T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Engineering, Manufacturing, Processing and Control

Employer-Set Project (8730-034)

Project Brief Autumn 2023

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The employer

JDH Engineering is a medium sized manufacturer of components and assemblies. They have stores of raw materials, which contain a variety of stainless steel tubes, so that appropriate materials are available on demand. This allows client orders to be put into production with minimal lead time.

The project

Efficient production requires raw materials that are the correct size and type to be delivered to a manufacturing area from the stores held onsite. There is a constant stream of materials being taken from the stores, and deliveries with replacement stock being stored on material racks.

When stainless steel stock tubes arrive at the manufacturing area, one essential check carried out by staff is to ensure that the size of tube being delivered is correct and meets the dimensions required by the company.

Recently, JDH Engineering has seen an increase in the number of components failing quality checks later in the manufacturing process. A root cause of this issue has been identified as staff being unable to measure the stainless steel tubes correctly when they are received in the manufacturing area. It's been found that staff are unfamiliar with, and lack the skills, to be able to use measurement equipment such as Vernier callipers, digital callipers and micrometers correctly.

In response to this process failure and to assure quality, JDH Engineering have decided to design and manufacture a series of simple 'go/no-go' gauges. The gauges will be used to measure the internal and external sizes of the tubes being delivered. These gauges will be used by staff to improve the accuracy and reliability of the measurement checks. It is key that these gauges are easy to use, can be used by workers in the store that are non-engineering specialists who will be carrying out the checks.

Project tasks

As an Engineering Technician, you are tasked with designing a series of ‘go/no-go’ gauges to meet JDH Engineering’s needs. The gauges must check the internal and external sizes of ∅5 mm, ∅20 mm, ∅50 mm, ∅150 mm tubes. The gauges need to be designed in accordance with the tolerance limits given in Table 1.

Specific issues

A manager at JDH Engineering has identified some specific issues which relate to this task:

- dimensional limits for the gauge will need to be calculated from the data provided in Table 1
- the gauge will need to take into consideration the potential range of stainless steel tube tolerances, provided in Table 2.

Gauge requirements

Gauges can be considered a hand tool as well as a measuring instrument. The design or type of 'go/no-go' gauge needs to consider ergonomic factors so that it is easy to handle. Gauges should be lightweight and safe to use.

Table 1 – Limits and Tolerances for Plain Limit Gauges

Workpiece Tolerance (mm)	Internal Gauges		External Gauges	
	Go (mm)	Not Go (mm)	Go (mm)	Not Go (mm)
0.009 ≤ 0.018	**L** +0.002 +0.001	**H** 0 -0.001	**H** -0.001 -0.002	**L** +0.001 0
> 0.018 ≥ 0.032	**L** +0.003 +0.001	**H** 0 -0.002	**H** -0.001 -0.003	**L** +0.002 0
> 0.032 ≥ 0.058	**L** +0.005 +0.002	**H** 0 -0.003	**H** -0.002 -0.005	**L** +0.003 0
> 0.058 ≥ 0.100	**L** +0.008 +0.004	**H** 0 -0.004	**H** -0.004 -0.008	**L** +0.004 0
> 0.100 ≥ 0.180	**L** +0.013 +0.007	**H** 0 -0.006	**H** -0.007 -0.013	**L** +0.006 0
> 0.180 ≥ 0.320	**L** +0.021 +0.012	**H** 0 -0.009	**H** -0.012 -0.021	**L** +0.009 0
> 0.320 ≥ 0.580	**L** +0.039 +0.025	**H** 0 -0.014	**H** -0.025 -0.039	**L** +0.014 0
> 0.580 ≥ 1.000	**L** +0.073 +0.048	**H** 0 -0.025	**H** -0.048 -0.073	**L** +0.025 0
> 1.000 ≥ 1.800	**L** +0.120 +0.080	**H** 0 -0.040	**H** -0.080 -0.120	**L** +0.040 0
> 1.800 ≥ 3.200	**L** +0.205 +0.155	**H** 0 -0.050	**H** -0.155 -0.205	**L** +0.050 0

Table 2 – Delivery Sizes for Stock Stainless Steel Tube

Nominal O/D	Tolerance on O/D	Nominal I/D	Tolerance on I/D
Ø5 mm	+/-0.08 mm	Ø3.5 mm	+/-0.05 mm
Ø20 mm	+/-0.08 mm	Ø17 mm	+/-0.08 mm
Ø50 mm	+/-0.20 mm	Ø42 mm	+/-0.20 mm
Ø150 mm	+/-0.75 mm	Ø125 mm	+/-1.88 mm

Get in touch

City & Guilds Technicals Quality Team

We are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

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