FAILURE ANALYSIS
SYSTEM CODES

be
think
innovate

GRUNDFOS

INTRODUCTION

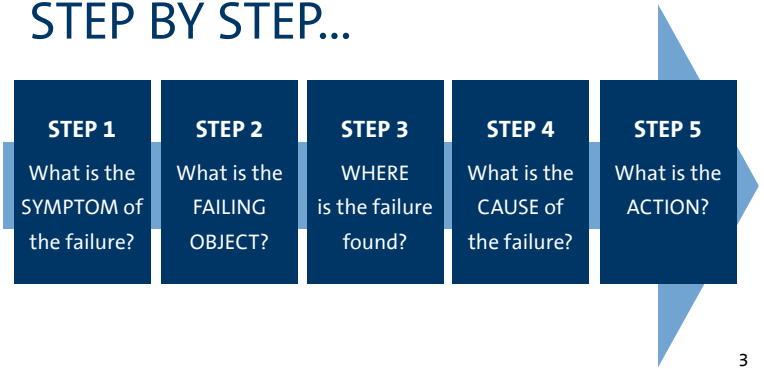
In this folder you will find the Failure Analysis System codes (FAS codes). The codes are divided into symptom, failing object, where, cause and action codes.

All products which fail during the warranty period must undergo a warranty inspection to determine whether it is Warranty, Invoice or Goodwill. All warranties are to be FAS recorded in SAP.

It is mandatory to fill out symptom (step 1), information about the failing object (step 2-4) and action (step 5).

Your inputs are essential for Grundfos in order to sustain customer satisfaction and continuously improve the quality of our products.

STEP BY STEP...



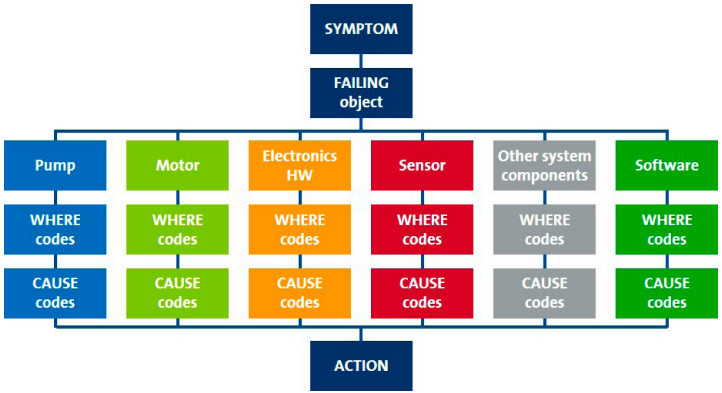
SYMPTOM

Code	Symptom/Damage	Description/Examples
1	Breakage	Visible fracture developed under operation due to material fatique.
2	Noise	Abnormal noise from product which can be caused by rubbing, seizing, damaged bearings etc.
3	Leaking	Product leaking media from connections, shaft seal, gaskets/O-ring, etc.
4	Low capacity/head	Product performance is not according to specification.
5	No operation	Product will not start up.
6	No communication	Not possible to connect from external device or no communication internally between devices.
7	Alarm indication	Alarm indicator on product (Red). Add error code in comment/text field.
8	Malfunction	Any system malfunction.
9	Start/stop cycling	Product starts/stops continually and not as programmed.
10	Wrong signal	Output/input signal not as expected/ programmed.
16	Warning indication	Warning indicator on product (yellow). Add error code in comment/text field.
17	Software feature malfunction	Software feature not working in application.

SYMPTOM

Code	Symptom/Damage	Description/Examples
18	Misinformation	Distorted or unreadable display or otherwise faulty or wrong information.
20	Other symptom	Other symptom not covered by any other symptom code. NOTE: This code must be followed by a keyword and a small description.
31	Safety hazard	Mechanical or Electrical potential safety risk identified. Visual or Instrument/megger indicated, like missing shield, loose fasteners, insulation fault or risk.
32	Red Alert Q-passed	No failure found during a Red Alert Quality-inspection. NOTE: Barcode/Serialno must be logged in FAS.
33	Red Alert rework action	Failure found during a Red Alert Quality-inspection. Rework/replacement action executed. NOTE: Barcode/Serialno must be logged in FAS.

FAILING OBJECT



PUMPS

WHERE

Code	Where/ Object part	Description/Examples
101	Base plate/foot	Component for fastening/clamping/fixing the product to floor/wall/piping system/ frame.
102	Bearing bracket/ flange	Bearing bracket/flange between motor and pump.
103	Pump bearing	Internal pump bearing(s).
104	Chamber	Chamber(s).
105	Clamp	Clamp function.
106	Coupling	Coupling between motor and pump.
107	Cutter	Cutter function in inlet.
108	Drain/air vent/ priming plug	Plugs in pump bases, cover, housing.
109	Ejector	Ejector function in inlet.
110	Impeller	Pump wheel.
111	MAG drive	Magnetic drive unit/inner/outer drive.
112	Neck ring/ wear ring	Neck ring/wear ring on impellers/chambers (missing, abnormal wear, noise, low performance, motor overload, broken/ damaged etc).
113	Non-return valve/flap valve	Non-return valve/flap valve in pump housing/inlet/outlet.

WHERE

Code	Where/ Object part	Description/Examples
114	O-ring/gasket	O-ring/gasket/lip seal at sleeve, flanges or connections.
115	Pump base	Pump base.
116	Pump head/ motor stool	Pump head/motor stool.
117	Pump housing	Pump housing.
118	Pump sleeve	Pump sleeve supports the cooling of the submersible motor.
119	Pump stator-rotor (SQ-flex)	SQ Flex pump parts.
120	Screw/bolt	Screw/bolt.
121	Shaft	Pump shaft.
122	Shaft nut	Shaft nut.
123	Shaft seal	Shaft seal.
124	Spacer (spacing pipe)	Spacer on pump shaft (abnormal wear, broken/damaged, etc).
125	Split cone/nut	Impeller split cone/nut.
126	Strainer	Strainer in pump inlet.
701	Unknown	Object is or has been failing according to alarm or log, but failing component is not identified.
900	No failure found	Failure not found or recreated.

CAUSE

Code	Cause	Description/Examples
201	Alignment	Misalignment between rotating and stationary parts. Seizing, rubbing or noise.
202	Blocked/clogged	Priming valve blocked by impurities, lime stone etc. Dynamic O-ring cannot move on shaft or pipe due to impurities, lime stone etc. Strainer blocked or seal ring blocked.
203	Breakage	Visible fracture developed under operation due to material fatique.
204	Cavitation	Pumps have been exposed for cavitation. Damage in first pump stage (impeller or chamber).
205	Corrosion	Corrosion which appears without leakage, damage on surface or poor surface treatment. Consider high humidity as a factor.
206	Damaged	Part or component damaged, but not broken.
207	Deform/bent	Part geometry deviates from design and drawings.
208	Dry running	Pump has been running without any media. Damage on shaft seal or bearings.
209	Excessive wear	Excessive wear on the part which is more than expected. It can be caused by wrong or missing material, hardening, chemical or particles in the pumped media.

CAUSE

Code	Cause	Description/Examples
210	Loose	Screws, bolts, nuts and other joints or connections are not tightened according to specifications.
211	Machining wrong/missing	Wrong or missing machining of flanges, threads and other components which follow a standard.
212	Melted	O-rings or other gasket, sealing or bearing materials are melted due to high temperatures.
213	Missing	Part or component is missing.
215	Rubbing	Contact between rotating and stationary part. Scratches can be seen on the surface of bearing, shaft, chamber, housing etc.
216	Seized/stuck	Shaft and/or bearing surface are damaged due to direct contact. Sticking between sliding surfaces in the shaft seal. Split cone has rotated or is fixed on the shaft.
217	Solids in media	Any non-fluid matter, which may influence flow. For example: Sludge, sand, metals, tree, plastics, rubber/latex, cloth, fabrics, textiles.

CAUSE

Code	Cause	Description/Examples
218	Swollen	O-ring or gasket has swollen up, for example EPDM has been exposed for oil.
219	Welding defect	Welding is broken or missing or not conducted in the expected way. Corrosion in welding.
220	Setting/ adjustment	Wrong settings or adjustments.
221	Wrong type	Wrong material or part, e.g. wrong O-ring or gasket type for the application. Corrosion due to wrong material (grade) combination.
222	Jammed	Impurities squeezed tightly in impeller.
230	Casting defects	Gas porosity, shrinkage defects, mold material defects, pouring metal defects or metallurgical defects.
231	MAG drive defect	Leaking, broken/damaged bearings/magnets, abnormal wear on bearing/can, misalignment etc.
800	Other cause	Failure is due to a cause not listed. Please write a keyword and a short description in cause text field.
801	Unknown cause	Product not functional, but failure cannot be located.
900	No failure found	Failure not found or recreated.
999	Not analysed	Product failure has not been analysed.

MOTOR

WHERE

Code	Where/ Object part	Description/Examples
121	Shaft	Mechanical damage or other irregularities in the shaft.
123	Shaft seal	Shaft seal.
131	All bearings	Issue with top and bottom bearings at the same time.
132	Bearing bottom	Issue with bottom bearing.
133	Bearing top	Issue with top bearing.
134	Fan	Fan or fan cover damaged.
135	Motor flange	Mechanical damage or other irregularities.
136	O-ring	O-ring damaged.
137	Supply terminals/cable plug/ socket	Mechanical damage or other irregularities in the terminal, plug or socket.
138	Stator windings	Any visible damage or damage ascertain by measuring.
139	Rotor	Any visible damage or damage ascertain by measuring.

WHERE

Code	Where/ Object part	Description/Examples
140	Stator housing	Any visible damage or damage ascertain by measuring.
141	Insulation	Any visible damage or damage ascertain by measuring.
142	Terminals	Mechanical damage or other irregularities in the terminals.
143	End shield	Mechanical damage or other irregularities in the end shield.
144	Motor cable	Mechanical damage or other irregularities in cable or insulation.
145	Capacitor	Start/run/operating capacitor.
146	Membrane	Membrane/diaphragm defect.
147	Liquid	Missing.
701	Unknown	Object is or has been failing according to alarm or log, but failing component is not identified.
900	No failure found	Failure not found or recreated.

CAUSE

Code	Cause	Description/Examples
203	Breakage	Visible fracture developed under operation due to material fatique.
206	Damaged	Exposed to blow or violence.
231	Alarm indication	All motor related alarms which are visible in the motor control unit.
232	Blocked/clogged	Motor is not able to rotate.
233	Burned	Melted due to too much heat, short-circuit or power.
234	Deform/bent	Any form deviation caused by mechanical force or overheating.
235	Faulty windings resistance	When the winding resistance is out of tolerances.
236	Faulty wiring	Faults in wiring. Too many or too few wires.
237	Fuse blown	Fuse is blown.
238	Insulation resistance low	Insulation resistance between the windings is out of tolerance.
239	No function at all	

CAUSE

Code	Cause	Description/Examples
240	Other functional failure	Failure detected, but the failure is not listed in the code set.
241	Seized/stuck	Shaft and/or bearing surface are damaged due to direct contact.
242	Short-circuit	Electronic components or PCBA damaged.
243	Wrong direction	The motor runs in opposite direction.
244	Setting/ adjustment	Wrong settings or adjustments.
245	Grease missing/ low	Bearing grease missing/low.
246	PM weakened	Permanent magnet has reduced magnetic force.
800	Other cause	Failure is due to a cause not listed. Please write a keyword and a short description in cause text field.
801	Unknown cause	Product not functional, but failure cannot be located.
900	No failure found	Failure not found or reproducible.
999	Not analysed	Product failure has not been analysed.

ELECTRONICS & CONTROLS

WHERE

Code	Where/ Object part	Description/Examples
151	Add-on module	Module added to the control box.
152	Aut. circuit breaker	Automatically operated electrical switch designed to protect the electrical circuit from damage.
153	Battery	Backup battery.
154	Cable/wires	Cables or wires used for connections either for power or signals.
155	Controller	Device used for controlling of motors or pumps.
156	Display	Device that presents information in visual form.
157	Enclosure	The box protecting the electronics against water and moisture.
158	Fan/fan cover	A rotating device used for cooling of the electronics.
159	Frequency converter	Device changing the fixed supply voltage or frequency into a variable voltage or frequency.
160	Fuse	Component used to protect against excessive current.
161	Indicator/LED malfunction	Light-emitting diode which displays a visible light.
162	IR communica-tion	The infrared communication between the unit and the handheld remote control.

WHERE

Code	Where/ Object part	Description/Examples
163	Manual motor starter	Manual motor circuit breaker device.
164	PCB/compo-nents	The Printed Circuit Board or electronic components.
165	Power line communication	The power line communication between motor electronics and control unit.
166	Push button	Button which can be pushed by user to manually reset alarm signals.
167	Relay	Device for breaking off or connecting current.
168	Switch	Button for switching on/off power supply or signal.
169	Temperature sensor	Device used for measurements.
170	Terminal(s)	Connection blocks for terminating wires.
171	Thermostat	A temperature dependent breaking or connecting device.
172	Transformer	Device that transfers energy by inductive coupling between its winding circuits.
173	Programming/ data/SW	Program or software which controls the unit.

WHERE

Code	Where/ Object part	Description/Examples
174	Terminal box	Interface between motor and wire termi-nals.
175	VDR	Voltage Dependent Resistor protects cir-cuits against excessive transient voltages.
701	Unknown	Object is or has been failing according to alarm or log, but failing component is not identified.
900	No failure found	Failure not found or recreated.

CAUSE

Code	Cause	Description/Examples
206	Damaged	Exposed to blow or violence.
233	Burned	Melted due to too much heat, short-circuit or power.
236	Faulty wiring	Faults in wiring. Too many or too few wires.
251	Erosion	The slow wearing of solids, especially metals, by chemical attack.
252	Defect	An imperfection, that causes a failure. No function at all.
253	Disconnected	Have lost connection.
254	Excessive temperature	Exposed to too much heat.
255	Lightning	High-voltage discharge of electricity within a cloud.
256	Moisture/water	Exposed to moisture or water.
257	Over voltage	Exposed to over voltage.
258	Setting/ adjustment	Wrong settings or adjustments.
259	Short-circuit	Circuit that allows the current to travel along an unintended path.

CAUSE

Code	Cause	Description/Examples
261	Under voltage	The supply voltage dropped below the needed voltage for operating.
262	Wear out	Abrasive degradation of the component.
263	Wrong/missing	Something wrong or missing.
264	Wrong handling	The handling is not done according to specifications.
265	Cannot be setup	Pre-settings cannot be performed.
266	No communication	No signals go from sender to receiver.
267	Control malfunction	Control system not in operation.
800	Other cause	Failure is due to a cause not listed. Please write a keyword and a short description in cause text field.
801	Unknown cause	Product not functional, but failure cannot be located.
900	No failure found	Failure not found or reproducible.
999	Not analysed	Product failure has not been analysed.

GRUNDFOS SENSOR

WHERE

Code	Where/ Object part	Description/Examples
180	Bluff body	A body in the fluid, which produce a significant pressure drag.
181	Capillary tubes	
182	Complete sensor/unknown	No fault finding done or possible on this stage.
183	Fittings	
184	Flat gasket	
185	Flow pipe	
186	O-ring	
187	Printed circuit board (PCB)	
188	Sensor cable	
189	Sensor house	
190	Sensor membrane	
800	Other part	
701	Unknown	Object is or has been failing according to alarm or log, but failing component is not identified.
900	No failure found	Failure not found or recreated.

CAUSE

Code	Cause	Description/Examples
3	Leaking	Measured media is leaking from sensor, e.g. from cable, connection, etc.
206	Damaged	Exposed to blow or violence.
271	Ambient pressure too high	
272	Ambient temp. too high	Part or component almost melted, e.g. cable, O-rings, etc.
273	Hazardous environment	Corrosion or other chemical wear on product.
274	IP class exceeded	Water on PCB (printed circuit board), but not in the bottom of the sensor around sensor membrane.
275	Missing	Part or component is missing, e.g. O-ring, sensor membrane, gasket, bluff body, fittings, etc.
276	No signal	No signal from sensor.
277	Sedimentation	Sedimentation or pollution on sensor membrane (a new membrane is glossy like a mirror).

CAUSE

Code	Cause	Description/Examples
278	Threads damaged	The threads have been exposed to a blow or violence due to wrong handling or installation.
279	Used out of specification	If the customer informs that the product has been used out of specifications.
280	Excessive wear	Excessive wear on the part, more than expected.
281	Welding defect	Welding is broken or missing or not conducted in the expected way. Corrosion in the welding.
282	Wrong signal	Sensor is sending signal, but the signal is not correct or regulating.
800	Other cause	Failure is due to a cause not listed. Please write a keyword and a short description in cause text field.
801	Unknown cause	Product not functional, but failure cannot be located.
900	No failure found	Failure not found or recreated.
999	Not analysed	Product failure has not been analysed.

OTHER SYSTEM COMPONENTS

WHERE

Code	Where/ Object part	Description/Examples
401	Accessories	Products and/or components supplied by Grundfos.
402	Base frame	Frame on which the Hydro Booster and/or control panel system is mounted.
403	Blind flange/ end cap	Flange, threaded or welded cap used to blind one end of the manifold.
404	Cable	Cables connecting control panel to the pumps and mains.
405	Isolation valve	Ball valve, butterfly valve and gate valves used for isolating flow.
406	Manifold	Suction and discharge manifolds for a Hydro Booster system.
407	Pressure gauge	Device for measuring liquid pressure.
408	Non-Grundfos switch/sensor	All switches and sensors not manufactured by Grundfos.

WHERE

Code	Where/ Object part	Description/Examples
409	Non-return valve	Non-return or check valves.
410	Pipe/fittings	All pipes, fittings and other connectors between manifold and pumps.
411	Tank	Diaphragm, membrane and bladder tanks supplied as option or accessory by Grundfos.
700	Other part	Parts and/or components mounted, but not listed.
701	Unknown	Object is or has been failing according to alarm or log, but failing component is not identified.
900	No failure found	Failure not found or recreated.

CAUSE

Code	Cause	Description/Examples
221	Wrong type	Wrong pump, tank or control panel according to the bill of material or customer specification.
236	Faulty wiring	Faulty wiring can be seen on pumps running the wrong way, non-functional or burned electrical components.
258	Setting/ adjustment	Wrong settings or adjustments. This refers to the control unit and/or sensors and switches.
280	Excessive wear	Excessive wear on the part which is more than expected. It can be caused by wrong or missing material, hardening, chemical or particles in the pumped media.
421	Cable defective	Broken cables, poor connection with terminals and/or bushes and cable shoes.
422	Charge pressure incorrect	Incorrect charge pressure on tanks can influence start/stop of pumps.
423	Component missing	Missing component which can be found by comparing the bill of material with the actual order or customer specification.
424	Construction failure	Poor execution and assembly of components either by manufacturing or design.

CAUSE

Code	Cause	Description/Examples
425	Corrosion	Corrosion which appears without leakage, damage on surface or poor surface treatment. Consider high humidity as a factor.
426	Crack	Cracks which can be found on all materials either caused by frost, excessive usage, wrong material or handling.
427	Deposit	Surplus materials from production which either damage components or gather debris that leads to bacteria growth.
428	Disconnected	Disconnected either on a breaker switch, removed from terminals or automatically by the control unit due to a failure.
429	Excessive liquid temp.	Mainly shows on non-return valves and rubber parts which are losing their function or melting down.
430	Frost damage	When components are deformed or broken as a result of frozen liquid which expands.
431	Installation failure	Burned electronics caused by wrong connection or overload, wrong torque and alignment with the pipes at the site.
432	Machining wrong/missing	Wrong or missing machining of flanges, threads and other components which follow a standard.

CAUSE

Code	Cause	Description/Examples
433	Production failure	Pump or non-return valve placed opposite the flow direction, wrong torque and not according to the order.
434	Sales failure	Product used in an application which does not correspond with the actual design.
435	Transport/ handling	Damages caused during wrong transportation, handling and/or lifting the Hydro Booster system.
436	Vibration	Vibration is mainly caused by imbalance of components rotating like the motor and pump.
437	Water hammer	Mainly shows on non-return valves where the inserts are damaged.
438	Welding defect	Shows on manifolds and double flanges, but can also be seen on the pump.
439	Wrong component	Wrong component mounted according to pressure stage, dimensions and/or electrical requirements.
800	Other cause	Failure is due to a cause not listed. Please write a keyword and a short description in cause text field.
801	Unknown cause	Product not functional, but failure cannot be located.
900	No failure found	Failure not found or recreated.
999	Not analysed	Product failure has not been analysed.

SOFTWARE CODES

WHERE

Code	Where/ Object part	Description/Examples
501	Control board	Controller, control unit, front-end.
502	Power board	Power electronics, back-end.
503	Communication	Bus, GENI-bus, radio, IR, bluetooth, etc.
504	Display	User interface - basic or advanced.
505	Accessories	PC tool, Grundfos GO etc.
506	Add-on modules	Add-on electronics, fieldbus, etc.
701	Unknown	Object is or has been failing according to alarm or log, but failing component/module is not identified.
900	No failure found	Failure not found or recreated.

CAUSE

Code	Cause	Description/Examples
601	Wrong/old software version	Detected either by tool or print on nameplate.
602	Communication to SCADA/BMS failure	Ex: Handshake lost.
603	Wrong configuration of product	Hardware or software elements are missing or wrong.
604	Data error, wrong values	Data or values outside boundaries.
605	Wrong texts, language errors	Misspellings or unclear wording.
606	Internal communication faults	Between modules X and Y: ErrorCode zzz. Please write code in cause text field.
607	Internal software error code	In module X: Error code xxx. Please write code in cause text field.
800	Other cause	Failure is due to a cause not listed. Please write a keyword and a short description in cause text field.
801	Unknown cause	Product not functional, but failure cannot be located.
900	No failure found	Failure not found or recreated.
999	Not analysed	Product failure has not been analysed.

ACTION

ACTION

Code	Symptom/Damage	Description/Examples
1	Repair	Restore faulty product to a condition where it can perform as intended.
2	Replace complete product	Replace faulty product with a product equally good to perform as intended.
3	Replace failing object/part	Replace faulty object or part with a new object or part to restore a condition where the product can perform as intended.
4	Adjust parameter	Alter/change a parameter in order to achieve the desired fit, appearance or result.
5	Update software	Make the software up to date.
6	Refund	Pay back money to customer who is not satisfied with the goods or service bought.
7	None - Q-passed	No action needed after Q-inspection - initiated by a Red Alert.
8	Rework	Make changes to the original version of the product.

MORE INFORMATION

For more information about warranty and quality, please visit Service & Solutions on Insite:
(Group Portal > Select Site > Service & Solutions).

If you are an authorised service partner, please use your local Grundfos service contact:

Local contact 1:

Name:

Phone:

e-mail:

Local contact 2:

Name:

Phone:

e-mail:

be think innovate

GRUNDFOS Holding A/S
Poul Due Jensens Vej 7
DK-8850 Bjerringbro
Tel: +45 87 50 14 00
www.grundfos.com

09.2018/GROUP QUALITY