiring resistance RL (for XPS BC only) between terminals T11-T13, T21-T23 as a function of the internal supply voltage U int (terminals T13-T23)			Ω	–	RL max. = $\frac{\text{U int - U min.}}{\text{I min.}}$ Ue = true voltage applied to terminals A1-A2 U int = supply voltage Ue -1 V (24 V version) (115 V, 230 V version) RL max. must not exceed 50 Ω U int between 30.5 V and 35 V, with typical value = 35 V
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			1 N/O (11-14)	2 N/O (13-14, 23-24)
	Number and type of additional circuits			1 N/C (11-12)	1 N/C (31-32)
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	5	2.5
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG or 6 fast acting	4 gG
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 38610/6	
Response time			**ms**	< 25	< 30
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				2	3
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connections		Type		Captive screw clamp terminals	
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm²	
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm²	
		With cable end		With bezel, flexible cable: 0.25…1.5 mm²	
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm²	
		With cable end		Without bezel, flexible cable: 0.25…1 mm²	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm²	

Principle: page 38790/2 | Selection, references: page 38790/5 | Connections: pages 38790/6 to 38790/9 | Dimensions: pages 38730/2 and 38730/3

Safety automation system solutions
Preventa safety modules type XPS BF
For electrical monitoring of two-hand control stations

Characteristics

Module type				XPS BF1132	XPS BF1132P
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 574 type III C/ISO 13851, EN/IEC 60947-1, EN/IEC 60947-5-1, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)	
Product certifications				UL, CSA, BIA	
Supply		Voltage	**V**	⎓ 24	
		Voltage limits		- 20…+ 20%	
Consumption			**W**	< 2.5	
Module inputs fuse protection				Internal, electronic	
Inputs				S1: 1 N/C + N/O, S2: 1 N/C + N/O	
Two-hand control type				III C conforming to EN 574/ISO 13851	
Synchronisation time			**s**	0.5 maximum	
Control unit voltage			**V**	24 V/8 mA	
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			2 N/O (13-14, 23-24)	
	Number and type of additional circuits			2 solid-state (type 24 V - 20 mA)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	4.2	
	Max. total thermal current		**A**	8.4	
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG or 6 fast acting	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 38610/6	
Response time			**ms**	< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connection		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm^2	Solid or flexible cable: 0.2…2.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm^2	
		With cable end		With bezel, flexible cable: 0.25…1.5 mm^2	With bezel, flexible cable: 0.25…2.5 mm^2
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm^2	Solid cable: 0.2…1 mm^2, flexible cable: 0.2…1.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…1 mm^2	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm^2	

Principle: page 38790/2
Selection, references: page 38790/5
Connections: pages 38790/6 to 38790/9
Dimensions: pages 38730/2 and 38730/3

Safety automation system solutions

Preventa safety modules types XPS BA, XPS BC, XPS BF

For electrical monitoring of two-hand control stations

Selection

Standard EN 574/ISO 13851 defines the selection of two-hand controls according to the control system category.
The following table details the three types of two-hand control conforming to EN 574/ISO 13851.
For each type, it lists the operating characteristics and minimum requirements.

Requirements of standard EN 574/ISO 13851	Type I	Type II	Type III		
			A	B	C
Use of both hands (simultaneous action)	■	■	■	■	■
Link between input and output signals	■	■	■	■	■
Output signal inhibited	■	■	■	■	■
Prevention of accidental operation	■	■	■	■	■
Tamper-proof	■	■	■	■	■
Output signal reinitialised		■	■	■	■
Synchronous action (specified time limit)			■	■	■
Use of proven components (Category 1 conforming to EN 954-1/ ISO 13849-1)	■		XPS BA●●		
Redundancy with partial error detection (Category 3 conforming to EN 954-1/ ISO 13849-1)		■		XPS BC XPS BF	
Redundancy + Self-monitoring (Category 4 conforming to EN 954-1/ ISO 13849-1)					XPS BC XPS BF
Two-hand control station	XY2 SB●●				

■ Meets the requirements of standard EN 574/ISO 13851

■ Conforming to standard EN 954-1/ISO 13849-1

References

XPS BA●●●●

XPS BC●●●●

XPS BF1132P

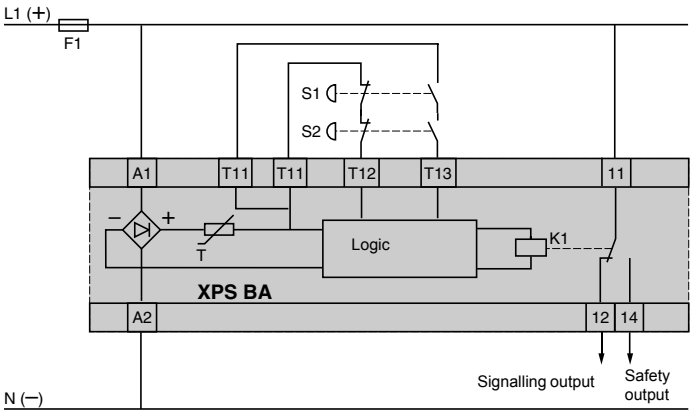
Description	Type conforming to standard EN 574/ ISO 13851	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight kg
Safety modules for electrical monitoring of two-hand control stations	III A	Integrated in module	1 N/O	1 N/C	~ or ⎓ 24 V	**XPS BA5120**	0.200
					~ 115 V	**XPS BA3420**	0.200
					~ 230 V	**XPS BA3720**	0.200
	III C	Integrated in module	2 N/O	1 N/C	⎓ 24 V	**XPS BC1110**	0.400
					~ 24 V	**XPS BC3110**	0.400
					~ 115 V	**XPS BC3410**	0.400
					~ 230 V	**XPS BC3710**	0.400
			2 N/O	2 solid-state	⎓ 24 V	**XPS BF1132**	0.150
		Removable from module	2 N/O	2 solid-state	⎓ 24 V	**XPS BF1132P**	0.150

Principle: page 38790/2
Characteristics: pages 38790/3 and 38790/4
Connections: pages 38790/6 to 38790/9
Dimensions: pages 38730/2 and 38730/3

Safety automation system solutions
Preventa safety modules type XPS BA
For electrical monitoring of two-hand control stations

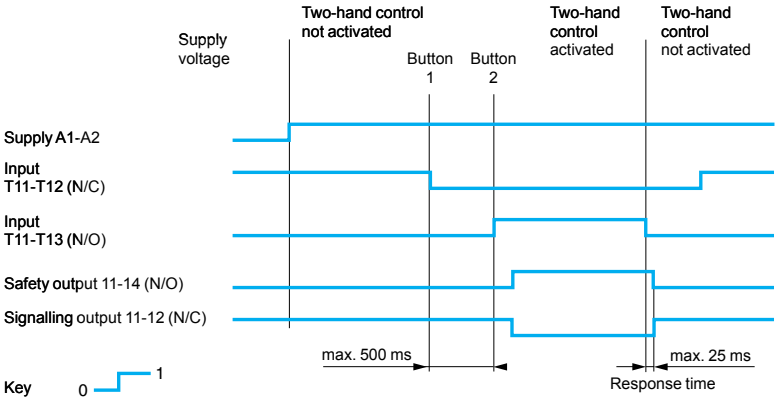
XPS BA
Module XPS BA associated with a two-hand control station

Type III A conforming to EN 574/ISO 13851

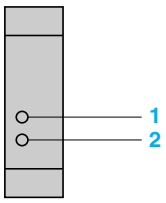


S1 and S2: pushbuttons. Must not be used for applications (presses) which require a type III C module (XPS BC).

Functional diagram of module XPS BA



LED details (XPS BA)



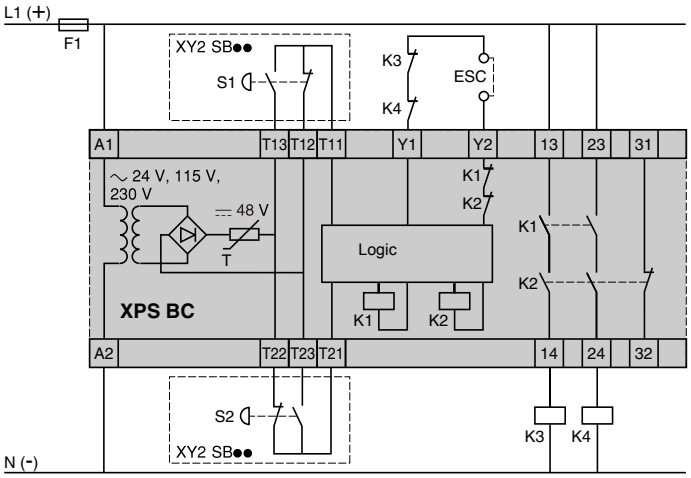
1 Supply voltage A1-A2.
2 K1 status (N/O safety output 11-14 closed).

Safety automation system solutions
Preventa safety modules type XPS BC
For electrical monitoring of two-hand control stations

XPS BC

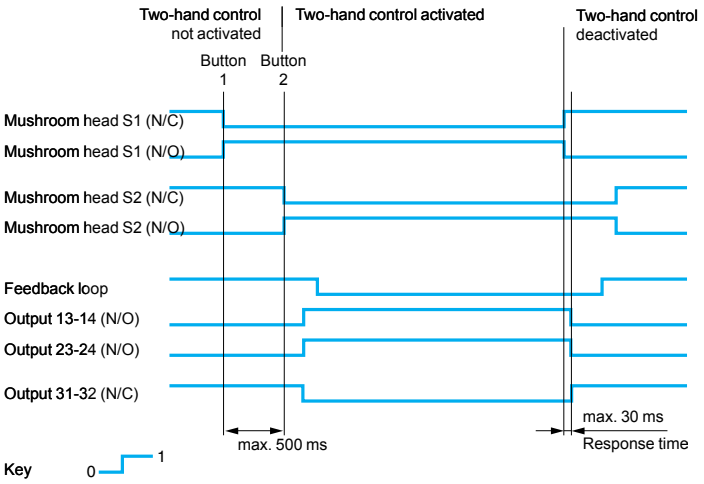
Module XPS BC associated with a two-hand control station

Type III C conforming to EN 574/ISO 13851

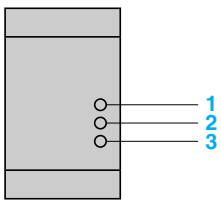


ESC: external start conditions.
Y1-Y2: feedback loop.
Output (31-32) must not be used as a safety circuit. It can be used for non-dangerous machine movements.

Functional diagram of module XPS BC



LED details (XPS BC)

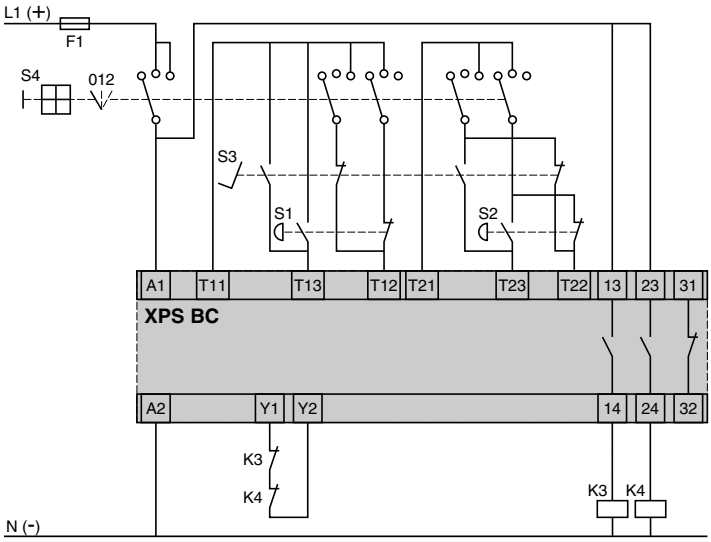


1 Supply voltage A1-A2, S1-S2. LED 1 indicates that buttons S1 and S2 are correctly connected.
2 Feedback loop Y1-Y2.
3 K1-K2 status (N/O safety outputs closed).

Safety automation system solutions
Preventa safety modules type XPS BC
For electrical monitoring of two-hand control stations

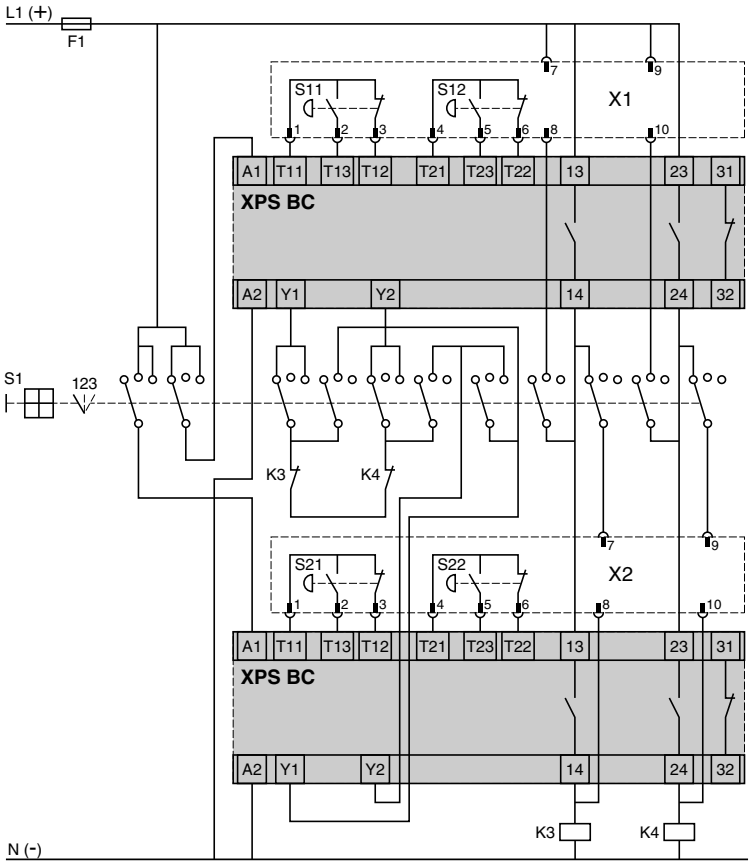
XPS BC

Module XPS BC associated with a two-hand control station and a foot switch



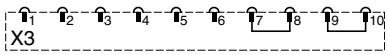
S4 selector switch:
0 = stop
1 = control station
2 = foot switch
S1-S2: two-hand control station pushbuttons
S3: foot switch

Modules XPS BC associated with 2 two-hand control stations



When operator 1 is absent: replace terminal block X1 by X3 and physically remove the two-hand control station.

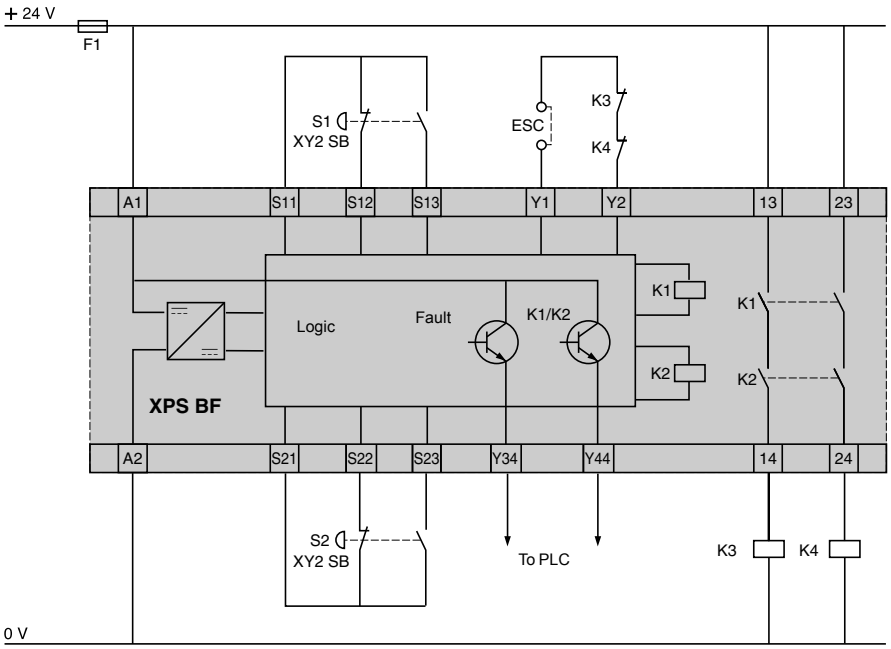
When operator 2 is absent: replace terminal block X2 by X3 and physically remove the two-hand control station.



S1 selector switch:
1 = operator 1
2 = operator 2
3 = operator 1 and operator 2
S11-S12, S21-S22: two-hand control station pushbuttons

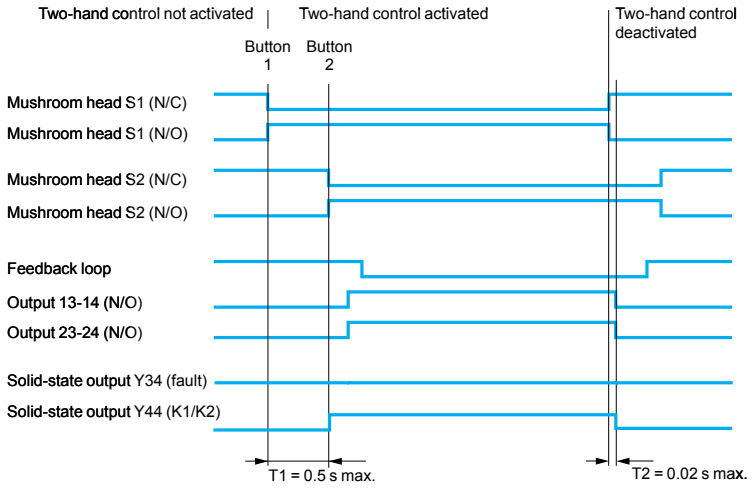
Safety automation system solutions
Preventa safety modules type XPS BF
For electrical monitoring of two-hand control stations

XPS BF
Module XPS BF associated with a two-hand control station

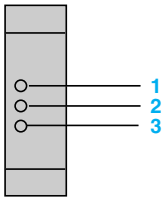


ESC: External start conditions.
Y1-Y2: feedback loop

Functional diagram of module XPS BF



LED details (XPS BF)



1 Supply voltage A1-A2 (fuse status).
2 Fault signalling.
3 K1-K2 status (N/O safety outputs closed).

Principle: page 38790/2
Characteristics: pages 38790/3 and 38790/4
Selection, references: page 38790/5
Dimensions: pages 38730/2 and 38730/3