SHEAR STUD

SUBMISSION FILE

IFORM ENGINEERING LIMITED

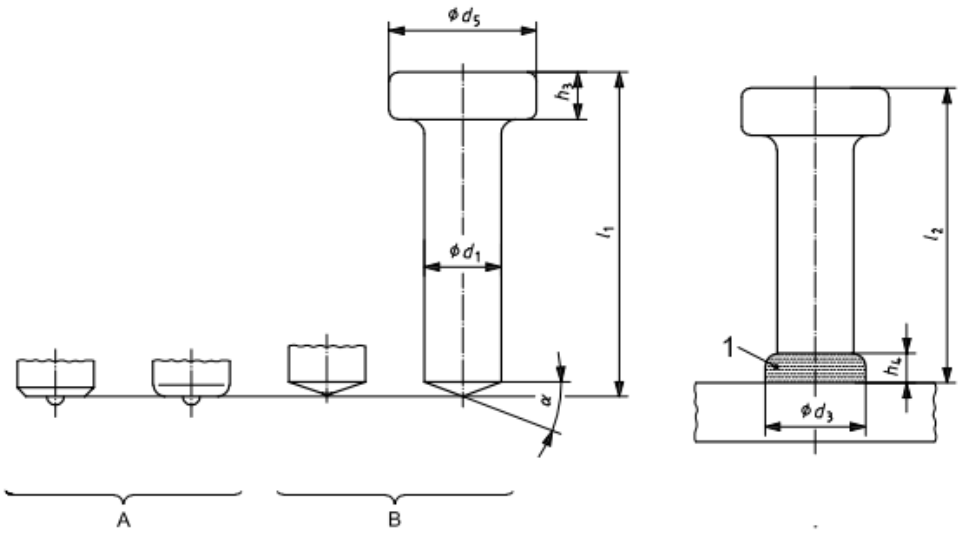
UNIT 1110, SHUN FAT INDUSTRIAL BUILDING,
NO.17 WANG HOI ROAD,
KOWLOON BAY
HONG KONG

Shear Studs General Information

STUD DIMENSION

The length dimension (L) carried throughout this specification is the overall length of the stud.

Please see the following table for your information.



Key

1 weld collar
A shape A of tip (example)
B shape B of tip (example)

Figure 5 — Shear connector (SD)

Table 10 — Dimensions of shear connectors (SD) with l_2 according to Table A.4

Dimensions in millimetres

d_1 – 0,4[a, e]	9,5	10	12,7	13	16	19	22	25	25,4
d_5 ± 0,3	19		25		32[d]	32	35	41	
d_3[c]	13		17		21	23	29	31	
h_3 $^{+1}_{-0,5}$	7		8		8	10	10	12	
h_4[c]	2,5		3		4,5	6	6	7	
α ± 2,5°	22,5°		22,5°		22,5°	22,5°	22,5°	22,5°	
l_1 ± 1,5	l_2[b, c] + 3		l_2[b, c] + 3		l_2[b, c] + 4	l_2[b, c] + 4,5	l_2[b, c] + 5	l_2[b, c] + 5,5	

[a] Excess diameter or production impressions in the shaft area below the head are permitted up to 0,5 mm, provided they do not affect proper plunge.

[b] Tolerance on l_2 is $^{+1}_{-2}$ mm.

[c] For special conditions, e.g. through-deck stud welding, the dimensions and the tolerances are not applicable.

[d] May be reduced to 29 mm for shear application.

[e] Use of the optional dimension depends on national regulations.

Specification For Construction Studs

Shear Connector

SHEAR CONNECTOR STUDS are designed to tie concrete to the steel beams and to resist shear loadings between the concrete slab and steel beam in composite construction. All orders for studs include required FERRULES.

Mechanical Property Requirements Table

ANSI / AWS D1.1:1996

Tensile Strength	≧ 415MPa
Yield Strength	≧ 345MPa
Elongation	≧ 20%
Reduction of area	≧ 50%

BS 5950

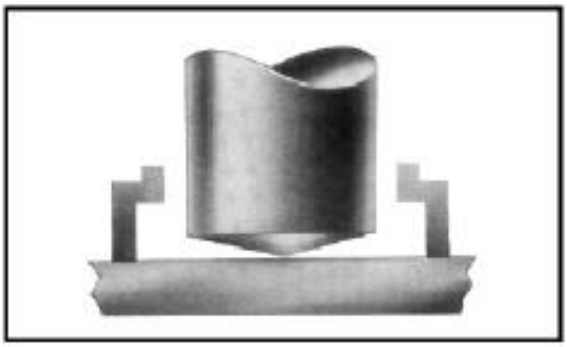
Tensile Strength	≧ 450MPa
Yield Strength	≧ 350MPa
Elongation	≧ 18%
Reduction of area	/

ISO 13918

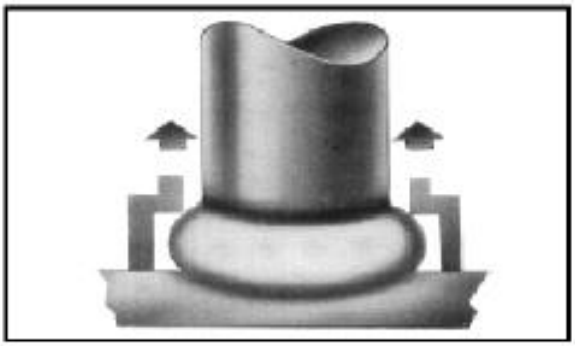
Tensile Strength	≧ 450MPa
Yield Strength	≧ 350MPa
Elongation	≧ 15%
Reduction of area	/

The process

The Arc Stud Welding Process

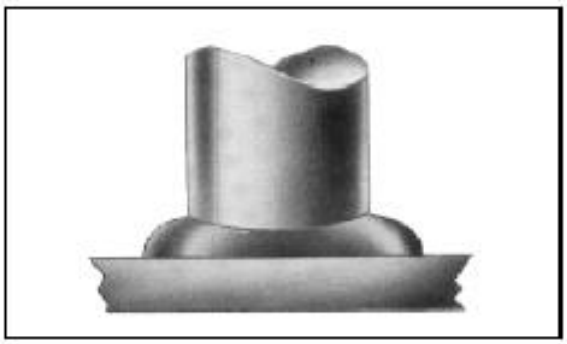


1. Stud and ceramic ferrule against the WORK PLATE



2. Stud lifts and arc is drawn

3. Control times out and stud plunges into Molten Steel



4. Metal solidifies and weld is COMPLETED in miliseconds

ARC stud welding involves the same basic principles and metallurgical aspects as any other arc welding procedures. The weld fun lifts the stud a short distance from the base metal and initiates a controlled electric arc from the power source which melts the end of the stud and a portion of the base metal. The ceramic ferrule contains the MOLTEN METAL into which the stud is trust automatically and a high-quality fusion weld is accomplished.

ARC stud welding is generally used to weld larger diameter studs to thick base metals. ARC stud may be almost any shape. However, they must have one end of the stud designed for ARC welding and must be made of weld-able materials. Mild steel, stainless steel and aluminum are applicable materials for ARC stud welding

Procedures for stud welding

Shear Connectors

In order to achieve optimum results in any shear connector weld, it is imperative that the following procedures be followed:

1. Top Flange of Beam

The top flange of all beams or plate to be welded should be free of paint, excessive rust or mill scale, dirt, moisture and all other foreign materials. These materials are contaminants to any welding process, BUT especially stud welding due to the short duration of the weld cycle.

2. Structural Ground

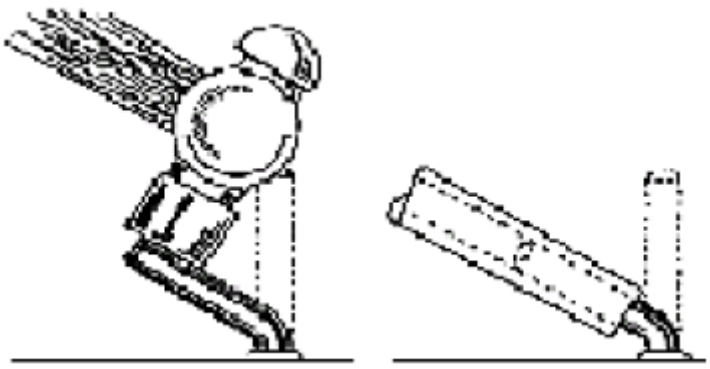
It is always recommended that the welding ground be attached to a spot on a beam that has been ground clean. Poor or inadequate ground connections can result in a loss of weld current and, therefore, affect weld quality.

3. Welding Current

It is essential to have the correct weld current for each application. The normal ranges are listed below. When excessive cable lengths are use, the result will be a reduction in weld current. This can contribute to weld inconsistency or even weld failure. Always use 4/0 cables in welding circuit, when excessive length is required. The amount of cable totally depends upon the power source being used. It may be necessary in some cases to parallel cable when long runs are necessary.

4. Testing of Welded Studs

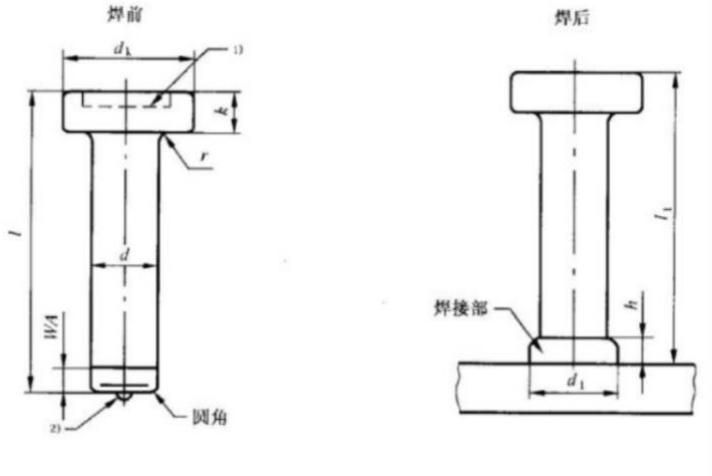
At least two studs should be bent in any direction to a 30-degree angle from weld position striking with a hammer or bending with a pipe. If failure occurs, re-adjust settings and repeat test. Once the the set-up has been approved; production may be started. This can be accomplished by bending several studs to a 15-degree angle from weld position. If failure does not occur, the weld should be considered good. It is not necessary to straighten a stud that is bent. Testing should be carried out at the beginning of each day, after any change in operator or if the set-up is changed in any way.



Shear connector

Bolt Dimension

Dimension in mm		10	13	16	19	22	25
d	min	9.64	12.57	15.57	18.48	21.48	24.48
	max	10	13	16	19	22	25
dk	min	18.35	22.42	29.42	32.5	35.5	40.5
	max	17.65	21.58	28.58	31.5	34.5	39.5
d1		13	17	21	23	29	31
h		2.5	3	4.5	5	6	7
k	min	7.45	8.45	8.45	10.45	10.45	12.55
	max	6.45	7.55	7.55	9.55	9.55	11.45
r	min	2	2	2	2	3	3
WA		4	5	5	6	6	6



Chemical Composition of Material

Material	C%	Si%	Mn%	P%	S%
ML.15/ML.15A1	≦0.20	≦0.10	0.30-0.90	≦0.04	≦0.04

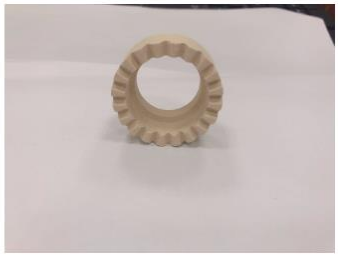
Ceramic Ferrule

UF 19 (Type A – 20 teeth)

Lower Outside Diameter: 31.5mm
Upper Outside Diameter: 27mm
Height: 18mm
Tooth: 20 No.

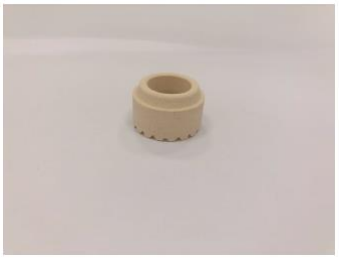

UF 25 (Type A – 20 teeth)

Lower Outside Diameter: 41mm
Upper Outside Diameter: 36mm
Height: 21mm
Tooth: 20 No.

UF 16 (Type A – 18 teeth)

Lower Outside Diameter: 27.5mm
Upper Outside Diameter: 23.5mm
Height: 18mm
Tooth: 18 No.

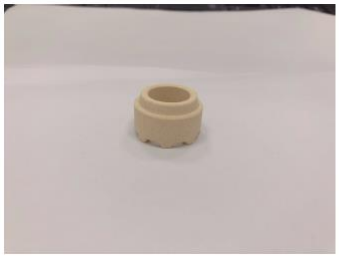



UF 22 (Type A – 20 teeth)

Lower Outside Diameter: 37mm
Upper Outside Diameter: 32mm
Height: 20mm
Tooth: 20 No.

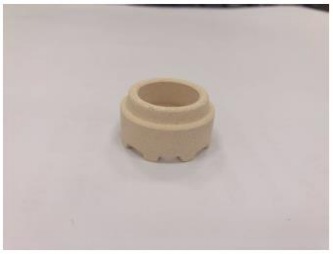
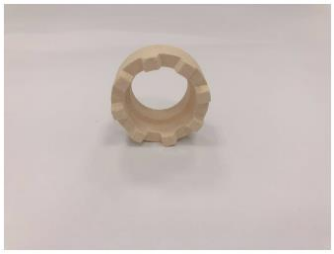

UF 16 (Type B – 8 teeth)

Lower Outside Diameter: 27.5mm
Upper Outside Diameter: 23.5mm
Height: 17.5mm
Tooth: 8 No.




UF 19 (Type B – 8 teeth)

Lower Outside Diameter: 31.5mm
Upper Outside Diameter: 27mm
Height: 18mm
Tooth: 8 No.

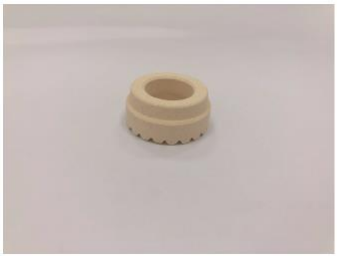



UF 22 (Type B – 8 teeth)

Lower Outside Diameter: 37mm
Upper Outside Diameter: 31mm
Height: 19mm
Tooth: 8 No.

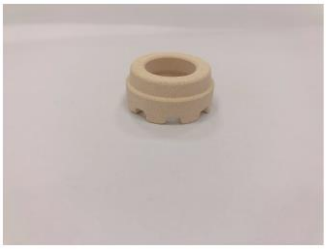
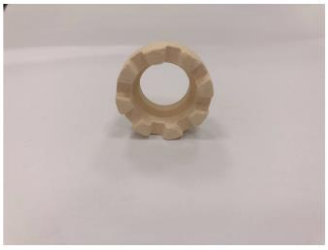

UF 16 (Type A – 18 teeth)

Lower Outside Diameter: 29.5mm
Upper Outside Diameter: 27mm
Height: 14mm
Tooth: 18 No.



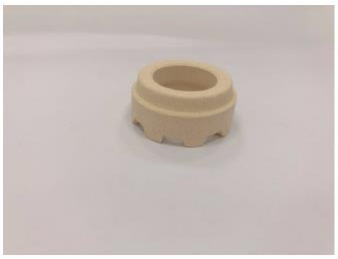

UF 16d (Type B – 8 teeth)

Lower Outside Diameter: 30mm
Upper Outside Diameter: 27mm
Height: 14mm
Tooth: 8 No.

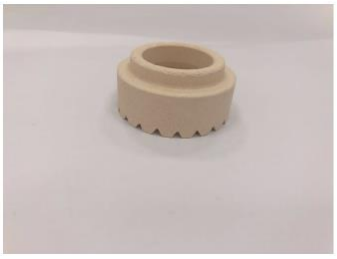
UF 19d (Type B – 8 teeth)

Lower Outside Diameter: 34mm
Upper Outside Diameter: 31mm
Height: 16mm
Tooth: 8 No.




UF 22 (Type A – 20 teeth)

Lower Outside Diameter: 39.5mm
Upper Outside Diameter: 32mm
Height: 21mm
Tooth: 20 No.

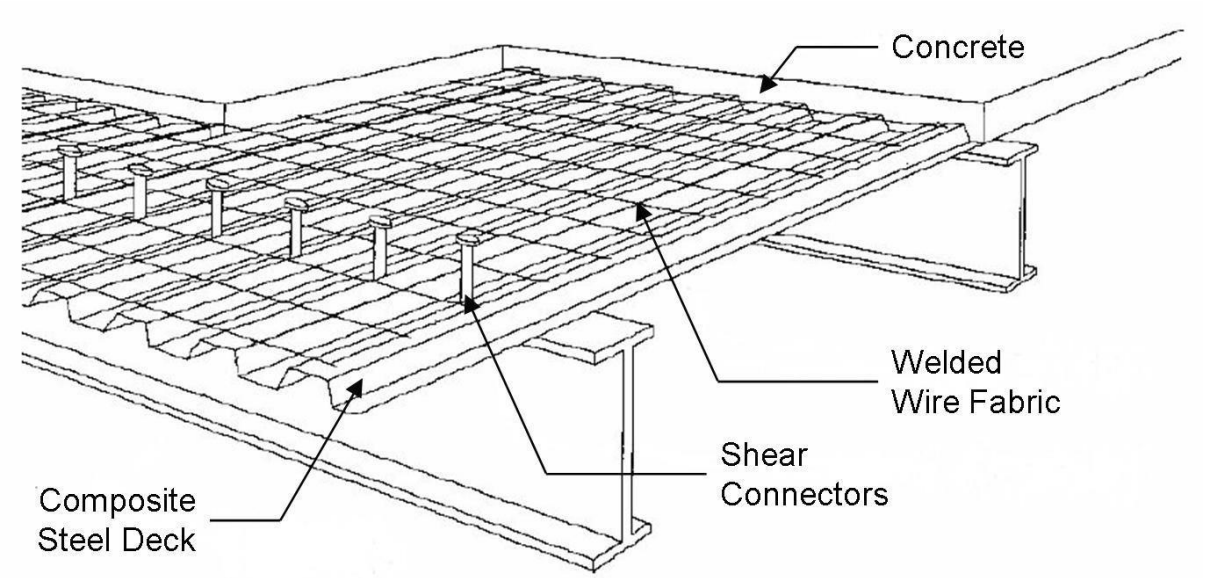



Welding Machine

Compatible with Nelweld Welding Machine

Machine Setting Up
I(A) = 1500
t(s) = 0.9

Composite Construction



Adapted From (ASCE 2002)

Composite construction refers to two load-carrying structural members that are integrally connected and deflects as a single unit.

An example of this is composite metal deck with concrete fill, steel filler beams, and girders made composite by using headed stud connectors.

A steel beam which is made composite by using shear connectors, composite metal decking and concrete is much stronger and stiffer than the base beam alone.

Composite floor systems are considered by many to be the highest quality type of construction. This has become a standard type of construction selected by many architects, engineers, and developers.

Advantages of Composite Construction

In a composite floor system the concrete acts together with the steel to create a stiffer, lighter, less expensive structure.

- It is typical to have a reduced structural steel frame cost
- Weight of the structural steel frame may be decreased which may reduce foundation costs
- Reduced live load deflections
- Shallower beams may be used which might reduce building height
- Increased span lengths are possible
- Stiffer floors

iForm Shear Studs – Hammer Test

iForm Shear Studs – Tensile Test Report

深圳市明基检测技术有限公司
SHENZHEN MINGJI TESTING TECHNOLOGY CO.,LTD.

TEST REPORT (报告) (Tensile Test of reinforcement bar or bar or through—thickness characteristics/ 钢筋或棒材或厚度方向拉伸)

Report Nº (报告编号): TT-240330-01

Page(页数)1 of 3 AMD Nº (修改次数):

Job Nº (工作编号):	240330-01
Date of Test(检测日期):	30-Mar.-2024
Date of First Issue(发行日期):	1-Apr.-2024

INFORMATION AS PROVIDED BY CUSTOMER(下述资料由客户提供)

Name of Customer*(客户名称):	iForm Engineering Limited
Address of Customer*(客户地址):	Unit 1110, Shun Fat Industrial Building, No. 17 Wan Hoi Road, Hong Kong
Project Reference*(工程名称):	General Project
Unit Under Test*(检测对象):	Stud
Test Standard*(检测标准):	BS EN ISO 6892-1:2019
Sample(s) Provided by*(试样提供):	/
Other requirement*(其他要求):	/

Procedure & Test Device(工艺及检测设备)

Equipment (设备):	Universal testing machine (万能试验机) SHT4106
EQM No.(设备编号):	MJ0013
Max. Load (最大负荷量程):	1000kN
Test Temperature (试验温度):	23°C to 23°C
Testing conditions (测试条件):	BS EN ISO 6892-1-2019 A123
Sample preparation (试样制备):	Accord with standard

Tested by: 何忠鹏
(检测者)

Approved Signatory: 姜钦鸿Q.H.JIANG
(授权签字人)

深圳市宝安区福永街道桥头社区立新路2号G栋G3-100
G3-100 Building G, No. 2 LiXin Road, BuYong, BaoAn, ShenZhen, P. R. China.
Tel (电话): 0755-29944539 Fax (传真): 0755-29944983

TEST REPORT (报告) (Tensile Test of reinforcement bar or bar or through—thickness characteristics/ 钢筋或棒材或厚度方向拉伸)

Report No (报告编号): TT-240330-01

Page(页数)2 of 3 AMD No (修改次数):

Sample note(试样说明)

Customer Sample No.* (客户编号)	MJ.Sample No.(明基试样编号)	Material description (材料说明)	Heat No. (炉号)	Mill steel No. (材质证书号)	Raw Material (材质)	(1)Sample Type (试样类型)	(1)Sample Selected Description (取样说明)	(2)Sample size (试样尺寸)		(3) Lo(mm) (原始标距)	(3) Le(mm) (引伸计标距)
								D	So		
1-1	TT-24-96-1	Φ19×100	/	/	SD1	/	D=10	9.97	78.03	50	50
1-2	TT-24-96-2	Φ19×100	/	/	SD1	/	D=10	9.98	78.19	50	50
1-3	TT-24-96-3	Φ19×100	/	/	SD1	/	D=10	9.98	78.19	50	50

Remark: Type A: Perpendicular to Rolling Direction(垂直于轧制方向); Type B: Parallel to Rolling Direction(平行于轧制方向);
备注(1) Type E: Others, specify here(其他, 在此说明):

(2) a:Thickness(mm) (试样厚度) b:Width(mm) (试样宽度)If the parallel part is circular, the measured value is diameter (mm) (如果平行长度部分为圆形，则测量值为直径 D。) So:Area(mm²) (横截面积。)

(3) Lo: Original Gauge Length (原始标距) Le: Extensometer Gauge Length (引伸计标距)

深圳市宝安区福永街道桥头社区立新路2号G栋G3-100
G3-100 Building G, No. 2 LiXin Road, FuYong, BaoAn, ShenZhen, P. R. China.
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Report No (报告编号): TT-240330-01

Page(页数)3 of 3 AMD No (修改次数):

Test Results(检测结果)

Customer Sample No.* (客户编号)	MJ Sample No. (明基试样编号)	Tensile Strength (抗拉强度) R_m (MPa)	Yield Strength (屈服强度) (MPa)	R_m/R_{eH} or $Rp_{0.2}$ (拉伸强度/屈服强度比)	Percentage Elongation after fracture(断后延伸率)A (%)	Percentage total elongation at maximum force A_{gt}(总延伸率)(%)	Percentage reduction of area(断面收缩率)Z(%)
1-1	TT-24-96-1	488	391	/	21.5	/	/
1-2	TT-24-96-2	483	382	/	20.5	/	/
1-3	TT-24-96-3	505	401	/	20.5	/	/

Note(说明): BS EN ISO13918-2018 SD1:

Rm≥450Mpa; R_{eH}≥350MPa; A5≥15%.

**This standard is referenced from the material certificate description and is not included in the HOKLAS scope of accreditation. 此标准引用材质证书说明，未包括在 HOKLAS 认可范围内。

The results apply only to the item inspected at the time of the examination.
HKAS has accredited this laboratory (Reg.No. HOKLAS 261) under HOKLAS for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories.

*Information where applicable was submitted by the customer.

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G3-100 Building G, No. 2 LiXin Road, FuYong, BaoAn, ShenZhen, P. R. China.
Tel (电话): 0755-29944539 Fax (传真): 0755-29944983

Job Reference

Client	Project	Year
Wan Kei Geotechnical Eng. Co., Ltd	Teaching-Research Complex, Area 39, The Chinese University of Hong Kong, Shatin	2024

FUGRO CERTIFICATION SERVICES LIMITED

Certificate No. : Q0402

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that

iFORM Engineering Limited

at

Unit 1110, Shun Fat Industrial Building, 17 Wang Hoi Road, Kowloon Bay, Hong Kong

has been found to conform to the Quality Management System Standard:

ISO 9001:2015

This certificate is valid for the following scope of certification:

Design and supply of fabricated structural steel works

This certificate remains valid subject to satisfactory maintenance of the system which will be monitored by Fugro Certification Services Limited.

Signed for and on behalf of

FUGRO CERTIFICATION SERVICES LIMITED

Place and Date
Hong Kong, 26 November 2022

Arthur Cheng
Certification Manager

Original Certification Date : 26 November 2022

Expiry Date : 26 November 2025

Address : Fugro Development Centre, 5 Lok Yi Street, Tai Lam, Tuen Mun, New Territories, Hong Kong
Tel : +852-2452 7188 Fax : +852-2452 7181 Email : fcs@fugro.com Website : www.fugro.com