

# ISO 20431:2023-07 (E)

## Heat treatment - Control of quality

---

<b>Contents</b>		<b>Page</b>
Foreword .....		v
Introduction .....		vi
<b>1</b>	<b>Scope .....</b>	<b>1</b>
<b>2</b>	<b>Normative references .....</b>	<b>1</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>1</b>
<b>4</b>	<b>System for assessment and scoring of requirements and recommendations .....</b>	<b>3</b>
4.1	General .....	3
4.2	General requirements .....	4
4.3	Scoring of requirements and recommendations .....	4
4.3.1	General .....	4
4.3.2	Scoring of requirements .....	4
4.3.3	Scoring of recommendations .....	4
4.4	Assessment of the heat treatment facility .....	5
<b>5</b>	<b>Requirements and recommendations .....</b>	<b>6</b>
5.1	General organisation of a heat treatment facility .....	6
5.1.1	Documentation (references GO1 to GO3) .....	6
5.1.2	Management responsibility (references GO4 and GO5) .....	6
5.1.3	Human resources management (references GO6 to GO10) .....	7
5.1.4	Infrastructure and equipment management (references GO11 to GO25) .....	7
5.1.5	Internal audit (reference GO26 and GO27) .....	8
5.1.6	Control of nonconforming product (references GO28 to GO36) .....	8
5.1.7	Continuous improvement (references GO37 and GO38) .....	9
5.1.8	Failure mode, effect and criticality analysis (FMECA) (references GO39 to GO41) .....	9
5.1.9	Monitoring plan (references GO42 to GO44) .....	9
5.1.10	Preproduction quality planning (reference GO45 and GO46) .....	9
5.1.11	Statistics: (references GO47 to GO49) .....	9
5.1.12	Controlling monitoring and recording (references GO50 to GO62) .....	10
5.2	Contract review and heat-treatment conception .....	11
5.2.1	Contract review .....	11
5.2.2	Heat-treatment conception .....	11
5.3	Carrying out heat treatments: preparation .....	11
5.3.1	General .....	11
5.3.2	Load preparation .....	12
5.4	Carrying out heat treatment: Control of the thermal cycle .....	13
5.4.1	Temperature drift and heat-treatment temperature error (references T1 to T10) .....	13
5.4.2	Measuring equipment error SAT (system accuracy test) (references T11 to T17) .....	15
5.4.3	Temperature uniformity survey (TUS) of furnace (references T18 to T31) .....	17
5.4.4	Drift of the soak times of the various heat-treatment phases (references HTT1 to HTT2) ...	20
5.5	Mastering of the heat-treatment medium .....	21
5.5.1	General .....	21
5.5.2	Control of carbon-containing atmosphere .....	21
5.5.3	Control of nitriding, nitrocarburising and derived heat-treatment atmospheres .....	22
5.5.4	Control of salt bath and drift of treatment medium .....	22
5.5.5	Control of operational conditions of surface hardening after induction superficial heating .....	22
5.5.6	Laser hardening (references L1 to L4) .....	23

5.5.7	Vacuum or low-pressure heat treatment (references V1 to V7) .....	24
5.6	Control of cooling .....	24
5.6.1	Equipment control and heat-treatment reproducibility (references CEQ1 to CEQ3) .....	24
5.6.2	Control of cooling parameters (references CPM1 to CPM12) .....	24
5.7	Control of product .....	25
5.7.1	Drift of testing means (references CP1 and CP2) .....	25
5.7.2	Non-conforming product (references CP3 to CP5) .....	25
5.8	Finishing process .....	25
Annex A (normative) Equipment calibration and frequency control .....		27
Annex B (informative) Example of scoring table for requirements and recommendations .....		29
Annex C (informative) Example of heat-treatment facility assessment .....		35
Annex D (normative) Measuring chain testing methods (SAT - system accuracy test) .....		36
Bibliography .....		41