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Manual

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Protection devices

3WA Air Circuit Breakers

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Protection devices 3WA Air Circuit Breakers

Equipment Manual

<u>Introduction</u>	1
<u>Description</u>	2
<u>Applications</u>	3
<u>Accessories</u>	4
<u>Inspection and maintenance</u>	5
<u>Technical specifications</u>	6
<u>Integration in power distribution equipment</u>	7
<u>Troubleshooting</u>	8
<u>Disposal</u>	9
<u>Appendix</u>	A
<u>ESD guidelines</u>	B
<u>List of abbreviations</u>	C


indicates that death or severe personal injury will result if proper precautions are not taken.

 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.

 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

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The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

1	Introduction	15
1.1	Scope of validity of this document.....	15
1.2	Target readers of this documentation.....	15
1.3	Technical Support	15
1.4	Reference documents	16
1.5	Advanced training courses	16
1.6	Safety instructions	17
1.6.1	Security information	18
1.6.2	Open Source Software	18
1.6.3	More information on Open Source software for 3WA circuit breakers.....	19
1.7	Standards	20
2	Description.....	21
2.1	Overview - applications and portfolio	21
2.1.1	Properties	21
2.1.2	Portfolio of the 3WA1 circuit breaker.....	23
2.1.3	Advantages.....	23
2.1.4	Applications.....	24
2.2	Circuit breakers and non-automatic circuit breakers.....	26
2.2.1	Distinction between circuit breakers and non-automatic circuit breakers.....	26
2.2.2	Design	27
2.2.2.1	Circuit breakers.....	27
2.2.2.2	Guide frame.....	28
2.2.2.3	Secondary disconnect terminals	33
2.2.3	Circuit breaker identification	35
2.2.3.1	Rating and accessory labels	35
2.2.3.2	Guide frame rating label.....	37
2.2.4	Operation	38
2.2.4.1	Charging the stored-energy spring	38
2.2.4.2	Closing and opening	39
2.2.4.3	Racking the circuit breaker in the guide frame	41
2.2.4.4	Commissioning checklist.....	43
2.3	Protection system	44
2.3.1	General description of function	44
2.3.2	Option plug	45
2.3.3	Guideline for setting the protection parameters.....	47
2.3.4	Time-current characteristic.....	47
2.3.5	Description of the protective functions.....	48
2.3.5.1	General description.....	48
2.3.5.2	Long time LT.....	49
2.3.5.3	Short time ST	51
2.3.5.4	Instantaneous short-circuit protection INST	52

2.3.5.5	Neutral protection N	53
2.3.5.6	Ground-fault alarm	54
2.3.5.7	Ground-fault protection GF	55
2.3.5.8	Ground-fault protection GF Hi-Z	58
2.3.5.9	Directional short time dST	60
2.3.5.10	Reverse power protection RP	62
2.3.5.11	Enhanced protective functions EPF	63
2.3.6	DAS+ maintenance mode	64
2.3.7	Activation limits and power supply	68
2.4	Electronic trip unit ETU600	69
2.4.1	Overview of variants	69
2.4.2	Operator controls, displays and voltage tap module	70
2.4.2.1	Overview	70
2.4.2.2	Display and operating keys F1 to F4	71
2.4.2.3	LED displays	71
2.4.2.4	Rotary switch	73
2.4.2.5	Voltage tap module	74
2.4.3	Display and menu structure	76
2.4.3.1	Operating philosophy	76
2.4.3.2	Menu structure	78
2.4.3.3	Start screen	79
2.4.3.4	Display after a trip	82
2.4.3.5	Display in case of a warning	84
2.4.3.6	Display of an error message	85
2.4.4	Interfaces	86
2.4.4.1	Bluetooth and USB-C interface	86
2.4.4.2	Digital input and output	89
2.4.4.3	Digital output for ground-fault alarm REF	90
2.4.4.4	External current sensors	90
2.4.4.5	Battery	91
2.4.4.6	Rear interfaces	92
2.4.5	Protection parameters	93
2.4.5.1	Parameter sets A and B	93
2.4.5.2	Enhanced protective functions EPF parameters	97
2.4.5.3	Parameter DAS+ maintenance mode	98
2.4.6	DAS+ maintenance mode	99
2.5	Function packages	102
2.6	Metering function (power metering function)	103
2.7	Communication and system connection	106
2.7.1	CubicleBUS ²	106
2.7.1.1	The bus system	106
2.7.1.2	Technical specifications	108
2.7.2	COM190 communication module	109
2.7.2.1	Overview	109
2.7.2.2	X61 connector	110
2.7.2.3	X62 connector	110
2.7.2.4	Adapter and temperature sensor	112
2.7.2.5	Ethernet ports X63 / X64	113
2.7.2.6	MAC addresses	113
2.7.2.7	LEDs	114

2.7.2.8	Operator controls.....	116
2.7.2.9	Commissioning.....	118
2.7.2.10	Access protection functions.....	122
2.7.2.11	Resetting to factory settings.....	126
2.7.2.12	System time.....	127
2.7.3	Status acquisition with breaker status sensor BSS200	129
2.8	Self-monitoring and diagnostics	130
2.8.1	Internal self-test.....	130
2.8.1.1	General.....	130
2.8.1.2	Internal self-test ETU600.....	131
2.8.2	Error display.....	133
2.8.3	Trip log.....	135
3	Applications.....	137
3.1	Use in systems with isolated transformer neutral point (IT systems)	137
3.1.1	General.....	137
3.1.2	Selection criteria	138
3.1.3	Fault situation.....	139
3.2	Transfer control	140
3.2.1	General.....	140
3.2.2	Application areas	141
3.2.3	Transfer control with two 3WA circuit breakers.....	141
3.2.4	Transfer control with three 3WA circuit breakers.....	141
3.2.5	Further information	142
3.3	powermanager	143
3.3.1	Energy management in accordance with ISO 50001	143
3.3.2	Features	144
3.3.3	Functions.....	145
3.3.4	TÜV certificate of conformity for energy management.....	145
3.4	7KN Powercenter 3000	146
3.4.1	IoT gateway for the intelligent power distribution equipment.....	146
3.4.2	IoT data platform	147
3.4.3	Parameterization and settings	147
4	Accessories	149
4.1	Overview	149
4.2	Preparatory and concluding installation steps for the installation of internal accessories....	151
4.3	Control and signaling accessories.....	156
4.3.1	Closing coil, shunt trip, undervoltage release.....	156
4.3.1.1	Description	156
4.3.1.2	Technical specifications.....	159
4.3.1.3	Installation.....	163
4.3.1.4	Article number.....	164
4.3.2	Capacitor trip device for shunt trips	166
4.3.2.1	Description	166
4.3.2.2	Technical specifications.....	166
4.3.2.3	Installation.....	167
4.3.2.4	Article number.....	167
4.3.3	Remote trip alarm reset coil.....	168

4.3.3.1	Description	168
4.3.3.2	Technical specifications	169
4.3.3.3	Installation	170
4.3.3.4	Article number.....	172
4.3.4	Emergency OPEN button.....	173
4.3.4.1	Description	173
4.3.4.2	Installation	173
4.3.4.3	Article number.....	173
4.3.5	IOM230 digital input/output module	174
4.3.5.1	Description	174
4.3.5.2	Technical specifications	178
4.3.5.3	Installation	179
4.3.5.4	Article number.....	179
4.3.6	Spring charging motor.....	180
4.3.6.1	Description	180
4.3.6.2	Technical specifications	181
4.3.6.3	Installation	182
4.3.6.4	Article number.....	182
4.3.7	Motor disconnect switch.....	183
4.3.7.1	Description	183
4.3.7.2	Installation	183
4.3.7.3	Article number.....	184
4.3.8	Mechanical operating cycles counter.....	185
4.3.8.1	Description	185
4.3.8.2	Installation	186
4.3.8.3	Article number.....	186
4.3.9	External Trip Controller ETC600.....	187
4.3.9.1	Description	187
4.3.9.2	Technical specifications	188
4.3.9.3	Installation	189
4.3.9.4	Article number.....	189
4.3.10	Second tripping solenoid with reclosing lockout.....	190
4.3.10.1	Description	190
4.3.10.2	Installation	190
4.3.10.3	Article number.....	194
4.4	Accessory auxiliary switches and signaling switches	195
4.4.1	Overview.....	195
4.4.2	Auxiliary switches S1 to S8 (AUX).....	196
4.4.2.1	Description	196
4.4.2.2	Technical specifications	196
4.4.2.3	Installation	197
4.4.2.4	Article number.....	197
4.4.3	Ready-to-close signaling switch.....	198
4.4.3.1	Description	198
4.4.3.2	Technical specifications	199
4.4.3.3	Installation	199
4.4.3.4	Article number.....	199
4.4.4	Spring charge signaling switch.....	200
4.4.4.1	Description	200
4.4.4.2	Technical specifications	200
4.4.4.3	Installation	201
4.4.4.4	Article number.....	201

4.4.5	Trip alarm switch	202
4.4.5.1	Description	202
4.4.5.2	Technical specifications.....	202
4.4.5.3	Installation.....	203
4.4.5.4	Article number.....	203
4.4.6	Position signaling switch module for guide frame	204
4.4.6.1	Description	204
4.4.6.2	Technical specifications.....	206
4.4.6.3	Installation.....	207
4.4.6.4	Article number.....	207
4.5	Accessories for main connections.....	208
4.5.1	Main connections for fixed-mounted circuit breakers.....	208
4.5.1.1	Description	208
4.5.1.2	Technical specifications.....	211
4.5.1.3	Installation.....	211
4.5.1.4	Article number.....	215
4.5.2	Main connections for withdrawable circuit breakers	217
4.5.2.1	Description	217
4.5.2.2	Technical specifications.....	220
4.5.2.3	Installation.....	220
4.5.2.4	Article number.....	221
4.6	Accessories for secondary disconnect terminals.....	224
4.6.1	Secondary disconnect terminals for fixed-mounted circuit breakers	224
4.6.1.1	Description	224
4.6.1.2	Installation.....	225
4.6.1.3	Connection.....	226
4.6.1.4	Article number.....	226
4.6.2	Secondary disconnect terminals for withdrawable circuit breakers	227
4.6.2.1	Description	227
4.6.2.2	Installation.....	228
4.6.2.3	Connection.....	229
4.6.2.4	Article number.....	229
4.7	Conversion set and coding for withdrawable circuit breakers	230
4.7.1	Conversion set for converting fixed-mounted circuit breakers into withdrawable circuit breakers	230
4.7.1.1	Description	230
4.7.1.2	Technical specifications.....	231
4.7.1.3	Installation.....	232
4.7.1.4	Article number.....	236
4.7.2	Equipment-dependent coding	237
4.7.2.1	Description	237
4.7.2.2	Installation.....	238
4.7.2.3	Article number.....	239
4.8	Accessories for protection against unauthorized operation	240
4.8.1	Overview of locking devices and locking provisions	240
4.8.2	Locking provision to prevent unauthorized closing - Safe Open.....	243
4.8.2.1	Description	243
4.8.2.2	Installation.....	245
4.8.2.3	Activation	247
4.8.2.4	Article number.....	248

4.8.3	Local electric close	249
4.8.3.1	Description	249
4.8.3.2	Installation	250
4.8.3.3	Connection.....	250
4.8.3.4	Activation.....	251
4.8.3.5	Article number.....	251
4.8.4	Locking provision for charging handle for padlocks.....	252
4.8.4.1	Description	252
4.8.4.2	Installation	252
4.8.4.3	Activation.....	253
4.8.4.4	Article number.....	253
4.8.5	Cover for the electronic trip unit.....	254
4.8.5.1	Description	254
4.8.5.2	Installation	255
4.8.5.3	Article number.....	255
4.8.6	Locking provision to prevent unauthorized closing of the withdrawable circuit breaker.....	256
4.8.6.1	Description	256
4.8.6.2	Installation	257
4.8.6.3	Activation.....	257
4.8.6.4	Article number.....	258
4.8.7	Locking provision with padlock for the racking handle of the racking mechanism.....	258
4.8.7.1	Description	258
4.8.7.2	Activation.....	258
4.8.8	Locking provision with safety lock for the racking handle.....	259
4.8.8.1	Description	259
4.8.8.2	Installation	260
4.8.8.3	Activation.....	261
4.8.8.4	Article number.....	261
4.8.9	Shutters.....	262
4.8.9.1	Installation	262
4.8.9.2	Article number.....	264
4.8.10	Locking provision to prevent opening of the control cabinet door when the circuit breaker is closed	265
4.8.10.1	Description	265
4.8.10.2	Installation	266
4.8.10.3	Activation / override.....	268
4.8.10.4	Article number.....	268
4.8.11	Locking provision to prevent racking of the withdrawable circuit breaker in the disconnected position.....	269
4.8.11.1	Description	269
4.8.11.2	Installation	270
4.8.11.3	Activation.....	271
4.8.11.4	Article number.....	272
4.8.12	Locking provision to prevent racking of the withdrawable circuit breaker when the control cabinet door is open.....	273
4.8.12.1	Description	273
4.8.12.2	Installation	274
4.8.12.3	Activation.....	274
4.8.12.4	Article number.....	274
4.8.13	Locking provision to prevent closing of the withdrawable circuit breaker when the control cabinet door is open.....	275
4.8.13.1	Description	275

4.8.13.2	Installation.....	276
4.8.13.3	Activation / override.....	279
4.8.13.4	Article number.....	279
4.9	Interlocking	280
4.9.1	Mechanical interlocking (Bowden cable interlocking).....	280
4.9.1.1	Description	280
4.9.1.2	Installation.....	284
4.9.1.3	Article number.....	288
4.9.2	Interlocking of two circuit breakers using a Bowden cable.....	289
4.9.3	Interlocking of three circuit breakers (one of three) using a Bowden cable	290
4.9.4	Interlocking of three circuit breakers using a Bowden cable	291
4.9.5	Interlocking of three circuit breakers, two of which are interlocked, using a Bowden cable	292
4.9.6	Interlocking of three circuit breakers using a Bowden cable	293
4.9.7	Interlock for mechanical close/open	294
4.9.7.1	Description	294
4.9.7.2	Installation.....	295
4.9.7.3	Activation.....	295
4.9.7.4	Article number.....	296
4.9.8	Interlock system to prevent unauthorized closing	297
4.9.8.1	Description	297
4.9.8.2	Installation.....	297
4.9.8.3	Activation.....	297
4.9.8.4	Article number.....	297
4.10	Accessories for integration in the power distribution equipment.....	298
4.10.1	Door sealing frame	298
4.10.1.1	Description	298
4.10.1.2	Installation.....	299
4.10.1.3	Article number.....	299
4.10.2	IP55 protective cover	300
4.10.2.1	Description	300
4.10.2.2	Installation.....	301
4.10.2.3	Article number.....	301
4.10.3	Arc chute cover.....	302
4.10.3.1	Description	302
4.10.3.2	Installation.....	303
4.10.3.3	Article number.....	305
4.10.4	Grounding connection between the guide frame and the circuit breaker.....	306
4.10.4.1	Description	306
4.10.4.2	Installation.....	307
4.10.4.3	Article number.....	309
4.10.5	Support brackets.....	310
4.10.5.1	Description	310
4.10.5.2	Installation.....	311
4.10.5.3	Article number.....	312
4.11	Accessories for the ETU600 electronic trip unit	313
4.11.1	External current sensor for neutral pole.....	313
4.11.1.1	Description	313
4.11.1.2	Technical specifications.....	314
4.11.1.3	Installation.....	314
4.11.1.4	Article number.....	315

4.11.2	Voltage tap module VTM.....	316
4.11.2.1	Description	316
4.11.2.2	Removal / installation.....	317
4.11.2.3	Article number.....	317
4.11.3	Option plug	318
4.11.3.1	Description	318
4.11.3.2	Removal / installation.....	319
4.11.3.3	Article number.....	320
4.11.4	Replacement battery for the ETU600 electronic trip unit.....	321
4.11.4.1	Description	321
4.11.4.2	Replacing the battery.....	321
4.11.4.3	Article number.....	321
4.12	Internal voltage tap on main circuits	322
4.12.1	Voltage tap conversion	322
4.12.1.1	Description	322
4.12.1.2	Installation	323
4.12.1.3	Article number.....	326
4.12.2	Retrofit of the internal voltage tap.....	327
4.12.2.1	Description	327
4.12.2.2	Installation	328
4.12.2.3	Article number.....	330
4.13	Connection of an external voltage transformer.....	331
4.13.1	Description	331
4.13.2	Connection.....	332
4.13.3	Article number.....	333
4.14	Function packages for the ETU600 electronic trip unit	334
4.14.1	Description	334
4.14.2	Function packages for protection and alarm functions.....	334
4.14.2.1	Description	334
4.14.2.2	Article number.....	334
4.14.3	Function packages for enhanced protective functions	335
4.14.3.1	Description	335
4.14.3.2	Article number.....	336
4.14.4	Function packages for function extensions.....	336
4.14.4.1	Description	336
4.14.4.2	Article number.....	336
4.14.5	Function packages for metering values	337
4.14.5.1	Description	337
4.14.5.2	Article number.....	338
4.15	Accessories for CubicleBUS ² modules	339
4.15.1	CubicleBUS ² terminating resistor.....	339
4.15.1.1	Description	339
4.15.1.2	Technical specifications	339
4.15.1.3	Article number.....	339
4.15.2	Mounting adapter for CubicleBUS ² modules	340
4.15.2.1	Description	340
4.15.2.2	Installation	340
4.15.2.3	Article number.....	343
4.16	Communication interface.....	344
4.16.1	PROFINET IO/Modbus TCP module COM190.....	344

4.16.1.1	Description	344
4.16.1.2	Technical specifications.....	345
4.16.1.3	Installation.....	346
4.16.1.4	Article number.....	346
4.16.2	Position signaling switch module for connection to the communication module	347
4.16.2.1	Description	347
4.16.2.2	Installation.....	347
4.16.2.3	Article number.....	347
4.17	Special packaging	348
4.17.1	Description	348
4.17.2	Article number.....	348
5	Inspection and maintenance	349
5.1	General.....	349
5.2	Safety regulations.....	351
5.3	Planning of inspection and maintenance	352
5.3.1	Inspection interval	352
5.3.2	Scope	353
5.3.3	Logging	355
5.4	Performing inspection.....	356
5.4.1	General.....	356
5.4.2	Visual inspection.....	356
5.4.3	Check of the available documentation and of the rating/accessory label.....	357
5.4.4	Testing of mechanical function of the circuit breaker	357
5.4.5	Testing of mechanical function of the withdrawable circuit breaker and the guide frame	358
5.4.6	Testing of auxiliary circuits	358
5.4.7	Testing of mechanical and electrical function of internal accessories.....	359
5.4.8	Testing of settings and inspection of electronic trip unit	360
5.4.9	Inspection of the arc chutes, arc chute cover and the contact system.....	360
5.4.10	Testing of the function of the CubicleBUS ² modules.....	361
5.5	Preparing for maintenance work	362
5.6	Maintaining the arc chutes.....	365
5.7	Maintaining the main contacts.....	368
5.7.1	Maintaining the main contacts and replacing the contact system.....	368
5.7.2	Article number.....	376
5.8	Decommissioning	378
6	Technical specifications.....	379
6.1	Circuit diagrams.....	379
6.1.1	Terminal connection diagram of secondary disconnect terminal	380
6.1.2	Closing coil	381
6.1.3	Remote trip alarm reset coil.....	381
6.1.4	Shunt trip ST / ST2.....	381
6.1.5	Capacitor trip device for shunt trips	382
6.1.6	Undervoltage release UVR / UVR-t.....	382
6.1.7	Second tripping solenoid F6 with reclosing lockout.....	383
6.1.8	External Trip Controller ETC600.....	383

6.1.9	Digital input / output module IOM230	383
6.1.10	Spring charging motor	384
6.1.11	Motor disconnect switch	384
6.1.12	Auxiliary switch	384
6.1.13	Ready-to-close signaling switch S20	385
6.1.14	Spring charge signaling switch S21	385
6.1.15	Trip alarm switches S24 and S25	385
6.1.16	Position signaling switch module PSS and PSS-COM	386
6.1.17	Local electric close S10	386
6.1.18	COM190 communication module	387
6.1.19	Breaker status sensor BSS	387
6.2	Dimension drawings	388
6.2.1	3WA1 - size 1	388
6.2.1.1	Fixed-mounted circuit breakers	388
6.2.1.2	Withdrawable circuit breakers	393
6.2.2	3WA1 - size 2	401
6.2.2.1	Fixed-mounted circuit breakers	401
6.2.2.2	Withdrawable circuit breakers	406
6.2.3	3WA1 - size 3	414
6.2.3.1	Fixed-mounted circuit breakers	414
6.2.3.2	Withdrawable circuit breakers	419
6.2.4	Safety clearances	426
6.2.4.1	3WA - size 1	426
6.2.4.2	3WA - size 2	428
6.2.4.3	3WA - size 3	430
6.2.5	Accessories and door cutouts	432
6.2.5.1	Capacitor storage device	432
6.2.5.2	COM190 communication module	433
6.2.5.3	External current sensor for the neutral pole (N-CT)	434
6.2.5.4	Support brackets	436
6.2.5.5	Door cutout/protective cover IP55	436
6.2.5.6	Door sealing frame	437
6.2.5.7	Interlocks and locking provisions	438
6.3	Technical specifications of 3WA circuit breakers	440
6.3.1	Size 1	440
6.3.1.1	General technical details	440
6.3.1.2	Breaking capacity and short-time withstand current	441
6.3.1.3	Permissible load, switching times, operating cycles and operating frequency	442
6.3.1.4	Conductor cross-sections	444
6.3.1.5	IT network capability	444
6.3.2	Size 2	445
6.3.2.1	General technical details	445
6.3.2.2	Breaking capacity and short-time withstand current	446
6.3.2.3	Permissible load, switching times, operating cycles and operating frequency	448
6.3.2.4	Conductor cross-sections	452
6.3.2.5	IT network capability	453
6.3.3	Size 3	454
6.3.3.1	General technical details	454
6.3.3.2	Breaking capacity and short-time withstand current	455
6.3.3.3	Permissible load, switching times, operating cycles and operating frequency	456
6.3.3.4	Conductor cross-sections	458

6.3.3.5	IT network capability.....	458
6.3.4	Other properties	459
6.4	Ambient conditions.....	460
6.5	Installation altitudes.....	461
6.6	Standards	461
6.7	Approvals	462
6.8	Failure probability acc. to B10 and B10d.....	463
6.9	Electromagnetic compatibility.....	466
7	Integration in power distribution equipment	467
7.1	Factors that affect the rating of the circuit breaker	467
7.2	Compact design.....	468
7.3	Derating in the power distribution equipment	469
7.3.1	Overview	469
7.3.2	Derating 3WA11	470
7.3.3	Derating 3WA12	474
7.3.4	Derating 3WA13	476
7.4	Insulation test of the power distribution equipment	478
7.5	Main connection.....	479
7.6	Requirement according to IEC 61439	479
7.6.1	Standard IEC 61439	479
7.6.2	Simplified integration	480
7.6.2.1	Structural integration in power distribution equipment.....	480
7.6.2.2	Using 3WA circuit breakers in 3WL guide frames.....	481
7.6.2.3	Retrofit: Simple replaceability in existing power distribution equipment.....	482
7.6.2.4	Checklist for replacing 3WL with 3WA circuit breaker according to IEC 61439-2	486
7.7	Phase barriers and horizontal partitions.....	488
8	Troubleshooting	491
8.1	Troubleshooting for circuit breaker.....	491
8.2	Troubleshooting for the ETU600 electronic trip unit.....	493
8.3	Troubleshooting for COM190 communication module.....	496
9	Disposal.....	497
9.1	End of maximum service life	497
9.2	Disposal of low-voltage circuit breakers.....	497
9.3	Disposal of waste electronic equipment.....	497
A	Appendix.....	499
A.1	Basic settings of parameter data sets.....	499
A.2	ETU600 menu structure	501
A.3	Templates for coding the equipment variants in use	504

B	ESD guidelines.....	509
B.1	Electrostatic sensitive devices (ESD)	509
C	List of abbreviations	511

Introduction

1.1 Scope of validity of this document

This equipment manual is a reference manual for technical information that users will need to configure, connect, and operate the 3WA air circuit breakers and their accessories.

1.2 Target readers of this documentation

The information contained in this manual is provided for the benefit of:

- Planners
- Power distribution equipment manufacturers/builders
- Commissioning engineers
- Users
- Maintenance personnel

1.3 Technical Support

You can find further support on the Internet at:

TechnicalSupport (<https://www.siemens.com/support-request>)

1.4 Reference documents

For more information, refer to the following documents:

Title	Article number
3WA Air Circuit Breaker Communication System Manual (https://support.industry.siemens.com/cs/ww/en/view/109792368)	
3WA Air Circuit Breakers Catalog (https://support.industry.siemens.com/cs/ww/en/view/109781806)	E86060-K8280-E401
Catalog LV 10 - Low-Voltage Power Distribution and Electrical Installation Technology Catalog (https://support.industry.siemens.com/cs/ww/en/view/109482234)	E86060-K8280-A101
3KC ATC3100 Transfer Control Devices Manual (https://support.industry.siemens.com/cs/ww/en/view/100341671)	
3KC ATC6300 Transfer Control Devices Manual (https://support.industry.siemens.com/cs/ww/en/view/109755149)	
3KC ATC6500 Transfer Control Devices Manual (https://support.industry.siemens.com/cs/ww/en/view/109758018)	
7KN Powercenter 3000 Manual (https://support.industry.siemens.com/cs/ww/en/view/109763838)	
Hartmut Kiank, Wolfgang Fruth: Planning Guide for Power Distribution Plants, Publicis Publishing	ISBN A19100-L531-B115
Schalten, Schützen, Verteilen in Niederspannungsnetzen (Switching, Protection and Distribution in Low-Voltage Networks), substantially extended and revised edition 1997	ISBN 3-89578-041-3
Siemens: Residual Current Protective Devices, Low-Voltage Circuit Protection Technology Primer Siemens AG © 04 / 2009	E10003-E38-9T-B3011

1.5 Advanced training courses

Find out about training courses on offer on the following link.

Training for Industry (<https://www.siemens.com/sitrain-lowvoltage>)

Here you can choose from:

- Web-based training courses (online, informative, free)
- Classroom training courses (course attendance, comprehensive, subject to fee)

You also have the possibility of compiling your own training portfolio via **Learning paths**.

**Hazardous voltage**

Will cause death, serious personal injury, or equipment damage.

During operation, parts of the device or system are carrying hazardous electrical voltage. Improper handling of the device or system can result in death or serious injury, as well as significant material damage.

- Inspection and maintenance may only be performed by qualified personnel.
- Pay attention to all the notices provided on the product and in this manual.
- Before commencing maintenance work, ensure that no voltage is present on the power distribution equipment and make sure that this condition is maintained while work is being performed (according to EN 50110-1, DIN VDE 0105-100 and BGV A2).

Proceed in accordance with the Five Safety Rules:

- Turn off all power supplying the equipment.
- Lock out all power supplying the equipment to secure against reconnection.
- Verify that no voltage is present on the device.
- Ground and short the circuit.
- Provide protection against adjacent live parts.

Qualified personnel

Inspection and maintenance may only be performed by qualified personnel.

In the context of these operating instructions and the warning notices on the product, qualified personnel refers to persons who are familiar with the erection, installation, commissioning and operation of the product and who possess the qualifications appropriate for their activities, e.g.:

- Training or instruction/authorization to close and open, ground, and tag circuits and devices and systems in accordance with established safety procedures.
- Training or instruction in the proper care and use of protective equipment in accordance with established safety procedures.
- Training in first aid.

Spare parts

Only spare parts approved by the manufacturer may be used.

1.6.1 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit (<https://www.siemens.com/industrialsecurity>).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To keep up to date with all the latest product updates, subscribe to the Siemens Industrial Security RSS Feed at (<https://www.siemens.com/industrialsecurity>).

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Siemens AG
Smart Infrastructure
Electrical Products
Technical Support
Postfach 10 09 53
93009 Regensburg
Germany

You will find Technical Support under (<https://www.siemens.com/support-request>).

Keyword: Open Source Request (please specify Product name and version, if applicable)

SIEMENS may charge a handling fee of up to 5 EUR to fulfil the request.

Warranty regarding further use of the Open Source Software

SIEMENS' warranty obligations are set forth in your agreement with SIEMENS. SIEMENS does not provide any warranty or technical support for this Product or any OSS components contained in it if they are modified or used in any manner not specified by SIEMENS. The license conditions may contain disclaimers that apply between you and the respective licensor. For the avoidance of doubt, SIEMENS does not make any warranty commitment on behalf of or binding upon any third-party licensor. The Open Source Software used in the product and the license agreements concerning this software can be found in the Readme_OSS.

1.6.3 More information on Open Source software for 3WA circuit breakers

In addition to the sources listed in Chapter Open Source Software (Page 18), further information about the used OSS licenses can be found on the Internet (<https://support.industry.siemens.com/cs/ww/en/view/109782123>).

1.7 Standards

The 3WA1 air circuit breakers comply with the following standards:

- IEC 60947-2
- IEC 60947-2 Annex F / CISPR 11/22 Class B
- Climate-proof according to IEC 60068-2-30

Description

2.1 Overview - applications and portfolio

2.1.1 Properties

The 3WA circuit breaker is the new generation of air circuit breakers in the Siemens AG portfolio. It is based on the proven and robust design of its predecessor 3WL. The technical data of the 3WA circuit breaker mechanics and the portfolio have been extended as compared with 3WL, and the electronic components have been completely redeveloped.

The 3WA circuit breaker is part of the product family of SENTRON protection, switching, measuring and monitoring devices and covers applications in the rated current range from 630 A to 6300 A.

- AC devices are available as circuit breakers and non-automatic circuit breakers.
- DC devices are only available as non-automatic circuit breakers.

The 3WA circuit breaker has the following characteristics:

- Three sizes:
 - Size 1 with a rated current I_n from 630 A to 2500 A
 - Size 2 with a rated current I_n from 2000 A to 4000 A
 - Size 3 with a rated current I_n from 4000 A to 6300 A
- ETU600 electronic trip unit:
 - Functionally expandable with an exchangeable option plug and digital function packages
 - Easy parameterization of the basic protective functions using rotary switches or via four operating keys and a color display
 - User-friendly parameter assignment or documentation of settings with the SENTRON powerconfig configuration software via Bluetooth, the USB interface, or a communication module
- Wide range of versatile primary connectors
- Easy integration into power distribution equipment according to IEC 61439-2
- Replacement of the 3WL circuit breaker with minimum design and testing effort
- Optional expansion with a wide range of internal and external accessories

2.1 Overview - applications and portfolio

- Integrated and shared communication concept with the 3VA molded case circuit breakers and the 7KM PAC measuring devices.
Option for direct integration into the Siemens communication environment via optional accessories:
 - Communication modules (Plug and Play) for PROFINET IO, Modbus TCP
 - Digital input/output modules
 - Staggered metering functions for efficient energy management
- Integration of the circuit breakers into the Totally Integrated Power (TIP) and Totally Integrated Automation (TIA) solutions
- Integration into the SENTRON software environment, such as SENTRON powerconfig configuration software and powermanager

The 3WA air circuit breaker meets the following basic requirements:

- Highly competitive breaking capacity up to 690 V AC
- The highest breaking capacity on the world market for rated voltages 1000 V AC and 1150 V AC (status in 2020)
- Optimum selectivity
- Metering function with internal voltage tap
- Optional connection to a fieldbus communication system or Ethernet-based IP communication system with up to two communication modules simultaneously

Product features

The main product features of the 3WA circuit breaker are:

- Compact dimensions
- Rated current range from 630 A to 6300 A
- Breaking capacity up to:
 - 150 kA at 500 V AC
 - 125 kA at 1000 V AC
- Available fixed-mounted and draw-out versions
- ETU600 electronic trip unit with Bluetooth and USB-C interface, future-oriented with upgradeable function extensions
- Optional integrated metering function according to IEC 61557-12
- Internal voltage tap up to 1000 V AC
- Use in AC and DC applications
- Optimized, low derating values according to IEC 60947-2
- Modular, easy-to-install accessories

- Accessories are designed for the maximum service life of the circuit breaker.
- Support by CAx files, EPLAN macros and Siemens tools simplifies planning and integration of the circuit breaker into the overall installation.

2.1.2 Portfolio of the 3WA1 circuit breaker

The 3WA1 series comprises the circuit breakers

- 3WA11: Size 1
- 3WA12: Size 2
- 3WA13: Size 3

The series covers breaking capacities up to 150 kA at 500 V AC.

Breaking capacity		Rated current										
Class	at 500 V AC [kA]	630 A	800 A	1000 A	1250 A	1600 A	2000 A	2500 A	3200 A	4000 A	5000 A	6300 A
C	150											
H	100											
M	85											
S	66											
N	55											

2.1.3 Advantages

- High modularity
In order to adapt the circuit breaker to new and changing requirements, components such as auxiliary releases, spring charging motors, overcurrent releases, external current sensors, auxiliary circuit signaling switches, automatic reset devices, and interlocks can be retrofit or replaced.
- Quick function extension

The protective functions of the ETU600 electronic trip unit can be quickly adapted to the requirements of the installation site:

- Ground-fault protection can be added by simply exchanging the option plug (LSIG version).
- Protection and alarm functions, but also graded metering functions, can be added via digital function packages.

- Flexible communication/metering function

The communication module of the 3WA circuit breaker offers the PROFINET IO and Modbus TCP communication protocols, which can be used simultaneously. Furthermore, two communication modules with the same or different protocols can be operated independently of each other on a circuit breaker, for example in a redundancy system. The retrofittable modules can be mounted directly on the circuit breaker to save space or flexibly and externally on a DIN rail. The communication modules are updatable, they provide security functions to protect against unauthorized access.

2.1 Overview - applications and portfolio

- Low inspection/maintenance effort
 - Only inspection required
 - No relubrication of moving parts in the circuit breaker
 - Parts only need to be replaced during maintenance if this is deemed necessary based on the inspection results. Accessory components are designed for the maximum specified service life of the circuit breaker under normal operating conditions.
 - Inspection and maintenance work may be carried out by qualified personnel of the operator or by a contracted company.
- Low space requirement
 The 3WA13 circuit breakers (size 3) are extremely compact:
 3-pole circuit breakers fit into an 800 mm wide control panel.
 4-pole circuit breakers can be installed in a 1000 mm wide control panel.

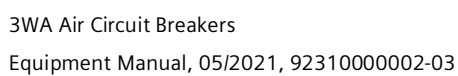
2.1.4 Applications

Applications

- As incoming feeder, distribution, coupling and outgoing feeder circuit breakers in electrical installations
- For switching and protecting motors, capacitors, generators, transformers, busbars, and cables.
- When connected to an electronic I&C system, the circuit breaker offers a wide range of options for monitoring network events.

The circuit breaker performs different protection tasks and can be used in the following areas:

Area	Buildings			Industry		Power generation	
Segments	Business buildings	Infrastructure	Industrial buildings	Production/process automation		Conventional power plants	Renewables
Examples	Office buildings, banks, hotels, cinemas, shopping malls, hospitals, universities, schools	Airports, train stations, sports stadiums, ports, exhibition sites, data centers	Industrial parks, warehouses, logistics centers, production halls	Paper industry, oil & gas industry, food & beverages	Presses, galvanizing lines, rolling mills, grinding mills, agitators and mixers, production lines	Coal-fired power plants, gas-fired power plants, combined heat and power plants	Wind power plants, energy storage, photovoltaic systems, biogas plants



2.2 Circuit breakers and non-automatic circuit breakers

2.2.1 Distinction between circuit breakers and non-automatic circuit breakers

The 3WA can be used as a circuit breaker with electronic trip unit, but also as a non-automatic circuit breaker according to IEC 60947-2.

Circuit breakers

The IEC 60947-2 standard applies to circuit breakers whose main contacts are designed for connection to circuits with rated voltages up to 1000 V AC or 1500 V DC. According to IEC 60947-2, a circuit breaker is “a mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions”.

Non-automatic circuit breakers

Non-automatic circuit breakers have a rated conditional short-circuit current I_{cc} and may be used as disconnectors, since the IEC 60947-2 standard also defines requirements for the isolating function.

The 3WA non-automatic circuit breakers are tested according to IEC 60947-2 Annex L. Annex L deals with circuit breakers which do not meet the requirements of overcurrent protection. They are called circuit breaker interrupters (CBI). A CBI can be tripped with auxiliary releases, e.g. shunt trips or undervoltage releases, also under short-circuit conditions, and is therefore to be considered a higher-value device compared to switch disconnectors according to IEC 60947-3, since switch disconnectors can disconnect at most the rated current.

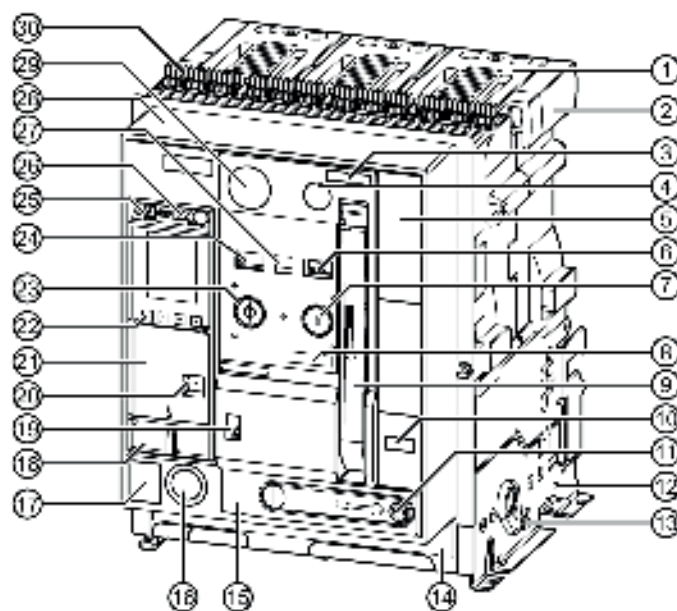
A CBI is part of a circuit breaker series, being derived from the equivalent circuit breaker by omitting the overcurrent release (type Y) or only the overload release (type X).

The following has been implemented for the 3WA non-automatic circuit breaker:

- Implementation of the circuit breaker without overcurrent release as CBI-Y
- The CBI-Y has an “isolating function”, hence the name “non-automatic circuit breaker”
- The rated conditional short-circuit current I_{cc} corresponds to the I_{cw} of the non-automatic circuit breaker over 0.5 s.

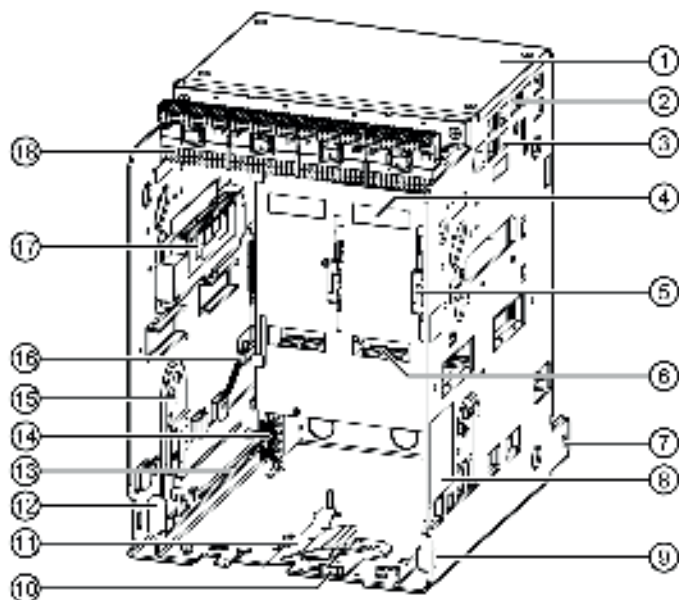
2.2.2 Design

2.2.2.1 Circuit breakers



- | | |
|---|--|
| (1) Arc chute | (16) Locking provision for racking handle (option) |
| (2) Carrying handle | (17) Label |
| (3) Labeling plate | (18) Voltage tap module VTM (optional) |
| (4) Motor disconnect switch (option) or local electric close (S10) (option) | (19) Mechanical unlatching of the racking handle |
| (5) Circuit breaker rating label | (20) Query button |
| (6) Spring charge indicator | (21) Electronic trip unit ETU |
| (7) Local mechanical close | (22) Operating keys ETU600 |
| (8) Max. rated circuit breaker current | (23) Mechanical OPEN button or Emergency OPEN button (mushroom pushbutton, option) |
| (9) Charging handle | (24) Switch position indicator |
| (10) Operating cycles counter (option) | (25) Trip indicator ETU TRIP (reset button) |
| (11) Racking handle | (26) Trip indicator EXT TRIP (reset button), optional |
| (12) Ground connection | (27) Ready-to-close indicator |
| (13) Retractable shaft (only withdrawable version) | (28) Operator panel |
| (14) Accessory label | (29) Locking provision Safe Open (option) |
| (15) Position indicator | (30) Base part for secondary disconnect terminal |

2.2.2.2 Guide frame

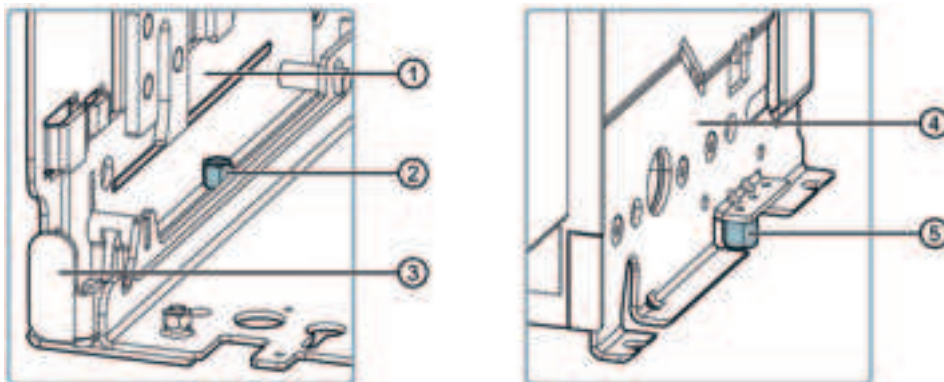


- | | |
|---|---|
| (1) Arc chute cover (option) | (10) Locking provision to prevent racking of the withdrawable circuit breaker with the control cabinet door open (option) |
| (2) Opening for crane hook | (11) Locking provision to prevent opening of the control cabinet door when the circuit breaker is closed (option) |
| (3) Arcing openings | (12) Racking rail |
| (4) Shutter | (13) Rated-current coding at factory |
| (5) Shutter lever | (14) Sliding contact for circuit breaker grounding (option) |
| (6) Finger clusters | (15) Equipment-dependent coding (option) |
| (7) Ground connection | (16) Shutter actuator |
| (8) Accessory label for guide frame | (17) Position signaling switch module (option) |
| (9) Locking provision for racking rails | (18) Sliding contact modules with attached push-in plugs |

Rated-current coding

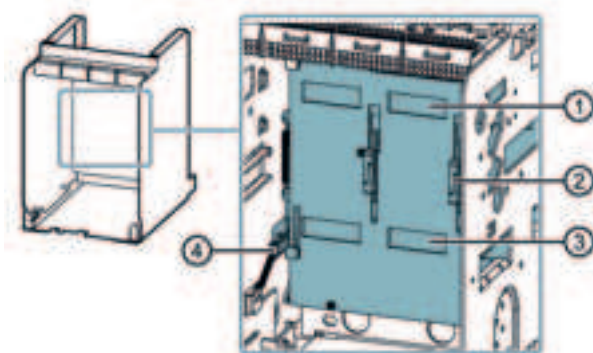
Guide frames and withdrawable circuit breakers are equipped with a rated-current coding as standard.

Rated-current coding ensures that only those circuit breakers whose guide frames are designed for the circuit breakers can be inserted into the guide frame.



- (1) Guide frame, left inner side (right inner side accordingly)
- (2) Coding pin on the racking rail in the guide frame
- (3) Racking rail
- (4) Withdrawable circuit breaker, right side (left side correspondingly)
- (5) Coding pin on withdrawable circuit breaker

Shutter



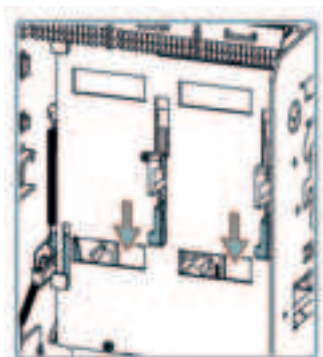
- (1) Top sliding cover
- (2) Shutter lever (in center position)
- (3) Bottom sliding cover
- (4) Shutter actuator

The shutter is used for touch protection. It consists of insulating panels and covers the live main circuits in the guide frame.

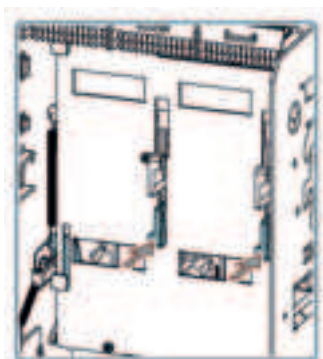
The sliding covers of the shutter close over the contacts of the guide frame in the movement positions "TEST" and "DISCONNECT". Thus the isolation condition is already fulfilled in the movement position "TEST".

For service purposes, the sliding covers can be opened and fixed manually with the aid of the shutter levers.

Example: opening the lower sliding covers



Light pressure on the shutter lever releases the fixation. The shutter levers return to the initial position and close the sliding covers.



NOTICE

Damage to the shutter

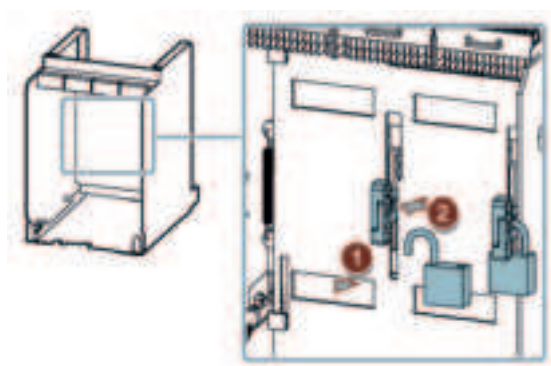
If the withdrawable circuit breaker is inserted while the shutter levers are fixed, the shutter may become damaged.

Only insert the withdrawable circuit breaker in the guide frame if the sliding covers are closed and the shutter levers are in the central position and unlocked.

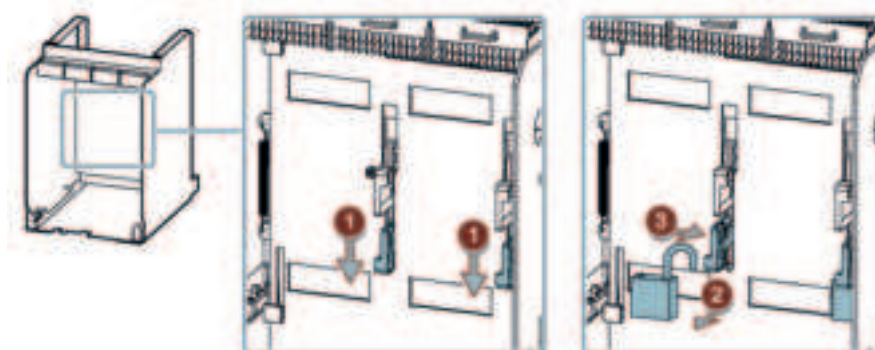
Locking provision for the shutter

The locking provision secures the shutter levers with padlocks in different positions. This protects the openings defined by the shutter lever position against unauthorized alteration.

- Locking in completely closed shutter position



- Locking with shutter open at the bottom



Before inserting the withdrawable circuit breaker, the padlocks must be removed from the shutter levers.

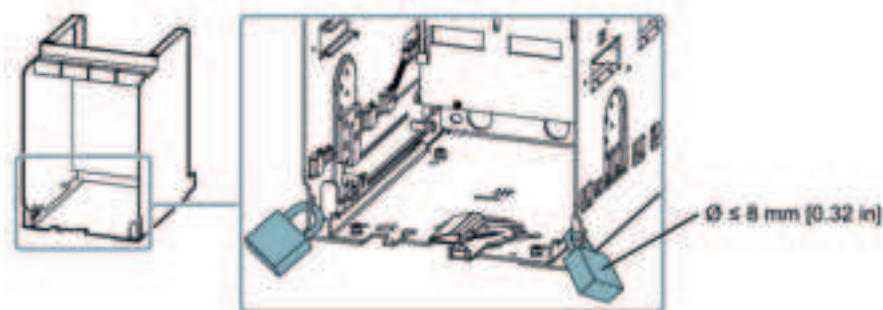
The locking provision for the shutter is included as standard. Padlocks are not included in the scope of supply.

Locking provision for racking rails

The locking provision prevents the insertion of a circuit breaker in the guide frame. For this purpose, the racking rails are locked with padlocks so that they cannot be pulled out again.

Activation

In order to activate the locking provision, once the circuit breaker has been removed, the racking rails are completely inserted into the guide frame and secured in this position with padlocks.



The locking provision for the racking rails is installed at the factory as standard. Padlocks are not included in the scope of supply.

2.2.2.3 Secondary disconnect terminals

Description



Internal electrical accessory components such as the closing coil receive their supply voltage via the secondary disconnect terminals.

A maximum of four secondary disconnect terminal blocks are available for size 1 circuit breakers and up to five for sizes 2 and 3. Included in the scope of supply as standard:

- Non-automatic circuit breaker: 3 secondary disconnect terminal blocks (X5 to X7)
- Circuit breaker: 4 secondary disconnect terminal blocks (X5 to X8)
- Communication-capable non-automatic circuit breaker: 4 secondary disconnect terminal blocks (X5 to X8)
- Circuit breaker with ETU600 LSIG Hi-Z: 5 secondary disconnect terminal blocks (X5 to X9)

All secondary disconnect terminals are designed with push-in technology as standard. With this innovative technology, solid conductors and conductors with end sleeves are simply inserted all the way into the clamping point (time savings of up to 50%). Finely stranded conductors can also be connected without much effort.

As an option, the secondary disconnect terminals are also available with screw-type technology from the factory.

For more information on the secondary disconnect terminals, see Chapters Secondary disconnect terminals for fixed-mounted circuit breakers (Page 224) and Secondary disconnect terminals for withdrawable circuit breakers (Page 227).

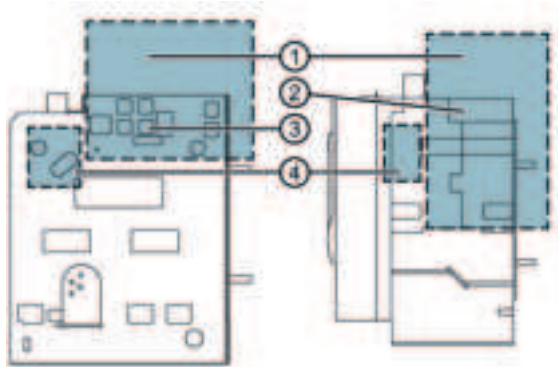
Laying of cables

NOTICE

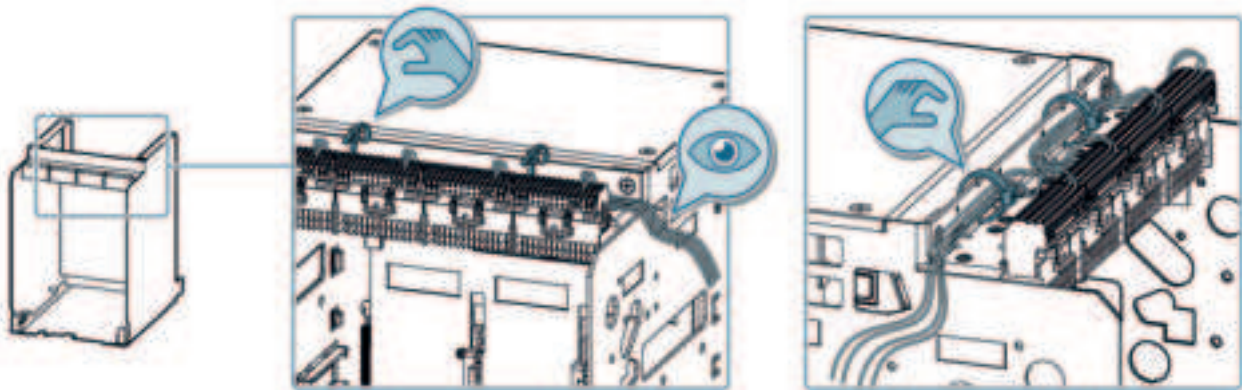
Damage to cables

Cables in impermissible areas can be damaged.

Route cables **outside** areas shown below.



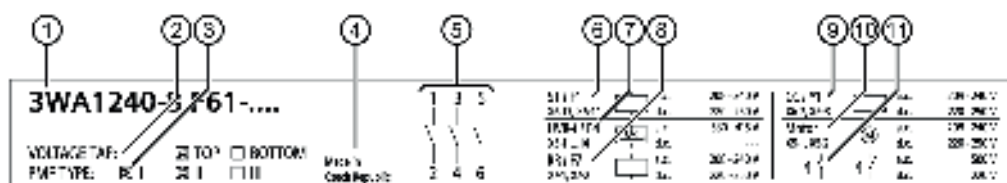
- (1) Arcing space
If arc chute covers are provided, the auxiliary conductors must not be laid on these covers.
- (2) Carrying handle
- (3) Arcing openings
- (4) Interlocks



2.2.3 Circuit breaker identification

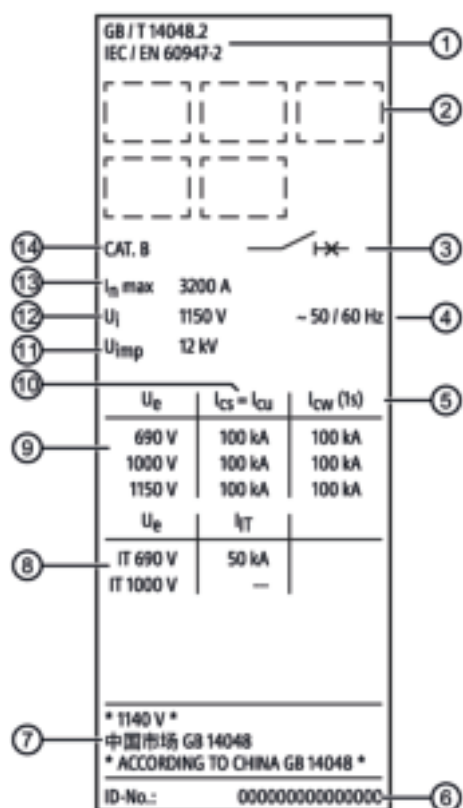
2.2.3.1 Rating and accessory labels

The rating and accessory labels provide identification of the circuit breaker. It contains the article number, equipment details, and further information on the circuit breaker.



- | | |
|---------------------------------------|---|
| (1) Article number circuit breaker | (7) 2 nd shunt trip (ST2) or undervoltage release (UVR or UVR-t) |
| (2) Internal voltage tap | (8) Remote trip alarm reset coil (RR) |
| (3) Variant of the metering function | (9) Closing coil (CC) |
| (4) Country of origin | (10) Spring charging motor (M) |
| (5) Polarity of main conducting paths | (11) Auxiliary contacts (AUX) |
| (6) First shunt trip (ST1) | |

2.2 Circuit breakers and non-automatic circuit breakers



- | | |
|--|---|
| (1) Standards | (8) Technical specifications for IT system low-voltage network type |
| (2) Approvals such as CE, CCC, EAC or C-Tick | (9) Rated operational voltage |
| (3) Isolating function | (10) Rated short-circuit breaking capacity |
| (4) Rated frequencies | (11) Rated impulse withstand voltage |
| (5) Rated short-time withstand current | (12) Rated insulation voltage |
| (6) ID number of the circuit breaker | (13) Maximum rated current of the circuit breaker |
| (7) Note regarding voltage reduction according to the Chinese standard | (14) Utilization category |

The rated current I_n of the circuit breaker is indicated on the option plug of the electronic trip unit. The option plug is described in Chapter Option plug (Page 45).

2.2.3.2 Guide frame rating label



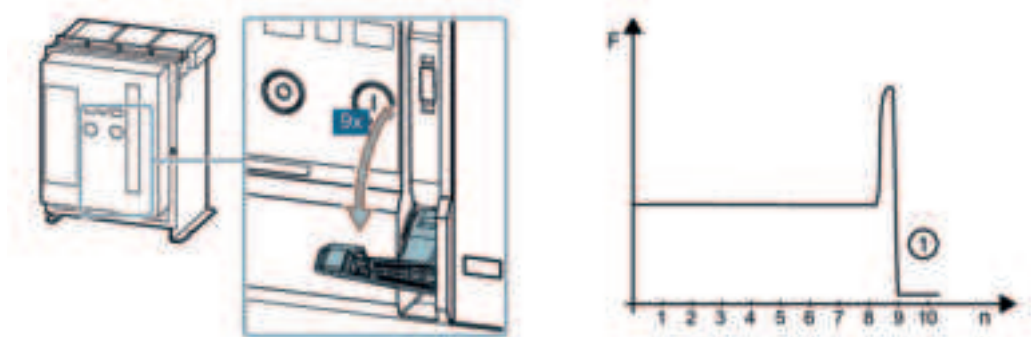
- (1) Article number guide frame
- (2) Indicator "Further options"
- (3) Rated operational voltage
- (4) Circuit breakers that can be used
- (5) Maximum rated current

2.2.4 Operation

2.2.4.1 Charging the stored-energy spring

To be able to close the circuit breaker, the stored-energy spring must be charged.

Manually charging the stored-energy spring



F Actuating force

n Number of strokes

(1) Stored-energy spring is charged

1. Fully grasp the charging handle.
2. Execute nine strokes evenly and completely to the stop.
Execute the ninth stroke just as far and evenly as the first eight strokes, although the actuating force will increase (see graphic above).

Once the stored-energy spring has been fully charged, the charging handle can be moved without resistance.

Automatically charging the stored-energy spring

As an option, the stored-energy spring can also be charged automatically with the spring charging motor. For more information, see Chapter Spring charging motor (Page 180).

2.2.4.2 Closing and opening

Note

The minimum time difference between ON and OFF command should be at least 100 ms.

Conditions for ready-to-close status

The conditions for the breaker's ready-to-close status can be found in Chapter Commissioning checklist (Page 43).

The circuit breaker is ready for closing when the READY window displays OK.

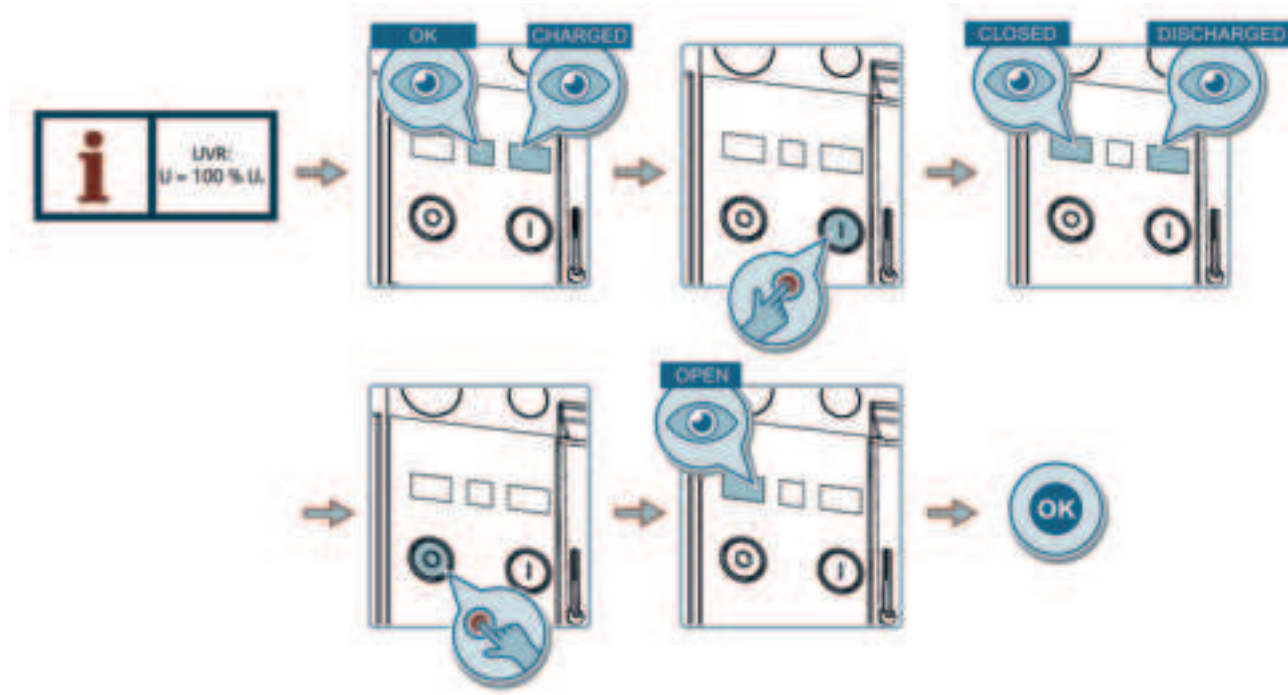


Automatically charging the stored-energy spring

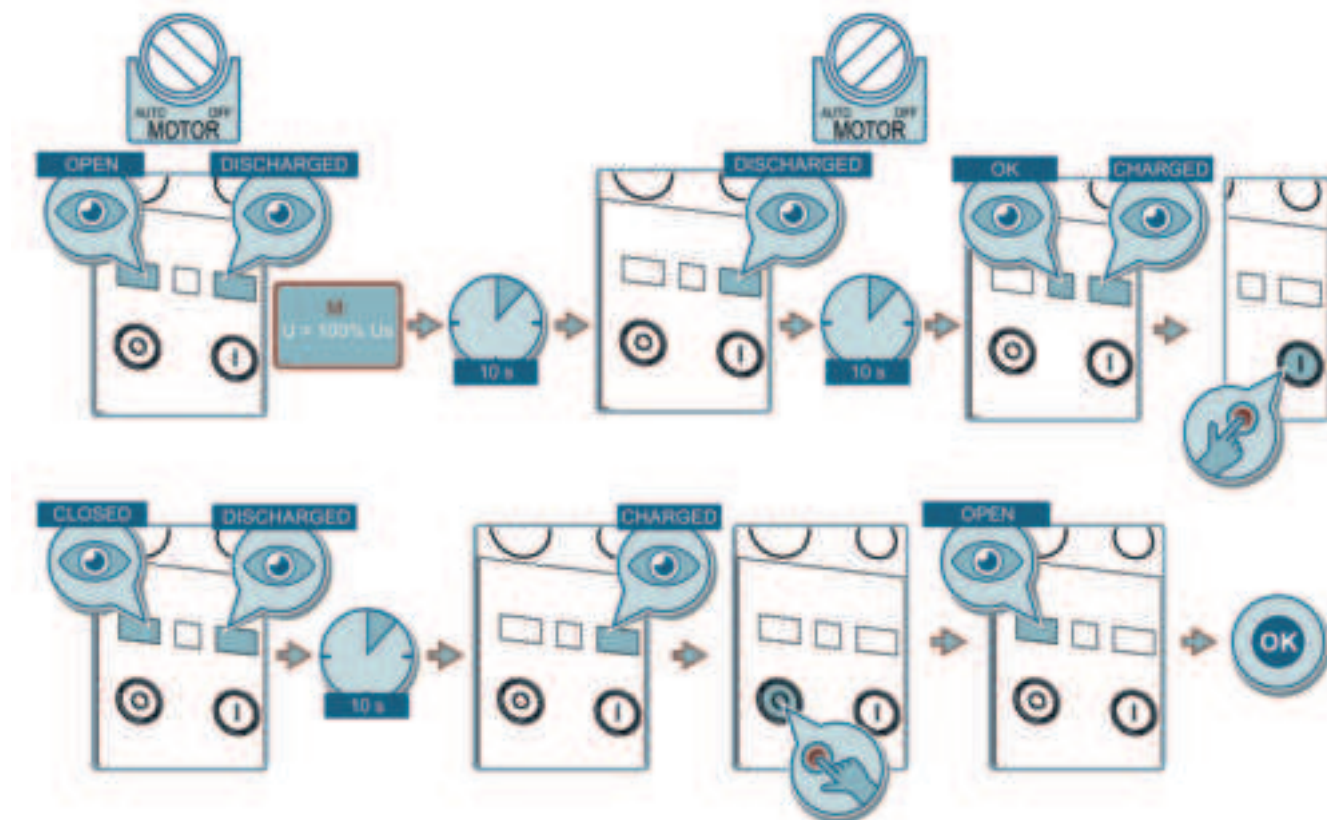
If a spring charging motor is integrated, immediately after switching on, the stored-energy spring is charged again by the spring charging motor. This can be prevented by an optional motor disconnect switch.

Switching on and off on the operator panel

Switching on and off without spring charging motor and motor disconnect switch



Switching on and off with spring charging motor and motor disconnect switch



Remote switching

Remote switching of the circuit breaker is possible as an option:

- Switching on takes place via the closing coil.
- Switching off takes place via the shunt trips.

Information on these components can be found in Chapter Closing coil, shunt trip, undervoltage release (Page 156).

See also

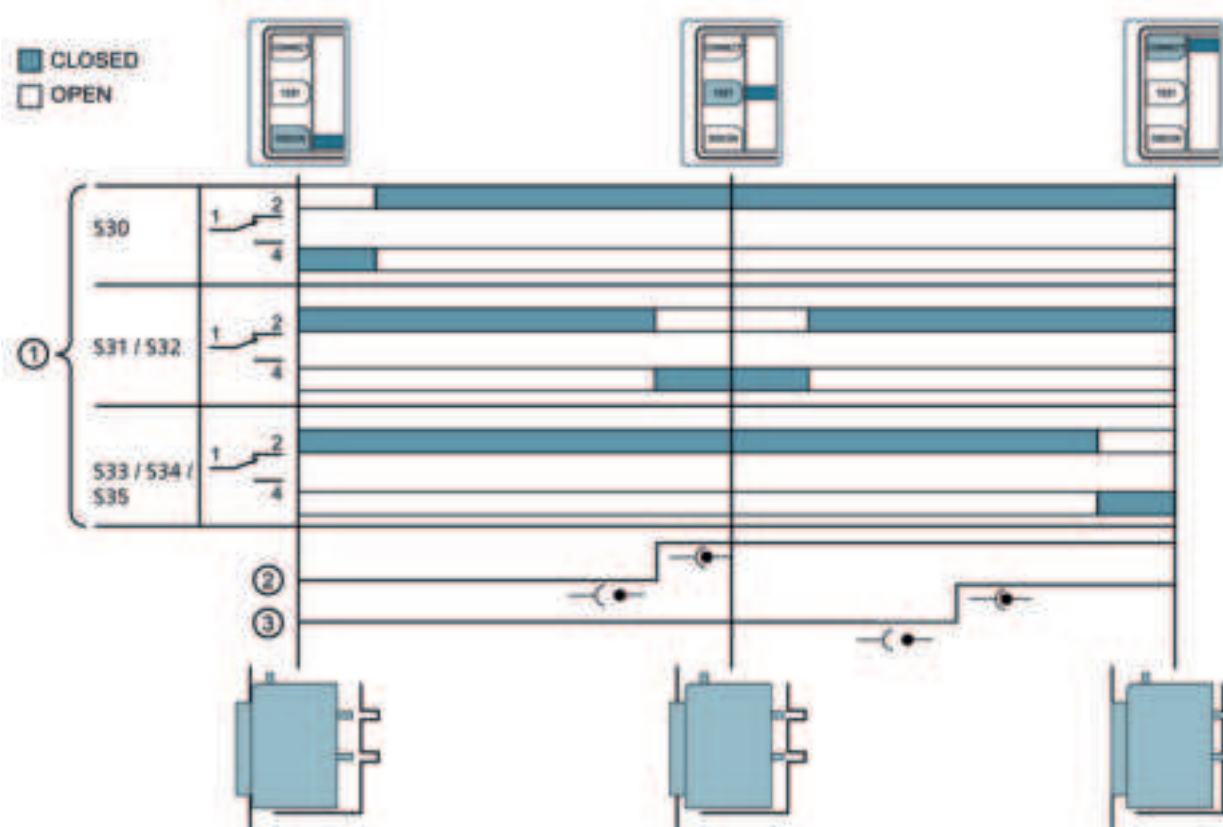
Communication and system connection (Page 106)

2.2.4.3 Racking the circuit breaker in the guide frame

The withdrawable circuit breaker can be moved to three positions by means of the racking handle. The current position is indicated by the position indicator on the circuit breaker, see Chapter Circuit breakers (Page 27).

Depending on the position, the main and auxiliary contacts are connected or isolated:

Position	Pictogram display	Main circuit connection	Auxiliary circuits	Shutter	Comment
CONNECT (connected position)	CONNECT	Connected	Connected	Open	
TEST (test position)	TEST	Disconnected and isolated	Connected	Closed	Disconnecter condition fulfilled Tests of accessories on the auxiliary circuit possible
DISCONNECT (disconnected position)	DISCON	Disconnected and isolated	Disconnected	Closed	Removal/insertion of the circuit breaker possible



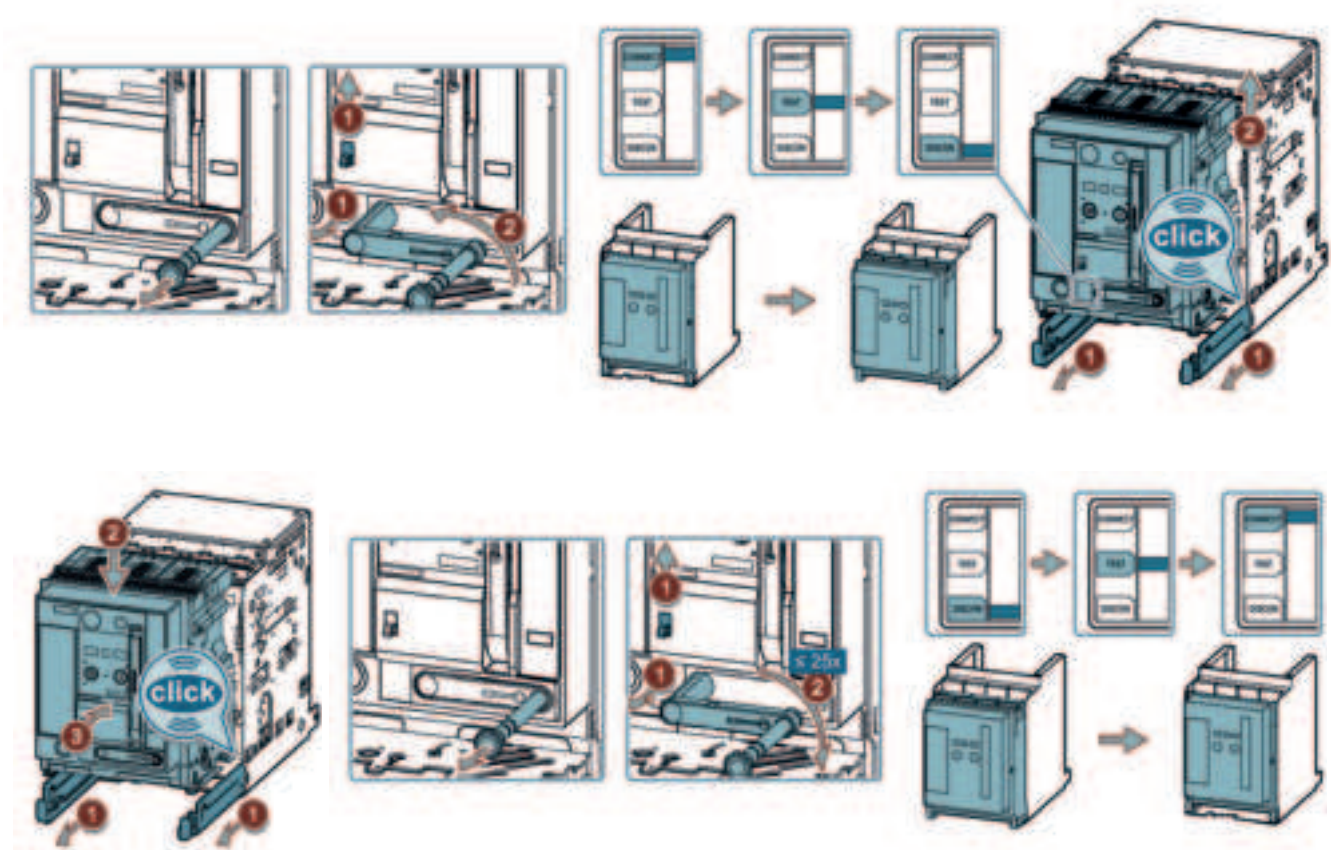
- (1) Position signaling switch module signal
- (2) Auxiliary circuits
- (3) Main connections

Racking the circuit breaker

NOTICE**Material damage due to over-rotation of the racking handle**

Over-rotation of the racking handle beyond its end stop can damage the racking mechanism.

Once the end stop is reached, the racking handle must be rotated counterclockwise to the rack-in position.



2.2.4.4 Commissioning checklist

Checks and work to be carried out

Before commencing work on the device, observe the safety instructions in Chapter Safety instructions (Page 17).

1. Open the circuit breaker and discharge the stored-energy spring.
2. Pull out the racking handle (for withdrawable circuit breakers).
3. Move the circuit breaker to the test position (for withdrawable circuit breakers).
4. Press the red reset buttons to reset the mechanical reclosing lockout.
5. Connect the auxiliary voltages.
6. Set the parameters on the electronic trip unit.
7. Assign the bus addresses for the communication modules.
8. Check the bus wiring and the terminating resistor.
9. Perform a communication test.
10. Test the auxiliary functions.
11. Close the control cabinet door.
12. Move the circuit breaker to the connected position (for withdrawable circuit breaker).
13. Insert the racking handle (for withdrawable circuit breakers).
14. Charge the stored-energy spring.

Conditions for ready-to-close status (depending on equipment with accessories)

The following conditions must be fulfilled for the ready-to-close status:

Undervoltage release:	energized (auxiliary voltage present)
Shunt trip:	not energized
Closing coil	not energized
Mechanical circuit breaker interlocking	not effective
Locking provisions	not activated

Observing status displays

The circuit breaker is ready for closing when the READY window displays OK. It can then be closed manually or by means of a control command.



2.3 Protection system

2.3.1 General description of function

The protection system of the 3WA circuit breaker consists of:

- **Current sensors for measurement**

The current sensors installed in the 3WA circuit breaker feature a Rogowski coil and an energy core. The measured signal is provided by the Rogowski coil.

The Rogowski coil is used as a component in electronic measuring devices to measure alternating current. It is a toroidal coil without a ferromagnetic core and can detect small operational currents as well as large short-circuit currents linearly and with very high accuracy.

- **Optional voltage tap at the main circuits, including voltage tap module for voltage measurement**

The optional internal voltage tap is implemented at the lower or upper main circuits.

The voltage is prepared by the voltage tap module and made available to the electronic trip unit for evaluation.

The voltage tap module is available in two versions, see Chapter Voltage tap module VTM (Page 316).

- **Electronic trip unit**

The electronic trip unit is controlled by a microprocessor and operates independently of an auxiliary voltage. It enables systems to be adapted to the different protection requirements of distribution systems, motors, transformers and generators. In order to enable a quick adaptation to new grid conditions on site, the electronic trip unit has been developed with consistent focus on modularity.

Among other things, the following functions can be added easily and at any time:

- Ground-fault protection
- Changing the current rating
- Communication
- Metering function

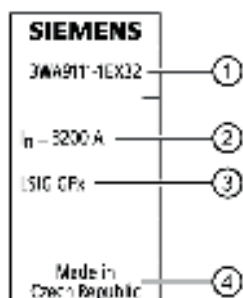
Depending on the configuration, the electronic trip unit has various protective functions which evaluate the measured currents and voltages and compare them with the parameterized settings. If a measured value exceeds the set threshold, the circuit breaker is tripped with a delay or instantaneously.

The electronic trip unit is powered (self-acting) by the internal current sensors, or optionally via the voltage tap of the metering function.

- **Tripping solenoid to control the mechanical system of the circuit breaker**

2.3.2 Option plug

The option plug determines the current rating and the basic protective functions of the electronic trip unit of the 3WA circuit breaker.



- (1) Article number (on top, not visible when plugged in)
- (2) Current rating
- (3) Basic protective functions
- (4) Country of manufacture (on the bottom side, not visible when plugged in)

The option plug can be replaced to adapt the circuit breaker to changing requirements.

Note

The electronic trip unit continuously monitors the option plug for presence and validity. If no or an impermissible option plug is detected, the electronic trip unit instantly trips the 3WA circuit breaker. This is indicated as an error via the red LED INFO as well as in the display of the ETU600.

Changing the current rating

For the three sizes of the 3WA circuit breaker, the rated current I_n can be changed to the values given in the table below by means of the option plug. The selected value should correspond to the rated current of the power distribution system and must not exceed the maximum rated current of the circuit breaker $I_{n\max}$ (see circuit breaker accessory label).

Rated current	Size 1	Size 2	Size 3
200 A	✓	✓	–
250 A	✓	✓	
315 A	✓	✓	
400 A	✓	✓	
500 A	✓	✓	
600 A	✓	✓	
630 A	✓	✓	
800 A	✓	✓	✓
1000 A	✓	✓	✓
1200 A	✓	✓	✓
1250 A	✓	✓	✓
1600 A	✓	✓	✓
2000 A	✓	✓	✓
2500 A	✓	✓	✓
3000 A	–	✓	✓
3200 A		✓	✓
4000 A		✓	✓
5000 A		–	✓
6000 A			✓
6300 A			✓
			✓

Changing the basic protective functions

Option plugs with the following basic protective functions are available for the ETU600 electronic trip unit:

	Option plug with protective function LSI	Option plug with protective function LSIG GFx
Long time LT	✓	✓
Short time ST	✓	✓
Instantaneous short-circuit protection INST	✓	✓
Ground-fault protection GF	–	✓

By exchanging the option plug and using an option plug LSI, the ground-fault protection GF on the ETU600 LSIG electronic trip unit can be completely deactivated.

2.3.3 Guideline for setting the protection parameters

The protection parameters of the electronic trip unit depend on the technical environment (e.g. power distribution equipment and applications) and the type of equipment to be protected. Therefore, the protection settings must be calculated according to the applicable regulations and the electronic trip unit must be set with these calculated parameters.

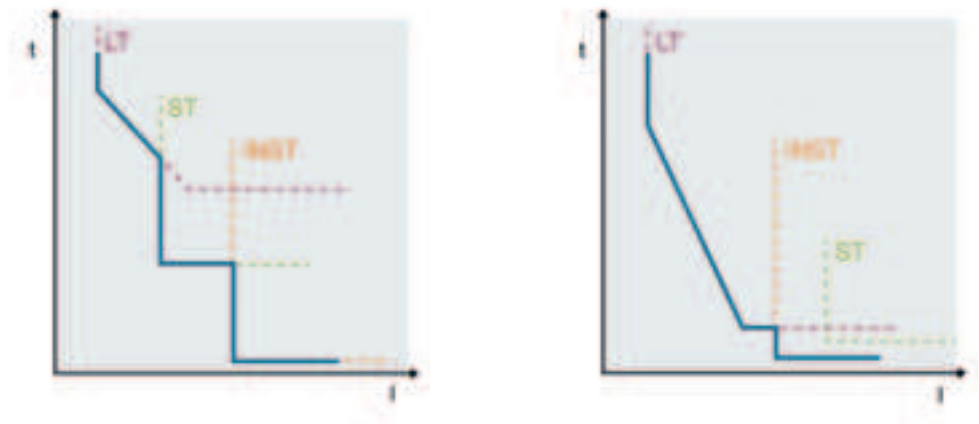
SIMARIS design

The Siemens SIMARIS design software tool is a simple and reliable tool for calculating and dimensioning networks.

For more information on SIMARIS design, refer to the Internet (<https://www.siemens.com/simaris>).

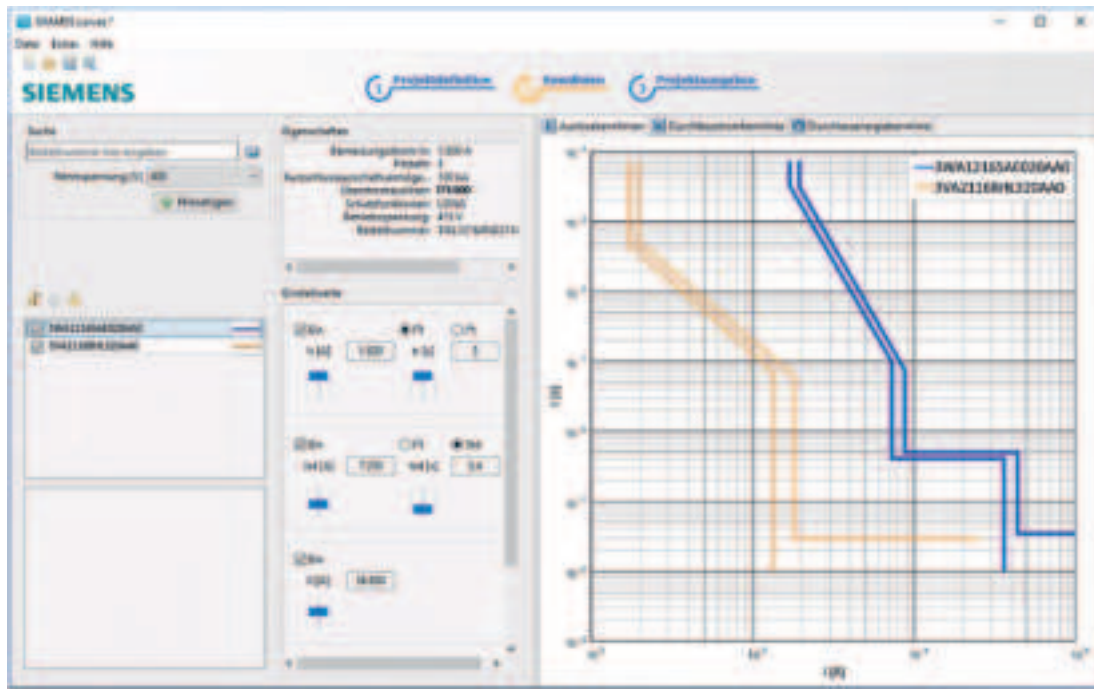
2.3.4 Time-current characteristic

The time-current characteristic of the circuit breaker's electronic trip unit is determined by the individual sub-characteristics of the active protective functions, e.g. long time LT, short time ST, and short-circuit protection INST.



SIMARIS curves

The Siemens software tool SIMARIS curves can be used to display the time-current characteristic for one or more devices.



For more information on SIMARIS curves, refer to the Internet (<https://www.siemens.com/simaris>).

2.3.5 Description of the protective functions

2.3.5.1 General description

Depending on the electronic trip unit and the options selected, the following protective functions are available:

- Long time LT
- Short time ST
- Instantaneous short-circuit protection INST
- Neutral protection N
- Ground-fault alarm
- Ground-fault protection GF
- Ground-fault protection GF Hi-Z