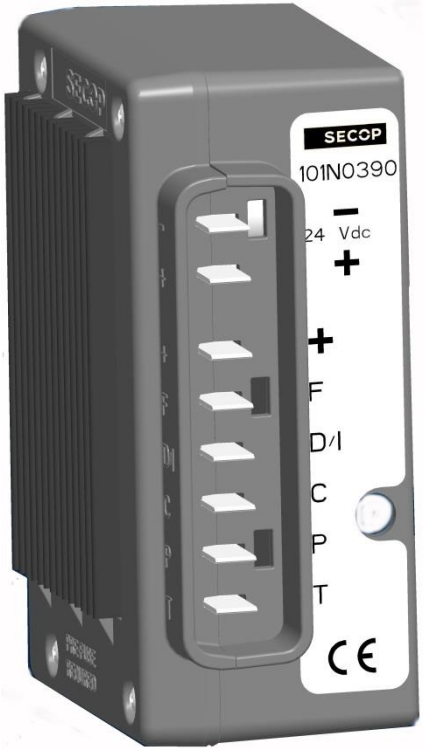
Replacement 24 Vdc electronic for BD80F-100CN & BD250GH.2
September 2015



2015.09.18

Purpose

1.
Replacement of ASIC. ASIC is an old and obsolete technology

The very first electronic controller for BD compressors are based on ASIC technology. Controller in question is the one with code nos:

Old codes

101N0290 12/24 Vdc	Single pack
101N0291 12/24 Vdc	Industrial pack

New codes

101N0390 24 Vdc	Single pack
101N0391 24 Vdc	Industrial pack

The controller will be replaced by a controller with µ-controller. **Only 24 Vdc**

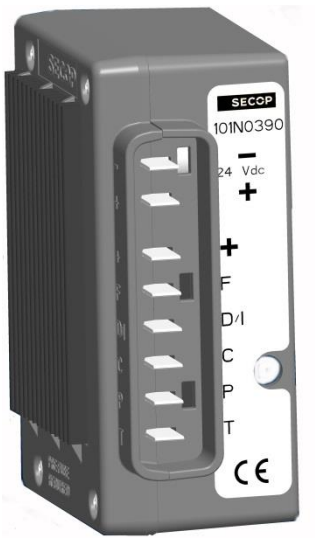
For <u>12 Vdc applications</u> 101N0290 will still be available on allocation untill further notice

2.
Improved product quality

3.
Higher flexibility due to SW

Form – Fit - Function

OLD



NEW

The new electronic will be backwards compatible, and can be used as spare part for old 24 VDC electronics.

Form - Will be changed slightly, <u>heat sink will be visible and without fan cooling</u>

Function - Will be backwards compatible for 24 Vdc systems , but can be adjusted via PC software Tool4Cool to release new functions if desired.

Wiring – Remain the same

Hardware comparison

The key hardware changes are:

- ASIC vs Microcontroller
- 2 layer PCB plus ceramic PCB vs single 4-layer PCB
- Advanced motor driver FETs (significantly reducing losses)
- EMI Filter

Concepts remaining unchanged:

- Boost concept
- Voltage control
- Fan control
- Inverter
- Regulation and safety features

old

New

Code no´s and official names

Code nos

101N0390	Single pack
101N0391	Industrial pack

Name

BD80F, BD100CN & BD250GH.2 High Speed

Specification

1 to 1 replacement for 24 Vdc systems.

Specification contains:

- Supply voltage 24 Vdc
- Same functions as 101N0290
- Via PC software Tool4Cool
  - Electronic thermostat incl ECO
  - Compressor speed, start stop delay setting
  - Fan start stop delays
- Improved EMI
- Improved leakage current

Comparison BD80F 24 Vdc

BD80F 101N0290

Capacity (EN 12900 Household / CECOMAF)										12/24 Vdc		Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	35	50	55	67	87	112	140					
3100	42	59	66	80	104	133	168					
3800	50	71	79	95	125	159	200					
4400	55	78	87	105	138	176	221					

Capacity (ASHRAE LBP)										12/24 Vdc		Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	44	61	68	82	108	138	174					
3100	52	73	81	98	129	165	207					
3800	61	87	97	118	154	197	248					
4400	68	96	197	130	170	218	274					

Power consumption										12/24 Vdc		Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	40	50	53	60	71	83	96					
3100	49	61	65	74	87	101	118					
3800	60	75	80	90	106	124	145					
4400	69	87	93	105	123	144	168					

Current consumption										12 Vdc		Amp
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	3,3	4,2	4,5	5,0	5,9	6,9	8,0					
3100	4,1	5,1	5,5	6,2	7,3	8,4	9,8					
3800	5,0	6,3	6,7	7,5	8,8	10,3	12,1					
4400	5,8	7,3	7,8	8,8	10,3	12,0	14,0					

COP (EN 12900 Household / CECOMAF)										12/24 Vdc		Watt/Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	0,88	0,99	1,03	1,10	1,22	1,35	1,46					
3100	0,86	0,96	1,00	1,08	1,20	1,32	1,42					
3800	0,83	0,94	0,98	1,06	1,18	1,28	1,38					
4400	0,79	0,90	0,93	1,00	1,12	1,22	1,32					

BD80F 101N0390

Capacity (EN 12900 Household / CECOMAF)										24 Vdc		Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	37	51	57	69	91	116	146					
3100	43	61	68	83	108	138	175					
3800	52	73	82	99	130	165	208					
4400	57	81	90	109	144	183	230					

Capacity (ASHRAE LBP)										24 Vdc		Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	45	64	71	85	112	144	181					
3100	54	76	84	102	134	172	215					
3800	64	90	101	123	160	205	258					
4400	70	100	205	135	177	227	285					

Power consumption										24 Vdc		Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	38	48	51	58	68	80	92					
3100	47	59	63	71	84	97	113					
3800	57	72	77	87	102	119	139					
4400	66	84	89	101	118	138	161					

Current consumption										24 Vdc		Amp
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	1,6	2,0	2,1	2,4	2,9	3,3	3,8					
3100	1,9	2,4	2,6	3,0	3,5	4,0	4,7					
3800	2,4	3,0	3,2	3,6	4,2	5,0	5,8					
4400	2,8	3,5	3,7	4,2	4,9	5,8	6,7					

COP (EN 12900 Household / CECOMAF)										24 Vdc		Watt/Watt
rpm/ °C	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2	10	15
2500	0,96	1,07	1,12	1,20	1,32	1,46	1,58					
3100	0,93	1,04	1,09	1,17	1,30	1,43	1,54					
3800	0,90	1,02	1,06	1,14	1,28	1,39	1,49					
4400	0,86	0,97	1,01	1,08	1,22	1,32	1,43					

4 % improvement

Preliminary

Comparison BD100CN 24 Vdc

BD100CN 101N0290

Capacity (EN 12900 Household / CECOMAF)										12/24 Vdc		Watt
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	31	40	52	66	71	83	103	126				
3100	36	49	65	83	90	105	130	160				
3800	41	57	76	98	106	124	154	189				
4400	45	62	83	108	117	137	170	209				
Capacity (ASHRAE LBP)										**12/24 Vdc**		**Watt**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	34	45	58	74	80	93	115	141				
3100	40	55	72	93	100	117	145	178				
3800	45	63	84	109	119	138	172	211				
4400	50	70	93	121	131	153	190	233				
Power consumption										**12/24 Vdc**		**Watt**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	36	40	45	51	53	56	62	68				
3100	42	49	56	64	67	72	79	87				
3800	49	59	69	79	82	88	98	106				
4400	57	69	81	93	96	104	115	125				
Current consumption										**12 Vdc**		**Amp**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	2,98	3,32	3,73	4,21	4,38	4,70	5,19	5,65				
3100	3,49	4,08	4,69	5,33	5,56	5,98	6,62	7,21				
3800	4,06	4,88	5,72	6,54	6,82	7,34	8,13	8,83				
4400	4,78	5,76	6,73	7,71	8,03	8,67	9,58	10,42				
COP (EN 12900 Household / CECOMAF)										**12/24 Vdc**		**Watt/Watt**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	0,86	1,01	1,16	1,31	1,36	1,47	1,65	1,86				
3100	0,86	1,00	1,15	1,30	1,35	1,46	1,64	1,85				
3800	0,83	0,97	1,10	1,25	1,30	1,41	1,58	1,78				
4400	0,78	0,90	1,03	1,17	1,21	1,32	1,48	1,67				

BD100CN 101N0390

Capacity (EN 12900 Household / CECOMAF)										24 Vdc		Watt
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	32	42	54	69	74	86	107	131				
3100	37	51	67	86	94	109	135	166				
3800	42	59	79	102	110	129	160	197				
4400	46	65	87	112	122	142	177	217				
Capacity (ASHRAE LBP)										**24 Vdc**		**Watt**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	35	47	60	77	83	96	120	147				
3100	42	57	75	96	104	122	151	185				
3800	47	66	88	113	124	144	179	219				
4400	52	72	97	126	136	159	198	242				
Power consumption										**24 Vdc**		**Watt**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	34	38	43	48	50	54	60	65				
3100	40	47	54	61	64	69	76	83				
3800	47	56	66	75	79	85	94	102				
4400	55	66	78	89	93	100	110	120				
Current consumption										**24 Vdc**		**Amp**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	1,4	1,6	1,8	2,0	2,1	2,3	2,5	2,7				
3100	1,7	2,0	2,3	2,6	2,7	2,9	3,2	3,5				
3800	1,9	2,3	2,7	3,1	3,3	3,5	3,9	4,2				
4400	2,3	2,8	3,2	3,7	3,9	4,2	4,6	5,0				
COP (EN 12900 Household / CECOMAF)										**24 Vdc**		**Watt/Watt**
rpm/ °C	-40	-35	-30	-25	-23,3	-20	-15	-10	-5	0	5	7,2
2500	0,93	1,09	1,26	1,42	1,47	1,59	1,79	2,01				
3100	0,93	1,09	1,24	1,40	1,46	1,58	1,77	2,00				
3800	0,90	1,05	1,19	1,35	1,40	1,52	1,71	1,93				
4400	0,84	0,98	1,12	1,26	1,31	1,43	1,60	1,81				

4 % improvement

Preliminary

Comparison BD250GH.2 24 Vdc

BD250GH.2 101N0290

Capacity (EN 12900 Household / CECOMAF)										12/24 Vdc		Watt
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	32	36	46	64	85	102	112	143	180	197	222	270
3100	43	49	61	84	111	132	143	181	225	246	275	332
3800	55	62	78	106	140	165	179	225	278	303	338	404
4400	61	69	87	119	156	184	200	251	308	336	373	446
Capacity (ASHRAE LBP)										**12/24 Vdc**		**Watt**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	40	45	57	79	106	127	139	178	224	246	277	338
3100	53	60	76	104	138	164	178	225	280	307	343	415
3800	68	77	97	132	173	205	223	280	345	377	420	505
4400	76	86	108	148	194	229	248	311	383	418	464	556
Power consumption										**12/24 Vdc**		**Watt**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	36	40	46	54	60	64	66	71	78	81	86	96
3100	44	48	55	65	74	79	82	91	102	107	114	130
3800	57	62	70	82	94	102	106	119	134	142	152	174
4400	68	72	82	95	108	117	122	138	156	165	177	202
Current consumption										**12 Vdc**		**Amp**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	3,0	3,3	3,8	4,5	5,0	5,3	5,5	5,9	6,5	6,7	7,1	8,0
3100	3,7	4,0	4,6	5,4	6,2	6,6	6,9	7,6	8,5	8,9	9,5	10,8
3800	4,8	5,2	5,9	6,9	7,8	8,5	8,8	9,9	11,2	11,8	12,7	14,5
4400	5,6	6,0	6,8	7,9	9,0	9,8	10,2	11,5	13,0	13,8	14,8	16,8
COP (EN 12900 Household / CECOMAF)										**12/24 Vdc**		**Watt/Watt**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	0,90	0,92	1,00	1,18	1,42	1,60	1,70	2,01	2,32	2,44	2,59	2,82
3100	0,98	1,01	1,10	1,28	1,50	1,66	1,74	1,98	2,21	2,30	2,41	2,55
3800	0,95	1,00	1,10	1,29	1,49	1,62	1,69	1,89	2,07	2,13	2,22	2,32
4400	0,91	0,96	1,07	1,26	1,44	1,57	1,64	1,82	1,97	2,04	2,11	2,21

BD250GH.2 101N0390

Capacity (EN 12900 Household / CECOMAF)										24 Vdc		Watt
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	33	38	48	66	89	106	116	149	187	205	231	281
3100	45	50	63	87	115	137	149	188	234	256	286	345
3800	57	64	81	110	146	172	186	234	289	315	352	420
4400	64	72	91	124	162	191	208	261	320	349	388	464
Capacity (ASHRAE LBP)										**24 Vdc**		**Watt**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	41	47	59	82	110	132	145	185	233	256	288	352
3100	55	63	79	108	144	171	185	234	291	319	357	432
3800	71	80	100	137	180	213	232	291	359	392	437	525
4400	79	90	112	154	202	238	258	323	398	435	483	578
Power consumption										**24 Vdc**		**Watt**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	34	38	44	52	58	61	63	68	75	78	82	92
3100	42	46	53	62	71	76	79	88	98	103	109	125
3800	55	60	68	79	90	98	102	114	129	136	146	167
4400	65	70	78	91	104	112	117	132	150	158	170	194
Current consumption										**24 Vdc**		**Amp**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	1,4	1,6	1,8	2,2	2,4	2,6	2,6	2,9	3,1	3,2	3,4	3,8
3100	1,8	1,9	2,2	2,6	3,0	3,2	3,3	3,7	4,1	4,3	4,6	5,2
3800	2,3	2,5	2,8	3,3	3,8	4,1	4,2	4,8	5,4	5,7	6,1	7,0
4400	2,7	2,9	3,3	3,8	4,3	4,7	4,9	5,5	6,2	6,6	7,1	8,1
COP (EN 12900 Household / CECOMAF)										**24 Vdc**		**Watt/Watt**
rpm/ °C	-25	-23,3	-20	-15	-10	-6,7	-5	0	5	7,2	10	15
2500	0,97	1,00	1,08	1,28	1,54	1,73	1,85	2,17	2,51	2,64	2,81	3,05
3100	1,06	1,09	1,19	1,39	1,63	1,80	1,88	2,15	2,39	2,49	2,61	2,77
3800	1,03	1,08	1,20	1,40	1,62	1,75	1,83	2,05	2,25	2,31	2,41	2,52
4400	0,98	1,04	1,16	1,36	1,56	1,70	1,78	1,97	2,14	2,21	2,28	2,39

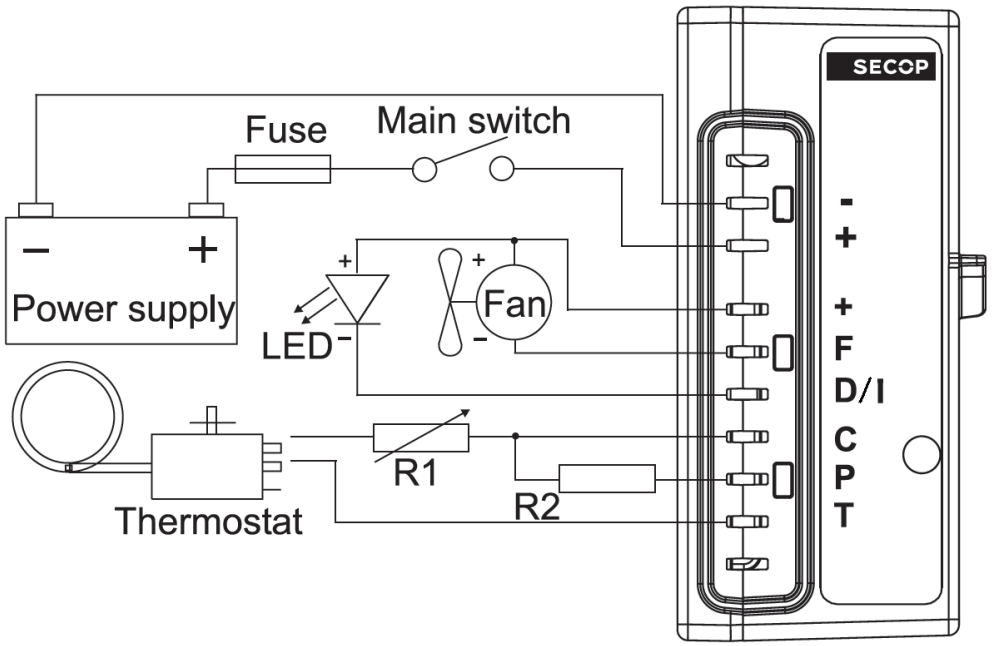
4 % improvement

Preliminary

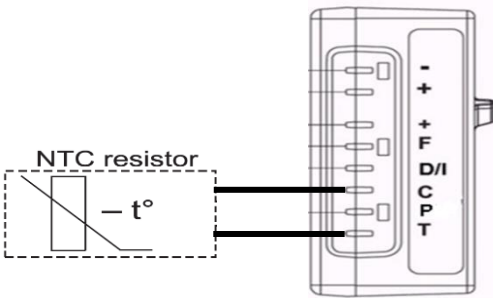
Comparision

	101N0390	old 101N0290
Unit name	AEO	AEO
Leakage current	2,4mA@24V	>=4mA
Adjustable start + stop delays for thermostat, fan and compressor	0-240s 0-240s 0-240s	no no no
Start Current (internal)	6A	3.8A
Comm. interface	Yes	No
Fan output	12 V dc	12 Vdc
Error Log	Yes	No
AEO	Yes	Yes
Voltage range Vdc	21.3 - 32	9,6 - 31.5
ECO function	Yes	No
Thermostat	mechanical or NTC	mechanical
Electronic efficiency / COP	+32% / +4%	Reference

Standard configuration



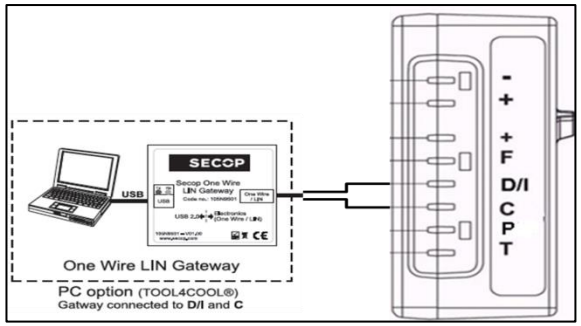
Alternative1: NTC connection



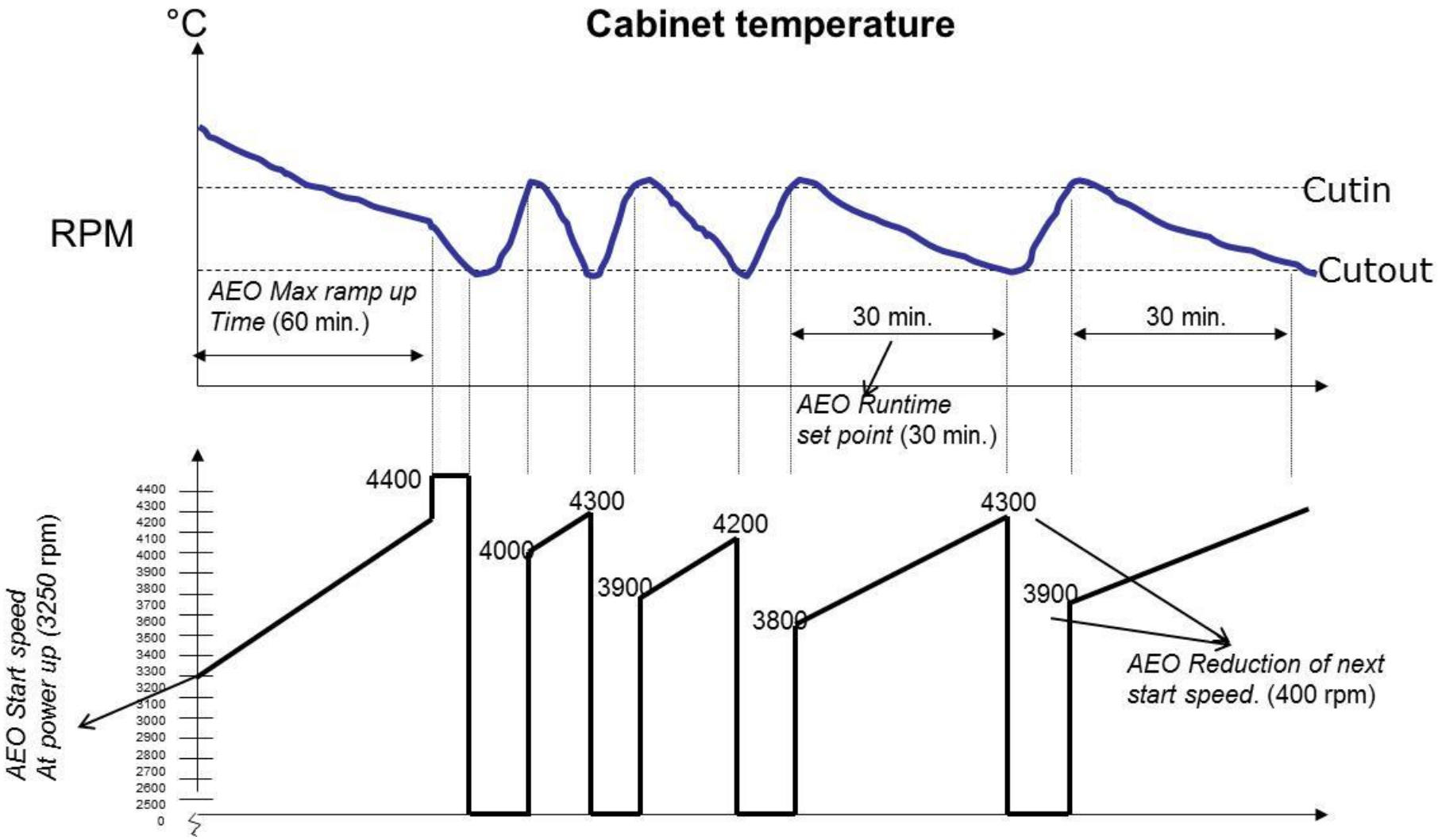
NTC function has to be enabled via communication interface

Alternative2:

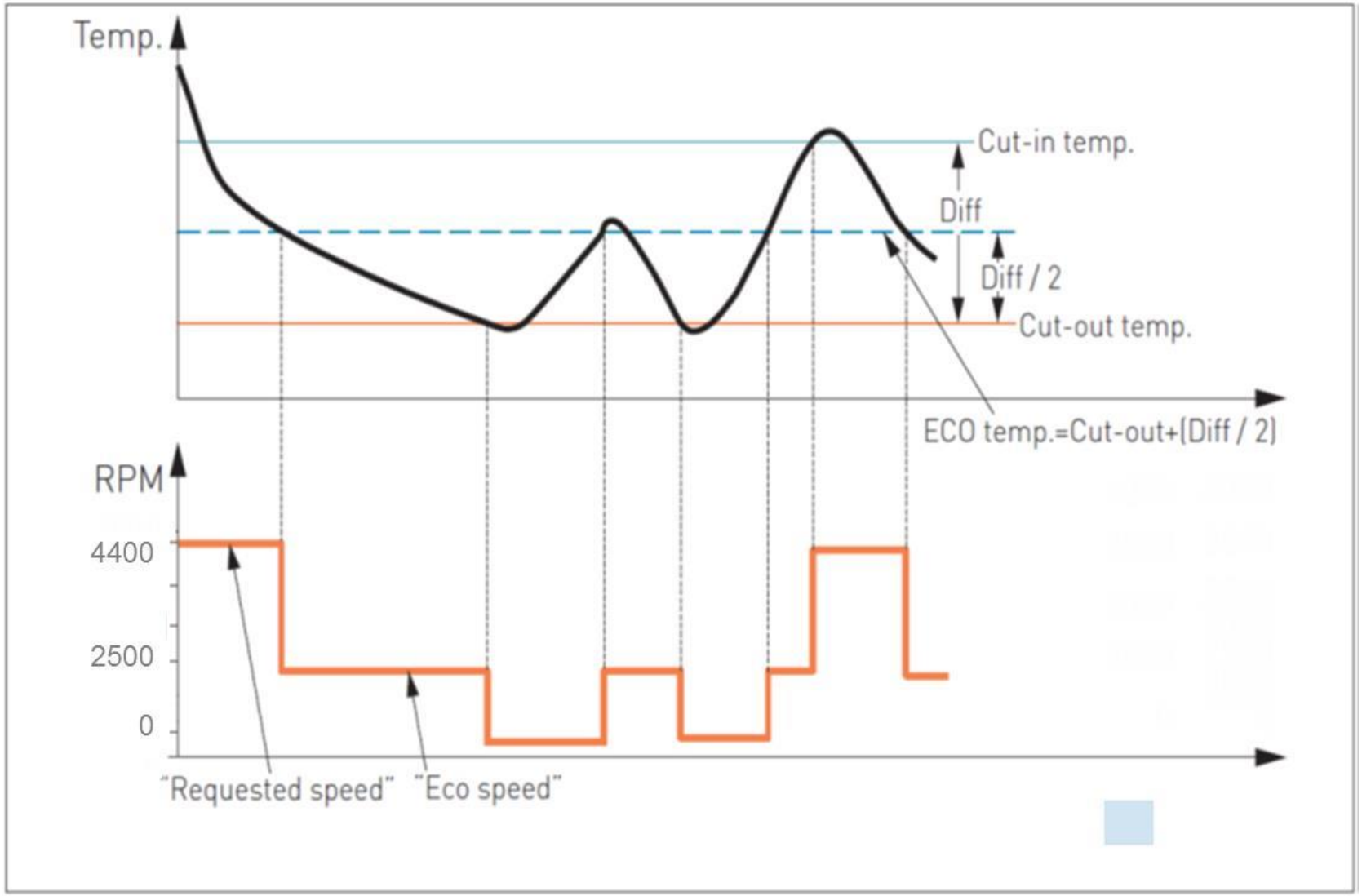
Communication interface



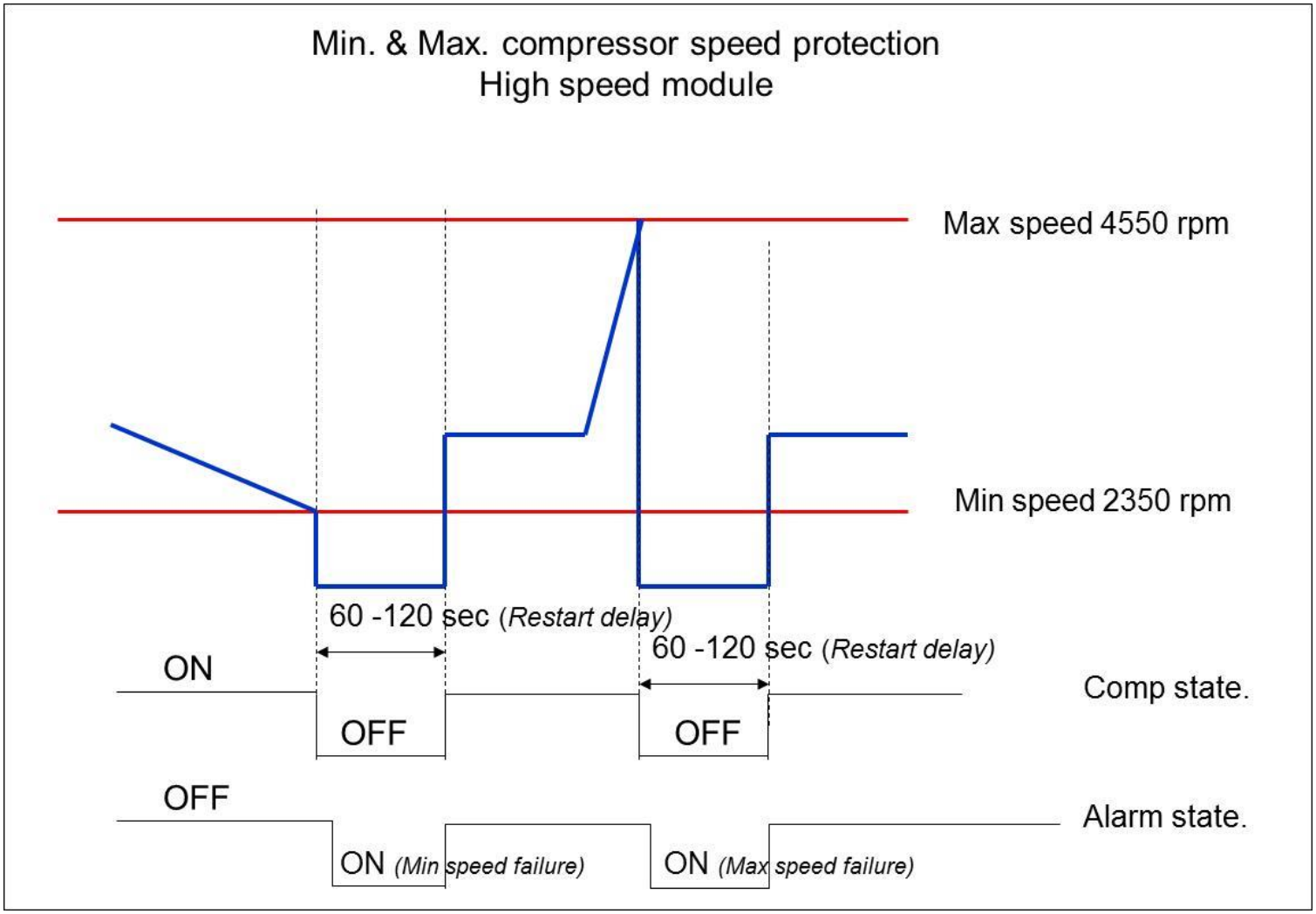
AEO function high speed module



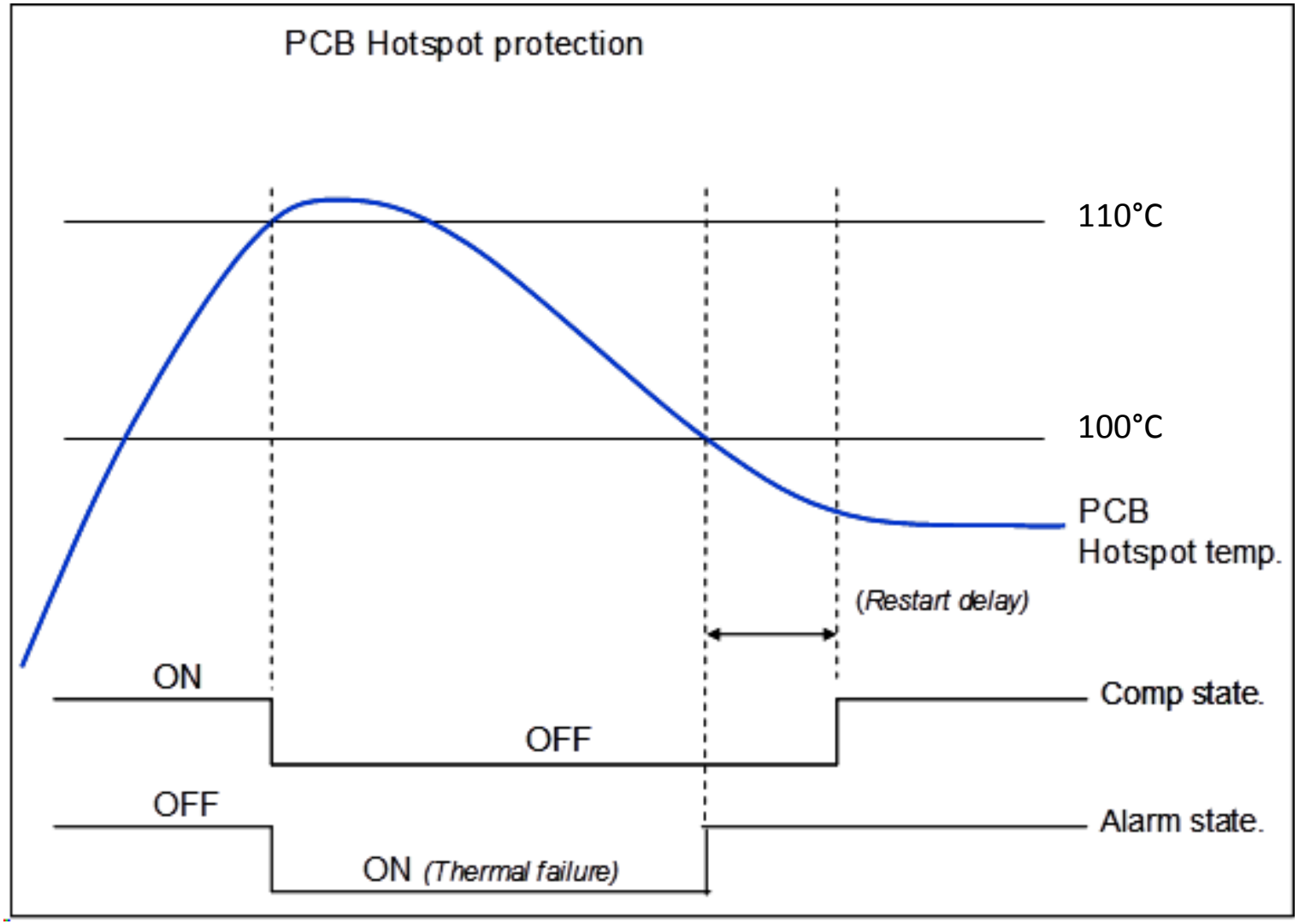
ECO function high speed module



Speed protection



PCB overheating protection



Battery protection settings. Only 24 Vdc supply

Standards battery protection settings			
	24 V cut-out (V)		24 V cut-in (V)
	22.8		24.1
Optional battery protection settings			
Resistor (kΩ) Terminals C - P	24 V cut-out (V)	24 V cut-in (V)	24 V max voltage
0	21.3	22.6	31.5
1.6	21.5	22.8	31.5
2.4	21.8	23.1	31.5
3.6	22.0	23.3	31.5
4.7	22.3	23.6	31.5
6.2	22.5	23.8	31.5
8.2	22.8	24.1	31.5
11	23.0	24.4	31.5
14	23.3	24.6	31.5
18	23.6	24.9	31.5
24	23.8	25.1	31.5
33	24.1	25.4	31.5
47	24.3	25.6	31.5
82	24.6	25.9	31.5

LED errors

No of flash	Error type
6	**NTC sensor failure** If the NTC is short circuited or interrupted
5	**Thermal failure > +110 C** Thermal cut out on PCB temperature. If the system has been too heavily loaded or the ambient temperature is very high, the electronic unit will switch off
4	**Speed failure** If the refrigeration system is too heavily loaded and the compressor can not maintain a minimum speed of approx. 2350 rpm or when the speed exceeds 4550 rpm
3	**Motor failure** The rotor is blocked or the differential pressure in the refrigeration system is to high > 5 bar
2	**Fan failure** The fan loads the electronic unit with more than the maximum allowed output current
1	**Voltage failure** The voltage is out side the specified settings. High or low voltage cut out.
0	**No error**

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